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June 20, 2018

**VIA ELECTRONIC FILING AND
OVERNIGHT DELIVERY**

M. Lynn Jarvis, Chief Clerk
North Carolina Utilities Commission
4325 Mail Service Center
Raleigh, North Carolina 27699-4300

**RE: Duke Energy Progress, LLC's Application for Approval of Demand-Side Management and Energy Efficiency Cost Recovery Rider
Docket No. E-2, Sub 1174**

Dear Ms. Jarvis:

I enclose Duke Energy Progress, LLC's Application for Approval of Demand-Side Management and Energy Efficiency Cost Recovery Rider, together with Direct Testimony and Exhibits of Carolyn T. Miller and Robert P. Evans, for filing in connection with the referenced matter.

I will deliver fifteen (15) paper copies of the Application, Direct Testimony, and Exhibits, as well as a flash drive containing the supporting workpapers for the filing, to the Clerk's Office by close of business on June 21, 2018, via overnight delivery.

Thank you for your attention to this matter. If you have any questions, please let me know.

Respectfully submitted,

Electronically submitted
s/ Molly McIntosh Jagannathan
molly.jagannathan@troutmansanders.com

Enclosure

Copy: Parties of Record

BEFORE THE NORTH CAROLINA UTILITIES COMMISSION

DOCKET NO. E-2, SUB 1174

In the Matter of Application of Duke Energy Progress, LLC for Approval of Demand-Side Management and Energy Efficiency Cost Recovery Rider Pursuant to N.C. Gen. Stat. § 62-133.9 and Commission Rule R8-69	)))))))	**APPLICATION OF DUKE ENERGY PROGRESS, LLC FOR APPROVAL OF DEMAND-SIDE MANAGEMENT AND ENERGY EFFICIENCY COST RECOVERY RIDER**

Duke Energy Progress, LLC ("DEP" or the "Company"), pursuant to N.C. Gen. Stat. § 62-133.9 and Rule R8-69 of the Rules and Regulations of the North Carolina Utilities Commission (the "Commission"), hereby applies to the Commission for approval of its demand-side management ("DSM") and energy efficiency ("EE") cost recovery rider for 2019. In support of this Application, DEP respectfully shows the Commission the following:

1. The Applicant's general offices are located at 410 South Wilmington Street, Raleigh, North Carolina 27601, and its mailing address is Post Office Box 1551, Raleigh, North Carolina 27602-1551.

2. The attorneys for the Company, to whom all communications and pleadings should be addressed, are:

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Associate General Counsel
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3. N.C. Gen. Stat. § 62-133.9(d) authorizes the Commission to approve an annual rider to the rates of electric public utilities to recover all reasonable and prudent costs incurred for the adoption and implementation of new DSM and EE programs. Recoverable costs include, but are not limited to, all capital costs, including cost of capital and depreciation expense, administrative costs, implementation costs, incentive payments to program participants, and operating costs. Such rider shall consist of the utility's forecasted costs during the rate period and an Experience Modification Factor ("EMF") to collect the difference between the utility's actual reasonable and prudent costs incurred during the test period and actual revenues realized during the test period. The Commission is also authorized to approve incentives to utilities for adopting and implementing new DSM and EE programs, including rewards based on the sharing of savings achieved by the programs.

4. Rule R8-69(b) provides that the Commission will each year conduct a proceeding for each electric public utility to establish an annual DSM/EE rider to recover DSM- and EE-related costs.

5. According to Rule R8-69(e), the electric public utility is to file its application for recovery of DSM and EE costs at the same time it files the information required by Rule R8-55, and the Commission is to conduct an annual DSM/EE rider hearing as soon as practicable after the hearing required by Rule R8-55.

6. Pursuant to the provisions of N.C. Gen. Stat. § 62-133.9 and Commission Rule R8-69, the Company requests the establishment of a rider to recover its reasonable and prudent DSM and EE costs, including program costs, net lost revenues, incentives, and an EMF. All costs, including net lost revenues and Portfolio Performance Incentive,

are calculated pursuant to the *Order Approving Revised Cost Recovery and Incentive Mechanism and Granting Waivers* issued by the Commission in Docket No. E-2, Sub 931 on January 20, 2015. The calculations of these costs, and the associated rider and EMF rates, are described in the Direct Testimony and Exhibits of Carolyn T. Miller. The rider and EMF are intended to allow DEP to recover $186,955,504 of DSM and EE expenses, net lost revenues, and incentives. This amount includes the estimated under-collection of $10,783,557 associated with test period activities during the period beginning January 1, 2017 and ending December 31, 2017, and an estimated $176,171,947 for expenses, net lost revenues, and incentives to be incurred during the rate period from January 1, 2019 through December 31, 2019.

7. Pursuant to the provisions of N.C. Gen. Stat. § 62-133.9 and Commission Rule R8-69, the Company requests Commission approval of the annual billing adjustments as follows (all shown on a cents per kilowatt-hour ("kWh") basis with and without NC regulatory fee):

Excluding regulatory fee:

Rate Class	DSM Rate (¢/kWh)	EE Rate (¢/kWh)	DSM EMF (¢/kWh)	EE EMF Rate (¢/kWh)	DSM/EE Annual Rider (¢/kWh)
Residential	0.120	0.530	0.009	(0.006)	0.653
General Service EE		0.684		0.122	0.806
General Service DSM	0.062		(0.018)		0.044
Lighting		0.099		0.001	0.100

Including regulatory fee:

Rate Class	DSM Rate (¢/kWh)	EE Rate (¢/kWh)	DSM EMF (¢/kWh)	EE EMF Rate (¢/kWh)	DSM/EE Annual Rider (¢/kWh)
Residential	0.120	0.531	0.009	(0.006)	0.654
General Service EE		0.685		0.122	0.807
General Service DSM	0.062		(0.018)		0.044
Lighting		0.099		0.001	0.100

The DSM/EE rider will be in effect for the twelve-month period January 1, 2019 through December 31, 2019.

8. Pursuant to Commission Rule R8-69(b)(6), DEP requests approval to defer prudently incurred costs to FERC account 182.3, "Other Regulatory Assets," until recovered. In addition, pursuant to Commission Rule R8-69(b)(6), DEP requests approval to defer the costs it incurs in adopting and implementing new DSM and EE measures up to six months prior to DEP filing for Commission approval of such measures in accordance with Commission Rule R8-68.

9. The Company has included herewith, as required by Commission Rule R8-69, the direct testimony and exhibits of witnesses Carolyn T. Miller and Robert P. Evans in support of its filing and the requested change in rates.

WHEREFORE, the Company respectfully prays:

That, consistent with this Application, the Commission approve the changes to its rates as set forth in paragraph 7 above.

Respectfully submitted this 20th day of June 2018.

By: Molly M. Jagannathan
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ATTORNEYS FOR DUKE ENERGY
PROGRESS, LLC

STATE OF NORTH CAROLINA)
)
COUNTY OF MECKLENBURG)

VERIFICATION

Carolyn T. Miller, being first duly sworn, deposes and says:

That she is MANAGER, RATES AND REGULATORY STRATEGY of DUKE ENERGY PROGRESS, LLC, applicant in the above-titled action; that she has read the foregoing Application and knows the contents thereof; that the same is true except as to the matters stated therein on information and belief; and as to those matters, she believes it to be true.

Carolyn T. Miller

Carolyn T. Miller

Sworn to and subscribed before me
this the 20th day of June, 2018.

THOMAS J. REED-HALL
NOTARY
PUBLIC
GASTON COUNTY, NC

Notary Public

My Commission Expires: 7-30-2022

BEFORE THE NORTH CAROLINA UTILITIES COMMISSION

DOCKET NO. E-2, SUB 1174

In the Matter of Application of Duke Energy Progress, LLC for Approval of Demand-Side Management and Energy Efficiency Cost Recovery Rider Pursuant to N.C. Gen. Stat. § 62-133.9 and Commission Rule R8-69	))))))	**DIRECT TESTIMONY OF CAROLYN T. MILLER FOR DUKE ENERGY PROGRESS, LLC**

I. INTRODUCTION AND PURPOSE

Q. PLEASE STATE YOUR NAME, BUSINESS ADDRESS AND POSITION WITH DUKE ENERGY CORPORATION.

A. My name is Carolyn T. Miller, and my business address is 550 South Tryon Street, Charlotte, North Carolina. I am a Manager, Rates & Regulatory Strategy for Duke Energy Corporation ("Duke Energy"), supporting both Duke Energy Progress, LLC ("DEP" or the "Company") and Duke Energy Carolinas, LLC ("DEC").

Q. PLEASE BRIEFLY STATE YOUR EDUCATIONAL BACKGROUND AND EXPERIENCE.

A. I graduated from the College of New Jersey in Trenton, New Jersey with a Bachelor of Science in Accountancy. I am a certified public accountant licensed in the State of North Carolina. I began my career in 1994 with Ernst & Young as a staff auditor. In 1997, I began working with Duke Energy as a senior business analyst and have held a variety of positions in the Finance organization. I joined the Rates Department in 2014 as Manager, Rates and Regulatory Strategy.

Q. HAVE YOU PREVIOUSLY PROVIDED TESTIMONY IN MATTERS BROUGHT BEFORE THIS COMMISSION?

A. Yes. I provided testimony in support of DEC's applications for approval of its demand-side management ("DSM") and energy efficiency ("EE") cost recovery rider in Docket No. E-7, Subs 1073, 1105, 1130, and 1164, as well as

DEP's application for approval of its DSM/EE cost recovery rider in Docket No. E-2, Subs 1070, 1108, and 1145.

Q. WHAT ARE YOUR CURRENT RESPONSIBILITIES?

A. I am responsible for providing regulatory support for retail rates and providing guidance on DEP's DSM/EE cost recovery process.

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?

A. The purpose of my testimony is to explain and support DEP's proposed DSM/EE cost recovery rider and Experience Modification Factor ("EMF") and provide information required by Commission Rule R8-69.

Q. PLEASE DESCRIBE THE EXHIBITS ATTACHED TO YOUR TESTIMONY.

A. Miller Exhibit 1 provides a summary of the proposed annual rates by customer class. Miller Exhibit 2, pages 1 through 3, shows the calculation of the DSM and EE rates for the rate period, as well as the breakdown by program of the various components of the estimated revenue requirement. Miller Exhibit 2, pages 4 through 6, presents the calculation of the DSM EMF and EE EMF rates for the test period, as well as the breakdown by program of the various components of the final revenue requirement. Adjustments resulting from Evaluation, Measurement and Verification ("EM&V") of the Company's DSM/EE programs are also presented in Miller Exhibit 2, page 7. Miller Exhibit 3, pages 1 through 4, calculates the amount of interest or return due on over- and under-collections for Vintage 2017. Miller Exhibit 4 shows a summary of revenue collected during calendar year 2017 by program type and customer class. Miller Exhibit 5, pages 1 through 7, presents the allocation factors used in the development of the rider, including the energy allocation factors applicable to DSM and EE program costs, the North Carolina and South Carolina retail allocation factors, and the lighting allocation factors. Miller Exhibit 6 includes both forecasted 2019 sales from the Spring 2018 forecast and the impact of opt-outs.

Q. WERE MILLER EXHIBITS 1-6 PREPARED BY YOU OR AT YOUR DIRECTION AND SUPERVISION?

A. Yes.

II. SUMMARY OF DSM/EE COSTS

Q. CAN YOU PROVIDE A SUMMARY OF THE COSTS FOR WHICH DEP IS REQUESTING RECOVERY IN THIS PROCEEDING?

A. Yes. The DSM/EE costs DEP is requesting to recover through the rates proposed in this proceeding are associated with the costs incurred during the test period, as well as the costs forecasted to be incurred during the rate period. The test period utilized in the development of the DSM/EE EMF is January 1, 2017 through December 31, 2017. The North Carolina allocated share of recoverable DSM/EE costs for the test period is $180,805,498. For the rate period of January 1, 2019 through December 31, 2019, the North Carolina allocated share of forecasted DSM/EE costs is $173,203,629. The total North Carolina allocated share of DSM/EE costs for the test period plus the rate period is $354,009,127.

A summary of the costs associated with DEP's recovery request by period and by DSM/EE program/measure is provided in the following table:

Program/Measure	Test Period **1/1/17 through 12/31/17**	Rate Period **1/1/19 through 12/31/19**
CIG DR	$1,488,540	$3,052,617
EnergyWise	$15,769,318	$17,723,656
EnergyWise for Business	$1,185,120	$2,059,581
DSDR Implementation	$25,490,210	$23,699,090
Residential Home Advantage	$176,476	$168,458
Home Energy Improvement	$7,113,193	$4,278,348
Residential Low Income – NES	$1,738,167	$1,798,481
CIG EE/EE For Business	$33,588,505	$7,241,363
Energy Efficient Lighting	$26,695,371	$20,644,474
Appliance Recycling	$520,771	$120,467
My Home Energy Report	$11,557,818	$13,647,883
Small Business Energy Saver	$15,215,157	$15,279,529
Residential New Construction	$11,650,143	$12,937,198
Multi-Family EE	$4,617,270	$4,309,031
Energy Education Program for Schools	$1,018,817	$878,941
Save Energy & Water Kit	$3,186,004	$6,355,307
Residential Energy Assessments	$2,009,382	$1,576,899
Business Energy Report	$17,193	$0
Smart $aver Prescriptive	N/A	$16,943,719
Smart $aver Custom	N/A	$1,923,951
Smart $aver Performance Incentive	$16,146	$267,143
Administrative & General Costs	$3,488,434	$4,338,927
Carrying Cost on Balances	$14,449,660	$14,289,019
Found Revenue (total)	$(186,197)	$(330,453)
Total Cost	$180,805,498	$173,203,629

In addition to the summary table above, Miller Exhibit 2, page 3, and Miller Exhibit 2, page 6, provide additional categorizations by cost element.

Q. ARE DEP'S PROPOSED RATES DESIGNED TO RECOVER THE TOTAL NORTH CAROLINA ALLOCATED SHARE OF $354,009,127?

A. No. Because many of the expenses incurred during the current test period to develop and implement DEP's DSM/EE programs produce benefits covering several years, a significant portion of those expenses will be deferred and recovered over varying amortization periods. A summary of the amortization periods for program expenses and Program/Portfolio Performance Incentive ("PPI")[1] is shown below:

Length of Amortization Period				
Program Name	Program Cost – batches prior to 2016	Program Cost – 2016 - present	PPI – vintages prior to 2016	PPI – 2016 - present
CIG DR	10	3	10	3
EnergyWise	10	10	10	10
EnergyWise for Business	N/A	3	N/A	3
DSDR Implementation	10	10	10	10
Residential Home Advantage	10	N/A	10	N/A
Home Energy Improvement	10	10	10	10
Residential Low Income - NES	10	10	10	10
Energy Efficient Lighting	5	5	10	5
Appliance Recycling	10	10	10	10
My Home Energy Report	1	1	1	1
Residential New Construction	10	10	10	10
CFL Pilot	10	N/A	10	N/A
Solar Hot Water Pilot	10	N/A	10	N/A
Multi-Family EE	5	5	5	5
Energy Education	5	5	5	5
CIG EE	10	3	10	3
Save Water & Energy Kit	N/A	5	N/A	5
Residential Energy Assessments	N/A	5	N/A	5
Small Business Energy $aver	10	3	10	3
Smart $aver Prescriptive	3	3	3	3
Smart $aver Custom	3	3	3	3

[1] As explained further below, for vintages prior to 2016, incentives are calculated on a program basis. Pursuant to the Commission's *Order Approving Revised Cost Recovery Mechanism and Granting Waivers* issued January 20, 2015 in Docket No. E-2, Sub 931 ("Order Approving Revised Mechanism"), which applies to Vintages 2016 and forward, incentives under the Company's revised cost recovery mechanism are calculated on a portfolio basis. For ease of reference, I will refer to both incentives as "PPI."

Business Energy Report	3	3	1	1
Admin. & General	3	3	3	3

In addition to the aforementioned deferrals, DEP's proposed rates include the recognition and amortization of prior period deferrals. In total, the EMF-related calculations based on test period costs reflect an estimated under-recovery of $10,783,557. The DSM/EE rate calculations associated with rate period estimates are based on a revenue requirement of $176,171,947. The rate period and EMF revenue requirements produce a combined revenue requirement of $186,955,504. Miller Exhibit 2, page 3, and Miller Exhibit 2, pages 4 and 5, detail the calculation of these amounts.

III. EMF REVENUE REQUIREMENT

Q. HOW WAS THE DSM/EE EMF UNDER-RECOVERY OF $10,783,557 DETERMINED?

A. The EMF under-recovery is a function of the sum of test period costs, including amounts relating to the amortization of deferred costs from prior periods, and credits for actual DSM/EE rider revenues for the period January 1, 2017 through December 31, 2017. The following table illustrates the relationship of these elements with respect to the determination of the DSM/EE EMF:

Rate Element	Amounts
Test Period Revenue Requirement	$168,088,803
Net DSM/EE Rate Revenue	$155,003,924
Add: Other Adjustments	$2,301,322
Total EMF Adjustments	$157,305,246
Adjusted DSM/EE EMF Revenue Requirement	$10,783,557

Miller Exhibit 2, pages 4 through 7, provides additional details associated with the development of these amounts.

Q. PLEASE DESCRIBE THE $2,301,322 THAT HAS BEEN CATEGORIZED AS "OTHER ADJUSTMENTS."

A. The $2,301,322 in "Other Adjustments" is the sum of lines 2 through 8 on page 7 of Miller Exhibit 2. Lines 2 and 3 are reserved for prospective uncollectible allowances in DEP's DSM/EE rates. DEP is not requesting an uncollectible adjustment as a part of its cost recovery request in this proceeding. In addition, the adjustments found on lines 4 through 7 reflect the true-up of PPI and net lost revenues for the 2015 and 2016 vintages. The last of these adjustments, found on line 8, recognizes estimated interest owed and return earned for revenue over- and under-collections during the period extending from January 1, 2017 through December 31, 2017. The Direct Testimony of Company witness Robert P. Evans provides further detail on program-specific impacts to PPI and net lost revenues.

IV. <u>RATE PERIOD REVENUE REQUIREMENT</u>

Q. PLEASE DESCRIBE THE BASIS FOR THE RATE PERIOD REVENUE REQUIREMENT.

A. As indicated previously, the estimated revenue requirement for the rate period is $176,171,947. This amount reflects the anticipated costs and necessary recoveries for the rate period, which extends from January 1, 2019 through December 31, 2019. The $176,171,947 revenue requirement includes: (1) $22,722,598 for anticipated rate period program expenses; (2) amortizations and carrying costs associated with deferred prior period costs totaling $77,083,142; (3) recovery of Distribution System Demand Response ("DSDR") depreciation and capital costs totaling $18,019,811; (4) net lost revenues for the rate period totaling $32,348,840 for vintage years 2017 through 2019; and (5) PPI totaling $25,997,556 associated with vintage years 2010 through 2019.

V. JURISDICTIONAL COST ALLOCATION

Q. HOW ARE DSM AND EE PROGRAM COSTS ALLOCATED TO THE NORTH CAROLINA RETAIL JURISDICTION?

A. DEP determines the total amount of recoverable costs and separates these costs into three categories: (1) DSM-related costs, (2) EE-related costs, and (3) costs that provide a system benefit in support of both DSM and EE programs. For each of these categories, different allocation methods are employed to assign those costs to the appropriate jurisdiction.

Q. HOW ARE COSTS IDENTIFIED AS EE-RELATED ALLOCATED TO NORTH CAROLINA?

A. Any program costs that are identified as being EE-related, including administrative and general ("A&G") costs, are allocated to the North Carolina retail jurisdiction based upon the ratio of North Carolina retail sales to DEP system retail sales at the point of generation. For calendar year test periods beginning in year 2016, the allocation percentage for the entire calendar year test period is based on the latest cost of service study available at the time of filing.

Q. HOW ARE DSM-RELATED COSTS ALLOCATED TO NORTH CAROLINA?

A. Any program costs that are identified as being DSM-related, including A&G costs, are allocated to the North Carolina retail jurisdiction based upon the ratio of the North Carolina retail demand to the DEP system retail demand at the hour of the annual summer system peak. For calendar year test periods beginning in year 2016, the allocation percentage for the entire calendar year test period is based on the latest cost of service study available at the time of filing.

Q. PLEASE ELABORATE ON THE METHODOLOGY USED TO ALLOCATE DSM/EE COSTS THAT OFFER A SYSTEM BENEFIT.

A. Certain A&G costs provide a system benefit in support of both DSM and EE programs and, therefore, are allocated in both categories. The allocation of these costs into either the DSM or EE category is based upon the percentage of program costs for each type of expenditure anticipated during the next forecast calendar year. For example, if 30% of direct program costs in the forecast period are EE-related, then 30% of these A&G costs will be considered EE-related costs for allocation purposes. The use of a forecast period recognizes the types of new programs DEP will offer in the immediate future that will be supported by these administrative costs. The assignment of A&G costs as either DSM- or EE-related is reviewed annually based upon forecasted program costs for the next calendar year. The A&G costs in this proceeding have been assigned to these categories based upon forecasted DSM and EE costs for 2019.

Q. IN MILLER EXHIBIT 2, PAGE 3, AND MILLER EXHIBIT 2, PAGE 6, THE DSDR PROGRAM IS SEPARATED FROM THE OTHER DSM/EE PROGRAMS. HOW IS THE DSDR PROGRAM CLASSIFIED?

A. The DSDR program has been classified by the Commission, for purposes of ratemaking, as an EE program. Due to the scope and nature of DSDR, its costs are being tracked separately. This separate tracking includes both direct costs and A&G costs associated with the program.

VI. PORTFOLIO PERFORMANCE INCENTIVE AND NET LOST REVENUES

Q. HOW IS THE PPI CALCULATED?

A. The PPI is calculated pursuant to the Order Approving Revised Mechanism and is based on the savings achieved by the portfolio of PPI-eligible DSM/EE programs. Under the terms of the Order Approving Revised Mechanism, the amount of PPI to be recovered during the rate period is 11.75 percent of the net benefits produced by the portfolio of PPI-eligible programs. Estimated net savings for all periods are determined by multiplying the number of measurement units projected to be installed for a specific program or measure in a vintage year by the most current estimate of the annual per installation kilowatt ("kW") and kilowatt-hour ("kWh") savings over the measurement unit's life and by the annual kW and kWh avoided costs. DEP then subtracts the estimated utility costs over the measurement unit's life related to the projected installations in that vintage year and discounts the result to determine a net present value.

The PPI for each program vintage is converted into a stream of up to ten levelized annual payments. DEP's overall weighted average net-of-tax rate of return approved in DEP's most recent general rate case is used as the appropriate discount rate. Pursuant to the Order Approving Revised Mechanism, PPI recoveries are subject to true-up on the basis of future EM&V results. PPI calculations are based on calendar year vintages. The PPI vintage assigned to the test period in this filing encompasses calendar year 2017. These values will be trued-up on the basis of future EM&V results. The estimated PPI for the rate period used in this filing is based on calendar year 2019 and will be trued-up as a part of DEP's 2020 DSM/EE cost recovery proceeding. Please see Evans Exhibit 1 for additional detail by program.

Q. HOW WERE NET LOST REVENUES DETERMINED?

A. The Company determines net lost revenues, which are applicable to both DSM and EE programs, by multiplying the estimated reduction in kWh sales associated with a program or measure by a margin-based net lost revenue rate. The following formula illustrates the basic components of the net lost revenue calculations: Net Lost Revenues ($) = Lost Sales (kWh) x Net Lost Revenue Rate ($/kWh).

Lost Sales are those sales that do not occur as a result of implementation of DEP DSM/EE measures. These values are initially based on engineering estimates and/or past impact evaluations. Future periods are based on updated impact evaluations resulting from EM&V activities and are applied prospectively and in conjunction with applicable net lost revenue true-ups. The net lost revenue rate represents the difference between the average retail rate applicable to the customer class impacted by the measure and the sum of (1) the embedded regulatory fees, (2) the related average customer charge component of that rate, (3) the average fuel component of the rate, and (4) the incremental variable operations and maintenance (O&M) rate as filed in DEP's last Cogeneration and Small Power Producer tariff. When multiple customer classes are impacted by a DSM/EE measure, as with the DSDR program, a weighted or system-wide net lost revenue rate is employed.

Pursuant to the Order Approving Revised Mechanism, DEP may only recover net lost revenues for up to 36 months of an installed measure's life, and as with the PPI, recoveries are subject to true-up on the basis of future EM&V results.

VII. COST ALLOCATION METHODOLOGY

Q. HOW ARE DSM- AND EE-RELATED COSTS ALLOCATED TO EACH RATE CLASS?

A. Costs are assigned to customer classes based on program design and participation. In other words, residential program costs are allocated solely to residential customers, general service program costs are allocated solely to general service customers, and lighting program costs are allocated solely to lighting customers. Where programs benefit multiple customer groups, the costs are allocated directly to groups receiving benefits or by employing annual energy- and/or coincident peak demand-based allocation factors.

Miller Exhibit 2, pages 1 and 2, and Miller Exhibit 2, pages 4 and 5, demonstrate the manner in which the costs associated with a specific program have been assigned to customer groups.

Q. HOW ARE SALES AND DEMAND ADJUSTED FOR THE IMPACT OF OPT-OUT CUSTOMERS?

A. Commercial customers with annual consumption of 1,000,000 kWh or greater in the billing months of the prior calendar year and all industrial customers who implement or will implement alternative DSM/EE measures may elect not to participate in DEP's DSM and/or EE programs. DEP reviewed its customer records and identified that commercial and industrial customers choosing to opt out of EE programs consumed 11,445,011,475 kWh during the year ended December 31, 2017. In addition, DEP identified that commercial and industrial customers choosing to opt out of DSM programs consumed 11,560,314,862 kWh during the year ended December 31, 2017.

DEP developed rate class allocation factors based on the assumption that customers that have elected to opt out of the Company's DSM/EE rider will remain opted out. If customers decide to change their opt-out status, revenue gains or losses will be recognized in subsequent DSM/EE EMF calculations.

Sales for the year ended December 31, 2017 for all customers electing to opt out of the DSM/EE rate are provided in Miller Exhibit 6.

Q. THE SALES FOR OPT-OUT CUSTOMERS ARE EASILY IDENTIFIED, BUT HOW IS THE COINCIDENT PEAK OF THESE CUSTOMERS ESTIMATED?

A. Currently installed metering for a great number of opt-out customers does not provide sufficient detail to determine their contribution to the system coincident peak hour load. Instead, the impact is estimated based upon the ratio of opt-out sales to total sales for the rate class multiplied by the rate class peak demand. This approach should accurately approximate the demand of opt-out accounts.

Q. AFTER ADJUSTING ENERGY AND DEMAND FOR OPT-OUT CUSTOMERS, HOW ARE THE RESULTING ALLOCATION FACTORS THEN USED TO DETERMINE THE REVENUE REQUIREMENT FOR EACH RATE CLASS?

A. Energy- and demand-based allocators are used in cases where programs or measures directly benefit multiple rate groups. When a DSM or EE program benefits multiple rate groups, DEP multiplies EE costs by rate class energy allocation factors and multiplies any associated DSM costs by rate class demand allocation factors for purposes of cost assignment.

Since usage for opt-out customers is not forecasted, the rate class energy allocation factors were developed from the forecasted rate class usage after subtracting actual sales for opt-out customers for the year ended December 31, 2017. Miller Exhibit 5, page 5, provides the energy allocation factors applicable to each rate class based upon the forecast of rate class sales for the rate period of January 1, 2019 through December 31, 2019.

The allocation rate class demand allocation factors are based on the summer coincident peak demand for 2017 after subtracting the estimated demand for opt-out customers as discussed above. The forecast does not provide rate class coincident peak demands; therefore, the most recent historic data was deemed to be representative of future demand impacts. Miller Exhibit 5, page 6, shows the demand allocation factors applicable to each rate class for the rate period.

Q. WHICH OF DEP'S PROGRAMS OR MEASURES BENEFIT MULTIPLE CUSTOMER CLASSES?

A. The Company's DSDR program benefits all customer classes. To allocate DSDR costs, DEP employs rate class energy allocation factors. These allocation procedures are elements of Miller Exhibit 2, pages 1 and 4. In addition, DEP's Energy Efficient Lighting Program provides benefits to both the residential and general service customer classes. These costs were allocated on the basis of bulbs provided to those classes using EM&V results as shown in Miller Exhibit 5, page 7.

Q. HOW DOES DEP DETERMINE RATE CLASS DSM/EE RATES?

A. The calculated rate class DSM and EE revenue requirements are divided by forecasted rate class sales, after adjustment for opt-out customers, to establish the rate class DSM/EE rate. Miller Exhibit 2, page 1, provides the derivation of the EE rate. Miller Exhibit 2, page 2, provides the derivation of the DSM rate.

Q. HOW DOES DEP DETERMINE RATES FOR THE DSM/EE EMF?

A. As with DSM/EE rate determination, the calculated rate class DSM and EE EMF revenue requirements, adjusted for cost recoveries, are divided by forecasted rate class sales, after adjustment for opt-out customers, to establish the rate class DSM/EE EMF rate. Miller Exhibit 2, page 4, provides the derivation of the EE EMF rate. Miller Exhibit 2, page 5, provides the derivation of the DSM EMF rate.

VIII. PROPOSED RATES

Q. WHAT RATES ARE PROPOSED FOR EACH RATE CLASS?

A. Miller Exhibit 1 is populated with the DSM/EE rates and EMF rates proposed in this proceeding. The DSM/EE rates recover costs forecasted to be incurred from January 1, 2019 through December 31, 2019. The DSM/EE EMF is a true-up mechanism recognizing costs and recoveries for the test period of January 1, 2017 through December 31, 2017. DEP proposes the following rates, exclusive of North Carolina regulatory fees, for each rate class:

Rate Class	DSM Rate (¢/kWh)	EE Rate (¢/kWh)	DSM EMF (¢/kWh)	EE EMF Rate (¢/kWh)	DSM/EE Annual Rider (¢/kWh)
Residential	0.120	0.530	0.009	(0.006)	0.653
General Service EE		0.684		0.122	0.806
General Service DSM	0.062		(0.018)		0.044
Lighting		0.099		0.001	0.100

Q. WHAT ARE THE RATES INCLUDING NORTH CAROLINA REGULATORY FEES?

A. The following table reflects the proposed billing rates, including North Carolina regulatory fees, for each rate class:

Rate Class	DSM Rate (¢/kWh)	EE Rate (¢/kWh)	DSM EMF (¢/kWh)	EE EMF (¢/kWh)	Annual DSM/EE Rider (¢/kWh)
Residential	0.120	0.531	0.009	(0.006)	0.654
General Service EE		0.685		0.122	0.807
General Service DSM	0.062		(0.018)		0.044
Lighting		0.099		0.001	0.100

Q. HOW WILL DEP REVISE ITS TARIFFS TO RECOVER THESE RATES?

A. The Company will update its Annual Billing Adjustment, Rider BA, to recognize these rates, adjusted for the North Carolina regulatory fees.

IX. CONCLUSION

Q. DOES THIS CONCLUDE YOUR PRE-FILED DIRECT TESTIMONY?

A. Yes.

Miller Exhibit 1

Duke Energy Progress, LLC
Docket No. E-2, Sub 1174
Summary of 2019 DSM/EE Rates

	Source:	cents/kWh Rate	Reg Fee	Billing Rate
Residential Rate				
EMF Rate - DSM	Miller Exhibit 2, page 5	0.009	0.000	0.009
EMF Rate - EE	Miller Exhibit 2, page 4	-0.006	0.000	-0.006
Projected Rate - DSM	Miller Exhibit 2, page 2	0.120	0.000	0.120
Projected Rate - EE	Miller Exhibit 2, page 1	0.530	0.001	0.531
Total Residential Rate		0.653		0.654
General Service				
EE EMF Rate	Miller Exhibit 2, page 4	0.122	0.000	0.122
EE Projected Rate	Miller Exhibit 2, page 1	0.684	0.001	0.685
Total General Service EE Rate		0.806		0.807
DSM EMF Rate	Miller Exhibit 2, page 5	-0.018	0.000	-0.018
DSM Projected Rate	Miller Exhibit 2, page 2	0.062	0.000	0.062
Total General Service DSM Rate		0.044		0.044
Lighting EE Rate				
Lighting EE EMF Rate	Miller Exhibit 2, page 4	0.001	0.000	0.001
Lighting EE Projected Rate	Miller Exhibit 2, page 1	0.099	0.000	0.099
Total Lighting EE Rate		0.100		0.100

DUKE ENERGY PROGRESS, LLC
Docket No. E-2, Sub 1174
Energy Efficiency Rate Derivation

			EE Revenue Requirements						
NC Rate Class	Adjusted NC Rate Class kWh Sales (1)	Rate Class Energy Allocation Factor (2)	Residential Programs (3)	CIG Programs (4)	DSDR (5)	Non-DSDR Allocated A&G and Carrying Costs(6)	DSDR Allocated A&G and Carrying Costs(7)	Total of Allocated Costs	Total EE Rate
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8) = Σ (3 thru 7)	(9) = (8) / (1)
Residential	15,740,238,953	60.65%	$ 61,089,894	$ -	$ 14,597,379	$ 6,829,356	$ 977,130	$ 83,493,759	0.530
General Service	9,852,771,378	37.96%	$ -	$ 52,049,316	$ 9,137,386	$ 5,609,117	$ 611,645	$ 67,407,463	0.684
Lighting	361,265,217	1.39%	$ -	$ -	$ 335,035	$ -	$ 22,427	$ 357,461	0.099
NC Retail	25,954,275,548	100%	$ 61,089,894	$ 52,049,316	$ 24,069,799	$ 12,438,473	$ 1,611,202	$ 151,258,684	

NOTES:

(1) Rate Class Sales, excluding "Opt-Out" sales, are derived in Miller Exhibit 6.
(2) Rate Class Energy Allocation Factor is derived in Miller Exhibit 5, page 5, column (4).
(3) Residential Program costs are allocated solely to the Residential Class in compliance with Commission's Order in Docket No. E-2, Sub 931, dated 1/20/15.
(4) Non-Residential Program costs are allocated solely to the General Service Class in compliance with Commission's Order in Docket No. E-2, Sub 931, dated 1/20/15.
(5) DSDR Costs allocated using the Rate Class Energy Allocation Factor from column (2) in compliance with Commission's Order in Docket No. E-2, Sub 931, dated 1/20/15.
(6) Non-DSDR A&G and Carrying Costs are allocated on the basis of Non-DSDR revenue requirements (excluding incentives and net lost revenues).
(7) DSDR A&G Costs and Carrying Costs are allocated using the Rate Class Energy Allocation Factor from column (2).

Please note: Exhibit may not foot due to rounding.

DUKE ENERGY PROGRESS, LLC
Docket No. E-2, Sub 1174
Demand-Side Management Rate Derivation

NC Rate Class	Adjusted NC Rate Class kWh Sales [(1)]	Rate Class Demand Allocation Factor[(2)]	DSM Revenue Requirements EnergyWise Program Costs[(3)]	CIG DR Program [(4)]	Allocated A&G Costs[(5)]	Allocated Carrying Costs[(5)]	Total of Allocated Costs	Total DSM Rate
	(1)	(2)	(3)	(4)	(5)	(6)	(7) = Σ (3 thru 6)	(8) = (7) / (1)
Residential	15,740,238,953	67.12%	$15,819,687	$ -	$ 538,120	$ 2,475,417	$ 18,833,224	0.120
General Service	9,737,467,991	32.88%	$ -	$ 4,835,895	$ 222,164	$ 1,021,980	$ 6,080,039	0.062
Lighting	360,425,890	0.00%	$ -	$ -	$ -	$ -	$ -	-
NC Retail	25,838,132,834	100.00%	$15,819,687	$ 4,835,895	$ 760,284	$ 3,497,397	$ 24,913,263	

NOTES:

(1) Rate Class Sales, excluding "Opt-Out" sales, are derived in Miller Exhibit 6.
(2) Rate Class Demand Allocation Factor is derived in Miller Exhibit 5, page 6, column (5).
(3) EnergyWise costs are directly assigned solely to the Residential Rate Class in compliance with Commission's Order in Docket No. E-2, Sub 931, dated 1/20/15.
(4) CIG DR Program costs are directly assigned solely to the General Service Class in compliance with Commission's Order in Docket No. E-2, Sub 931, dated 1/20/15.
(5) A&G and Carrying Costs are allocated on the basis of revenue requirements (excluding incentives and net lost revenues).

Please note: Exhibit may not foot due to rounding.

DUKE ENERGY PROGRESS, LLC
Docket No. E-2, Sub 1174
Rate Period Revenue Requirement Summary - NC Level
January 2019 - December 2019

NORTH CAROLINA JURISDICTIONALLY ALLOCATED RETAIL COSTS ONLY

			O&M	Insurance	A&G Expense	Capitalized O&M and A&G	Amortization of Capitalized O&M	Amortization of Capitalized A&G	Prior Period Amortization	DSDR Capital Costs	Income Taxes on DSDR Capital Costs	DSDR Property Taxes	DSDR Depreciation	Carrying Costs Net of Taxes	Income Taxes on Carrying Cost	Rev Reqmt Before PPI & NLR	Net Lost Revenue Recoupment	Program Performance Incentive	Rev Reqmt With PPI & NLR
			(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*		*(10)*	*(11)*	*(12)*	*(13)*	*(14)*	*(15)*	*(16)*	*(17)*	*(18)*	*(19)*
						ΣCols(1)thru(3)	*((1)+(2))/10 or 5 or 3*	*(3)/3*								*ΣCols(5)thru(15)*			*ΣCols(16)thru(18)*
	NC DSM Program Expenses																		
1	CIG DR	*Per Forecast*	2,242,859		-	2,242,859	747,620	-	1,808,922							2,556,542		809,758	3,366,300
2	EnergyWise	*Per Forecast*	11,585,804		-	11,585,804	1,158,580	-	8,523,255							9,681,835		6,137,852	15,819,687
3	EnergyWise for Business	*Per Forecast*	2,030,607		-	2,030,607	676,869	-	763,752							1,440,621	113,832	(84,858)	1,469,595
4	Total DSM	*Σ Lines 1 thru 2*	15,859,270	-	-	15,859,270	2,583,069	-	11,095,929	-	-	-	-	-	-	13,678,998	113,832	6,862,752	20,655,582
5	DSM Assigned A&G and CCost	*Per Forecast*	-		794,570	794,570		264,857	495,427					2,859,534	637,863	4,257,681			4,257,681
6	Total DSM and Assigned Costs	*Σ Lines 4 thru 5*	15,859,270		794,570	16,653,840	2,583,069	264,857	11,591,356					2,859,534	637,863	17,936,679	113,832	6,862,752	24,913,263
	NC EE Program Expenses																		
7	Res Home Advantage	*Per Forecast*	-			-	-	-	317,234							317,234	-	168,458	485,692
8	Res Home Energy Improvem't	*Per Forecast*	3,222,042			3,222,042	322,204	-	4,395,337							4,717,541	724,481	331,825	5,773,847
9	Neighborhood Energy Saver	*Per Forecast*	1,640,297			1,640,297	164,030	-	1,416,497							1,580,527	158,184	-	1,738,711
10	Solar Hot Water Pilot	*Per Forecast*	-			-	-	-	31,026							31,026		-	31,026
11	EE Lighting (Res)*	*Per Forecast (allocated)*	9,513,184			9,513,184	1,902,637	-	8,842,428							10,745,065	3,377,430	4,281,624	18,404,120
12	Res Appliance Recycling	*Per Forecast*	-			-	-	-	681,344							681,344	-	120,467	801,811
13	My Home Energy Report*	*Per Forecast*	6,457,601			6,457,601	6,457,601	-	-							6,457,601	7,267,092	(76,809)	13,647,883
14	Residential New Construction	*Per Forecast*	10,255,599			10,255,599	1,025,560	-	4,161,785							5,187,345	1,776,751	904,849	7,868,944
15	Multi-Family	*Per Forecast*	2,212,059			2,212,059	442,412	-	1,524,692							1,967,104	1,315,711	781,261	4,064,076
16	Energy Education Program for Schoo	*Per Forecast*	610,964			610,964	122,193	-	476,552							598,745	267,977	-	866,722
17	Save Energy and Water Kit	*Per Forecast*	1,234,634			1,234,634	246,927	-	502,990							749,917	3,750,041	1,370,632	5,870,590
18	Residential Energy Assessments	*Per Forecast*	921,529			921,529	184,306	-	696,796							881,102	496,978	158,392	1,536,472
19	Home Depot CFL	*Per Forecast*	-			-	-	-	-							-		-	-
20	Residential Found Revenue	*Per Forecast*														-	-		-
21	Subtotal-Residential	*Σ Lines 7 thru 20*	36,067,909		-	36,067,909	10,867,870	-	23,046,681					-	-	33,914,551	19,134,644	8,040,699	61,089,894
22	CIG Energy Efficiency	*Per Forecast*						-	3,841,812							3,841,812			3,841,812
23	EE Lighting (General Service)*	*Per Forecast (allocated)*	1,153,016			1,153,016	230,603	-	1,073,488							1,304,091	832,240	1,486,980	3,623,310
24	Energy Efficiency for Business	*Per Forecast*				-			5,965,591							5,965,591	7,241,363		13,206,954
25	Smart Saver Prescriptive	*Per Forecast*	10,417,475			10,417,475	3,472,492		2,613,153							6,085,645		6,526,244	12,611,889
26	Smart Saver Custom	*Per Forecast*	1,588,219			1,588,219	529,406		399,463							928,869		335,732	1,264,601
27	Smart Saver Performance Incentive	*Per Forecast*							-							-	212,540	54,602	267,143
28	Small Business Energy Saver	*Per Forecast*	7,444,308			7,444,308	2,481,436	-	7,241,864							9,723,300	5,144,673	2,690,548	17,558,521
29	Business Energy Report	*Per Forecast*	-			-	-	-	5,539							5,539	-		5,539
30	General Service Found Revenue	*Per Forecast*														-	(330,453)		(330,453)
	Subtotal-General Service	*Σ Lines 22 thru 30*	20,603,018	-	-	20,603,018	6,713,937	-	21,140,910	-	-	-	-	-	-	27,854,847	13,100,363	11,094,106	52,049,316
31	Total of EE Programs	*Σ Lines 21 + 30*	56,670,927		-	56,670,927	17,581,807	-	44,187,591					-	-	61,769,398	32,235,008	19,134,804	113,139,210
32	EE Assigned A&G and CCost	*Per Forecast*			3,544,357	3,544,357		1,181,452	2,076,601					7,506,074	1,674,346	12,438,473			12,438,473
33	Total EE and Assigned Costs	*Lines 31 + 32*	56,670,927		3,544,357	60,215,284	17,581,807	1,181,452	46,264,192					7,506,074	1,674,346	74,207,871	32,235,008	19,134,804	125,577,683
	NC DSDR Program Expenses																		
34	DSDR Program	*Per Forecast*	4,409,208	666,199		5,075,407	507,541	-	4,938,575	6,323,991	1,410,664	603,872	10,285,156			24,069,799	-	-	24,069,799
35	DSDR Assigned A&G and CCost	*Per Forecast*				-		-	-					1,317,347	293,855	1,611,202			1,611,202
36	Total DSDR and Assigned Costs	*Σ Lines 34 thru 35*	4,409,208	666,199	-	5,075,407	507,541	-	4,938,575	6,323,991	1,410,664	603,872	10,285,156	1,317,347	293,855	25,681,001	-	-	25,681,001
37	Rate Period Totals	*Lines 6 + 33 + 36*	76,939,405	666,199	4,338,927	81,944,531	20,672,417	1,446,309	62,794,123	6,323,991	1,410,664	603,872	10,285,156	11,682,955	2,606,064	117,825,551	32,348,840	25,997,556	176,171,948

*All Non-Residential programs are amortized over a 3 year period. The Residential Lighting Program, Multi-Family EE, EE Education, Save Energy and Water Kit and Residential Energy Assessments are recoverable over a 5 year period. My Home Energy Report is recoverable over a 1 year period. All other Residential EE programs are recoverable over 10 years.

Please note: Exhibit may not foot due to rounding.

DUKE ENERGY PROGRESS, LLC
Docket No. E-2, Sub 1174
Energy Efficiency Experience Modification Factor Rate Derivation

NC Rate Class	Adjusted NC Rate Class kWh Sales [1]	Rate Class Energy Allocation Factor [2]	EE EMF Revenue Requirement: Residential Programs[3]	CIG Programs[4]	DSDR [5]	Non-DSDR Allocated A&G and Carrying Costs[6]	DSDR Allocated A&G and Carrying Costs[5]	Total of Allocated Costs	Less: Prior Period EE Rate Adjustment[7]	Adjusted EE EMF Revenue Requirement	Total EE EMF Rate (cents/kWh)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8) = Σ (3 thru 7)	(9)	(10)=(8)-(9)	(11) = (10) / (1)
Residential	15,740,238,953	60.65%	$ 58,531,465	$0	$ 15,578,065	$ 7,267,354	$ 1,016,925	$ 82,393,808	$ 83,295,916	$ (902,108)	(0.006)
General Service	9,852,771,378	37.96%	$0	$ 49,737,883	$ 9,751,257	$ 5,536,262	$ 636,555	$ 65,661,956	$ 53,649,216	$ 12,012,740	0.122
Lighting	361,265,217	1.39%	$0	$0	$ 357,543	$ -	$ 23,340	$ 380,883	$ 377,991	$ 2,892	0.001
NC Retail	25,954,275,548	100.00%	$ 58,531,465	$ 49,737,883	$ 25,686,864	$ 12,803,616	$ 1,676,820	$ 148,436,648	$ 137,323,123	$ 11,113,524	

NOTES:

(1) Rate Class Sales, excluding "Opt-Out" sales, are derived in Miller Exhibit 6.
(2) Rate Class Energy Allocation Factor is derived in Miller Exhibit 5, page 5, column (4).
(3) Residential Program costs are allocated solely to the Residential rates in compliance with Commission's Order in Docket No. E-2, Sub 931, dated 1/20/15.
(4) Non-residential Program costs are allocated solely to the General Service rates in compliance with Commission's Order in Docket No. E-2, Sub 931, dated 1/20/15.
(5) DSDR Costs allocated using the Rate Class Energy Allocation Factor from column (2) in compliance with Commission's Order in Docket No. E-2, Sub 931, dated 1/20/15.
(6) Non-DSDR A&G and Carrying Costs are allocated on the basis of Non-DSDR revenue requirements (excluding incentives and net lost revenues) assigned in preceding columns.
(7) Amounts are derived in Miller Exhibit 2, page 7.

Please note: Exhibit may not foot due to rounding.

DUKE ENERGY PROGRESS,LLC
Docket No. E-2, Sub 1174
Demand-Side Management Experience Modification Factor Rate Derivation

NC Rate Class	Adjusted NC Rate Class kWh Sales [(1)]	Rate Class Demand Allocation Factor[(2)]	DSM EMF Revenue Requirement: EnergyWise Program Costs[(3)]	CIG DR Program [(4)]	Allocated A&G Costs[(5)]	Allocated Carrying Costs[(5)]	Total of Allocated Costs	Less: Prior Period DSM Rate Adjustment[(6)]	Adjusted DSM EMF Revenue Requirement	Total DSM EMF Rate (cents/kWh)
	(1)	(2)	(3)	(4)	(5)	(6)	(7) = Σ (3 thru 6)	(8)	(9)=(7)-(8)	(10) = (9) / (1)
Residential	15,740,238,953	67.12%	$12,886,943	$ -	$ 684,567	$ 2,528,644	$ 16,100,154	$ 14,703,167	$ 1,396,988	0.009
General Service	9,737,467,991	32.88%	$ -	$ 2,606,451	$ 201,447	744,103	$ 3,552,001	$ 5,278,956	$ (1,726,955)	(0.018)
Lighting	360,425,890	0.00%	$ -	$ -	$ -	$ -	$ -	$ -	$ -	-
NC Retail	25,838,132,834	100%	$12,886,943	$ 2,606,451	$ 886,014	$ 3,272,747	$ 19,652,155	$ 19,982,122	$ (329,967)	

NOTES:

(1) Rate Class Sales, excluding "Opt-Out" sales, are derived in Miller Exhibit 6.
(2) Rate Class Demand Allocation Factor is derived in Miller Exhibit 5, page 6, column (5).
(3) EnergyWise costs are directly assigned solely to the Residential Rate Class in compliance with Commission's Order in Docket No. E-2, Sub 931, dated 1/20/15.
(4) CIG DR costs are directly assigned solely to the General Service Rate Class in compliance with Commission's Order in Docket No. E-2, Sub 931, dated 1/20/15.
(5) A&G and Carrying Costs are allocated on the basis of revenue requirements (excluding incentives and net lost revenues) assigned in preceding columns.
(6) Amounts are derived in Miller Exhibit 2, page 7.

Please note: Exhibit may not foot due to rounding.

DUKE ENERGY PROGRESS, LLC
Docket No. E-2, Sub 1174
EMF Period Revenue Requirement Summary - NC Level
January 2017 - December 2017

			O&M	Insurance	A&G Expense	Capitalized O&M and A&G	Amortization of Capitalized O&M	Amortization of Capitalized A&G	Prior Period Amortization	DSDR Capital Costs	Income Taxes on DSDR Capital Costs	DSDR Property Taxes	DSDR Depreciation	Carrying Costs Net of Taxes	Income Taxes on Carrying Cost	Rev Reqmt Before PPI & NLR	Net Lost Revenue Recoupment	Program Performance Incentive	Rev Reqmt With PPI & NLR
			(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
						ΣCols(1)thru(3)	((1)+(2))/10	(3)/3								ΣCols(5)thru(13)			ΣCols(14)thru(16)
	NC DSM Program Expenses																		
1	CIG DR	*Per Books*	1,254,690			1,254,690	418,230	-	1,211,354					-	-	1,629,584		233,850	1,863,435
2	EnergyWise	*Per Books*	10,809,353			10,809,353	1,080,935	-	6,846,043					-	-	7,926,978		4,959,965	12,886,943
3	EnergyWise for Business		1,145,187			1,145,187	381,729		321,354							703,083	49,698	(9,765)	743,016
4	Total DSM	*Σ Lines 1 thru 2*	13,209,230			13,209,230	1,880,894	-	8,378,751					-	-	10,259,646	49,698	5,184,051	15,493,394
5	DSM Assigned A&G and CCost	*Per Books*	-		724,598	724,598		241,533	644,481					2,302,515	970,232	4,158,761			4,158,761
6	Total DSM and Assigned Costs	*Σ Lines 4 thru 5*	13,209,230		724,598	13,933,828	1,880,894	241,533	9,023,232					2,302,515	970,232	14,418,407	49,698	5,184,051	19,652,155
	NC EE Program Expenses																		
7	Residential Home Advantage	*Per Books*	-			-	-	-	409,789					-	-	409,789	-	176,476	586,265
8	Home Energy Improvem't	*Per Books*	5,690,293			5,690,293	569,029		3,799,377					-	-	4,368,406	1,068,146	354,753	5,791,306
9	Neighborhood Energy Saver	*Per Books*	1,455,850			1,455,850	145,585		1,173,332					-	-	1,318,917	282,317	-	1,601,234
10	Solar Hot Water Pilot	*Per Books*	-			-	-		39,343					-	-	39,343	-	-	39,343
11	EE Lighting (Res)*	*Per Books (allocated)*	8,914,921			8,914,921	1,782,984		9,708,887					-	-	11,491,871	9,105,170	3,742,027	24,339,068
12	Appliance Recycling	*Per Books*	4,566			4,566	457		633,458					-	-	633,915	396,451	119,754	1,150,119
13	My Home Energy Report	*Per Books*	5,519,603			5,519,603	5,519,603		-					-	-	5,519,603	6,016,176	22,039	11,557,818
14	Residential New Construction	*Per Books*	9,539,733			9,539,733	953,973		2,170,251					-	-	3,124,224	1,588,365	522,045	5,234,634
15	Home Depot CFL	*Per Books*	-			-	-	-	21,623					-	-	21,623	-	-	21,623
16	Energy Education Program for Schools	*Per Books*	683,286			683,286	136,657		253,900							390,557	335,531	-	726,088
17	Save Energy & Water Kits	*Per Books*	726,505			726,505	145,301		109,117							254,418	1,741,733	717,765	2,713,917
18	Residential Energy Assessments	*Per Books*	1,523,096			1,523,096	304,619		229,371							533,990	370,750	115,536	1,020,276
19	Multi-Family	*Per Books*	2,055,123			2,055,123	411,025		776,602							1,187,627	2,056,521	505,626	3,749,773
20	Found Revenue	*Per Books*															-		
21	Subtotal-Residential	*Σ Lines 7 thru 20*	36,112,976			36,112,976	9,969,233	-	19,325,050	-	-	-	-	-	-	29,294,283	22,961,160	6,276,021	58,531,465
22	CIG Energy Efficiency	*Per Books*	-			-	-		4,181,401					-	-	4,181,401			4,181,401
23	EE Lighting (Gen Svc)*	*Per Books (allocated)*	1,080,475			1,080,475	216,095		1,178,424							1,394,519	2,639,252	1,213,527	5,247,297
24	Non-Residential Energy Efficiency Programs	*Per Books*	17,896,772			17,896,772	5,965,591		3,817,368							9,782,959	8,747,463	6,944,270	25,474,692
25	Smart Saver Prescriptive	*Per Books*																-	-
26	Smart Saver Custom	*Per Books*																-	-
27	Smart Saver Performance Incentive	*Per Books*															8,952	7,194	16,146
25	Small Business Energy Saver	*Per Books*	7,168,664			7,168,664	2,389,555		4,522,520					-	-	6,912,075	5,825,104	2,221,389	14,958,568
28	Business Energy Report	*Per Books*	16,616			16,616	5,539		39,860							45,399	577	-	45,976
29	Found Revenue	*Per Books*															(186,197)		(186,197)
30	Subtotal-General Service	*Σ Lines 22 thru 29*	26,162,527			26,162,527	8,576,779	-	13,739,573	-	-	-	-	-	-	22,316,352	17,035,151	10,386,380	49,737,883
31	Total of EE Programs	*Lines 21 + 30*	62,275,503			62,275,503	18,546,012	-	33,064,623					-	-	51,610,635	39,996,311	16,662,401	108,269,348
32	EE Assigned A&G and CCost	*Per Books*	-		2,763,836	2,763,836		921,279	2,382,244					6,683,696	2,816,397	12,803,616			12,803,616
33	Total EE and Assigned Costs	*Lines 31 + 32*	62,275,503		2,763,836	65,039,339	18,546,012	921,279	35,446,867					6,683,696	2,816,397	64,414,251	39,996,311	16,662,401	121,072,963
	NC DSDR Program Expenses																		
34	DSDR Program	*Per Books*	3,976,242	735,060		4,711,302	471,130	-	4,436,826	6,339,403	2,672,041	603,847	11,031,510			25,554,757	132,107		25,686,864
35	DSDR Assigned A&G and CCost	*Per Books*			-	-		-	-					1,179,711	497,109	1,676,820			1,676,820
36	Total DSDR and Assigned Costs	*Σ Lines 34 thru 35*	3,976,242	735,060	-	4,711,302	471,130	-	4,436,826	6,339,403	2,672,041	603,847	11,031,510	1,179,711	497,109	27,231,577	132,107	-	27,363,684
37	Test Period Totals	*Lines 6 + 33 + 36*	79,460,975	735,060	3,488,434	83,684,469	20,898,037	1,162,811	48,906,925	6,339,403	2,672,041	603,847	11,031,510	10,165,922	4,283,738	106,064,236	40,178,116	21,846,452	168,088,803

*All Non-Residential programs are amortized over a 3 year period. The Residential Lighting Program, Multi-Family EE and EE Education are recoverable over a 5 year period. My Home Energy Report is recoverable over a 1 year period. All other Residential EE programs are recoverable over 10 years.

Please note: Exhibit may not foot due to rounding.

DUKE ENERGY PROGRESS, LLC
Docket No. E-2, Sub 1174
EMF Adjustment Summary
January 2017 - December 2017

		Residential				General Service				Lighting				Totals			
Line	Description	DSM	DSDR	EE	Total	DSM	DSDR	EE	Total	DSM	DSDR	EE	Total	DSM	DSDR	EE	Total
1	Test Period DSM/EE Rate Billings [1] *Amounts from Miller Exhibit 4*	$ 14,703,167	$ 16,626,699	$ 64,015,210	$ 95,345,076	$ 5,024,209	$ 10,881,855	$ 43,374,475	$ 59,280,539	$ -	$ 378,309	$ -	$ 378,309	$ 19,727,376	$ 27,886,864	$ 107,389,685	$ 155,003,924
2	Less: Uncollectible Allowance in Rates[2]	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
3	Over or (Under) collection of Uncollectibles [3]	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4	True up of Vintage 2015 PPI [4] *Amounts from Evans Exhibit 1 page 1*	-		174,301	174,301	-		-	-			-	-	-	-	174,301	174,301
5	True up of Vintage 2016 PPI [5] *Amounts from Evans Exhibit 1 page 3*	-		212,573	212,573	66,218		9,162	75,380			-	-	66,218	-	221,735	287,953
6	True up of Vintage 2015 Lost Revenue through Year 2015 [6] *Amounts from Evans Exhibit 2 page 3 -4*			959,904	959,904			-	-			-	-	-	-	959,904	959,904
7	True up of Vintage 2016 Lost Revenue through Year 2015 [7] *Amounts from Evans Exhibit 2 page 3 -4*			1,345,437	1,345,437			$ (173,308)	(173,308)				-	-	-	1,172,129	1,172,129
8	Interest on Overcollections/(Undercollections) [8] *Amounts from Miller Exhibit 3*	-	-	(38,207)	(38,207)	188,529	-	(442,967)	(254,439)	-	(318)	-	(318)	188,529	(318)	(481,175)	(292,964)
9	Net Adjustments to DSM/EE EMF Clause *Σ Lines 1 through 8*	$ 14,703,167	$ 16,626,699	$ 66,669,217	$ 97,999,083	$ 5,278,956	$ 10,881,855	$ 42,767,361	$ 58,928,172	$ -	$ 377,991	$ -	$ 377,991	$ 19,982,122	$ 27,886,545	$ 109,436,578	$ 157,305,246
		Miller Exhibit 2 page 5				*To Miller Exhibit 2 page 5*							*To Miller Exhibit 2 page 4*	*o Miller Exhibit 2 page 5*			
			$83,295,916 *To Miller Exhibit 2 page 4*				$53,649,216 *To Miller Exhibit 2 page 4*								$137,323,123 *To Miller Exhibit 2 page 4*		

[1] Actual DSM/EE Rate billings for test period *(January 2017 through December 2017)* .
[2] The Company is not requesting an adjustment for uncollectibles in this proceeding.
[3] The Company is not requesting an adjustment for uncollectibles in this proceeding.
[4] See Evans Exhibit 1 page 1 for a detail list of Vintage 2015 programs impacted by EM&V true-ups
[5] See Evans Exhibit 1 page 3 for a detail list of Vintage 2016 programs impacted by EM&V true-ups
[6] See Evans Exhibit 2 page 5 for a detail list of Vintage 2015 programs impacted by EM&V true-ups
[7] See Evans Exhibit 2 page 5 for a detail list of Vintage 2016 programs impacted by EM&V true-ups
[9] Calculated interest obligation associated with test period *(January 1, 2017 through December 31, 2017).*

Please note: Exhibit may not foot due to rounding.

Duke Energy Progress, LLC
Docket No. E-2, Sub 1174
Estimated Return Calculation - Residential EE & DSM Programs Vintage 2017

		Residential EE Costs, PPI & LR	Residential DSM Costs and PPI	Residential DSDR Program Costs Incurred	Total Program Costs Incurred	NC Residential Revenue Collected	NC Residential EE Program Collection %	EE Program Costs Revenue Collected	(Over)/Under Collection
2017	January	6,489,703	1,655,694	1,706,581	9,851,978	9,805,015	100.00%	(9,805,015)	46,963
2017	February	5,156,632	1,315,593	1,356,027	7,828,252	7,790,936	100.00%	(7,790,936)	37,316
2017	March	4,999,080	1,275,397	1,314,596	7,589,073	7,552,897	100.00%	(7,552,897)	36,176
2017	April	4,012,550	1,023,707	1,055,170	6,091,428	6,062,391	100.00%	(6,062,391)	29,037
2017	May	4,413,655	1,126,039	1,160,648	6,700,343	6,668,403	100.00%	(6,668,403)	31,939
2017	June	5,238,830	1,336,563	1,377,642	7,953,036	7,915,125	100.00%	(7,915,125)	37,911
2017	July	6,608,133	1,685,909	1,737,725	10,031,766	9,983,946	100.00%	(9,983,946)	47,820
2017	August	6,273,181	1,600,453	1,649,643	9,523,277	9,477,881	100.00%	(9,477,881)	45,396
2017	September	5,643,094	1,439,702	1,483,951	8,566,746	8,525,910	100.00%	(8,525,910)	40,836
2017	October	4,488,126	1,145,039	1,180,231	6,813,396	6,780,918	100.00%	(6,780,918)	32,478
2017	November	4,217,286	1,075,941	1,109,009	6,402,236	6,371,718	100.00%	(6,371,718)	30,518
2017	December	5,566,334	1,420,118	1,463,765	8,450,217	8,409,936	100.00%	(8,409,936)	40,281
		63,106,604	16,100,154	16,594,990	95,801,748	95,345,076			456,672

Since DEP is under-collected on program costs, but over-collected on PPI and lost revenues, the Company is calculating a return due to customers on the net balance in total.

Note 1: Revenue source - CIM CRY4 reports
Note 2: Program & Carrying Costs allocated on a weighted average basis based on revenues collected.

		Cumulative (Over)/Under Recovery	Current Income Tax Rate	Monthly Deferred Income Tax	Cumulative Deferred Income Tax	Net Deferred After Tax Balance	Monthly Return	Monthly A/T Return on Deferral	YTD After Tax Interest	Gross up of Return to Pretax Rate	Gross up of Return to Pretax
			2017 tax rate				6.76%			0.764964	
2017	January	46,963	37.0599%	17,404.39	17,404	29,558	0.005632	83	83	0.764964	109
2017	February	84,279	37.0599%	13,829.30	31,234	53,045	0.005632	233	316	0.764964	413
2017	March	120,455	37.0599%	13,406.77	44,640	75,814	0.005632	363	679	0.764964	887
2017	April	149,492	37.0599%	10,761.04	55,401	94,090	0.005632	478	1,157	0.764964	1,513
2017	May	181,431	37.0599%	11,836.75	67,238	114,193	0.005632	586	1,744	0.764964	2,279
2017	June	219,342	37.0599%	14,049.74	81,288	138,054	0.005632	710	2,454	0.764964	3,208
2017	July	267,162	37.0599%	17,722.00	99,010	168,152	0.005632	862	3,316	0.764964	4,335
2017	August	312,558	37.0599%	16,823.71	115,834	196,724	0.005632	1,027	4,343	0.764964	5,678
2017	September	353,394	37.0599%	15,133.91	130,968	222,427	0.005632	1,180	5,524	0.764964	7,221
2017	October	385,873	37.0599%	12,036.46	143,004	242,869	0.005632	1,310	6,834	0.764964	8,934
2017	November	416,391	37.0599%	11,310.11	154,314	262,077	0.005632	1,422	8,256	0.764964	10,792
2017	December	456,672	37.0599%	14,928.05	169,242	287,430	0.005632	1,547	9,803	0.764964	12,815
								9,803			12,815
			Twelve months return on 2017 Year End Balance			287,430		19,424			25,392
			Total return on Non-Residential Lighting								38,207

Duke Energy Progress, LLC
Docket No. E-2, Sub 1174
Estimated Return Calculation -Non-Residential DSM Programs Vintage 2017

		Non-Residential DSM Program Costs Incurred	Non-Residential Allcoated Carrying Costs & A&G	Total Program Costs Incurred	NC Non-Residential DSM Revenue Collected	NC Non- Residential DSM Program Collection %	Non- Residential DSM Program Costs Revenue Collected	(Over)/Under Collection
2017	Januar	188,617	70,209	258,825	373,056	100.0000%	(373,056)	(114,231)
2017	Februa	188,807	70,280	259,087	373,433	100.0000%	(373,433)	(114,346)
2017	March	193,733	72,113	265,847	383,176	100.0000%	(383,176)	(117,330)
2017	April	181,725	67,644	249,369	359,426	100.0000%	(359,426)	(110,057)
2017	May	209,257	77,891	287,148	413,879	100.0000%	(413,879)	(126,731)
2017	June	229,679	85,493	315,172	454,271	100.0000%	(454,271)	(139,099)
2017	July	253,508	94,363	347,871	501,402	100.0000%	(501,402)	(153,531)
2017	Augus	249,242	92,775	342,017	492,964	100.0000%	(492,964)	(150,947)
2017	Septer	249,818	92,990	342,807	494,103	100.0000%	(494,103)	(151,296)
2017	Octob	221,959	82,620	304,579	439,003	100.0000%	(439,003)	(134,424)
2017	Noven	187,499	69,793	257,291	370,845	100.0000%	(370,845)	(113,554)
2017	Decen	186,389	69,380	255,769	368,651	100.0000%	(368,651)	(112,882)
		2,540,233	945,550	3,485,783	5,024,209		(5,024,209)	(1,538,426)

DEP is overcollected on all components Interest is calculated on the entire balance.

Note 1: Revenue source - CIM CRY4 reports
Note 2: Program & Carrying Costs allocated on a weighted average basis based on revenues collected.

		Cumulative (Over)/Under Recovery	Current Income Tax Rate	Monthly Deferred Income Tax	Cumulative Deferred Income Tax	Net Deferred After Tax Balance	Monthly Return	Monthly A/T Return on Deferral	YTD After Tax Interest	Gross up of Return to Pretax Rate	Gross up of Return to Pretax
			2017 tax rate				10.00%			0.764964	
2017	Januar	(114,231)	37.0599%	(42,334)	(42,334)	(71,897)	0.008333	(300)	(300)	0.764964	(392)
2017	Februa	(228,577)	37.0599%	(42,377)	(84,710)	(143,867)	0.008333	(899)	(1,199)	0.764964	(1,567)
2017	March	(345,907)	37.0599%	(43,482)	(128,193)	(217,714)	0.008333	(1,507)	(2,705)	0.764964	(3,536)
2017	April	(455,964)	37.0599%	(40,787)	(168,980)	(286,984)	0.008333	(2,103)	(4,808)	0.764964	(6,285)
2017	May	(582,695)	37.0599%	(46,966)	(215,946)	(366,749)	0.008333	(2,724)	(7,532)	0.764964	(9,846)
2017	June	(721,794)	37.0599%	(51,550)	(267,496)	(454,298)	0.008333	(3,421)	(10,953)	0.764964	(14,318)
2017	July	(875,324)	37.0599%	(56,898)	(324,394)	(550,930)	0.008333	(4,188)	(15,141)	0.764964	(19,794)
2017	Augus	(1,026,271)	37.0599%	(55,941)	(380,335)	(645,936)	0.008333	(4,987)	(20,128)	0.764964	(26,313)
2017	Septer	(1,177,567)	37.0599%	(56,070)	(436,405)	(741,162)	0.008333	(5,780)	(25,908)	0.764964	(33,868)
2017	Octob	(1,311,991)	37.0599%	(49,817)	(486,222)	(825,768)	0.008333	(6,529)	(32,437)	0.764964	(42,403)
2017	Noven	(1,425,544)	37.0599%	(42,083)	(528,305)	(897,239)	0.008333	(7,179)	(39,616)	0.764964	(51,788)
2017	Decen	(1,538,426)	37.0599%	(41,834)	(570,139)	(968,287)	0.008333	(7,773)	(47,389)	0.764964	(61,949)
								(47,389)			(61,949)
			Twelve months return on 2017 Year End Balance			(968,287)		(96,829)			(126,579)
			Total return on Non-Residential Lighting								(188,529)

Duke Energy Progress, LLC
Docket No. E-2, Sub 1174
Estimated Return Calculation -Lighting DSDR Programs Vintage 2017

		Lighting DSDR Program Costs Incurred	Lighting Allocated Carrying Costs & A&G	Total Program Costs Incurred	NC Lighting Revenue Collected	NC Lighting Program Collection %	Lighting Program Costs Revenue Collected	(Over)/Under Collection
2017	Januar	30,483	1,990	32,473	32,254	100.0000%	(32,254)	219
2017	Februa	30,173	1,970	32,142	31,925	100.0000%	(31,925)	217
2017	March	30,322	1,979	32,301	32,083	100.0000%	(32,083)	218
2017	April	28,509	1,861	30,370	30,165	100.0000%	(30,165)	205
2017	May	31,237	2,039	33,276	33,051	100.0000%	(33,051)	225
2017	June	29,794	1,945	31,739	31,524	100.0000%	(31,524)	214
2017	July	29,637	1,935	31,572	31,359	100.0000%	(31,359)	213
2017	Augus	29,812	1,946	31,758	31,543	100.0000%	(31,543)	215
2017	Septer	29,366	1,917	31,283	31,071	100.0000%	(31,071)	211
2017	Octob	30,232	1,974	32,205	31,988	100.0000%	(31,988)	218
2017	Noven	29,393	1,919	31,312	31,100	100.0000%	(31,100)	212
2017	Decem	28,586	1,866	30,452	30,246	100.0000%	(30,246)	206
		357,543	23,340	380,883	378,309		(378,309)	2,574

DEP is undercollected on the DSDRprogram, therefore, interest is calculated on the total.

Note 1: Revenue source - CIM CRY4 reports
Note 2: Program & Carrying Costs allocated on a weighted average basis based on revenues collected.

		Cumulative (Over)/Under Recovery	Current Income Tax Rate	Monthly Deferred Income Tax	Cumulative Deferred Income Tax	Net Deferred After Tax Balance	Monthly Return	Monthly A/T Return on Deferral	YTD After Tax Interest	Gross up of Return to Pretax Rate	Gross up of Return to Pretax
			2017 tax rate				10.00%			0.764964	
2017	Januar	219	37.0599%	81	81	138	0.008333	1	1	0.764964	1
2017	Februa	437	37.0599%	81	162	275	0.008333	2	2	0.764964	3
2017	March	655	37.0599%	81	243	412	0.008333	3	5	0.764964	7
2017	April	860	37.0599%	76	319	541	0.008333	4	9	0.764964	12
2017	May	1,085	37.0599%	83	402	683	0.008333	5	14	0.764964	19
2017	June	1,300	37.0599%	79	482	818	0.008333	6	20	0.764964	27
2017	July	1,513	37.0599%	79	561	952	0.008333	7	28	0.764964	36
2017	Augus	1,728	37.0599%	80	640	1,087	0.008333	8	36	0.764964	48
2017	Septer	1,939	37.0599%	78	719	1,220	0.008333	10	46	0.764964	60
2017	Octob	2,157	37.0599%	81	799	1,357	0.008333	11	57	0.764964	74
2017	Noven	2,368	37.0599%	78	878	1,491	0.008333	12	69	0.764964	90
2017	Decem	2,574	37.0599%	76	954	1,620	0.008333	13	82	0.764964	107
								82			107
			Twelve months return on 2017 Year End Balance			1,620		162			212
			Total return on Non-Residential Lighting								318

Duke Energy Progress, LLC
Docket No. E-2, Sub 1174
Estimated Return Calculation -Non-Residential EE & DSDR Programs Vintage 2017

		Non-Residential EE Costs Incurred	Non-Residential DSDR Costs Incurred	Total Program Costs Incurred	NC EE Non-Residential Revenue Collected	NC Non-Residential EE Program Collection %	Total EE Revenue Collected	NC DSDR Non-Residential Revenue Collected	NC Non-Residential DSDR Program Collection %	DSDR Program Costs Revenue Collected	Total EE & DSDR Revenue Collected	(Over)/Under Collection
2017	January	1,860,441	879,879	2,740,320	1,468,476	100.0000%	(1,468,476)	921,726	100.0000%	(921,726)	(2,390,202)	350,118
2017	February	1,850,339	762,434	2,612,774	1,460,503	100.0000%	(1,460,503)	798,696	100.0000%	(798,696)	(2,259,199)	353,575
2017	March	1,982,588	782,730	2,765,318	1,564,889	100.0000%	(1,564,889)	819,957	100.0000%	(819,957)	(2,384,846)	380,472
2017	April	2,007,474	733,407	2,740,881	1,584,532	100.0000%	(1,584,532)	768,288	100.0000%	(768,288)	(2,352,820)	388,061
2017	May	2,408,114	845,345	3,253,459	1,900,764	100.0000%	(1,900,764)	885,549	100.0000%	(885,549)	(2,786,313)	467,146
2017	June	2,532,014	926,576	3,458,590	1,998,560	100.0000%	(1,998,560)	970,644	100.0000%	(970,644)	(2,969,204)	489,386
2017	July	2,848,324	1,025,239	3,873,562	2,248,228	100.0000%	(2,248,228)	1,073,999	100.0000%	(1,073,999)	(3,322,227)	551,335
2017	August	2,889,731	1,008,432	3,898,163	2,280,912	100.0000%	(2,280,912)	1,056,393	100.0000%	(1,056,393)	(3,337,305)	560,858
2017	September	3,113,717	1,011,080	4,124,797	2,457,708	100.0000%	(2,457,708)	1,059,167	100.0000%	(1,059,167)	(3,516,875)	607,923
2017	October	2,784,276	898,283	3,682,559	2,197,674	100.0000%	(2,197,674)	941,005	100.0000%	(941,005)	(3,138,680)	543,879
2017	November	2,022,576	760,034	2,782,610	1,596,452	100.0000%	(1,596,452)	796,181	100.0000%	(796,181)	(2,392,633)	389,976
2017	December	1,553,021	754,372	2,307,393	1,225,825	100.0000%	(1,225,825)	790,250	100.0000%	(790,250)	(2,016,075)	291,318
		27,852,614	10,387,812	38,240,426	21,984,523		(21,984,523)	10,881,855		(10,881,855)	(32,866,378)	5,374,048

Note 1: Revenue source - CIM CRY4 reports
Note 2: Program & Carrying Costs allocated on a weighted average basis based on revenues collected.

		Cumulative (Over)/Under Recovery	Current Income Tax Rate	Monthly Deferred Income Tax	Cumulative Deferred Income Tax	Net Deferred After Tax Balance	Monthly Return	Monthly A/T Return on Deferral	YTD After Tax Interest	Gross up of Return to Pretax Rate	Gross up of Return to Pretax
			2017 tax rate				6.76%			0.764964	
2017	January	350,118	37.0599%	129,753	129,753	220,364	0.005632	621	621	0.764964	811
2017	February	703,693	37.0599%	131,035	260,788	442,905	0.005632	1,868	2,488	0.764964	3,253
2017	March	1,084,165	37.0599%	141,003	401,790	682,374	0.005632	3,169	5,657	0.764964	7,395
2017	April	1,472,226	37.0599%	143,815	545,605	926,621	0.005632	4,531	10,187	0.764964	13,317
2017	May	1,939,372	37.0599%	173,124	718,729	1,220,643	0.005632	6,046	16,234	0.764964	21,221
2017	June	2,428,758	37.0599%	181,366	900,095	1,528,663	0.005632	7,741	23,975	0.764964	31,341
2017	July	2,980,093	37.0599%	204,324	1,104,419	1,875,673	0.005632	9,586	33,561	0.764964	43,873
2017	August	3,540,951	37.0599%	207,853	1,312,273	2,228,678	0.005632	11,557	45,118	0.764964	58,980
2017	September	4,148,874	37.0599%	225,295	1,537,568	2,611,305	0.005632	13,628	58,746	0.764964	76,796
2017	October	4,692,753	37.0599%	201,561	1,739,129	2,953,623	0.005632	15,670	74,416	0.764964	97,280
2017	November	5,082,729	37.0599%	144,525	1,883,654	3,199,075	0.005632	17,325	91,741	0.764964	119,928
2017	December	5,374,048	37.0599%	107,962	1,991,617	3,382,431	0.005632	18,532	110,273	0.764964	144,154
								110,273			144,154
		Twelve months return on 2017 Year End Balance				3,382,431		228,581			298,813
		Total return on Non-Residential EE programs									442,967

Since DEP is under-collected on program costs and undercollected in total, therefore the Company is calculating interest on the program cost piece of the balance.

Miller Exhibit 4

DUKE ENERGY PROGRESS, LLC
Docket No. E-2, Sub 1174
2017 Actual Revenues

	DSM	DSDR	EE	Total
Rate Period				
Residential	$ 14,703,167	$ 16,626,699	$ 64,015,210	$ 95,345,076
General Service	5,024,209	10,881,855	43,374,475	59,280,539
Lighting		378,309		378,309
Total	$ 19,727,376	$ 27,886,864	$ 107,389,685	$ 155,003,924
EMF				
Residential	$ 54,363	$ 889,280	$ 19,513,373	$ 20,457,015
General Service	4,759	569,682	4,887,581	5,462,023
Lighting		4,348	(161)	4,187
Total	$ 59,121	$ 1,463,310	$ 24,400,793	$ 25,923,225

DUKE ENERGY PROGRESS, LLC
Docket No. E-2, Sub 1174
Allocation Factor Summary through test year 2015

					DSM NC	DSM SC	EE NC	EE SC
A. Allocation Factors								
1	May-08	to	Apr-09	*Calendar 2007 Analysis* [1]	86.73%	13.27%	84.81%	15.19%
1	May-09	to	Apr-10	*Calendar 2008 Analysis* [1]	86.16%	13.84%	85.06%	14.94%
2	May-10	to	Apr-11	*Calendar 2009 Analysis* [2]	85.89%	14.11%	85.41%	14.59%
3	May-11	to	Apr-12	*Calendar 2010 Analysis* [3]	86.49%	13.51%	85.53%	14.47%
4	May-12	to	Apr-13	*Calendar 2011 Analysis* [4]	86.63%	13.37%	85.92%	14.08%
5	May-13	to	Apr-14	*Calendar 2012 Analysis* [5]	86.47%	13.53%	86.06%	13.94%
6	May-14	to	Apr-15	*Calendar 2013 Analysis* [6]	85.68%	14.32%	85.57%	14.43%
7	May-15	to	Apr-16	*Calendar 2014 Analysis* [7]	86.23%	13.77%	85.15%	14.85%
B. Custom Period Factors								
	Test Period [4]							
8	Apr-10	to	Mar-11	*Line 1 x $\frac{1}{12}$ + Line 2 x 11 x $\frac{1}{12}$*	85.91%	14.09%	85.38%	14.62%
	Prospective Period [4]							
9	Apr-11	to	Jul-11	*Line 2 x $\frac{1}{4}$ + Line 3 x $\frac{3}{4}$*	86.34%	13.66%	85.50%	14.50%
	Rate Period [4]							
10	Dec-11	to	Nov-12	*Line 3*	86.49%	13.51%	85.53%	14.47%
	Calendar Year 2010 [8]							
11	Jan-10	to	Dec-10	*Line 1 x $\frac{1}{3}$ + Line 2 x $\frac{2}{3}$*	85.98%	14.02%	85.29%	14.71%
	Calendar Year 2011 [8]							
12	Jan-11	to	Dec-11	*Line 2 x $\frac{1}{3}$ + Line 3 x $\frac{2}{3}$*	86.29%	13.71%	85.49%	14.51%
	Calendar Year 2012 [8]							
13	Jan-12	to	Dec-12	*Line 3 x $\frac{1}{3}$ + Line 4 x $\frac{2}{3}$*	86.58%	13.42%	85.79%	14.21%
	Calendar Year 2013 [8]							
14	Jan-13	to	Dec-13	*Line 4 x $\frac{1}{3}$ + Line 5 x $\frac{2}{3}$*	86.52%	13.48%	86.01%	13.99%
	Calendar Year 2014 [8]							
15	Jan-14	to	Dec-14	*Line 5 x $\frac{1}{3}$ + Line 6 x $\frac{2}{3}$*	85.94%	14.06%	85.73%	14.27%
	Calendar Year 2015 [8]							
16	Jan-15	to	Dec-15	*Line 6 x $\frac{1}{3}$ + Line 7 x $\frac{2}{3}$*	86.05%	13.95%	85.29%	14.71%

Notes:

[1] Allocation Factors values from Docket No. E-2, Sub 951
[2] Allocation Factors values from Docket No. E-2, Sub 977
[3] Allocation Factors values from Docket No. E-2, Sub 1002
[4] Allocation Factors values from Docket No. E-2, Sub 1019
[5] Allocation Factors values from Docket No. E-2, Sub 1030
[6] Allocation Factors values from Docket No. E-2, Sub 1044
[7] Allocation Factors values from Docket No. E-2, Sub 1070
[8] Employed in the allocation of Utility Cost Test (UCT) results for PPI determination.

Duke Energy Progress, LLC
Docket No. E-2, Sub 1174
Allocation Factor For Year 2016
Allocation Factors from 2016 Filed Cost of Service Study

Line	Sales Allocator at Generation		MWh		
1	NC Retail MWh Sales Allocation	Company Records	38,844,804		
2	SC Retail MWh Sales Allocation	Company Records	6,620,461		
3	Total Retail	Line 1 + Line 2	45,465,264		
	Allocation 1 to state based on kWh sales				
4	NC Retail	Line 1 / Line 3	**85.4384204%**		
	Demand Allocators (kW)		**NC**	**SC**	**Total**
5	Residential	Company Records	3,530,456	484,305	4,014,761
6	Non Residential	Company Records	4,003,521	724,998	4,728,519
7	Total	Line 5 + Line 6	7,533,977	1,209,303	8,743,280
	Allocation 2 to state based on peak demand				
8	NC Retail	Line 7, NC / Line 7 Total	**86.1687719%**		
	Allocation 3 NC res vs non-res Peak Demand to retail system peak				
9	NC Residential	Line 5 NC/ Line 7 Total	**40.3790797%**		
10	NC Non-residential	Line 6 NC/ Line 7 Total	**45.7896922%**		
	Allocation 4 NC res vs non-res Peak Demand				
11	NC Residential	Line 5 NC / Line 7 NC	**46.8604563%**		
12	NC Non-residential	Line 6 NC / Line 7 NC	**53.1395437%**		

Duke Energy Progress, LLC
Docket No. E-2, Sub 1174
Allocation Factor For Year 2017
Allocation Factors from 2017 Filed Cost of Service Study

Line			MWh		
	Sales Allocator at Generation				
1	NC Retail MWh Sales Allocation	Company Records	38,923,501		
2	SC Retail MWh Sales Allocation	Company Records	6,596,650		
3	Total Retail	Line 1 + Line 2	45,520,150		
	Allocation 1 to state based on kWh sales				
4	NC Retail	Line 1 / Line 3	**85.5082864%**		
	Demand Allocators (kW)		**NC**	**SC**	**Total**
5	Residential	Company Records	3,743,750	509,212	4,252,962
6	Non Residential	Company Records	4,012,019	736,825	4,748,844
7	Total	Line 5 + Line 6	7,755,769	1,246,037	9,001,806
	Allocation 2 to state based on peak demand				
8	NC Retail	Line 7, NC / Line 7 Total	**86.1579245%**		
	Allocation 3 NC res vs non-res Peak Demand to retail system peak				
9	NC Residential	Line 5 NC/ Line 7 Total	**41.5888790%**		
10	NC Non-residential	Line 6 NC/ Line 7 Total	**44.5690455%**		
	Allocation 4 NC res vs non-res Peak Demand				
11	NC Residential	Line 5 NC / Line 7 NC	**48.2705209%**		
12	NC Non-residential	Line 6 NC / Line 7 NC	**51.7294791%**		

NOTE: These allocation factors are used for Vintage 2017 based on the Cost of Service Study filed in May 2017.

Duke Energy Progress, LLC
Docket No. E-2, Sub 1174
Allocation Factor For Year 2018
Estimated Allocation Factor For Year 2019
Allocation Factors from 2018 Filed Cost of Service Study

Line			MWh		
	Sales Allocator at Generation				
1	NC Retail MWh Sales Allocation	Company Records	38,153,842		
2	SC Retail MWh Sales Allocation	Company Records	6,438,789		
3	Total Retail	Line 1 + Line 2	44,592,631		
	Allocation 1 to state based on kWh sales				
4	NC Retail	Line 1 / Line 3	**85.5608674%**		
	Demand Allocators (kW)		**NC**	**SC**	**Total**
5	Residential	Company Records	3,699,632	487,425	4,187,058
6	Non Residential	Company Records	3,915,717	698,002	4,613,719
7	Total	Line 5 + Line 6	7,615,350	1,185,427	8,800,777
	Allocation 2 to state based on peak demand				
8	NC Retail	Line 7, NC / Line 7 Total	**86.5304240%**		
	Allocation 3 NC res vs non-res Peak Demand to retail system peak				
9	NC Residential	Line 5 NC/ Line 7 Total	**42.0375642%**		
10	NC Non-residential	Line 6 NC/ Line 7 Total	**44.4928598%**		
	Allocation 4 NC res vs non-res Peak Demand				
11	NC Residential	Line 5 NC / Line 7 NC	**48.5812530%**		
12	NC Non-residential	Line 6 NC / Line 7 NC	**51.4187470%**		

NOTE: These allocation factors are used for vintages 2018-2019 based on the most recently filed Cost of Service Study (May 2018)

DUKE ENERGY PROGRESS, LLC
Docket No. E-2, Sub 1174
Energy Allocation Factors - Applicable to EE Program Costs

North Carolina Rate Class Energy Allocation Factors

	Total NC Rate Class Sales (MWh) [1]	Opt-Out Sales[2]	Adjusted NC Rate Class MWh Sales	Rate Class Energy Allocation Factor
	(1)	(2)	(3) = (1) - (2)	(4) = (3) / NC Total in Column 3
Rate Class				
Residential	15,740,239	-	15,740,239	60.65%
General Service	21,297,783	(11,445,011)	9,852,771	37.96%
Lighting	378,515	(17,250)	361,265	1.39%
NC Retail	37,416,537	(11,462,261)	25,954,276	100.00%

NOTES:
(1) Total NC Rate Class Sales (MWh) are for the forecasted year ending December 2019.
(2) Opt-Out sales are provided in Miller Exhibit 6. Since sales are not forecasted by individual customer, historic opt-out sales are assumed to be unchanged during the rate recovery period.

DUKE ENERGY PROGRESS, LLC
Docket No. E-2, Sub 1174
Demand Allocation Factors - Applicable to DSM Programs

North Carolina Rate Class Demand Allocation Factors

Rate Class	Total NC Rate Class Sales (1)	Sales Subject to Opt-Out (2)	Rate Class Demand (3)	Revised Rate Class Demand	Rate Class Allocation Factor
	(1)	(2)	(3)	(4) = ((1 - 2) / 1) * 3	(5) = (4)/Total of Column 4
Residential	15,740,239	-	3,743,750	3,743,750	67.12%
General Service	21,297,783	(11,560,315)	4,012,019	1,834,318	32.88%
Lighting	378,515	(18,089)	0	0	0.00%
NC Retail	37,416,537	(11,578,404)	7,755,769	5,578,068	100.00%

NOTES:

(1) Total NC Rate Class Sales (MWh) are for the forecasted year ended December 2019.
(2) Opt-Out sales are provided in Miller Exhibit 6. Since sales are not forecasted by individual customer, historic opt-out sales are assumed to be unchanged during the rate recovery period.
(3) The Coincident Peak ("CP") demands are based on the 2017 CP occurring on July 13 during the hour ended at 1700 EDT.

DUKE ENERGY PROGRESS, LLC

Docket No. E-2, Sub 1174

Determination of Lighting Allocation Factors

January through March 2017

		Bulb %s		Allocation Factors	
1	Residential	82.30%	*Per M&V*	89.17%	*Lines 1 / (1 + 2)*
2	General Service	10.00%	*Per M&V*	10.83%	*Lines 2 / (1 + 2)*
3	Leakage	7.70%	*Per M&V*	0.00%	*-NA-*
4	Totals	100.00%	*Σ Lines 1 thru 3*	100.00%	*Σ Lines 1 thru 3*

April through December 2017

		Bulb %s		Allocation Factors	
1	Residential	81.70%	*Per M&V*	89.19%	*Lines 1 / (1 + 2)*
2	General Service	9.90%	*Per M&V*	10.81%	*Lines 2 / (1 + 2)*
3	Leakage	8.40%	*Per M&V*	0.00%	*-NA-*
4	Totals	100.00%	*Σ Lines 1 thru 3*	100.00%	*Σ Lines 1 thru 3*

Miller Exhibit 6

Duke Energy Progress, LLC
Docket No. E-2, Sub 1174
Forecasted 2019 kWh Sales

Line	**Spring 2018 Sales Forecast - kWh**	**Total 2019**		
	North Carolina Retail:			
1	Residential	15,740,238,953		
2	Non-Residential	21,297,782,853		
3	Lighting	378,515,081		
4	Total Retail	**37,416,536,887**		
	Non-Residential	**Gross kWh**	**Opt-outs**	**Net kWh**
5	Energy Efficiency	21,297,782,853	(11,445,011,475)	**9,852,771,378**
6	DSM	21,297,782,853	(11,560,314,862)	**9,737,467,991**
7	Lighting - EE	378,515,081	(17,249,864)	**361,265,217**
8	Lighting - DSM	378,515,081	(18,089,191)	**360,425,890**

[1] Actual Opt-Out volumes for the twelve-months ending December 31, 2017.

BEFORE THE NORTH CAROLINA UTILITIES COMMISSION

DOCKET NO. E-2, SUB 1174

In the Matter of	)	
Application of Duke Energy Progress, LLC	)	**DIRECT TESTIMONY OF**
for Approval of Demand-Side Management	)	**ROBERT P. EVANS**
and Energy Efficiency Cost Recovery Rider	)	**FOR**
Pursuant to N.C. Gen. Stat. § 62-133.9 and	)	**DUKE ENERGY PROGRESS, LLC**
Commission Rule R8-69	)	

I. INTRODUCTION AND PURPOSE

Q. PLEASE STATE YOUR NAME, BUSINESS ADDRESS, AND POSITION WITH DUKE ENERGY.

A. My name is Robert P. Evans, and my business address is 150 Fayetteville Street, Raleigh, North Carolina 27602. I am employed by Duke Energy Corporation ("Duke Energy") as Senior Manager-Strategy and Collaboration for the Carolinas in the Market Solutions Regulatory Strategy and Evaluation group.

Q. PLEASE BRIEFLY STATE YOUR EDUCATIONAL BACKGROUND AND EXPERIENCE.

A. I graduated from Iowa State University ("ISU") in 1978 with a Bachelor of Science Degree in Industrial Administration and a minor in Industrial Engineering. As a part of my undergraduate work, I participated in graduate level regulatory studies programs sponsored by American Telephone and Telegraph Corporation, as well as graduate level study programs in Engineering Economics. Subsequent to my graduation from ISU, I received additional Engineering Economics training at the Colorado School of Mines, completed the National Association of Regulatory Utility Commissioners Regulatory Studies program at Michigan State, and completed the Advanced American Gas Association Ratemaking program at the University of Maryland. Upon graduation from ISU, I joined the Iowa State Commerce Commission (now known as the Iowa Utility Board ("IUB")) in the Rates and Tariffs Section of the Utilities Division. During my tenure with the IUB, I held several positions, including Senior Rate Analyst in charge of Utility Rates and Tariffs and Assistant Director of the Utility Division. In those positions, I provided testimony in gas, electric, water, and telecommunications proceedings as an expert witness in the areas of rate design, service rules, and tariff applications. In 1982, I accepted employment with City Utilities of Springfield, Missouri, as an Operations Analyst. In that capacity, I provided support for rate-related matters associated with the municipal utility's gas, electric, water, and sewer operations. In addition, I worked closely with its load management and energy conservation programs. In 1983, I joined the Rate Services staff of the Iowa Power and Light Company, now known as MidAmerican Energy, as a Rate Engineer. In this position, I was responsible for the preparation of rate-related filings and presented testimony on rate design, service rules, and accounting issues before the IUB. In 1986, I accepted employment with Tennessee-Virginia Energy Corporation (now known as the United Cities Division of Atmos Energy) as Director of Rates and Regulatory Affairs. While in this position, I was responsible for regulatory filings, regulatory relations, and customer billing. In 1987, I went to work for the Virginia State Corporation Commission in the Division of Energy Regulation as a Utilities Specialist. In this capacity, I worked on electric and natural gas issues and provided testimony on cost of service and rate design matters brought before that regulatory body. In 1988, I joined North Carolina Natural Gas Corporation ("NCNG") as its Manager of Rates and Budgets. Subsequently, I was promoted to Director-Statistical Services in

NCNG's Planning and Regulatory Compliance Department. In that position, I performed a variety of work associated with financial, regulatory, and statistical analysis and presented testimony on several issues brought before the North Carolina Utilities Commission ("Commission"). I held that position until the closing of NCNG's merger with Carolina Power and Light Company, the predecessor of Progress Energy, Inc. ("Progress"), on July 15, 1999.

From July 1999 through January 2008, I was employed in Principal and Senior Analyst roles by the Progress Energy Service Company, LLC. In these roles, I provided NCNG, Progress Energy Carolinas, Inc. (now Duke Energy Progress, LLC ("DEP" or the "Company")), and Progress Energy Florida, Inc. with rate and regulatory support in their state and federal venues. From 2008 through the merger of Duke Energy and Progress, I provided regulatory support for demand-side management ("DSM") and energy efficiency ("EE") programs. Subsequent to the Progress merger with Duke Energy, I obtained my current position.

Q. HAVE YOU PREVIOUSLY PROVIDED TESTIMONY IN MATTERS BROUGHT BEFORE THIS COMMISSION?

A. Yes. I have provided testimony to this Commission in matters concerning revenue requirements, avoided costs, cost of service, rate design, and the recovery of costs associated with DSM/EE programs and related accounting matters.

Q. WHAT ARE YOUR CURRENT RESPONSIBILITIES?

A. I am responsible for the regulatory support of DSM/EE programs in North Carolina for both DEP and Duke Energy Carolinas, LLC ("DEC").

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY IN THIS PROCEEDING?

A. The purpose of my testimony is to explain and support DEP's proposed DSM/EE Cost Recovery Rider and Experience Modification Factor ("EMF"). My testimony provides: (1) a discussion of items the Commission specifically directed the Company to address in this proceeding; (2) an overview of the Commission's Rule R8-69 filing requirements; (3) a synopsis of the DSM/EE programs included in this filing; (4) a discussion of program results; (5) an explanation of how these results have affected DSM/EE rate calculations; (6) information on DEP's Evaluation Measurement & Verification ("EM&V") activities; and (7) an overview of the calculation of the Portfolio Performance Incentive ("PPI").

Q. PLEASE DESCRIBE THE EXHIBITS ATTACHED TO YOUR TESTIMONY.

A. Evans Exhibit 1 supplies load impacts, program costs, and avoided costs for each program, which are used in the calculation of the PPI and revenue requirements by vintage. Evans Exhibit 2 contains a summary of net lost revenues for the period January 1, 2014 through December 31, 2017. Evans Exhibit 3 contains the actual program costs for North Carolina for the period January 1, 2013 through December 31, 2017. Evans Exhibit 4 contains the found revenues used in the net lost revenues calculations. Evans Exhibit 5 supplies evaluations of event-based programs. Evans Exhibit 6 contains information about the results of DEP's programs and a comparison of actual impacts to previous estimates. Evans Exhibit 7 contains the projected program and portfolio cost-effectiveness results for DEP's approved programs. Evans Exhibit 8 contains a summary of 2017 program performance and an explanation of the variances between the expected program results and the actual results. It is designed to create more transparency with regard to the factors that have driven these variances. Evans Exhibit 9 is a list of DEP's industrial and large commercial customers that have opted out of participation in the Company's DSM and/or EE programs and a listing of those customers that have elected to participate in new measures after having initially notified the Company that they declined to participate, as required by Commission Rule R8-69(d)(2). Evans Exhibit 10 provides a summary of the estimated activities and timeframe for completion of EM&V by program. Evans Exhibit 11 provides the actual and expected dates when the EM&V for each program or measure will become effective.

Evans Exhibits A through K provide detailed EM&V reports, completed or updated since DEP's DSM/EE Cost Recovery Rider Filing in Docket No. E-2, Sub 1145, for the following programs: Demand Response Automation – 2016 (Evans Exhibit A); EE Education Program – 2015 & 2016 (Evans Exhibit B); EnergyWise Home Demand Response Program – Summer 2016 (Evans Exhibit C); EnergyWise Home Demand Response Program – Winter 2016 & 2017 (Evans Exhibit D); Residential Multi-Family EE

Program – 2015 & 2016 (Evans Exhibit E); Non-Residential Smart $aver Program (Prescriptive) – 2016 & 2017 (Evans Exhibit F); EnergyWise for Business Program – 2016 (Evans Exhibit G); Energy Efficient Lighting Program – 2016 & 2017 (Evans Exhibit H); My Home Energy Report (MyHER) Program – 2016 (Evans Exhibit I); Small Business Energy Saver Program – 2015 & 2016 (Evans Exhibit J); and Residential Save Energy and Water Program – 2016 (Evans Exhibit K).

Q. WERE EVANS EXHIBITS 1-11 PREPARED BY YOU OR AT YOUR DIRECTION AND SUPERVISION?

A. Yes, they were.

II. <u>ACTIONS ORDERED BY THE COMMISSION</u>

Q. PLEASE DESCRIBE THE ACTIONS THE COMMISSION DIRECTED DEP TO TAKE IN THE COMMISSION'S ORDER IN DOCKET NO. E-2, SUB 1145.

A. In its November 27, 2017 *Order Approving DSM/EE Rider and Requiring Filing of Proposed Customer Notice* in Docket No. E-2, Sub 1145 ("Sub 1145 Order"), the Commission ordered that: (1) the Appliance Recycling Program shall be canceled as of December 31, 2017; (2) in its next DSM/EE rider filing, DEP should address the continuing cost-effectiveness of the Smart $aver Performance (Custom) Program, Smart $aver Performance (Prescriptive) Program, the Smart $aver Performance Incentive Program, and the Home Energy Improvement Program; (3) with respect to the Smart $aver Performance (Custom) Program and the Smart $aver Performance

(Prescriptive) Program, the Company should include a discussion of the actions being taken to maintain or improve cost-effectiveness, or alternatively, its plans to terminate the program(s) in its next DSM/EE rider filing; (4) if the Commission-approved modifications to the Residential Home Energy Improvement Program do not maintain or improve the program's cost-effectiveness by the Company's next DSM/EE rider proceeding, the program should be terminated at the end of 2018; (5) the EM&V reports for the Small Business Energy Saver Program (Evans Exhibit D) and the Multi-Family EE Program (Evans Exhibit E) should be revised as discussed by Public Staff witness Williamson and refiled in the next rider proceeding and their respective program approval dockets; (6) the Company should, when feasible and not cost prohibitive, incorporate the recommendations made by Public Staff witness Williamson regarding EM&V into future EM&V reports filed with the Commission in subsequent DSM/EE rider proceedings; and (7) the issues raised in Southern Alliance for Clean Energy ("SACE") and North Carolina Justice Center ("NC Justice Center") witness James Grevatt's testimony shall be discussed in the DEP Collaborative as addressed herein, and the results of such discussions shall be reported in the Company's application in the next DSM/EE rider proceeding. In addition, the Commission directed DEP to file updated cost-effectiveness scores for its Distribution System Demand Response ("DSDR") Program in each of DEP's DSM/EE rider proceedings.

Q. DID THE COMPANY CANCEL ITS APPLIANCE RECYCLING PROGRAM AS OF DECEMBER 31, 2017?

A. Yes.

Q. PLEASE ADDRESS THE CONTINUING COST-EFFECTIVENESS OF THE SMART $AVER PERFORMANCE (CUSTOM) MEASURE, THE SMART $AVER PERFORMANCE (PRESCRIPTIVE) MEASURE, THE SMART $AVER PERFORMANCE INCENTIVE PROGRAM, AND THE HOME ENERGY IMPROVEMENT PROGRAM.

A. Both the Smart $aver Custom and Prescriptive measures are not programs but rather subsets of the Nonresidential Smart $aver Energy Efficient Products and Assessment Program. This program, formerly known as EE for Business, is estimated to produce a Utility Cost Test ("UCT") cost-effectiveness score of 2.45 and a Total Resource Cost ("TRC") cost-effectiveness score of 1.07. These resulting scores indicate that the program has exceeded the standard cost-effectiveness thresholds.

DEP's Non-Residential Smart $aver Performance Incentive Program is not expected to have a TRC score exceeding 1.0 in 2019. The forecasted 2019 TRC score is 0.92, and the UCT score is 3.75. These scores are significantly greater than the 0.40 TRC and 0.54 UCT scores submitted in the Company's 2017 cost recovery request. While the 0.92 TRC score may be viewed as slightly less than optimal in isolation, it is important to note that this program is largely an extension of the Non-Residential Smart $aver Program. In particular, the Performance Incentive Program encompasses energy saving measures related to new technologies, unknown building conditions and system constraints, as well as uncertain operating circumstances, occupancy, or production schedules. In these cases, energy savings are difficult to project with any level of accuracy. Due to the scope of projects envisioned, the Company also believes that the program could impact a customer's decision to opt into the EE portion of the rider; in other words, if this program were no longer offered as part of the Company's EE portfolio, additional customers may elect to opt out as a result. Another important element of this program is that it limits the prospects of overcompensating participants, at the expense of other customers, or undercompensating participants for their EE improvements. The Company believes that this program is an important element of its non-residential portfolio of programs and that its cost-effectiveness results will continue to improve as more customers become familiar with it and participation increases.

DEP's Home Energy Improvement Program has been renamed the "Residential Smart $aver EE Program" and modified in several ways. However, this program continues to struggle to maintain cost-effectiveness. During 2016 and 2017, the Company made a number of changes to the program to address the erosion in the program's cost-effectiveness caused by advancements in efficiency standards and the associated lower incremental savings associated with exceeding the new standards. These program changes, which were highlighted by the redesign of the program to include a referral channel that reduced program costs, proved successful in returning the program to cost-effectiveness in 2017 and 2018. Unfortunately, with the application of the new lower avoided costs in 2019, the program is again projecting to no longer be cost-effective. For this reason, the Company is actively working to evaluate additional programmatic changes, such as the Public Staff's recommendation to eliminate all non-referral channel measures, that would offset the decline in avoided costs and make this critical residential program cost-effective in 2019 and beyond.

While the Residential Smart $aver EE Program is not assumed to be cost-effective at this time, the Company believes that suspending or terminating the only program that offers assistance for making the largest single energy user in the home, a customer's HVAC system, more energy efficient does not seem reasonable, especially when the decision to make said investment only comes around once every fifteen years. A suspension of this program would also impact the Company's relationships with HVAC contractors and could erode trust and engagement, which would make it difficult to offer similar types of programs that would require trade ally support in the future.

In the past, when the program's cost-effectiveness has struggled due to efficiency standard changes, the Company has demonstrated the ability to effectively modify the program to restore cost-effectiveness and should have the opportunity to attempt to restore the cost-effectiveness of the program that was eroded by reduction in avoided costs.

The Company is confident that there is a solution available that will lead to a cost-effective program and that shutting down the current operations without an appropriate time frame for planning and adjustment is not the best answer for its customers.

Q. HAS THE COMPANY RE-FILED REVISED EM&V REPORTS FOR THE SMALL BUSINESS ENERGY SAVER PROGRAM (EVANS EXHIBIT D) AND THE MULTI-FAMILY EE PROGRAM (EVANS EXHIBIT E), AS RECOMMENDED BY PUBLIC STAFF WITNESS WILLIAMSON?

A. Yes. The revised EM&V report for the Small Business Energy Saver Program is included as Evans Exhibit J, and the revised EM&V report for the Residential Multi-Family EE Program is included as Evans Exhibit E.

Q. PLEASE SUMMARIZE THE RECOMMENDATIONS MADE BY PUBLIC STAFF WITNESS WILLIAMSON REGARDING FUTURE EM&V REPORTS FILED WITH THE COMMISSION IN SUBSEQUENT DSM/EE RIDER PROCEEDINGS.

A. Witness Williamson recommended that: (1) future EM&V reports should describe any key methodological changes or differences between past and present studies, including differences in methodologies across multiple programs that offer similar or identical measures; (2) if feasible, future evaluations of the Residential Multi-Family EE Program should include a billing analysis and more specific data on bulbs being replaced (if it is not feasible to do so, then the evaluator should address what limitations in program design or evaluation resources would prevent a billing analysis from being conducted); (3) future evaluations of the Small Business Energy Saver program should update the coincidence factors for lighting measures, incorporate HVAC interactive effects, and begin tracking the heating and cooling types of participants to improve estimates of the HVAC interaction factors; and (4) future evaluations of the Neighborhood Energy Saver Program and similar programs should consider utilizing state-level specific data when providing estimates in the program's EM&V review, unless cost-prohibitive.

Q. HAS THE COMPANY ADOPTED WITNESS WILLIAMSON'S RECOMMENDATIONS?

A. Yes. The Company has notified its third-party evaluators of Witness Williamson's recommendations and such recommendations are being adopted to the extent that they are both feasible and cost-effective.

Q. CAN YOU SUMMARIZE THE NEW PROGRAMS AND ENHANCEMENTS TO EXISTING PROGRAMS RECOMMENDED BY SACE AND NC JUSTICE CENTER WITNESS GREVATT?

A. The Commission's Sub 1145 Order provided that the issues raised in witness Grevatt's testimony shall be discussed in the DEP Collaborative. Witness Grevatt recommended that DEP work with the Collaborative to: (1) consider the potential for comprehensive program approaches with longer measure lives, such as home retrofits and HVAC system improvements; (2) consider the maximization of cross-program marketing in behavior, audit, and kit programs; (3) examine opportunities to save more energy in multi-family housing, including in common areas and for commonly-metered systems; (4) consider the expansion of the Company's low-income program offerings; (5) examine ways to continue to promote adoption of a greater range of measures through the Company's Small Business Energy Saver Program; (6) discuss ways to encourage participation of non-residential customers who are eligible to opt out, including making sure that the available programs meet these customers' needs and by providing personalized outreach to engage them; and (7) discuss the use of Advanced Metering Infrastructure ("AMI") technology to drive more EE and DSM for customers if DEP launches a large-scale deployment of AMI.

Q. HAVE THE RECOMMENDATIONS BY WITNESS GREVATT BEEN CONSIDERED BY THE COLLABORATIVE?

A. Yes. Witness Grevatt's proposals have been discussed in the combined DEP and DEC Collaboratives. As previously noted to the Commission, the Collaborative continues to consider ways to improve current residential and non-residential programs and to develop new programs. In addition to originating its own new program proposals, the Company is receptive to ideas for new programs from Collaborative members and has developed a New Program Assumptions Template so that Collaborative members can gather the necessary data for the Company to evaluate their new program ideas. The Company continues to look forward to receiving completed New Program Assumptions Templates from Collaborative members which would provide sufficient data from which the Company can evaluate the viability of new program ideas.

Q. HAS THE COMPANY ANALYZED THE COST-EFFECTIVENESS SCORES FOR ITS DSDR PROGRAM?

A. Yes. The Company has determined that the TRC and UCT cost-effectiveness scores are both 1.204. In addition, the present value of DSDR Program net benefits is approximately $60,567,000.

Q. HAS THE COMPANY MADE ANY CHANGES TO ITS ANNUAL RATIOS OF ALLOCATIONS BETWEEN NON-DSDR AND DSDR EQUIPMENT?

A. DEP reviews the allocation ratios annually each summer and implements any necessary updates the following year. The Company reviewed 2016 units during the summer of 2017 and determined that no change in the 20.12 percent allocation ratio applicable to capacitors was necessary for 2018; however, the allocation ratio applied to regulators was elevated from 77.79 to 79.45 percent. The 2017 units will be reviewed this summer, and any further changes will be communicated to the Public Staff and implemented on January 1, 2019.

III. RULE R8-69 FILING REQUIREMENTS

Q. PLEASE PROVIDE AN OVERVIEW OF THE INFORMATION DEP IS PROVIDING IN RESPONSE TO THE COMMISSION'S FILING REQUIREMENTS.

A. The information for this filing is provided pursuant to the Commission's filing requirements contained in R8-69(f)(1) and can be found in my testimony and exhibits, as well as the testimony and exhibits of Company witness Carolyn T. Miller as follows:

R8-69(f)(1)		Items	Location in Testimony
(i)		Projected NC retail sales for the rate period	Miller Exhibit 6
(ii)		For each measure for which cost recovery is requested through DSM/EE rider:	
(ii)	a.	Total expenses expected to be incurred during the rate period	Evans Exhibit 1
(ii)	b.	Total costs savings directly attributable to measures	Evans Exhibit 1
(ii)	c.	EM&V activities for the rate period	Evans Exhibit 10
(ii)	d.	Expected summer and winter peak demand reductions	Evans Exhibit 1
(ii)	e.	Expected energy reductions	Evans Exhibit 1
(iii)		Filing requirements for DSM/EE EMF rider, including:	
(iii)	a.	Total expenses for the test period in the aggregate and broken down by type of expenditure, unit, and jurisdiction	Evans Exhibit 3
(iii)	b.	Total avoided costs for the test period in the aggregate and broken down by type of expenditure, unit, and jurisdiction	Evans Exhibit 1
(iii)	c.	Description of results from EM&V activities	Testimony of Robert Evans and Evans Exhibits A-K
(iii)	d.	Total summer and winter peak demand reductions in the aggregate and broken down per program	Evans Exhibit 1
(iii)	e.	Total energy reduction in the aggregate and broken down per program	Evans Exhibit 1
(iii)	f.	Discussion of findings and results of programs	Testimony of Robert Evans and Evans Exhibit 6

(iii)	g.	Evaluations of event-based programs	Evans Exhibit 5
(iii)	h.	Comparison of impact estimates from previous year and explanation of significant differences	Testimony of Robert Evans and Evans Exhibits 6 and 8
(iv)		Determination of utility incentives	Testimony of Robert Evans and Evans Exhibit 1
(v)		Actual revenues from DSM/EE and DSM/EE EMF riders	Miller Exhibit 3
(vi)		Proposed DSM/EE rider	Testimony of Carolyn Miller and Miller Exhibit 1
(vii)		Projected NC sales for customers opting out of measures	Miller Exhibit 6
(viii)		Supporting work papers	Flash drive accompanying filing

IV. PROGRAM OVERVIEW

Q. WHAT ARE DEP'S CURRENT DSM AND EE PROGRAMS?

A. The Company's current DSM and EE programs are as follows:

RESIDENTIAL CUSTOMER PROGRAMS

- Appliance Recycling Program
- EE Education Program
- Multi-Family EE Program
- My Home Energy Report Program
- Neighborhood Energy Saver Program
- Residential Smart $aver EE Program (formerly known as the Home Energy Improvement Program)
- New Construction Program
- Load Control Program (EnergyWise)
- Save Energy and Water Kit Program

- Energy Assessment Program

NON-RESIDENTIAL CUSTOMER PROGRAMS

- Non-Residential Smart$aver Energy Efficient Products and Assessment Program (formerly known as the EE for Business Program)
- Non-Residential Smart$aver Performance Incentive Program
- Small Business Energy Saver Program
- CIG Demand Response Automation Program
- EnergyWise for Business

COMBINED RESIDENTIAL/NON-RESIDENTIAL PROGRAMS

- Energy Efficient Lighting Program
- DSDR

Q. PLEASE DESCRIBE ANY UPDATES MADE TO THE UNDERLYING ASSUMPTIONS FOR DEP'S PROGRAMS THAT HAVE ALTERED PROJECTIONS FOR VINTAGE 2019.

A. EM&V results were used to update the savings impacts for those programs for which DEP received EM&V results after it prepared its application in Docket No. E-2, Sub 1145. Updating programs for EM&V results changes the projected avoided cost benefits associated with the projected participation and, hence, impacts the calculation of the specific program and overall portfolio cost-effectiveness, as well as the calculation of DEP's projected shared savings incentive.

Q. AFTER FACTORING THESE UPDATES INTO DEP'S PROGRAMS FOR VINTAGE 2019, DO THE RESULTS OF DEP'S PROSPECTIVE COST-EFFECTIVENESS TESTS INDICATE THAT IT SHOULD DISCONTINUE OR MODIFY ANY OF ITS PROGRAMS?

A. DEP performed a prospective analysis of each of its programs and the aggregate portfolio for the Vintage 2019 period. The results of this prospective analysis are contained in Evans Exhibit 7. This exhibit shows that there are three programs which do not pass the TRC and/or UCT thresholds of 1.0. These programs are: (1) the Neighborhood Energy Saver Program, which was not cost-effective at the time of Commission approval (but was approved based on its societal benefits); (2) the Residential Smart $aver EE Program, formerly known as the Home Energy Improvement Program; (3) My Home Energy Report; (4) the Non-Residential Smart$aver Performance Incentive Program; and (5) the EnergyWise for Business Program. In the aggregate, DEP's portfolio of programs continues to project cost-effectiveness.

As discussed earlier in my testimony, DEP continues its efforts to make the Residential Smart $aver EE Program cost-effective and believes it should continue to be included in the Company's portfolio. The Non-Residential Smart$aver Performance Incentive Program was also discussed earlier in my testimony, and the Company believes that its TRC value will increase in the future in part due to increased scrutiny in the project selection process. As to the MyHER results, while the Company is concerned by the program's projected marginally negative cost-effectiveness, it believes that it is merely a short-term issue that will resolve itself over time. The program is still relatively young (launched in March 2015), with an evaluation period of January 2016 through December 2016. In effect, the Company believes that this first evaluation may not provide a complete picture of the savings that can be realized from participants over time. Based on the MyHER results the Company has experienced in other jurisdictions where the program has been in the market longer (including DEC), the Company believes that as the customer engagement becomes more established that the savings realized by participants will increase. In addition, the Company continues to work with the program vendor to identify potential cost savings associated with offering the program. The cost-effectiveness of the Company's EnergyWise for Business Program was negatively impacted by lower than anticipated participation. The Company believes that the program's 0.72 UCT score will elevate as participation increases.

V. DSM/EE PROGRAM RESULTS TO DATE

Q. HOW MUCH ENERGY, CAPACITY AND AVOIDED COST SAVINGS DID DEP DELIVER AS A RESULT OF ITS DSM/EE PROGRAMS DURING VINTAGE 2017?

A. During Vintage 2017, DEP's DSM/EE programs delivered over 416 million kilowatt hours ("kWh") of energy savings and over 450 megawatts ("MW") of capacity savings, which produced a net present value of avoided cost savings of close to $287 million. The 2017 performance results for individual programs are provided in Evans Exhibits 6 and 8.

Q. DID ANY PROGRAMS SIGNIFICANTLY OUT-PERFORM RELATIVE TO THEIR ORIGINAL ESTIMATES FOR VINTAGE 2017?

A. Yes. In the residential market, two programs did significantly out-perform compared to their original energy savings estimates: the Residential Energy Assessment Program and the Residential Smart $aver EE Program. When compared to estimates originally filed for Vintage 2017, the programs exceeded projections by 174 percent and 295 percent, respectively. Both programs achieved these increases largely through higher participation levels.

The non-residential program with the largest percentage increase in expected energy savings from those forecasted for 2017 is the Small Business Energy Saver Program. This program produced energy savings that exceeded DEP's projections by 162 percent.

Q. HAVE ANY PROGRAMS SIGNIFICANTLY UNDERPERFORMED RELATIVE TO THEIR ORIGINAL ESTIMATES IN VINTAGE 2016?

A. Yes. In the residential market, three programs did not achieve energy savings in excess of those forecasted for 2017. These were: (1) the Energy Efficient Lighting Program; and (2) the My Home Energy Report Program. These programs achieved 70 percent and 88 percent of projected energy savings, respectively. The primary drivers for the underperformance of these programs are changes in estimated impacts and changes in the mix of program measures.

In the non-residential market, the Energy Efficient Lighting Program failed to meet energy savings expectations. The primary drivers for the underperformance of the Energy Efficient Lighting Program were changes to the estimated impacts and changes in the mix of program measures.

VI. PROJECTED RESULTS

Q. PLEASE PROVIDE A PROJECTION OF THE RESULTS THAT DEP EXPECTS TO SEE FROM IMPLEMENTATION OF ITS PORTFOLIO OF PROGRAMS.

A. DEP will update the actual and projected DSM/EE achievement levels in its annual DSM/EE cost recovery filing to account for any program or measure additions based on the performance of programs, market conditions, economics, and consumer demand. The actual results for Vintage 2017 and projection of the results for the next two years, as well as the associated projected program expenses, are summarized in the table below:

DEP System (NC & SC) DSM/EE Portfolio 2017 Actual Results and 2018-2019 Projected Results			
	2017	2018	2019
Annual System MW	450	426	461
Annual System Net Gigawatt-Hours	416	374	385
Annual Program Costs (Millions)	$97	$90	$100

VII. EM&V ACTIVITIES

Q. CAN YOU PROVIDE INFORMATION ON THE COMPANY'S EM&V ACTIVITIES?

A. Yes. Evans Exhibit 10 provides a summary of the estimated activities and timeframe for completion of EM&V by program. Evans Exhibit 11 provides the actual and expected dates of when the EM&V for each program or measure will become effective. Evans Exhibits A through K provide the completed EM&V reports or updates for the following programs:

Evans Exhibit	EM&V Reports	Report Finalization Date
A	Demand Response Automation – 2016	6/19/2017
B	EE Education Program – 2015 & 2016	7/28/2017
C	EnergyWise Home Demand Response Program – Summer 2016	6/5/2017
D	EnergyWise Home Demand Response Program – Winter 2016 & 2017	7/6/2017
E	Residential Multi-Family Efficiency Program – 2015 & 2016	6/27/2017
F	Non-Residential Smart $aver Program (Prescriptive) – 2016 & 2017	3/25/2018
G	EnergyWise for Business Program – 2016	6/12/2017
H	Energy Efficient Lighting Program – 2016 & 2017	4/26/2018
I	My Home Energy Report (MyHER) Program - 2016	7/31/2017
J	Small Business Energy Saver Program – 2015 & 2016	6/6/2017
K	Residential Save Energy and Water Program – 2016	11/29/2017

Q. HOW WERE EM&V RESULTS UTILIZED IN DEVELOPING THE PROPOSED RATES?

A. The Company has applied EM&V in accordance with the process approved by the Commission in its Order Approving Revised Cost Recovery Mechanism and Granting Waivers issued January 20, 2015 in Docket No. E-2, Sub 931 ("Order Approving Revised Mechanism").

The level of EM&V required varies by program and depends upon that program's contribution to the total portfolio, the duration the program has been in the portfolio without material change, and whether the program and administration is new and different in the energy industry. DEP estimates, however, that no additional costs above five percent of total program costs will be associated with performing EM&V for all measures in the portfolio.

Q. WHICH PROGRAMS CONTAIN IMPACT RESULTS BASED ON CAROLINAS-BASED EM&V?

A. All of the impact results included in the Company's filing (Evans Exhibits A through K) are based on Carolinas-based EM&V.

VIII. RATE IMPACTS

Q. HAVE THE PARTICIPATION RESULTS AFFECTED THE VINTAGE 2017 EMF?

A. Yes. The EMF accounts for changes to actual participation relative to the forecasted participation levels utilized in DEP's 2017 DSM/EE rider. As DEP receives actual participation information, it is then able to update participation-driven actual avoided cost benefits and the net lost revenues derived from its DSM and EE programs. For example, with all other things being equal, for programs that underperform relative to their original participation targets, the EMF will be reduced to reflect lower costs, net lost revenues, and shared savings incentives. On the other hand, higher-than-expected participation in programs causes the EMF to reflect higher program costs, net lost revenues, and shared savings incentives. In addition, the EMF is impacted by the application of EM&V results.

Q. HOW WILL EM&V BE INCORPORATED INTO THE VINTAGE 2016 EMF COMPONENT OF ITS RATES?

A. All of the final EM&V results that were received by DEP as of December 31, 2017 have been applied prospectively from the first day of the month immediately following the month in which the study participation sample for the EM&V was completed. Accordingly, for any program for which DEP has received EM&V results, the per participant impact applied to the projected program participation in Vintage 2017 is based upon the actual EM&V results that have been received.

Q. HAS THE OPT-OUT OF NON-RESIDENTIAL CUSTOMERS AFFECTED THE RESULTS OF APPROVED PROGRAMS?

A. Yes, the opt-out of qualifying non-residential customers has had a significant effect on DEP's overall non-residential participation and the associated impacts. For Vintage 2017, DEP had 4,165 eligible customer accounts opt out of participating in DEP's non-residential portfolio of EE programs and had 4,099 eligible customer accounts opt out of participating in DEP's non-residential portfolio of DSM programs. This is an increase from the 3,869 EE accounts and 3,919 DSM opt-outs reported for 2016.

Q. IS THE COMPANY CONTINUING ITS EFFORTS TO ATTRACT THE PROGRAM PARTICIPATION OF OPT-OUT ELIGIBLE CUSTOMERS?

A. Yes. Increasing the participation of opt-out eligible customers in DSM and EE programs is very important to the Company. DEP continues to evaluate and revise its non-residential programs to accommodate new technologies, eliminate product gaps, remove barriers to participation, and make its programs more attractive. It also continues to leverage its Large Account Management Team to make sure customers are informed about product offerings. Forty-four customers did opt in to participate in programs during 2017.

IX. NET LOST REVENUES

Q. IS DEP REQUESTING RECOVERY OF NET LOST REVENUES FOR ALL OF ITS PROGRAMS?

A. No. At this time, DEP is not requesting recovery of net lost revenues for its EnergyWise or CIG Demand Response Automation programs.

Q. IS THE COMPANY REQUESTING THE RECOVERY OF NET LOST REVENUES ASSOCIATED WITH ITS DSDR PROGRAM IN THIS PROCEEDING?

A. Yes. The Company has recognized net lost revenues for the test period based on its analysis of energy savings impacts related to DSDR activations occurring between January 1 and May 31, 2017.

Q. HAS THE COMPANY RECOGNIZED FOUND REVENUES IN ITS CALCULATION OF NET LOST REVENUES?

A. Yes. The recognized found revenues are provided in Evans Exhibit 4.

Q. PLEASE DESCRIBE HOW DEP DETERMINES ITS FOUND REVENUES.

A. Consistent with the Commission's Order Approving Revised Mechanism, DEP has adopted the "Decision Tree" located in Attachment C of the approved revised cost recovery mechanism. Consistent with the methodology employed by DEP, found revenue activities are identified, categorized, and netted against the net lost revenues created by DEP's EE programs. Found revenues, as calculated, result from DEP's activities that are perceived to directly or indirectly result in an increase in customer demand or energy consumption within DEP's service territory. However, revenues resulting from load-building activities would not be considered found revenues if they (1) would have occurred regardless of DEP's activity, (2) were a result of a Commission-approved economic development activity not determined to produce found revenues, or (3) were part of an unsolicited request for DEP to engage in an activity that supports efforts to grow the economy. DEP also adjusts the calculation of found revenues to account for the impacts of activities outside of its DSM/EE programs that it undertakes that reduce customer consumption – i.e., "negative found revenues." Based on the results of this work, all potential found revenue-related activities are identified and categorized in Evans Exhibit 4.

Q. PLEASE DISCUSS THE ADJUSTMENT THAT DEP MAKES TO ITS FOUND REVENUE CALCULATION TO ACCOUNT FOR NEGATIVE FOUND REVENUES.

A. DEP continues to aggressively pursue, with its outdoor lighting customers, the replacement of aging Mercury Vapor lights with Light Emitting Diode

("LED") fixtures. By moving customers past the standard High Pressure Sodium ("HPS") fixture to an LED fixture in this replacement process, DEP is generating significant energy savings. These energy savings, since they come outside of DEP's EE programs, are not captured in DEP's calculation of lost revenues. Since one of the activities that DEP includes in the calculation of found revenues is the increase in consumption from new outdoor lighting fixtures added by DEP, it is logical and symmetrical to count the energy consumption reduction realized in outdoor lighting efficiency upgrades. The Company does not take credit for the entire efficiency gain from replacing Mercury Vapor lights, but rather only the efficiency gain from replacing HPS with LED fixtures. Also, DEP has not recognized any negative found revenues in excess of the found revenues calculated; in other words, the net found revenues number will never be negative and have the effect of increasing net lost revenue calculations.

X. PPI CALCULATION

Q. PLEASE PROVIDE AN OVERVIEW OF THE SHARED SAVINGS RECOVERY MECHANISM APPROVED IN THE ORDER APPROVING REVISED MECHANISM.

A. Pursuant to the Commission's Order Approving Revised Mechanism, for Vintage Year 2017 and subsequent vintage years, DEP's revised cost recovery mechanism allows it to (1) recover the reasonable and prudent costs incurred for adopting and implementing DSM and EE measures in accordance with N.C. Gen. Stat. § 62-133.9 and Commission Rules R8-68 and R8-69; (2)

recover net lost revenues incurred for up to 36 months of a measure's life for DSM and EE programs; and (3) earn a PPI based upon the sharing of 11.75% of the net savings achieved through DEP's DSM/EE programs on an annual basis.

Q. IS DEP REQUESTING PPI FOR ALL OF ITS PROGRAMS?

A. No. The Company is not requesting PPI recovery for its Residential Low-Income Program or its EE Education Program. In addition, under the terms of the revised cost recovery mechanism, DEP is not eligible for a PPI for its DSDR Program.

Q. PLEASE EXPLAIN HOW DEP DETERMINES THE PPI.

A. First, DEP determines the net savings eligible for incentive by subtracting the present value of the annual lifetime DSM/EE program costs (excluding low-income programs or other programs with societal benefits which are explicitly approved with expected UCT results less than 1.0) from the net present value of the annual lifetime avoided costs achieved through the Company's programs (again, excluding approved low-income and societal programs). The Company then multiplies the net savings eligible for incentive by the 11.75% shared savings percentage to determine its pretax incentive.

XI. CONCLUSION

Q. DOES THIS CONCLUDE YOUR PRE-FILED DIRECT TESTIMONY?

A. Yes.

Duke Energy Progress
Evans Exhibit 1, page 1
Vintage 2015 True Up - January 1, 2015 to December 31, 2015
Docket Number E-2, Sub 1174
Load Impacts and Estimated Revenue Requirements by Program

			A	B	C	D =(A-B)*C	E = (B+D)	F		G	H =O (from page 2)
Residential Programs	**System kW Reduction - Summer Peak**	**System Energy Reduction (kWh)**	**System NPV of Avoided Costs**	**Total Cost**	**Shared Savings %**	**Incentive**	**Unadjusted Rev Requirement [2]**	**NC Retail kWh Sales Allocation Factor**		**NC Residential Unadjusted Revenue Requirement [2]**	**Adjusted Revenue Requirement (EMF)**
EE Programs											
Appliance Recycling Program	566	4,407,053	$ 1,508,567	$ 1,220,465	13.00%	$ 37,453	$ 1,257,919	85.2900000%	E1 * F1	$ 1,072,879	$ -
Energy Education Program for Schools	1,102	2,602,999	$ 1,576,241	$ 703,689	0.00%	$ -	$ 703,689	85.2900000%	E2 * F2	$ 600,176	$ -
Energy Efficient Lighting	8,839	61,303,976	$ 35,910,710	$ 14,616,136	13.00%	$ 2,768,295	$ 17,384,431	85.2900000%	E3 * F3	$ 14,827,181	$ -
Home Energy Improvement Program	1,911	6,086,957	$ 6,858,804	$ 5,298,232	13.00%	$ 202,874	$ 5,501,106	85.2900000%	E4 * F4	$ 4,691,894	$ -
Multi-Family	2,112	17,949,005	$ 9,816,135	$ 2,615,745	13.00%	$ 936,051	$ 3,551,795	85.2900000%	E5 * F5	$ 3,029,326	$ (21,570)
Neighborhood Energy Saver	315	2,067,494	$ 1,134,613	$ 1,586,061	0.00%	$ -	$ 1,586,061	85.2900000%	E6 * F6	$ 1,352,751	$ -
Residential New Construction	2,828	6,607,792	$ 12,081,218	$ 7,447,258	13.00%	$ 602,415	$ 8,049,672	85.2900000%	E8 * F8	$ 6,865,566	$ (31,782)
Save Energy and Water Kit	-	-	$ -	$ -	13.00%	$ -	$ -	85.2900000%	E10 * F10	$ -	$ -
Residential Home Advantage	-	-	$ -	$ -	13.00%	$ -	$ -	85.2900000%		$ -	$ -
Total for Residential Conservation Programs	17,673	101,025,275	$ 68,886,289	$ 33,487,585		$ 4,547,088	$ 38,034,673			$ 32,439,773	$ (53,353)
My Home Energy Report	17,141	105,857,368	$ 5,791,217	$ 5,808,941	13.00%	$ -	$ 5,808,941	85.2900000%	E11 * F11	$ 4,954,446	$ 227,654
Total Residential Conservation and Behavioral Programs	34,814	206,882,643	$ 74,677,506	$ 39,296,526		$ 4,547,088	$ 43,843,614			$ 37,394,219	$ 174,301
								NC Residential Peak Demand Allocation Factor			
EnergyWise	28,015	-	$ 32,617,641	$ 5,205,545	8.00%	$ 2,192,968	$ 7,398,513	86.0466667%		$ 6,366,174	$ -
Total Residential	62,829	206,882,643	$ 107,295,146	$ 44,502,071		$ 6,740,055	$ 51,242,126			$ 43,760,393	$ 174,301
Non-Residential Programs	**System kW Reduction - Summer Peak**	**System Energy Reduction (kWh)**	**System NPV of Avoided Costs**	**Total Cost**	**Shared Savings %**	**Incentive**	**Unadjusted Rev Requirement (2)**	**NC Retail kWh Sales Allocation Factor**		**NC Residential Unadjusted Revenue Requirement (2)**	**Adjusted Revenue Requirement (EMF)**
EE Programs											
Business Energy Report	-	-	$ -	$ 74,374	13.00%	$ -	$ 74,374	85.2900000%	E13 * F13	$ 63,433	$ -
Energy Efficiency for Business	4,829	57,365,602	$ 29,902,372	$ 6,226,453	13.00%	$ 3,077,869	$ 9,304,322	85.2900000%	E14 * F14	$ 7,935,657	$ -
Energy Efficient Lighting	4,172	19,250,609	$ 11,551,470	$ 1,775,958	13.00%	$ 1,270,817	$ 3,046,775	85.2900000%	E16 * F16	$ 2,598,594	$ -
Small Business Energy Saver	6,829	42,318,074	$ 25,239,036	$ 9,780,196	13.00%	$ 2,009,649	$ 11,789,845	85.2900000%	E17 * F17	$ 10,055,559	$ -
Total for Non-Residential Conservation Programs	15,830	118,934,285	$ 66,692,877	$ 17,856,981		$ 6,358,335	$ 24,215,316			$ 20,653,243	$ -
EnergyWise for Business	-	-	$ -	$ 65,456	8.00%	$ -	$ 65,456	86.0466667%	E19 * F19	$ 56,323	$ -
Commercial, Industrial, & Governmental Demand Response	894	-	$ 1,025,439	$ 569,444	8.00%	$ 36,480	$ 605,924	86.0466667%	E20 * F20	$ 521,377	$ -
Total for Non-Residential DSM Programs	894	-	$ 1,025,439	$ 634,900		$ 36,480	$ 671,380	86.0466667%		$ 577,700	$ -
Total Non Residential	16,725	118,934,285	$ 67,718,316	$ 18,491,881		$ 6,394,815	$ 24,886,696			$ 21,230,943	$ -
Total All Programs	79,554	325,816,928	$ 175,013,463	$ 62,993,952		$ 13,134,870	$ 76,128,823			$ 64,991,336	$ 174,301

(1) My Home Energy Report impacts reflect cumulative capability as of end of vintage year, including impacts for participants from prior vintages
(2) Total System DSM programs allocated to Residential and Non-Residential based on contribution to retail system peak

DSDR	315,673	41,988,428		7,999,427			$ 7,999,427				
Total with DSDR	395,226	367,805,357	$ 175,013,463	$ 70,993,380		$ 13,134,870	$ 84,128,250			$ 64,991,336	$ 174,301

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Vintage 2015 True Up - January 1, 2015 to December 31, 2015

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Load Impacts and Estimated Revenue Requirements by Program

Residential Programs

EE Programs

		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
				=A*B	=A+C			=-PMT(E,F,D)	=1-B	=G/H		=J-I		=L*K	=M*L*E	=M+N
		NC Incentive	Income Tax Rate	Income Taxes	Net-of-Tax PPI - Total NPV	Discount Rate	PPI Amortization Period	Vintage Year 2015 - Year 1 PPI	Income Tax Gross-Up Factor	Adjusted PPI	Original Vintage 2015 PPI	PPI Over / (Under) Collection	Years at Original PPI Level	Cumulative PPI Over / (Under) Collection	Carrying Costs	PPI Over/(Under) Collection w/CCost
1	**Appliance Recycling Program**	$ 31,944	38.16%	$ (12,190)	$ 19,754	6.73%	10	$ 2,778	61.84%	$ 4,492	$ 4,492	$ -	1	$ -	$ -	$ -
2	**Energy Education Program for Schools**	$ -	38.16%	$ -	$ -	6.73%	N/A	$ -	61.84%	$ -	$ -	$ -	1	$ -	$ -	$ -
3	**Energy Efficient Lighting**	$ 2,361,078	38.16%	$ (900,992)	$ 1,460,086	6.73%	10	$ 205,338	61.84%	$ 332,048	$ 332,048	$ -	1	$ -	$ -	$ -
4	**Home Energy Improvement Program**	$ 173,032	38.16%	$ (66,029)	$ 107,002	6.73%	10	$ 15,048	61.84%	$ 24,334	$ 24,334	$ -	1	$ -	$ -	$ -
5	**Multi-Family**	$ 798,358	38.16%	$ (304,655)	$ 493,703	6.73%	5	$ 119,554	61.84%	$ 193,329	$ 173,120	$ (20,209)	1	$ (20,209)	$ (1,361)	$ (21,570)
6	**Neighborhood Energy Saver**	$ -	38.16%	$ -	$ -	6.73%	N/A	$ -	61.84%	$ -	$ -	$ -	1	$ -	$ -	$ -
7	**Residential New Construction**	$ 513,800	38.16%	$ (196,067)	$ 317,733	6.73%	10	$ 44,684	61.84%	$ 72,258	$ 42,480	$ (29,777)	1	$ (29,777)	$ (2,005)	$ (31,782)
8	**Save Energy and Water Kit**	$ -	38.16%	$ -	$ -	6.73%	5	$ -	61.84%	$ -	$ -	$ -	1	$ -	$ -	$ -
9	**Residential Home Advantage**	$ -	38.16%	$ -	$ -	6.73%	10	$ -	61.84%	$ -	$ -	$ -	1	$ -	$ -	$ -
10	**Total for Residential Conservation Programs**	$ 3,878,211		$ (1,479,933)	$ 2,398,278			$ 387,402		$ 626,461	$ 576,474	$ (49,986)		$ (49,986)	$ (3,366)	$ (53,353)
11	**My Home Energy Report**	$ -	38.16%	$ -	$ -	6.73%	1	$ -	61.84%	$ -	$ 213,290	$ 213,290	1	$ 213,290	$ 14,364	$ 227,654
12	**Total Residential Conservation and Behavioral Programs**	$ 3,878,211		$ (1,479,933)	$ 2,398,278			$ 387,402		$ 626,461	$ 789,764	$ 163,304		$ 163,304	$ 10,997	$ 174,301
13	**EnergyWise**	$ 1,886,976	38.16%	$ (720,074)	$ 1,166,902	6.73%	10	$ 164,106	61.84%	$ 265,373	$ 265,373	$ -	1	$ -	$ -	$ -
14	**Total Residential**	$ 5,765,187		$ (2,200,007)	$ 3,565,180			$ 551,508		$ 891,833	$ 1,055,137	$ 163,304		$ 163,304	$ 10,997	$ 174,301

		J							K
									=J+I
		Σ Prior Period PPI	Vintage 2009 PPI	Vintage 2010 PPI	Vintage 2011 PPI	Vintage 2012 PPI	Vintage 2013 PPI	Vintage 2014 PPI	PPI Values for Test Period
1	**Appliance Recycling Program**	$ 112,329	$ -	$ 28,547	$ 20,592	$ 38,647	$ 17,038	$ 7,505	$ 116,821
2	**Energy Education Program for Schools**	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
3	**Energy Efficient Lighting**	$ 2,512,631	$ -	$ 546,425	$ 309,670	$ 621,854	$ 636,857	$ 397,825	$ 2,844,679
4	**Home Energy Improvement Program**	$ 325,755	$ 10,405	$ 75,357	$ 116,481	$ 108,864	0	$ 14,647	$ 350,089
5	**Multi-Family**	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 193,329
6	**Neighborhood Energy Saver**	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
7	**Residential New Construction**	$ 102,391	$ -	$ -	$ -	$ -	$ 47,653	$ 54,738	$ 174,649
8	**Save Energy and Water Kit**	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
9	**Residential Home Advantage**	$ 176,476	$ 8,018	$ 27,550	$ 79,940	$ 60,450	$ 517	$ -	$ 176,476
10	**Total for Residential Conservation Programs**	$ 3,229,582	$ 18,424	$ 677,879	$ 526,684	$ 829,814	$ 702,066	$ 474,715	$ 3,856,042
11	**My Home Energy Report**	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
12	**Total Residential Conservation and Behavioral Programs**	$ 3,229,582	$ 18,424	$ 677,879	$ 526,684	$ 829,814	$ 702,066	$ 474,715	$ 3,856,042
13	**EnergyWise**	$ 2,978,510	$ 135,141	$ 1,043,048	$ 781,456	$ 347,959	$ 301,384	$ 369,522	$ 3,243,883
14	**Total Residential**	$ 6,208,092	$ 153,564	$ 1,720,927	$ 1,308,140	$ 1,177,773	$ 1,003,450	$ 844,237	$ 7,099,925

Non-Residential Programs

EE Programs

		NC Incentive	Income Tax Rate	Income Taxes	Net-of-Tax PPI - Total NPV	Discount Rate	PPI Amortization Period	Vintage Year 2015 - Year 1 PPI	Income Tax Gross-Up Factor	Adjusted PPI	Original Vintage 2015 PPI	PPI Over / (Under) Collection	Years at Original PPI Level	Cumulative PPI Over / (Under) Collection	Carrying Costs	PPI Over/(Under) Collection w/CCost
15	**Business Energy Report**	$ -	38.16%	$ -	$ -	6.73%	1	$ -	61.84%	$ -	$ -	$ -	1	$ -	$ -	$ -
16	**Energy Efficiency for Business**	$ 2,625,115	38.16%	$ (1,001,749)	$ 1,623,366	6.73%	10	$ 228,300	61.84%	$ 369,180	$ 369,180	$ -	1	$ -	$ -	$ -
17	**Energy Efficient Lighting**	$ 1,083,879	38.16%	$ (413,611)	$ 670,269	6.73%	10	$ 94,263	61.84%	$ 152,430	$ 152,430	$ -	1	$ -	$ -	$ -
18	**Small Business Energy Saver**	$ 1,714,030	38.16%	$ (654,077)	$ 1,059,953	6.73%	10	$ 149,065	61.84%	$ 241,051	$ 241,051	$ -	1	$ -	$ -	$ -
19	**Total for Non-Residential Conservation Programs**	$ 5,423,024		$ (2,069,437)	$ 3,353,587			$ 471,628		$ 762,661	$ 762,661	$ -		$ -	$ -	$ -
20	**EnergyWise for Business**	$ -	38.16%	$ -	$ -	6.73%	10	$ -	61.84%	$ -	$ -	$ -	1	$ -	$ -	$ -
21	**Commercial, Industrial, & Governmental Demand Respons**	$ 31,389	38.16%	$ (11,978)	$ 19,411	6.73%	10	$ 2,730	61.84%	$ 4,414	$ 4,414	$ -	1	$ -	$ -	$ -
22	**Total for Non-Residential DSM Programs**	$ 31,389		$ (11,978)	$ 19,411			$ 2,730		$ 4,414	$ 4,414	$ -		$ -	$ -	$ -
23	**Total Non Residential**	$ 5,454,413		$ (2,081,415)	$ 3,372,998			$ 474,358		$ 767,075	$ 767,075	$ -		$ -	$ -	$ -
24	**Total All Programs**	$ 11,219,600		$ (4,281,422)	$ 6,938,178			$ 1,025,866		$ 1,658,908	$ 1,822,212	$ 163,304		$ 163,304	$ 10,997	$ 174,301

		Σ Prior Period PPI	Vintage 2009 PPI	Vintage 2010 PPI	Vintage 2011 PPI	Vintage 2012 PPI	Vintage 2013 PPI	Vintage 2014 PPI	PPI Values for Test Period
15	**Business Energy Report**	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
16	**Energy Efficiency for Business**	$ 3,112,222	$ 169,910	$ 452,376	$ 649,907	$ 722,666	$ 678,479	$ 438,885	$ 3,481,402
17	**Energy Efficient Lighting**	$ 650,689	$ -	$ 134,853	$ 74,572	$ 153,107	$ 171,971	$ 116,186	$ 803,120
18	**Small Business Energy Saver**	$ 298,032	$ -	$ -	$ -	$ -	$ 80,709	$ 217,323	$ 539,082
19	**Total for Non-Residential Conservation Programs**	$ 4,060,943	$ 169,910	$ 587,229	$ 724,479	$ 875,773	$ 931,159	$ 772,394	$ 4,823,604
20	**EnergyWise for Business**	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
21	**Commercial, Industrial, & Governmental Demand Respons**	$ 146,545	$ -	$ 65,722	$ 17,655 `	$ 28,315	$ 9,714	$ 25,139	$ 150,959
22	**Total for Non-Residential DSM Programs**	$ 146,545	$ -	$ 65,722	$ 17,655	$ 28,315	$ 9,714	$ 25,139	$ 150,959
23	**Total Non Residential**	$ 4,207,488	$ 169,910	$ 652,951	$ 742,134	$ 904,088	$ 940,873	$ 797,533	$ 4,974,563
24	**Total All Programs**	$ 10,415,580	$ 323,474	$ 2,373,878	$ 2,050,273	$ 2,081,861	$ 1,944,323	$ 1,641,770	$ 12,074,488

(1) Energy Efficient Benchmarking impacts reflect cumulative capability as of end of vintage year, including impacts for participants from prior vintages

(2) Total System DSM programs allocated to Residential and Non-Residential based on contribution to retail system peak

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	Residential Programs	System kW Reduction - Summer Peak	System Energy Reduction (kWh)	A System NPV of Avoided Costs	B Total Cost	C Shared Savings %	D =(A-B)*C Incentive	E = (B+D) Unadjusted Rev Requirement [2]	F NC Retail kWh Sales Allocation Factor		G NC Residential Unadjusted Revenue Requirement [2]	H =O (from page 2) NC Residential Adjusted Revenue Requirement
	EE Programs											
1	Appliance Recycling Program	27	206,569	$ 76,177	$ (137,009)	11.75%	$ 25,049	$ (111,960)	85.4384204%	E1 * F1	$ (95,657)	$ -
2	Energy Education Program for Schools	1,081	2,553,617	$ 1,693,087	$ 827,497	0.00%	$ -	$ 827,497	85.4384204%	E2 * F2	$ 707,000	$ -
3	Energy Efficient Lighting	6,006	41,649,479	$ 33,998,827	$ 15,552,184	11.75%	$ 2,167,481	$ 17,719,665	85.4384204%	E3 * F3	$ 15,139,401	$ -
4	Home Energy Improvement Program	1,904	6,289,383	$ 6,991,688	$ 6,013,170	11.75%	$ 114,976	$ 6,128,146	85.4384204%	E4 * F4	$ 5,235,791	$ 15
5	Multi-Family	1,480	12,462,490	$ 7,155,924	$ 2,045,220	11.75%	$ 600,508	$ 2,645,727	85.4384204%	E5 * F5	$ 2,260,468	$ (12,725)
6	Neighborhood Energy Saver	304	1,992,091	$ 1,167,680	$ 2,052,535	0.00%	$ -	$ 2,052,535	85.4384204%	E6 * F6	$ 1,753,654	$ -
7	Residential Energy Assessments	692	4,141,847	$ 3,725,714	$ 1,417,924	11.75%	$ 271,165	$ 1,689,090	85.4384204%	E7 * F7	$ 1,443,131	$ -
8	Residential New Construction	4,703	10,959,146	$ 21,071,142	$ 9,405,615	11.75%	$ 1,370,699	$ 10,776,315	85.4384204%	E7 * F7	$ 9,207,113	$ 3,847
9	Save Energy and Water Kit	5,914	17,671,857	$ 13,873,513	$ 674,538	11.75%	$ 1,550,880	$ 2,225,418	85.4384204%	E8 * F8	$ 1,901,362	$ (104,416)
10	Residential Home Advantage	-	-	$ -	$ -	11.75%	$ -	$ -	85.4384204%		$ -	$ -
11	Total for Residential Conservation Programs	22,110	97,926,479	$ 89,753,752	$ 37,851,674		$ 6,100,758	$ 43,952,432			$ 37,552,263	$ (113,279)
12	My Home Energy Report	16,905	102,921,181	$ 7,524,461	$ 5,890,093	11.75%	$ 192,038	$ 6,082,131	85.4384204%	E11 * F11	$ 5,196,477	$ 325,852
13	Total Residential Conservation and Behavioral Programs	39,015	200,847,659	$ 97,278,213	$ 43,741,767		$ 6,292,796	$ 50,034,563			$ 42,748,740	$ 212,573
									NC Residential Peak Demand Allocation Factor (2)	**NC Allocation Factor (2)**		
14	EnergyWise	34,059	-	$ 70,854,171	$ 6,887,758	11.75%	$ 7,516,054	$ 14,403,811	86.1687719%	46.8604563%	$ 6,223,969	$ -
15	Total Residential	73,074	200,847,659	$ 168,132,384	$ 50,629,524		$ 13,808,850	$ 64,438,374			$ 48,972,709	$ 212,573

	Non-Residential Programs	System kW Reduction - Summer Peak	System Energy Reduction (kWh)	System NPV of Avoided Costs	Total Cost	Shared Savings %	Incentive	System Revenue Requirement	NC Retail kWh Sales Allocation Factor		NC Non-Residential Unadjusted Revenue Requirement [2]	NC Non-Residential Adjusted Revenue Requirement
	EE Programs											
15	Business Energy Report	740	4,546,814	$ 309,365	$ 69,516		$ -	$ 69,516	85.4384204%	E13 * F13	$ 59,393	$ -
16	Energy Efficiency for Business	10,201	71,154,719	$ 47,824,935	$ 14,159,310	11.75%	$ 3,955,711	$ 18,115,021	85.4384204%	E14 * F14	$ 15,477,188	$ 272
17	Energy Efficient Lighting	2,818	12,180,303	$ 10,884,259	$ 1,889,694	11.75%	$ 1,056,861	$ 2,946,556	85.4384204%	E16 * F16	$ 2,517,491	$ -
18	Small Business Energy Saver	8,675	49,979,294	$ 32,988,897	$ 9,336,274	11.75%	$ 2,779,183	$ 12,115,457	85.4384204%	E17 * F17	$ 10,351,255	$ 8,890
19	Total for Non-Residential Conservation Programs	22,434	137,861,130	$ 92,007,456	$ 25,454,794		$ 7,791,755	$ 33,246,550			$ 28,405,327	$ 9,162
20	EnergyWise for Business	1,059	412,047	$ 238,096	$ 1,112,815	11.75%	$ (102,779)	$ 1,010,035	86.1687719%	E19 * F19	$ 7,057,953	$ 66,218
21	Commercial, Industrial, & Governmental Demand Respon	(5,344)	-	$ (10,684,733)	$ -	11.75%	$ -	$ -	86.1687719%	E20 * F20	$ -	$ -
22	Total for Non-Residential DSM Programs	(4,285)	412,047	$ (10,446,637)	$ 1,112,815		$ (102,779)	$ 1,010,035	86.1687719%	**NC Allocation Factor (2)** 53.1395437%	$ 7,057,953	$ 66,218
23	Total Non Residential	18,149	138,273,177	$ 81,560,818	$ 26,567,609		$ 7,688,976	$ 34,256,585			$ 35,463,280	$ 75,380
24	Total All Programs	91,223	339,120,836	$ 249,693,202	$ 77,197,134		$ 21,497,825	$ 98,694,959			$ 84,435,989	$ 287,953

(1) My Home Energy Report impacts reflect cumulative capability as of end of vintage year, including impacts for participants from prior vintages
(2) Total System DSM programs allocated to Residential and Non-Residential based on contribution to retail system peak

24	DSDR	281,372	33,941,086		7,944,728			$ 7,944,728				
25	Total with DSDR	372,595	373,061,922	$ 249,693,202	$ 85,141,861		$ 21,497,825	$ 106,639,687			$ 84,435,989	$ 287,953

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		A	B	C	D	E	F	G	H	I
				=A*B	=A+C			=-PMT(E,F,D)	=1-B	
										new
	Residential Programs	**NC Incentive**	**Income Tax Rate**	**Income Taxes**	**Net-of-Tax PPI - Total NPV**	**Discount Rate**	**PPI Amortization Period**	**Vintage Year 2016 - Year 1 PPI**	**Income Tax Gross-Up Factor**	**Adjusted PPI**
	EE Programs									
1	**Appliance Recycling Program**	$ 21,402	37.61%	$ (8,049)	$ 13,353	6.75%	10	$ 1,879	62.39%	$ 3,011
2	**Energy Education Program for Schools**	$ -	37.61%	$ -	$ -	6.75%	N/A	$ -	62.39%	$ -
3	**Energy Efficient Lighting**	$ 1,851,861	37.61%	$ (696,487)	$ 1,155,374	6.75%	5	$ 279,872	62.39%	$ 448,586
4	**Home Energy Improvement Program**	$ 98,234	37.61%	$ (36,946)	$ 61,288	6.75%	10	$ 8,624	62.39%	$ 13,823
5	**Multi-Family**	$ 513,064	37.61%	$ (192,964)	$ 320,100	6.75%	5	$ 77,539	62.39%	$ 124,282
6	**Neighborhood Energy Saver**	$ -	37.61%	$ -	$ -	6.75%	N/A	$ -	62.39%	$ -
7	**Residential Energy Assessments**	$ 231,679	37.61%	$ (87,135)	$ 144,544	6.75%	5	$ 35,014	62.39%	$ 56,121
8	**Residential New Construction**	$ 1,171,104	37.61%	$ (440,453)	$ 730,651	6.75%	10	$ 102,811	62.39%	$ 164,787
9	**Save Energy and Water Kit**	$ 1,325,047	37.61%	$ (498,352)	$ 826,696	6.75%	5	$ 200,255	62.39%	$ 320,973
10	**Residential Home Advantage**	$ -	37.61%	$ -	$ -	6.75%	10	$ -	62.39%	$ -
11	**Total for Residential Conservation Programs**	$ 5,212,391		$ (1,960,385)	$ 3,252,006			$ 705,993		$ 1,131,583
12	**My Home Energy Report**	$ 164,074	37.61%	$ (61,709)	$ 102,366	6.75%	1	$ 102,366	62.39%	$ 164,074
13	**Total Residential Conservation and Behavioral Programs**	$ 5,376,465		$ (2,022,094)	$ 3,354,371			$ 808,359		$ 1,295,657
14	**EnergyWise**	$ 6,476,491	37.61%	$ (2,435,815)	$ 4,040,676	6.75%	10	$ 568,568	62.39%	$ 911,314
15	**Total Residential**	$ 11,852,956		$ (4,457,909)	$ 7,395,048			$ 1,376,927		$ 2,206,971
	Non-Residential Programs	**NC Incentive**	**Income Tax Rate**	**Income Taxes**	**Net-of-Tax PPI - Total NPV**	**Discount Rate**	**PPI Amortization Period**	**Vintage Year 2016 - Year 1 PPI**	**Income Tax Gross-Up Factor**	**Adjusted PPI**
	EE Programs									
15	**Business Energy Report**	$ -	37.61%	$ -	$ -	6.75%	1	$ -	62.39%	$ -
16	**Energy Efficiency for Business**	$ 3,379,697	37.61%	$ (1,271,107)	$ 2,108,590	6.75%	3	$ 799,757	62.39%	$ 1,281,869
17	**Energy Efficient Lighting**	$ 902,966	37.61%	$ (339,606)	$ 563,359	6.75%	5	$ 136,465	62.39%	$ 218,730
18	**Small Business Energy Saver**	$ 2,374,490	37.61%	$ (893,048)	$ 1,481,442	6.75%	3	$ 561,889	62.39%	$ 900,609
19	**Total for Non-Residential Conservation Programs**	$ 6,657,153		$ (2,503,762)	$ 4,153,391			$ 1,498,112		$ 2,401,209
20	**EnergyWise for Business**	$ (88,564)	37.61%	$ 33,309	$ (55,255)	6.75%	1	$ (58,982)	62.39%	$ (94,538)
21	**Commercial, Industrial, & Governmental Demand Respc**	$ -	37.61%	$ -	$ -	6.75%	3	$ -	62.39%	$ -
22	**Total for Non-Residential DSM Programs**	$ (88,564)		$ 33,309	$ (55,255)			$ (58,982)		$ (94,538)
23	**Total Non Residential**	$ 6,568,589		$ (2,470,453)	$ 4,098,136			$ 1,439,129		$ 2,306,670
24	**Total All Programs**	$ 18,421,545		$ (6,928,362)	$ 11,493,184			$ 2,816,056		$ 4,513,641

		v2016 PPI True-Up J	K	L	M	N	O	P									K
			=J-I		=L*K	=M*L*E	=M+N										=J+I
		old															
	Residential Programs	**Original Vintage 2016 PPI**	**PPI Over / (Under) Collection**	**Years at Original PPI Level**	**Cumulative PPI Over / (Under) Collection**	**Carrying Costs**	**PPI Over/(Under) Collection w/CCost**	**Σ Prior Period PPI**	**Vintage 2009 PPI**	**Vintage 2010 PPI**	**Vintage 2011 PPI**	**Vintage 2012 PPI**	**Vintage 2013 PPI**	**Vintage 2014 PPI**	**Vintage 2015 PPI**		**PPI Values for Test Period**
	EE Programs																
1	**Appliance Recycling Program**	$ 3,011	$ -	1	$ -	$ -	$ -	$ 116,821	$ -	$ 28,547	$ 20,592	$ 38,647	$ 17,038	$ 7,505	$ 4,492		$ 119,833
2	**Energy Education Program for Schools**	$ -	$ -	1	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -		$ -
3	**Energy Efficient Lighting**	$ 448,586	$ -	1	$ -	$ -	$ -	$ 2,844,679	$ -	$ 546,425	$ 309,670	$ 621,854	$ 636,857	$ 397,825	$ 332,048		$ 3,293,264
4	**Home Energy Improvement Program**	$ 13,837	$ 14	1	$ 14	$ 1	$ 15	$ 350,089	$ 10,405	$ 75,357	$ 116,481	$ 108,864	0	$ 14,647	$ 24,334		$ 363,911
5	**Multi-Family**	$ 112,362	$ (11,920)	1	$ (11,920)	$ (804)	$ (12,725)	$ 193,329	$ -	$ -	$ -	$ -	$ -	$ -	$ 193,329		$ 317,611
6	**Neighborhood Energy Saver**	$ -	$ -	1	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -		$ -
7	**Residential Energy Assessments**	$ 56,121	$ -	1	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	no 2015	$ 56,121
8	**Residential New Construction**	$ 168,391	$ 3,604	1	$ 3,604	$ 243	$ 3,847	$ 174,649	$ -	$ -	$ -	$ -	$ 47,653	$ 54,738	$ 72,258		$ 339,436
9	**Save Energy and Water Kit**	$ 223,155	$ (97,817)	1	$ (97,817)	$ (6,599)	$ (104,416)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -		$ 320,973
10	**Residential Home Advantage**	$ -	$ -	1	$ -	$ -	$ -	$ 176,476	$ 8,018	$ 27,550	$ 79,940	$ 60,450	$ 517	$ -	$ -		$ 176,476
11	**Total for Residential Conservation Programs**	$ 1,025,463	$ (106,120)		$ (106,120)	$ (7,159)	$ (113,279)	$ 3,856,042	$ 18,424	$ 677,879	$ 526,684	$ 829,814	$ 702,066	$ 474,715	$ 626,461		$ 4,987,625
12	**My Home Energy Report**	$ 469,333	$ 305,259	1	$ 305,259	$ 20,593	$ 325,852	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -		$ 164,074
13	**Total Residential Conservation and Behavioral Programs**	$ 1,494,796	$ 199,139		$ 199,139	$ 13,434	$ 212,573	$ 3,856,042	$ 18,424	$ 677,879	$ 526,684	$ 829,814	$ 702,066	$ 474,715	$ 626,461		$ 5,151,699
14	**EnergyWise**	$ 911,314	$ -	1	$ -	$ -	$ -	$ 3,243,883	$ 135,141	$ 1,043,048	$ 781,456	$ 347,959	$ 301,384	$ 369,522	$ 265,373		$ 4,155,197
15	**Total Residential**	$ 2,406,110	$ 199,139		$ 199,139	$ 13,434	$ 212,573	$ 7,099,925	$ 153,564	$ 1,720,927	$ 1,308,140	$ 1,177,773	$ 1,003,450	$ 844,237	$ 891,833		$ 9,306,896
	Non-Residential Programs	**Original Vintage 2016 PPI**	**PPI Over / (Under) Collection**	**Years at Original PPI Level**	**Cumulative PPI Over / (Under) Collection**	**Carrying Costs**	**PPI Over/(Under) Collection w/CCost**	**Σ Prior Period PPI**	**Vintage 2009 PPI**	**Vintage 2010 PPI**	**Vintage 2011 PPI**	**Vintage 2012 PPI**	**Vintage 2013 PPI**	**Vintage 2014 PPI**	**Vintage 2015 PPI**		**PPI Values for Test Period**
	EE Programs																
15	**Business Energy Report**	$ -	$ -	1	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -		$ -
16	**Energy Efficiency for Business**	$ 1,282,124	$ 254	1	$ 254	$ 17	$ 272	$ 3,481,402	$ 169,910	$ 452,376	$ 649,907	$ 722,666	$ 678,479	$ 438,885	$ 369,180		$ 4,763,272
17	**Energy Efficient Lighting**	$ 218,730	$ -	1	$ -	$ -	$ -	$ 803,120	$ -	$ 134,853	$ 74,572	$ 153,107	$ 171,971	$ 116,186	$ 152,430		$ 1,021,849
18	**Small Business Energy Saver**	$ 908,938	$ 8,328	1	$ 8,328	$ 562	$ 8,890	$ 539,082	$ -	$ -	$ -	$ -	$ 80,709	$ 217,323	$ 241,051		$ 1,439,692
19	**Total for Non-Residential Conservation Programs**	$ 2,409,791	$ 8,583		$ 8,583	$ 579	$ 9,162	$ 4,823,604	$ 169,910	$ 587,229	$ 724,479	$ 875,773	$ 931,159	$ 772,394	$ 762,661		$ 7,224,812
20	**EnergyWise for Business**	$ (32,505)	$ 62,033	1	$ 62,033	$ 4,185	$ 66,218	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -		$ (94,538)
21	**Commercial, Industrial, & Governmental Demand Respc**	$ -	$ -	1	$ -	$ -	$ -	$ 150,959	$ -	$ 65,722	$ 17,655 `	$ 28,315	$ 9,714	$ 25,139	$ 4,414		$ 150,959
22	**Total for Non-Residential DSM Programs**	$ (32,505)	$ 62,033		$ 62,033	$ 4,185	$ 66,218	$ 150,959	$ -	$ 65,722	$ 17,655	$ 28,315	$ 9,714	$ 25,139	$ 4,414		$ 56,421
23	**Total Non Residential**	$ 2,377,286	$ 70,616		$ 70,616	$ 4,764	$ 75,380	$ 4,974,563	$ 169,910	$ 652,951	$ 742,134	$ 904,088	$ 940,873	$ 797,533	$ 767,075		$ 7,281,233
24	**Total All Programs**	$ 4,783,396	$ 269,755		$ 269,755	$ 18,198	$ 287,953	$ 12,074,488	$ 323,474	$ 2,373,878	$ 2,050,273	$ 2,081,861	$ 1,944,323	$ 1,641,770	$ 1,658,908		$ 16,588,129

(1) Energy Efficient Benchmarking impacts reflect cumulative capability as of end of vintage year, including impacts for participants from prior vintages
(2) Total System DSM programs allocated to Residential and Non-Residential based on contribution to retail system peak

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				A	B	C	D	E	F		G	H
							=(A-B)*C	= (B+D)				=K (from page 2)
	Residential Programs	**System kW Reduction - Summer Peak**	**System Energy Reduction (kWh)**	**System NPV of Avoided Costs**	**Total Cost**	**Shared Savings %**	**Incentive**	**Unadjusted Rev Requirement (2)**	**NC Retail kWh Sales Allocation Factor**		**NC Residential Unadjusted Revenue Requirement (2)**	**NC Residential Adjusted Revenue Requirement**
	EE Programs											
1	**Appliance Recycling Program**	-	-	$ -	$ 5,586	11.75%	$ (656)	$ 4,930	85.5082864%	E1 * F1	$ 4,215	$ 119,754
2	**Energy Education Program for Schools**	996	2,353,765	$ 1,376,442	$ 835,991	0.00%	$ -	$ 835,991	85.5082864%	E2 * F2	$ 714,841	$ -
3	**Energy Efficient Lighting**	4,314	29,913,877	$ 29,337,282	$ 10,904,279	11.75%	$ 2,165,878	$ 13,070,157	85.5082864%	E3 * F3	$ 11,176,067	$ 3,742,027
4	**Home Energy Improvement Program**	1,975	7,357,987	$ 6,314,054	$ 6,961,463	11.75%	$ (76,071)	$ 6,885,392	85.5082864%	E4 * F4	$ 5,887,581	$ 354,753
5	**Multi-Family**	2,192	16,150,507	$ 10,237,157	$ 2,514,413	11.75%	$ 907,422	$ 3,421,836	85.5082864%	E5 * F5	$ 2,925,953	$ 505,626
6	**Neighborhood Energy Saver**	335	2,200,240	$ 1,117,743	$ 1,781,211	0.00%	$ -	$ 1,781,211	85.5082864%	E6 * F6	$ 1,523,083	$ -
7	**Residential Energy Assessments**	910	5,447,736	$ 4,303,959	$ 1,863,486	11.75%	$ 286,756	$ 2,150,241	85.5082864%	E7 * F7	$ 1,838,634	$ 115,536
8	**Residential New Construction**	6,022	13,996,035	$ 24,581,226	$ 11,671,724	11.75%	$ 1,516,867	$ 13,188,590	85.5082864%	E7 * F7	$ 11,277,338	$ 522,045
9	**Save Energy and Water Kit**	8,377	25,021,451	$ 17,187,186	$ 888,869	11.75%	$ 1,915,052	$ 2,803,921	85.5082864%	E8 * F8	$ 2,397,585	$ 717,765
10	**Residential Home Advantage**	-	-	$ -	$ -	11.75%	$ -	$ -	85.5082864%		$ -	$ 176,476
11	**Total for Residential Conservation Programs**	25,121	102,441,597	94,455,049	37,427,021		$ 6,715,248	$ 44,142,269			$ 37,745,297	$ 6,253,982
12	**My Home Energy Report**	19,964	117,851,515	$ 6,972,509	$ 6,753,153	11.75%	$ 25,774	$ 6,778,928	85.5082864%	E11 * F11	$ 5,796,545	$ 22,039
13	**Total Residential Conservation and Behavioral Programs**	45,085	220,293,112	$ 101,427,558	$ 44,180,174		$ 6,741,022	$ 50,921,196			$ 43,541,842	$ 6,276,021
									NC Residential Peak Demand Allocation Factor	**NC Allocation Factor (2)**		
14	**EnergyWise**	33,428	-	$ 62,965,960	$ 6,502,032	11.75%	$ 6,634,512	$ 13,136,544	86.1579245%	48.2705209%	$ 6,722,314	$ 4,959,965
15	**Total Residential**	78,513	220,293,112	$ 164,393,519	$ 50,682,206		$ 13,375,534	$ 64,057,740			$ 50,264,156	$ 11,235,986

	Non-Residential Programs	**System kW Reduction - Summer Peak**	**System Energy Reduction (kWh)**	**System NPV of Avoided Costs**	**Total Cost**	**Shared Savings %**	**Incentive**	**System Revenue Requirement**	**NC Retail kWh Sales Allocation Factor**		**NC Non-Residential Unadjusted Revenue Requirement (2)**	**NC Non-Residential Adjusted Revenue Requirement**
	EE Programs											
16	**Business Energy Report**	-	-	$ 737	$ 20,330		$ -	$ 20,330	85.5082864%	E13 * F13	$ 17,384	$ -
17	**Energy Efficiency for Business**	16,958	103,103,354	$ 78,970,008	$ 21,749,807	11.75%	$ 6,723,374	$ 28,473,180	85.5082864%	E14 * F14	$ 24,346,929	$ 6,944,270
18	**Energy Efficient Lighting**	2,024	7,877,874	$ 9,198,119	$ 1,324,943	11.75%	$ 925,098	$ 2,250,041	85.5082864%	E16 * F16	$ 1,923,972	$ 1,213,527
19	**Non-Res SmartSaver Performance**	58	435,108	$ 335,899	$ 147,160	11.75%	$ 22,177	$ 169,337	85.5082864%	E17 * F17	$ 144,797	$ 7,194
20	**Small Business Energy Saver**	9,600	48,044,115	$ 29,279,207	$ 8,770,755	11.75%	$ 2,409,743	$ 11,180,499	85.5082864%	E18 * F18	$ 9,560,253	$ 2,221,389
21	**Total for Non-Residential Conservation Programs**	28,640	159,460,452	$ 117,783,970	$ 32,012,995		$ 10,080,392	$ 42,093,387			$ 35,993,335	$ 10,386,380
22	**EnergyWise for Business**	6,461	983,712	$ 1,300,199	$ 1,390,549	11.75%	$ (10,616)	$ 1,379,933	86.1579245%	E19 * F19	$ 6,469,855	$ (9,765)
23	**Commercial, Industrial, & Governmental Demand Response**	1,969	-	$ 3,551,967	$ 1,393,650	11.75%	$ 253,602	$ 1,647,252	86.1579245%	E20 * F20	$ 1,419,239	$ 233,850
24	**Total for Non-Residential DSM Programs**	8,430	983,712	$ 4,852,166	$ 2,784,199		$ 242,986	$ 3,027,186	86.1579245%	**NC Allocation Factor (2)** 51.7294791%	$ 7,889,094	$ 224,086
25	**Total Non Residential**	37,070	160,444,163	$ 122,636,136	$ 34,797,195		$ 10,323,378	$ 45,120,572			$ 43,882,429	$ 10,610,466
26	**Total All Programs**	115,583	380,737,275	$ 287,029,654	$ 85,479,401		$ 23,698,911	$ 109,178,312			$ 94,146,585	$ 21,846,452

(1) My Home Energy Report impacts reflect cumulative capability as of end of vintage year, including impacts for participants from prior vintages
(2) Total System DSM programs allocated to Residential and Non-Residential based on contribution to retail system peak

24	DSDR	334,505	35,518,685		$ 11,146,179			$ 11,146,179				
25	Total with DSDR	450,088	416,255,960	$ 287,029,654	$ 96,625,580		$ 23,698,911	$ 120,324,491			$ 94,146,585	$ 21,846,452

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	A	B	C	D	E	F	G	H	I	J									K
			=A*B	=A+C			=-PMT(E,F,D)	=1-B											=J+I
Residential Programs	NC Incentive	Income Tax Rate	Income Taxes	Net-of-Tax PPI - Total NPV	Discount Rate	PPI Amortization Period	Vintage Year 2017 - Year 1 PPI	Income Tax Gross-Up Factor	Adjusted PPI	Σ Prior Period PPI	Vintage 2009 PPI	Vintage 2010 PPI	Vintage 2011 PPI	Vintage 2012 PPI	Vintage 2013 PPI	Vintage 2014 PPI	Vintage 2015 PPI	Vintage 2016 PPI	PPI Values for Test Period
EE Programs																			
1 Appliance Recycling Program	$ (561)	37.06%	$ 208	$ (353)	6.76%	10	$ (50)	62.94%	$ (79)	$ 119,833	$ -	$ 28,547	$ 20,592	$ 38,647	$ 17,038	$ 7,505	$ 4,492	$ 3,011	$ 119,754
2 Energy Education Program for Schools	$ -	37.06%	$ -	$ -	6.76%	N/A	$ -	62.94%	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
3 Energy Efficient Lighting	$ 1,852,005	37.06%	$ (686,353)	$ 1,165,652	6.76%	5	$ 282,451	62.94%	$ 448,763	$ 3,293,264	$ -	$ 546,425	$ 309,670	$ 621,854	$ 636,857	$ 397,825	$ 332,048	$ 448,586	$ 3,742,027
4 Home Energy Improvement Program	$ (65,047)	37.06%	$ 24,106	$ (40,940)	6.76%	10	$ (5,764)	62.94%	$ (9,158)	$ 363,911	$ 10,405	$ 75,357	$ 116,481	$ 108,864	0	$ 14,647	$ 24,334	$ 13,823	$ 354,753
5 Multi-Family	$ 775,921	37.06%	$ (287,556)	$ 488,365	6.76%	5	$ 118,337	62.94%	$ 188,015	$ 317,611	$ -	$ -	$ -	$ -	$ -	$ -	$ 193,329	$ 124,282	$ 505,626
6 Neighborhood Energy Saver	$ -	37.06%	$ -	$ -	6.76%	N/A	$ -	62.94%	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
7 Residential Energy Assessments	$ 245,200	37.06%	$ (90,871)	$ 154,329	6.76%	5	$ 37,396	62.94%	$ 59,415	$ 56,121	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 56,121	$ 115,536
8 Residential New Construction	$ 1,297,047	37.06%	$ (480,685)	$ 816,361	6.76%	10	$ 114,934	62.94%	$ 182,609	$ 339,436	$ -	$ -	$ -	$ -	$ 47,653	$ 54,738	$ 72,258	$ 164,787	$ 522,045
9 Save Energy and Water Kit	$ 1,637,528	37.06%	$ (606,868)	$ 1,030,661	6.76%	5	$ 249,741	62.94%	$ 396,792	$ 320,973	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 320,973	$ 717,765
10 Residential Home Advantage	$ -	37.06%	$ -	$ -	6.76%	10	$ -	62.94%	$ -	$ 176,476	$ 8,018	$ 27,550	$ 79,940	$ 60,450	$ 517	$ -	$ -	$ -	$ 176,476
11 Total for Residential Conservation Programs	$ 5,742,093		$ (2,128,019)	$ 3,614,074			$ 797,045		$ 1,266,357	$ 4,987,625	$ 18,424	$ 677,879	$ 526,684	$ 829,814	$ 702,066	$ 474,715	$ 626,461	$ 1,131,583	$ 6,253,982
12 My Home Energy Report	$ 22,039	37.06%	$ (8,168)	$ 13,871	6.76%	1	$ 13,871	62.94%	$ 22,039	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 22,039
13 Total Residential Conservation and Behavioral Programs	$ 5,764,132		$ (2,136,187)	$ 3,627,946			$ 810,917		$ 1,288,396	$ 4,987,625	$ 18,424	$ 677,879	$ 526,684	$ 829,814	$ 702,066	$ 474,715	$ 626,461	$ 1,131,583	$ 6,276,021
14 EnergyWise	$ 5,716,157	37.06%	$ (2,118,407)	$ 3,597,750	6.76%	10	$ 506,521	62.94%	$ 804,768	$ 4,155,197	$ 135,141	$ 1,043,048	$ 781,456	$ 347,959	$ 301,384	$ 369,522	$ 265,373	$ 911,314	$ 4,959,965
15 Total Residential	$ 11,480,290		$ (4,254,594)	$ 7,225,696			$ 1,317,438		$ 2,093,165	$ 9,142,821	$ 153,564	$ 1,720,927	$ 1,308,140	$ 1,177,773	$ 1,003,450	$ 844,237	$ 891,833	$ 2,042,897	$ 11,235,986

Non-Residential Programs	NC Incentive	Income Tax Rate	Income Taxes	Net-of-Tax PPI - Total NPV	Discount Rate	PPI Amortization Period	Vintage Year 2017 - Year 1 PPI	Income Tax Gross-Up Factor	Adjusted PPI	Σ Prior Period PPI	Vintage 2009 PPI	Vintage 2010 PPI	Vintage 2011 PPI	Vintage 2012 PPI	Vintage 2013 PPI	Vintage 2014 PPI	Vintage 2015 PPI	Vintage 2016 PPI	PPI Values for Test Period
EE Programs																			
16 Business Energy Report	$ -	37.06%	$ -	$ -	6.76%	1	$ -	62.94%	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
17 Energy Efficiency for Business	$ 5,749,042	37.06%	$ (2,130,594)	$ 3,618,447	6.76%	3	$ 1,372,721	62.94%	$ 2,180,999	$ 4,763,272	$ 169,910	$ 452,376	$ 649,907	$ 722,666	$ 678,479	$ 438,885	$ 369,180	$ 1,281,869	$ 6,944,270
18 Energy Efficient Lighting	$ 791,036	37.06%	$ (293,158)	$ 497,878	6.76%	5	$ 120,642	62.94%	$ 191,677	$ 1,021,849	$ -	$ 134,853	$ 74,572	$ 153,107	$ 171,971	$ 116,186	$ 152,430	$ 218,730	$ 1,213,527
18 Non-Res SmartSaver Performance	$ 18,963	37.06%	$ (7,028)	$ 11,935	6.76%	3	$ 4,528	62.94%	$ 7,194	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 7,194
19 Small Business Energy Saver	$ 2,060,530	37.06%	$ (763,632)	$ 1,296,898	6.76%	3	$ 492,001	62.94%	$ 781,698	$ 1,439,692	$ -	$ -	$ -	$ -	$ 80,709	$ 217,323	$ 241,051	$ 900,609	$ 2,221,389
20 Total for Non-Residential Conservation Programs	$ 8,619,570		$ (3,194,412)	$ 5,425,158			$ 1,989,891		$ 3,161,568	$ 7,224,812	$ 169,910	$ 587,229	$ 724,479	$ 875,773	$ 931,159	$ 772,394	$ 762,661	$ 2,401,209	$ 10,386,380
21 EnergyWise for Business	$ (9,147)	37.06%	$ 3,390	$ (5,757)	6.76%	1	$ (6,146)	62.94%	$ (9,765)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ (9,765)
22 Commercial, Industrial, & Governmental Demand Response	$ 218,498	37.06%	$ (80,975)	$ 137,523	6.76%	3	$ 52,172	62.94%	$ 82,891	$ 150,959	$ -	$ 65,722	$ 17,655 `	$ 28,315	$ 9,714	$ 25,139	$ 4,414	$ -	$ 233,850
23 Total for Non-Residential DSM Programs	$ 209,352		$ (77,586)	$ 131,766			$ 46,026		$ 73,126	$ 150,959	$ -	$ 65,722	$ 17,655	$ 28,315	$ 9,714	$ 25,139	$ 4,414	$ -	$ 224,086
24 Total Non Residential	$ 8,828,922		$ (3,271,998)	$ 5,556,924			$ 2,035,917		$ 3,234,694	$ 7,375,772	$ 169,910	$ 652,951	$ 742,134	$ 904,088	$ 940,873	$ 797,533	$ 767,075	$ 2,401,209	$ 10,610,466
25 Total All Programs	$ 20,309,212		$ (7,526,592)	$ 12,782,620			$ 3,353,355		$ 5,327,859	$ 16,518,593	$ 323,474	$ 2,373,878	$ 2,050,273	$ 2,081,861	$ 1,944,323	$ 1,641,770	$ 1,658,908	$ 4,444,105	$ 21,846,452

(1) Energy Efficient Benchmarking impacts reflect cumulative capability as of end of vintage year, including impacts for participants from prior vintages
(2) Total System DSM programs allocated to Residential and Non-Residential based on contribution to retail system peak

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Residential Programs

				A	B	C	D	E	F	G		H	I
							=(A-B)*C	= (B+D)					=K (from page 2)
		System kW Reduction - Summer Peak	System Energy Reduction (kWh)	System NPV of Avoided Costs	Total Cost	Shared Savings %	Incentive	Unadjusted Rev Requirement (2)	NC Retail kWh Sales Allocation Factor	NC Allocation Factor (2)		NC Residential Unadjusted Revenue Requirement (2)	NC Residential Adjusted Revenue Requirement
	EE Programs												
1	**Appliance Recycling Program**	-	-	-	-	11.75%	$ -	$ -	85.5608674%		E1 * F1	$ -	$ 120,467
2	**Energy Education Program for Schools**	980	2,314,528	1,158,100	753,793	0.00%	$ -	$ 753,793	85.5608674%		E2 * F2	$ 644,952	$ -
3	**Energy Efficient Lighting**	4,110	24,931,977	19,928,859	11,781,213	11.75%	$ 957,348	$ 12,738,561	85.5608674%		E3 * F3	$ 10,899,223	$ 4,281,624
4	**Home Energy Improvement**	1,111	4,183,859	3,427,625	3,985,069	11.75%	$ (65,500)	$ 3,919,569	85.5608674%		E4 * F4	$ 3,353,618	$ 331,825
5	**Multi-Family**	2,131	15,206,371	7,753,023	2,738,339	11.75%	$ 589,225	$ 3,327,564	85.5608674%		E5 * F5	$ 2,847,093	$ 781,261
6	**Neighborhood Energy Saver**	326	2,135,101	880,811	2,028,200	0.00%	$ -	$ 2,028,200	85.5608674%		E6 * F6	$ 1,735,346	$ -
7	**Residential Energy Assessments**	428	2,565,216	1,656,142	1,138,481	11.75%	$ 60,825	$ 1,199,306	85.5608674%		E7 * F7	$ 1,026,137	$ 158,392
8	**Residential New Construction**	7,101	16,446,576	23,483,512	12,691,351	11.75%	$ 1,268,079	$ 13,959,430	85.5608674%		E8 * F8	$ 11,943,809	$ 904,849
9	**Save Energy and Water Kit**	8,915	30,940,131	17,934,660	1,527,511	11.75%	$ 1,927,840	$ 3,455,351	85.5608674%		E9 * F9	$ 2,956,428	$ 1,370,632
10	**Residential Home Advantage**	-	-	-	-	11.75%	$ -	$ -	85.5608674%		E10 * F10	$ -	$ 168,458
11	**Total for Residential Conservation Programs**	25,101	98,723,759	76,222,731	36,643,956		$ 4,737,818	$ 41,381,774				$ 35,406,606	$ 8,117,508
12	**My Home Energy Report (1)**	20,008	119,273,463	7,230,046	7,994,059	11.75%	$ (89,772)	$ 7,904,288	85.5608674%		E11 * F11	$ 6,762,977	$ (76,809)
13	**Total Residential Conservation and Behavioral Programs**	45,109	217,997,222	$ 83,452,777	$ 44,638,015		$ 4,648,046	$ 49,286,062				$ 42,169,583	$ 8,040,699
									NC Residential Peak Demand Allocation Factor				
14	**EnergyWise ® Home**	27,116	-	48,615,454	5,238,465	11.75%	$ 5,096,796	$ 10,335,262	86.5304240%	48.5812530%	(E13+E23) *F13 *G13	$ 8,241,070	$ 6,137,852
15	**Total Residential**	72,225	217,997,222	$ 132,068,231	$ 49,876,481		$ 9,744,843	$ 59,621,323				$ 50,410,653	$ 14,178,551

Non-Residential Programs

		System kW Reduction - Summer Peak	System Energy Reduction (kWh)	System NPV of Avoided Costs	Total Cost	Shared Savings %	Incentive	Unadjusted Rev Requirement (2)	NC Retail kWh Sales Allocation Factor			NC Residential Unadjusted Revenue Requirement (2)	NC Non-Residential Adjusted Revenue Requirement
	EE Programs												
16	**Energy Efficient Lighting**	1,702	6,572,638	6,244,853	1,427,906	11.75%	$ 565,991	$ 1,993,897	85.5608674%		E15 * F15	$ 1,705,996	$ 1,486,980
17	**Non-Residential Smart $aver Performance (Custom)**	1,584	13,879,016	6,291,089	2,719,960	11.75%	$ 419,608	$ 3,139,567	85.5608674%		E16 * F16	$ 2,686,241	$ 335,732
18	**Non-Residential Smart $aver Performance (Prescriptive)**	7,337	48,474,009	26,084,465	11,408,405	11.75%	$ 1,724,437	$ 13,132,842	85.5608674%		E17 * F17	$ 11,236,574	$ 6,526,244
19	**Non-Residential Smart $aver Performance Incentive**	751	6,576,526	2,981,012	845,910	11.75%	$ 250,874	$ 1,096,785	85.5608674%		E18 * F18	$ 938,418	$ 54,602
20	**Small Business Energy Saver**	8,947	46,011,147	22,392,278	9,294,966	11.75%	$ 1,538,934	$ 10,833,900	85.5608674%		E19 * F19	$ 9,269,579	$ 2,690,548
21	**Total for Non-Residential Conservation Programs**	20,321	121,513,336	$ 63,993,697	$ 25,697,147		$ 4,499,845	$ 30,196,992				$ 25,836,808	$ 11,094,106
									NC Non-Residential Peak Demand Allocation Factor				
22	**EnergyWise ® for Business**	8,886	1,536,576	1,694,124	2,476,808	11.75%	$ (91,965)	$ 2,384,843				$ 2,244,257	$ (84,858)
23	**Commercial Industrial Governmental Demand Response**	7,357	-	12,595,610	6,123,482	11.75%	$ 760,475	$ 6,883,957				$ 6,478,150	$ 809,758
24	**Total for Non-Residential DSM Programs**	16,243	1,536,576	$ 14,289,734	$ 8,600,290		$ 668,510	$ 9,268,800	86.5304240%	51.4187470%	(E13+E23) *F23 *G23	$ 8,722,407	$ 724,900
25	**Total Non Residential**	36,564	123,049,913	$ 78,283,431	$ 34,297,437		$ 5,168,354	$ 39,465,791				$ 34,559,215	$ 11,819,005
26	**Total All Programs**	108,789	341,047,135	$ 210,351,662	$ 84,173,918		$ 14,913,197	$ 99,087,114				$ 84,969,868	$ 25,997,556

DSDR

		System kW Reduction - Summer Peak	System Energy Reduction (kWh)	System NPV of Avoided Costs	Total Cost	Shared Savings %	Incentive	Unadjusted Rev Requirement (3)	NC Retail kWh Sales Allocation Factor	NC Retail kWh Sales Allocation Factor		NC DSDR Unadjusted Revenue Requirement (3)	NC DSDR Adjusted Revenue Requirement
1	**DSDR**	352,416	43,664,336		$ 15,425,418	N/A	$ -	$ 15,425,418					
	Total All Programs with DSDR	461,204	384,711,471	$ 210,351,662	$ 99,599,336		$ 14,913,197	$ 114,512,533				$ 84,969,868	$ 25,997,556

(1) My Home Energy Report impacts reflect cumulative capability as of end of vintage year, including impacts for participants from prior vintages
(2) Total System DSM programs allocated to Residential and Non-Residential based on contribution to retail system peak

Duke Energy Progress
Evans Exhibit 1, page 8
Vintage 2019 Estimate - January 1, 2019 to December 31, 2019
Docket No. E-2, Sub 1174
Load Impacts and Estimated Revenue Requirements by Program

	A	B	C	D	E	F	G	H	I	J											K
			=A*B	=A+C			=-PMT(E,F,D)	=1-B													=J+I
Residential Programs	**NC Incentive**	**Income Tax Rate**	**Income Taxes**	**Net-of-Tax PPI - Total NPV**	**Discount Rate**	**PPI Amortization Period**	**Vintage Year 2019 - Year 1 PPI**	**Income Tax Gross-Up Factor**	**Adjusted PPI**	**Σ Prior Period PPI**	**Vintage 2009 PPI**	**Vintage 2010 PPI**	**Vintage 2011 PPI**	**Vintage 2012 PPI**	**Vintage 2013 PPI**	**Vintage 2014 PPI**	**Vintage 2015 PPI**	**Vintage 2016 PPI**	**Vintage 2017 PPI**	**Vintage 2018 PPI**	**PPI Values for Test Period**
EE Programs																					
1 **Appliance Recycling Program**	$ -	23.50%	$ -	$ -	6.64%	10	$ -	76.50%	$ -	$ 120,467	$ -	$ 28,547	$ 20,592	$ 38,647	$ 17,038	$ 7,505	$ 4,492	$ 3,011	$ (79)	$ 713	$ 120,467
2 **Energy Education Program for Schools**	$ -	23.50%	$ -	$ -	6.64%	N/A	$ -	76.50%	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
3 **Energy Efficient Lighting**	$ 819,116	23.50%	$ (192,522)	$ 626,594	6.64%	5	$ 151,330	76.50%	$ 197,827	$ 4,083,798	$ -	$ 546,425	$ 309,670	$ 621,854	$ 636,857	$ 397,825	$ 332,048	$ 448,586	$ 448,763	$ 341,771	$ 4,281,624
4 **Home Energy Improvement**	$ (56,042)	23.50%	$ 13,172	$ (42,870)	6.64%	10	$ (6,001)	76.50%	$ (7,845)	$ 339,670	$ -	$ 75,357	$ 116,481	$ 108,864	$ -	$ 14,647	$ 24,334	$ 13,823	$ (9,158)	$ (4,678)	$ 331,825
5 **Multi-Family**	$ 504,146	23.50%	$ (118,492)	$ 385,654	6.64%	5	$ 93,140	76.50%	$ 121,758	$ 659,503	$ -	$ -	$ -	$ -	$ -	$ -	$ 193,329	$ 124,282	$ 188,015	$ 153,878	$ 781,261
6 **Neighborhood Energy Saver**	$ -	23.50%	$ -	$ -	6.64%	N/A	$ -	76.50%	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
7 **Residential Energy Assessments**	$ 52,043	23.50%	$ (12,232)	$ 39,811	6.64%	5	$ 9,615	76.50%	$ 12,569	$ 145,823	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 56,121	$ 59,415	$ 30,287	$ 158,392
8 **Residential New Construction**	$ 1,084,979	23.50%	$ (255,009)	$ 829,970	6.64%	10	$ 116,184	76.50%	$ 151,881	$ 752,967	$ -	$ -	$ -	$ -	$ 47,653	$ 54,738	$ 72,258	$ 164,787	$ 182,609	$ 230,922	$ 904,849
9 **Save Energy and Water Kit**	$ 1,649,477	23.50%	$ (387,686)	$ 1,261,791	6.64%	5	$ 304,738	76.50%	$ 398,369	$ 972,263	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 320,973	$ 396,792	$ 254,498	$ 1,370,632
10 **Residential Home Advantage**	$ -	23.50%	$ -	$ -	6.64%	10	$ -	76.50%	$ -	$ 168,458	$ -	$ 27,550	$ 79,940	$ 60,450	$ 517	$ -	$ -	$ -	$ -	$ -	$ 168,458
11 **Total for Residential Conservation Progr**	4,053,718		(952,769)	3,100,949			669,006		874,559	7,242,949	-	677,879	526,684	829,814	702,066	474,715	626,461	1,131,583	1,266,357	1,007,391	8,117,508
12 **My Home Energy Report**	$ (76,809)	23.50%	$ 18,053	$ (58,756)	6.64%	1	$ (58,756)	76.50%	$ (76,809)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ (76,809)
13 **Total Residential Conservation and Beh**	3,976,909		(934,716)	3,042,193			610,250		797,749	7,242,949	-	677,879	526,684	829,814	702,066	474,715	626,461	1,131,583	1,266,357	1,007,391	8,040,699
14 **EnergyWise ® Home**	$ 4,410,279	23.50%	$ (1,036,574)	$ 3,373,706	6.64%	10	$ 472,270	76.50%	$ 617,375	$ 5,520,478	$ -	$ 1,043,048	$ 781,456	$ 347,959	$ 301,384	$ 369,522	$ 265,373	$ 911,314	$ 804,768	$ 695,653	$ 6,137,852
15 **Total Residential**	8,387,188		(1,971,290)	6,415,899			1,082,519		1,415,124	12,763,427	-	1,720,927	1,308,140	1,177,773	1,003,450	844,237	891,833	2,042,897	2,071,125	1,703,045	14,178,551

Non-Residential Programs	**NC Incentive**	**Income Tax Rate**	**Income Taxes**	**Net-of-Tax PPI - Total NPV**	**Discount Rate**	**Vintage Year 2014 - Year 1 PPI**	**Vintage Year 2019 - Year 1 PPI**	**Income Tax Gross-Up Factor**	**Adjusted PPI**	**Σ Prior Period PPI**	**Vintage 2009 PPI**	**Vintage 2010 PPI**	**Vintage 2011 PPI**	**Vintage 2012 PPI**	**Vintage 2013 PPI**	**Vintage 2014 PPI**	**Vintage 2015 PPI**	**Vintage 2016 PPI**	**Vintage 2017 PPI**	**Vintage 2018 PPI**	**PPI Values for Test Period**
EE Programs																					
16 **Energy Efficient Lighting**	$ 484,267	23.50%	$ (113,820)	$ 370,447	6.64%	5	$ 89,468	76.50%	$ 116,957	$ 1,370,023	$ -	$ 134,853	$ 74,572	$ 153,107	$ 171,971	$ 116,186	$ 152,430	$ 218,730	$ 191,677	$ 156,496	$ 1,486,980
17 **Non-Residential Smart $aver Performan**	$ 359,020	23.50%	$ (84,383)	$ 274,637	6.64%	3	$ 103,954	76.50%	$ 135,894	$ 199,838	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 199,838	$ 335,732
18 **Non-Residential Smart $aver Performan**	$ 1,475,443	23.50%	$ (346,782)	$ 1,128,661	6.64%	3	$ 427,214	76.50%	$ 558,476	$ 5,967,768	$ -	$ 452,376	$ 649,907	$ 722,666	$ 678,479	$ 438,885	$ 369,180	$ -	$ 2,180,999	$ 475,277	$ 6,526,244
19 **Non-Residential Smart $aver Performan**	$ 214,650	23.50%	$ (50,451)	$ 164,200	6.64%	3	$ 62,152	76.50%	$ 81,248	$ (26,646)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 7,194	$ (33,840)	$ 54,602
20 **Small Business Energy Saver**	$ 1,316,725	23.50%	$ (309,478)	$ 1,007,248	6.64%	3	$ 381,257	76.50%	$ 498,399	$ 2,192,149	$ -	$ -	$ -	$ -	$ 80,709	$ 217,323	$ 241,051	$ -	$ 781,698	$ 871,369	$ 2,690,548
21 **Total for Non-Residential Conservation**	3,850,106		(904,913)	2,945,193			1,064,045		1,390,973	9,703,132	-	587,229	724,479	875,773	931,159	772,394	762,661	218,730	3,161,568	1,669,141	11,094,106
22 **EnergyWise ® for Business**	$ (79,578)	23.50%	$ 18,704	$ (60,874)	6.64%	1	$ (64,913)	76.50%	$ (84,858)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ (84,858)
23 **Commercial, Industrial, & Governmenta**	$ 658,042	23.50%	$ (154,663)	$ 503,379	6.64%	3	$ 190,536	76.50%	$ 249,078	$ 560,680	$ -	$ 65,722	$ 17,655 `	$ 28,315	$ 9,714	$ 25,139	$ 4,414	$ -	$ 82,891	$ 326,829	$ 809,758
24 **Total for Non-Residential DSM Program**	578,464		(135,960)	442,504			125,622		164,220	560,680	-	65,722	17,655	28,315	9,714	25,139	4,414	-	82,891	326,829	724,900
25 **Total Non Residential**	4,428,570		(1,040,873)	3,387,698			1,189,667		1,555,193	10,263,812	-	652,951	742,134	904,088	940,873	797,533	767,075	218,730	3,244,459	1,995,970	11,819,005
26 **Total All Programs**	12,815,759		(3,012,162)	9,803,597			2,272,186		2,970,317	23,027,239	-	2,373,878	2,050,273	2,081,861	1,944,323	1,641,770	1,658,908	2,261,627	5,315,584	3,699,014	25,997,556

Excludes BER

Duke Energy Progress
For the Period January 1, 2015 - December 31, 2019
Docket Number E-2, Sub 1174
North Carolina Net Lost Revenue for Vintages 2015 - 2019

Vintage 2014

Line	Residential	2014	2015	2016(a)	2017(a)	2018(a)	2019	Total
1	Appliance Recycling Program	$ 120,357	$ 258,341	$ 257,297	$ 138,135	$ -		$ 774,131
2	Home Energy Improvement Program	$ 169,864	$ 271,941	$ 270,841	$ 103,462	$ -		816,108
3	Residential Lighting Program	$ 2,967,804	$ 5,441,135	$ 5,401,532	$ 2,897,296	$ -		16,707,768
4	Neighborhood Energy Saver Program	$ 37,747	$ 79,192	$ 78,872	$ 41,516	$ -		237,327
5	Residential New Construction	$ 184,096	$ 271,509	$ 270,412	$ 89,208	$ -		815,226
6	Residential Energy Efficient Benchmarking	$ 809,163	$ (4,268)	$ -	$ -	$ -		804,895
7	Net Lost Residential Revenues	**$ 4,289,032**	**$ 6,317,851**	**$ 6,278,954**	**$ 3,269,618**	**$ -**		**$ 20,155,455**

Line	Non-Residential	2014	2015	2016(a)	2017(a)	2018(a)	2019	Total
8	Energy Efficiency for Business	$ 1,442,220	$ 2,222,371	$ 2,235,683	$ 809,474	$ -		$ 6,709,748
9	Small Business Energy Saver Program	$ 749,923	$ 1,496,286	$ 1,505,249	$ 756,072	$ -		4,507,530
10	Non-Residential Lighting Program	$ 1,153,089	$ 2,064,379	$ 2,069,735	$ 1,108,056	$ -		6,395,259
11	Net Lost Non-Residential Revenues	**$ 3,345,232**	**$ 5,783,036**	**$ 5,810,667**	**$ 2,673,603**	**$ -**		**$ 17,612,537**

Vintage 2015 updated 5/30/2018 Jan-Mar 15

Line	Residential	2014	2015	2016(a)	2017(a)	2018	2019	Total
1	Appliance Recycling Program		$ 123,909	$ 238,215	$ 246,008	$ 46,185		$ 654,317
2	Energy Education Program for Schools		$ 71,588	$ 120,886	$ 124,841	$ 24,481		341,797
3	Energy Efficient Lighting		$ 1,665,788	$ 3,332,098	$ 3,441,107	$ 536,645		8,975,638
4	Home Energy Improvement Program		$ 170,038	$ 347,916	$ 359,298	$ 65,009		942,260
5	Multi-Family		$ 429,296	$ 909,897	$ 939,665	$ 182,264		2,461,122
6	My Home Energy Report		$ 4,024,242	$ -	$ -	$ -		4,024,242
7	Neighborhood Energy Saver		$ 54,534	$ 89,993	$ 92,937	$ 15,265		252,729
8	Residential New Construction		$ 252,450	$ 390,785	$ 403,570	$ 54,943		1,101,749
9	Save Energy and Water Kit		$ -	$ -	$ -	$ -		-
10	Total Lost Revenues	$ -	$ 6,791,845	$ 5,429,790	$ 5,607,426	$ 924,793		$ 18,753,854
11	Found Residential Revenues		$ -	$ -	$ -			-
12	Net Lost Residential Revenues	**$ -**	**$ 6,791,845**	**$ 5,429,790**	**$ 5,607,426**	**$ 924,793**		**$ 18,753,854**

Line	Non-Residential	2014	2015	2016(a)	2017(a)	2018	2019	Total
13	Energy Efficiency for Business		$ 1,386,578	$ 2,353,629	$ 2,443,707	$ 374,092		$ 6,558,006
14	Energy Efficient Lighting		$ 420,420	$ 846,915	$ 879,329	$ 126,026		$ 2,272,690
15	Small Business Energy Saver		$ 737,092	$ 1,703,045	$ 1,768,224	$ 315,792		$ 4,524,153
16	EnergyWise for Business		$ -	$ -	$ -	$ -		$ -
17	Total Lost Revenues	$ -	$ 2,544,090	$ 4,903,589	$ 5,091,260	$ 815,910		$ 13,354,849
18	Found Non-Residential Revenues		$ -	$ -	$ -			-
19	Net Lost Non-Residential Revenues	**$ -**	**$ 2,544,090**	**$ 4,903,589**	**$ 5,091,260**	**$ 815,910**		**$ 13,354,849**

Line	DSDR		2015	2016(a)	2017(a)	2018	2019	Total
20	DSDR	$ -	$ 420,831	$ 145,979	$ -	$ -		$ 566,810

Vintage 2016 Jan-Mar 15

Line	Residential	2014	2015	2016(a)	2017(a)	2018	2019	Total
1	Appliance Recycling Program			$ 5,095	$ 12,308	$ 2,515	$ -	$ 19,918
2	Energy Education Program for Schools			$ 59,240	$ 135,532	$ 27,693	$ -	$ 222,465
3	Energy Efficient Lighting			$ 1,033,814	$ 2,116,981	$ 432,565	$ -	$ 3,583,361
4	Home Energy Improvement Program			$ 163,848	$ 370,108	$ 75,625	$ -	$ 609,580
5	My Home Energy Report			$ 5,418,524	$ -	$ 134,484	$ -	$ 5,553,007
6	Neighborhood Energy Saver			$ 44,319	$ 105,283	$ -	$ -	$ 149,602
7	Multi-Family			$ 332,768	$ 658,165	$ 21,513	$ -	$ 1,012,445
8	Residential Energy Assessments			$ 74,198	$ 222,923	$ 45,550	$ -	$ 342,671
9	Residential New Construction			$ 298,122	$ 670,358	$ 136,975	$ -	$ 1,105,455
10	Save Energy and Water Kit			$ 362,685	$ 987,169	$ 201,709	$ -	$ 1,551,563
11	Total Lost Revenues	$ -	$ -	$ 7,792,613	$ 5,278,826	$ 1,078,628	$ -	$ 14,150,067
12	Found Residential Revenues			$ -	$ -	$ -		-
13	Net Lost Residential Revenues	**$ -**	**$ -**	**7,792,613**	**5,278,826**	**1,078,628**	**-**	**$ 14,150,067**

Line	Non-Residential	2014	2015	2016(a)	2017(a)	2018	2019	Total
14	Business Energy Reports			$ 191,245	$ -	$ -	-	$ 191,245
15	Energy Efficiency for Business			$ 1,638,505	$ 3,101,812	$ 632,371	-	$ 5,372,689
16	Energy Efficient Lighting			$ 246,438	$ 478,231	$ 97,498	-	$ 822,166
17	Small Business Energy Saver			$ 1,100,746	$ 2,221,654	$ 452,932	-	$ 3,775,332
18	EnergyWise for Business			$ 7,298	$ 19,733	$ 4,023	$ -	$ 31,054
19	Total Lost Revenues	$ -	$ -	$ 3,184,232	$ 5,821,430	$ 1,186,824	$ -	$ 10,192,486
20	Found Non-Residential Revenues			$ (68,561)	$ (113,553)	$ (113,553)	$ -	(295,666)
21	Net Lost Non-Residential Revenues	**$ -**	**$ -**	**$ 3,115,672**	**$ 5,707,877**	**$ 1,073,272**	**$ -**	**$ 9,896,820**

Line	DSDR	2014	2015	2016(a)	2017(a)	2018	2019	Total
22	DSDR	$ -	$ -	$ 115,745	$ 66,983			$ 182,728

Vintage 2017

Line	Residential	2014	2015	2016(a)	2017(a)	2018	2019	Total
1	Appliance Recycling Program				$ -	$ -	$ -	$ -
2	Energy Education Program for Schools				$ 75,158	$ 122,660	$ 122,862	$ 320,680
3	Energy Efficient Lighting				$ 649,785	$ 1,541,746	$ 1,544,287	$ 3,735,818
4	Home Energy Improvement Program				$ 235,278	$ 420,443	$ 421,135	$ 1,076,856
5	Multi-Family				$ 458,691	$ 900,109	$ 901,592	$ 2,260,393
6	My Home Energy Report				$ 6,016,176	$ -	$ -	$ 6,016,176
7	Neighborhood Energy Saver				$ 42,581	$ 89,418	$ 89,565	$ 221,565
8	Residential Energy Assessments				$ 147,827	$ 278,204	$ 278,662	$ 704,694
9	Residential New Construction				$ 425,229	$ 839,386	$ 840,769	$ 2,105,383
10	Save Energy and Water Kit				$ 754,565	$ 1,340,146	$ 1,342,354	$ 3,437,064
11	Total Lost Revenues	$ -	$ -	$ -	$ 8,805,290	$ 5,532,112	$ 5,541,227	$ 19,878,629
12	Found Residential Revenues				$ -	$ -	$ -	-
13	Net Lost Residential Revenues	**$ -**	**$ -**	**$ -**	**$ 8,805,290**	**$ 5,532,112**	**$ 5,541,227**	**$ 19,878,629**

Line	Non-Residential	2014	2015	2016(a)	2017(a)	2018	2019	Total
14	Business Energy Report				$ 577	$ -	$ -	$ 577
15	Energy Efficiency for Business				$ 2,392,469	$ 4,469,059	$ 4,466,854	$ 11,328,382
15	Energy Efficient Lighting				$ 173,636	$ 406,847	$ 407,517	$ 988,000
16	Small Business Energy Saver				$ 1,079,154	$ 1,987,679	$ 1,986,908	$ 5,053,741
17	Non-Res SmartSaver Performance				$ 8,952	$ 21,025	$ 21,017	$ 50,993
18	EnergyWise for Business				$ 29,965	$ 46,791	$ 46,773	$ 123,529
19	Total Lost Revenues	$ -	$ -	$ -	$ 3,684,753	$ 6,931,401	$ 6,929,068	$ 17,545,222
20	Found Non-Residential Revenues				$ (72,644)	$ (106,296)	$ (106,296)	(285,236)
21	Net Lost Non-Residential Revenues	**$ -**	**$ -**	**$ -**	**$ 3,612,109**	**$ 6,825,105**	**$ 6,822,772**	**$ 17,259,986**

Line	DSDR	2014	2015	2016(a)	2017(a)	2018	2019	Total
22	DSDR	$ -	$ -	$ -	$ 65,125	$ 2,329	$ -	$ 67,453

Vintage 2018

Line	Residential	2014	2015	2016(a)	2017	2018 (a)	2019	Total
1	Appliance Recycling Program					$ 59,966	$ -	$ 59,966
2	Energy Education Program for Schools					$ 39,410	$ 99,626	$ 139,037
3	Energy Efficient Lighting					$ 616,478	$ 1,172,842	$ 1,789,321
4	Home Energy Improvement Program					$ 74,905	$ 193,400	$ 268,305
5	My Home Energy Report					$ 7,382,388	$ -	$ 7,382,388
6	Neighborhood Energy Saver					$ 55,190	$ 103,639	$ 158,829
7	Multi-Family Energy Efficiency					$ 379,048	$ 769,220	$ 1,148,268
8	Residential Energy Assessments					$ 77,398	$ 140,525	$ 217,923
9	Residential New Construction					$ 439,985	$ 888,107	$ 1,328,092
10	Save Energy and Water Kit					$ 591,129	$ 1,495,300	$ 2,086,429
11	Total Lost Revenues	$ -	$ -	$ -	$ -	$ 9,715,899	$ 4,862,660	$ 14,578,558
12	Found Residential Revenues				$ -	$ -	$ -	-
13	Net Lost Residential Revenues	**$ -**	**$ -**	**$ -**	**$ -**	**$ 9,715,899**	**$ 4,862,660**	**$ 14,578,558**

Line	Non-Residential	2014	2015	2016(a)	2017	2018 (a)	2019	Total
14	Business Energy Reports					$ -	$ -	$ -
15	Energy Efficiency for Business					$ 832,065	$ 1,771,404	$ 2,603,469
16	Energy Efficient Lighting					$ 163,369	$ 250,652	$ 414,021
17	Non-Residential Smart $aver Performance Incentive					$ -	$ 71,032	$ 71,032
18	Small Business Energy Saver					$ 1,166,751	$ 2,196,937	$ 3,363,688
19	EnergyWise ® for Business					$ 47,865	$ 34,279	$ 82,144
20	Total Lost Revenues	$ -	$ -	$ -		$ 2,210,049	$ 4,324,304	$ 6,534,354
21	Found Non- Residential Revenues					$ (78,327)	$ (144,767)	$ (223,094)
22	Net Lost Non-Residential Revenues	**$ -**	**$ -**	**$ -**		**$ 2,131,722**	**$ 4,179,537**	**$ 6,311,259**

(a) Lost revenues were estimated by applying forecasted lost revenue rates for residential and non-residential customers to state specific forecasted program participation.

Vintage 2019

Line	Residential	2014	2015	2016(a)	2017	2018 (a)	2019	Total
1	Appliance Recycling Program						$ -	$ -
2	Energy Education Program for Schools						$ 45,488	$ 45,488
3	Energy Efficient Lighting						$ 660,301	$ 660,301
4	Home Energy Improvement Program						$ 109,946	$ 109,946
5	My Home Energy Report						$ 6,365,499	$ 6,365,499
6	Neighborhood Energy Saver						$ 54,545	$ 54,545
7	Multi-Family Energy Efficiency						$ 456,925	$ 456,925
8	Residential Energy Assessments						$ 77,791	$ 77,791
9	Residential New Construction						$ 47,875	$ 47,875
10	Save Energy and Water Kit						$ 912,388	$ 912,388
11	Total Lost Revenues	$ -	$ -	$ -	$ -	$ -	$ 8,730,758	$ 8,730,758
12	Found Residential Revenues	$ -	$ -	$ -	$ -	$ -	$ -	$ -
13	Net Lost Residential Revenues	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 8,730,758**	**$ 8,730,758**

Line	Non-Residential	2014	2015	2016(a)	2017	2018 (a)	2019	Total
14	Business Energy Reports					$ -	$ -	$ -
15	Energy Efficiency for Business					$ -	$ 1,003,105	$ 1,003,105
16	Energy Efficient Lighting					$ -	$ 174,071	$ 174,071
17	Non-Residential Smart $aver Performance Incentive					$ -	$ 120,492	$ 120,492
18	Small Business Energy Saver					$ -	$ 960,827	$ 960,827
19	EnergyWise ® for Business					$ -	$ 32,780	$ 32,780
20	Total Lost Revenues	$ -	$ -	$ -	$ -	$ -	$ 2,291,275	$ 2,291,275
21	Found Non- Residential Revenues	$ -	$ -	$ -	$ -	$ -	$ (79,389)	$ (79,389)
22	Net Lost Non-Residential Revenues	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 2,211,886**	**$ 2,211,886**

Duke Energy Progress
For the Period January 1, 2015 - December 31, 2016
Docket Number E-2, Sub 1174
North Carolina Net Lost Revenue True Up for Vintages 2015 - 2016

Vintage 2015 as Filed Lost Revenue kWh $

Line	Residential	2015	2016(a)	2017(a)	2018	Total
1	Appliance Recycling Program	$ 123,909	$ 238,215	$ 227,380	$ -	$ 589,505
2	Energy Education Program for Schools	$ 62,859	$ 106,146	$ 101,267	$ -	$ 270,272
3	Energy Efficient Lighting	$ 1,665,788	$ 3,332,098	$ 4,238,474	$ -	$ 9,236,360
4	Home Energy Improvement Program	$ 170,038	$ 347,916	$ 331,043	$ -	$ 848,996
5	Multi-Family	$ 456,463	$ 971,916	$ 847,368	$ -	$ 2,275,747
6	My Home Energy Report	$ 5,020,104	$ -	$ -	$ -	$ 5,020,104
7	Neighborhood Energy Saver	$ 54,534	$ 89,993	$ 73,350	$ -	$ 217,877
8	Residential New Construction	$ 212,546	$ 329,015	$ 314,051	$ -	$ 855,612
9	Save Energy and Water Kit	$ -	$ -	$ -	$ -	$ -
10	Lost Residential Revenues	**$ 7,766,241**	**$ 5,415,298**	**$ 6,132,933**	**$ -**	**$ 19,314,472**
11	Found Residential Revenues	$ -	$ -	$ -	$ -	$ -
12	Net Lost Residential Revenues	**$ 7,766,241**	**$ 5,415,298**	**$ 6,132,933**	**$ -**	**$ 19,314,472**

Line	Non-Residential	2015	2016(a)	2017(a)	2018	Total
13	Energy Efficiency for Business	$ 1,386,578	$ 2,353,629	$ 2,229,685	$ -	$ 5,969,892
14	Energy Efficient Lighting	$ 420,420	$ 846,915	$ 1,621,916	$ -	$ 2,889,251
15	Small Business Energy Saver	$ 737,092	$ 1,703,045	$ 1,613,361	$ -	$ 4,053,498
16	EnergyWise for Business	$ -	$ -	$ 69	$ -	$ 69
17	Net Lost Non-Residential Revenues	**$ 2,544,090**	**$ 4,903,589**	**$ 5,465,031**	**$ -**	**$ 12,912,710**
18	Found Non- Residential Revenues	$ -	$ -	$ -	$ -	$ -
19	Net Lost Non-Residential Revenues	**$ 2,544,090**	**$ 4,903,589**	**$ 5,465,031**	**$ -**	**$ 12,912,710**

Line	DSDR	2015	2016(a)	2017(a)	2018	Total
20	DSDR	$ 420,831	$ 145,979	$ -	$ -	**$ 566,810**

Vintage 2016 as Filed Lost Revenue kWh $

Line	Residential	2015	2016(a)	2017(a)	2018	Total
1	Appliance Recycling Program	$ -	$ 5,095	$ 203,747	$ -	$ 208,843
2	Energy Education Program for Schools	$ -	$ 52,016	$ 97,012	$ -	$ 149,028
3	Energy Efficient Lighting	$ -	$ 1,033,814	$ 2,253,342	$ -	$ 3,287,156
3	Home Energy Improvement Program	$ -	$ 163,889	$ 122,724	$ -	$ 286,613
4	My Home Energy Report	$ -	$ 6,776,039	$ -	$ -	$ 6,776,039
5	Neighborhood Energy Saver	$ -	$ 44,319	$ 84,254	$ -	$ 128,573
6	Multi-Family	$ -	$ 361,415	$ 535,662	$ -	$ 897,077
7	Residential Energy Assessments	$ -	$ 74,198	$ 61,525	$ -	$ 135,723
8	Residential New Construction	$ -	$ 294,653	$ 436,338	$ -	$ 730,991
9	Save Energy and Water Kit	$ -	$ 332,610	$ 621,659	$ -	$ 954,269
10	Lost Residential Revenues	**$ -**	**$ 9,138,049**	**$ 4,416,263**	**$ -**	**$ 13,554,312**
11	Found Residential Revenues	$ -	$ -	$ -	$ -	$ -
12	Net Lost Residential Revenues	**$ -**	**$ 9,138,049**	**$ 4,416,263**	**$ -**	**$ 13,554,312**

Line	Non-Residential	2015	2016(a)	2017(a)	2018	Total
11	Business Energy Reports		$ -	$ -	$ -	$ -
12	Energy Efficiency for Business		$ 1,638,561	$ 1,895,405	$ -	$ 3,533,966
13	Energy Efficient Lighting		$ 246,438	$ 1,251,716	$ -	$ 1,498,155
14	Small Business Energy Saver		$ 1,107,111	$ 1,557,986	$ -	$ 2,665,097
15	EnergyWise for Business		$ 18,814	$ 27,113	$ -	$ 45,927
16	Net Lost Non-Residential Revenues	**$ -**	**$ 3,010,924**	**$ 4,732,221**	**$ -**	**$ 7,743,145**
17	Found Non- Residential Revenues	$ -	$ (68,561)	$ (113,553)	$ -	$ (182,114)
18	Net Lost Non-Residential Revenues	**$ -**	**$ 2,942,363**	**$ 4,618,668**	**$ -**	**$ 7,561,031**

Line	DSDR	2015	2016(a)	2017(a)	2018	Total
19	DSDR		$ 115,745	$ 66,983	$ -	**$ 182,728**

Duke Energy Progress
For the Period January 1, 2015 - December 31, 2016
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North Carolina Net Lost Revenue True Up for Vintages 2015 - 2016

		Vintage 2015 True Up Lost Revenue kWh $				
Line	**Residential**	**2015**	**2016(a)**	**2017(a)**	**2018**	**Total**
1	Appliance Recycling Program	$ 123,909	$ 238,215	$ 246,008	$ 46,185	$ 654,317
2	Energy Education Program for Schools	$ 71,588	$ 120,886	$ 124,841	$ 24,481	$ 341,797
3	Energy Efficient Lighting	$ 1,665,788	$ 3,332,098	$ 3,441,107	$ 536,645	$ 8,975,638
4	Home Energy Improvement Program	$ 170,038	$ 347,916	$ 359,298	$ 65,009	$ 942,260
5	Multi-Family	$ 429,296	$ 909,897	$ 939,665	$ 182,264	$ 2,461,122
6	My Home Energy Report	$ 4,024,242	$ -	$ -	$ -	$ 4,024,242
7	Neighborhood Energy Saver	$ 54,534	$ 89,993	$ 92,937	$ 15,265	$ 252,729
8	Residential New Construction	$ 252,450	$ 390,785	$ 403,570	$ 54,943	$ 1,101,749
9	Save Energy and Water Kit	$ -	$ -	$ -	$ -	$ -
10	Lost Residential Revenues	**$ 6,791,845**	**$ 5,429,790**	**$ 5,607,426**	**$ 924,793**	**$ 18,753,854**
11	Found Residential Revenues	$ -	$ -	$ -	$ -	$ -
12	Net Lost Residential Revenues	**$ 6,791,845**	**$ 5,429,790**	**$ 5,607,426**	**$ 924,793**	**$ 18,753,854**

Line	**Non-Residential**	**2015**	**2016(a)**	**2017(a)**	**2018**	**Total**
13	Energy Efficiency for Business	$ 1,386,578	$ 2,353,629	$ 2,443,707	$ 374,092	$ 6,558,005.99
14	Energy Efficient Lighting	$ 420,420	$ 846,915	$ 879,329	$ 126,026	$ 2,272,690.21
15	Small Business Energy Saver	$ 737,092	$ 1,703,045	$ 1,768,224	$ 315,792	$ 4,524,152.76
16	EnergyWise for Business	$ -	$ -	$ -	$ -	$ -
17	Net Lost Non-Residential Revenues	**$ 2,544,090**	**$ 4,903,589**	**$ 5,091,260**	**$ 815,910**	**$ 13,354,849**
18	Found Non- Residential Revenues	$ -	$ -	$ -	$ -	$ -
19	Net Lost Non-Residential Revenues	**$ 2,544,090**	**$ 4,903,589**	**$ 5,091,260**	**$ 815,910**	**$ 13,354,849**
		-	-	-	-	

Line	**DSDR**	**2015**	**2016(a)**	**2017(a)**	**2018**	**Total**
20	DSDR	$ 420,831	$ 145,979	$ -	$ -	**$ 566,810**

		Vintage 2016 True Up Lost Revenue kWh $				
Line	**Residential**	**2015**	**2016(a)**	**2017(a)**	**2018**	**Total**
1	Appliance Recycling Program	$ -	$ 5,095	$ 12,308	$ 2,515	$ 19,918
2	Energy Education Program for Schools	$ -	$ 59,240	$ 135,532	$ 27,693	$ 222,465
3	Energy Efficient Lighting	$ -	$ 1,033,814	$ 2,116,981	$ 432,565	$ 3,583,361
3	Home Energy Improvement Program	$ -	$ 163,848	$ 370,108	$ 75,625	$ 609,580
4	My Home Energy Report	$ -	$ 5,418,524	$ -	$ 134,484	$ 5,553,007
5	Neighborhood Energy Saver	$ -	$ 44,319	$ 105,283	$ -	$ 149,602
6	Multi-Family	$ -	$ 332,768	$ 658,165	$ 21,513	$ 1,012,445
7	Residential Energy Assessments	$ -	$ 74,198	$ 222,923	$ 45,550	$ 342,671
8	Residential New Construction	$ -	$ 298,122	$ 670,358	$ 136,975	$ 1,105,455
9	Save Energy and Water Kit	$ -	$ 362,685	$ 987,169	$ 201,709	$ 1,551,563
10	Lost Residential Revenues	**$ -**	**$ 7,792,613**	**$ 5,278,826**	**$ 1,078,628**	**$ 14,150,067**
11	Found Residential Revenues	$ -	$ -	$ -	$ -	$ -
12	Net Lost Residential Revenues	**$ -**	**$ 7,792,613**	**$ 5,278,826**	**$ 1,078,628**	**$ 14,150,067**
			-	-	-	

Line	**Non-Residential**	**2015**	**2016(a)**	**2017(a)**	**2018**	**Total**
11	Business Energy Reports	$ -	$ 191,245	$ -	$ -	$ 191,244.69
12	Energy Efficiency for Business	$ -	$ 1,638,505	$ 3,101,812	$ 632,371	$ 5,372,688.80
13	Energy Efficient Lighting	$ -	$ 246,438	$ 478,231	$ 97,498	$ 822,166.50
14	Small Business Energy Saver	$ -	$ 1,100,746	$ 2,221,654	$ 452,932	$ 3,775,331.82
15	EnergyWise for Business	$ -	$ 7,298	$ 19,733	$ 4,023	$ 31,054.46
16	Net Lost Non-Residential Revenues	**$ -**	**$ 3,184,232**	**$ 5,821,430**	**$ 1,186,824**	**$ 10,192,486**
17	Found Non- Residential Revenues	$ -	$ (68,561)	$ (113,553)	$ (113,553)	$ (295,666)
18	Net Lost Non-Residential Revenues	**$ -**	**$ 3,115,672**	**$ 5,707,877**	**$ 1,073,272**	**$ 9,896,820**
			-	-	-	

Line	**DSDR**	**2015**	**2016(a)**	**2017(a)**	**2018**	**Total**
19	DSDR	$ -	$ 115,745	$ 66,983		**$ 182,728**

Duke Energy Progress
For the Period January 1, 2015 - December 31, 2016
Docket Number E-2, Sub 1174
North Carolina Net Lost Revenue True Up for Vintages 2015 - 2016

Vintage 2015 Variance Lost Revenue kWh $

Line	Residential	2015	2016(a)	2017(a)	2018	Total
1	Appliance Recycling Program	$ -	$ -	$ 18,628	$ 46,185	$ 64,812
2	Energy Education Program for Schools	$ 8,729	$ 14,741	$ 23,574	$ 24,481	$ 71,526
3	Energy Efficient Lighting	$ -	$ -	$ (797,366)	$ 536,645	$ (260,721)
4	Home Energy Improvement Program	$ -	$ -	$ 28,255	$ 65,009	$ 93,264
5	Multi-Family	$ (27,168)	$ (62,018)	$ 92,297	$ 182,264	$ 185,375
6	My Home Energy Report	$ (995,862)	$ -	$ -	$ -	$ (995,862)
7	Neighborhood Energy Saver	$ -	$ -	$ 19,587	$ 15,265	$ 34,852
8	Residential New Construction	$ 39,904	$ 61,770	$ 89,519	$ 54,943	$ 246,137
9	Save Energy and Water Kit	$ -	$ -	$ -	$ -	$ -
10	Lost Residential Revenues	**$ (974,396)**	**$ 14,493**	**$ (525,507)**	**$ 924,793**	**$ (560,617)**
11	Found Residential Revenues	$ -	$ -	$ -	$ -	$ -
12	Net Lost Residential Revenues	**$ (974,396)**	**$ 14,493**	**$ (525,507)**	**$ 924,793**	**$ (560,617)**
	Non-Residential	**2015**	**2016(a)**	**2017(a)**	**2018**	**Total**
13	Energy Efficiency for Business	-	-	214,022	374,092	588,114
14	Energy Efficient Lighting	-	-	(742,587)	126,026	(616,561)
15	Small Business Energy Saver	-	-	154,863	315,792	470,655
16	EnergyWise for Business	-	-	(69)	-	(69)
17	Net Lost Non-Residential Revenues	**0**	**0**	**(373,771)**	**815,910**	**442,139**
18	Found Non- Residential Revenues	$ -	$ -	$ -	$ -	$ -
19	Net Lost Non-Residential Revenues	**$ -**	**$ -**	**$ (373,771)**	**$ 815,910**	**$ 442,139**
	DSDR	**2015**	**2016(a)**	**2017(a)**	**2018**	**Total**
20	DSDR	-	-	-	-	**$** -

Vintage 2016 Variance Lost Revenue kWh $

Line	Residential	2015	2016(a)	2017(a)	2018	Total
1	Appliance Recycling Program	$ -	$ -	$ (191,440)	$ 2,515	$ (188,925)
2	Energy Education Program for Schools	$ -	$ 7,224	$ 38,520	$ 27,693	$ 73,437
3	Energy Efficient Lighting	$ -	$ -	$ (136,360)	$ 432,565	$ 296,205
3	Home Energy Improvement Program	$ -	$ (41)	$ 247,384	$ 75,625	$ 322,967
4	My Home Energy Report	$ -	$ (1,357,515)	$ -	$ 134,484	$ (1,223,032)
5	Neighborhood Energy Saver	$ -	$ -	$ 21,028	$ -	$ 21,028
6	Multi-Family	$ -	$ (28,648)	$ 122,503	$ 21,513	$ 115,368
7	Residential Energy Assessments	$ -	$ -	$ 161,398	$ 45,550	$ 206,948
8	Residential New Construction	$ -	$ 3,469	$ 234,020	$ 136,975	$ 374,464
9	Save Energy and Water Kit	$ -	$ 30,075	$ 365,510	$ 201,709	$ 597,294
10	Lost Residential Revenues	**$ -**	**$ (1,345,437)**	**$ 862,563**	**$ 1,078,628**	**$ 595,755**
11	Found Residential Revenues	$ -	$ -	$ -	$ -	$ -
12	Net Lost Residential Revenues	**$ -**	**$ (1,345,437)**	**$ 862,563**	**$ 1,078,628**	**$ 595,755**
	Non-Residential	**2015**	**2016(a)**	**2017(a)**	**2018**	**Total**
11	Business Energy Reports	-	191,245	-	-	191,245
12	Energy Efficiency for Business	-	(56)	1,206,407	632,371	1,838,722
13	Energy Efficient Lighting	-	-	(773,486)	97,498	(675,988)
14	Small Business Energy Saver	-	(6,366)	663,668	452,932	1,110,235
15	EnergyWise for Business	-	(11,515)	(7,380)	4,023	(14,872)
16	Net Lost Non-Residential Revenues	**0**	**173,308**	**1,089,209**	**1,186,824**	**2,449,341**
17	Found Non- Residential Revenues	-	0	0	(113,553)	(113,552)
18	Net Lost Non-Residential Revenues	**$ -**	**$ 173,308**	**$ 1,089,209**	**$ 1,073,272**	**$ 2,335,789**
	DSDR	**2015**	**2016(a)**	**2017(a)**	**2018**	**Total**
19	DSDR	-	-	-	-	**$** -

Evans Exhibit 3

Duke Energy Progress
Actual Program Costs for Vintage Years 2013 - 2017
Docket Number E-2 Sub 1174

			Carolinas System - 12 Months Ended 12/31/2013	Carolinas System - 12 Months Ended 12/31/2014	Carolinas System - 12 Months Ended 12/31/2015	Carolinas System - 12 Months Ended 12/31/2016	Carolinas System - 12 Months Ended 12/31/2017
1	Appliance Recycling Program		$ 1,473,097	$ 1,158,732	$ 1,220,465	$ (137,009)	$ 5,586
2	Home Energy Improvement Program		$ 5,419,581	$ 4,815,836	$ 5,298,232	$ 6,013,170	$ 6,961,463
3	Residential Lighting Program		$ 8,235,185	$ 19,568,417	$ 14,616,136	$ 15,552,184	$ 10,904,279
4	Neighborhood Energy Saver Program		$ 2,051,973	$ 1,731,995	$ 1,586,061	$ 2,052,535	$ 1,781,211
5	Residential New Construction		$ 2,348,349	$ 6,463,903	$ 7,447,258	$ 9,405,615	$ 11,671,724
6	Residential Energy Efficient Benchmarking		$ 591,861	$ 171,840	$ -	$ -	$ -
7	Residential Home Advantage		$ 67,611	$ -	$ -	$ -	$ -
8	Energy Education Program for Schools		$ -	$ -	$ 703,689	$ 827,497	$ 835,991
9	Multi-Family		$ -	$ -	$ 2,615,745	$ 2,045,220	$ 2,514,413
10	My Home Energy Report		$ -	$ 69,946	$ 5,808,941	$ 5,890,093	$ 6,753,153
11	Residential Energy Assessments					$ 1,417,924	$ 1,863,486
12	Save Energy and Water Kit					$ 674,538	$ 888,869
13	Business Energy Report		$ -	$ -	$ 74,374	$ 69,516	$ 20,330
14	Energy Efficiency for Business		$ 8,424,007	$ 7,247,613	$ 6,226,453	$ 14,159,310	$ 21,749,807
15	Energy Efficient Lighting		$ 1,000,191	$ 2,376,651	$ 1,775,958	$ 1,889,694	$ 1,324,943
16	Non-Res SmartSaver Performance						$ 147,160
17	Small Business Energy Saver		$ 3,345,513	$ 10,108,948	$ 9,780,196	$ 9,336,274	$ 8,770,755
18	EnergyWise		$ 9,709,664	$ 9,898,623	$ 12,212,851	$ 13,633,666	$ 13,125,314
19	EnergyWise for Business		$ -	$ -	$ 65,456	$ 1,112,815	$ 1,390,549
20	CIG DR		$ 1,353,172	$ 1,388,074	$ 1,899,146	$ 1,615,703	$ 1,523,514
21	**Total Energy Efficiency & Demand Side Program Co**	Sum(Lines 1-19)	**$ 44,020,203**	**$ 65,000,579**	**$ 71,330,960**	**$ 85,558,746**	**$ 92,232,546**
						$ -	
22	NC Allocation Factor for EE programs	Miller Exhibit 5 Pg.1 thro	86.01%	85.73%	85.29%	85.44%	85.51%
23	NC Allocation Factor for DSM programs	Miller Exhibit 5 Pg.1 thro	86.52%	85.94%	86.05%	86.17%	86.16%

			Carolinas System - 12 Months Ended 12/31/2013	NC Allocated - 12 Months Ended 12/31/2014	NC Allocated - 12 Months Ended 12/31/2015 (1)	NC Allocated - 12 Months Ended 12/31/2016 (1)	NC Allocated - 12 Months Ended 12/31/2017 (1)
24	Appliance Recycling Program	Line 1 * Line 21	$ 1,267,059.70	$ 993,419.25	$ 1,040,934.99	$ (117,058.57)	$ 4,776.58
25	Home Energy Improvement Program	Line 2 * Line 21	$ 4,661,562.08	$ 4,128,777.14	$ 4,518,861.95	$ 5,137,557.41	$ 5,952,627.50
26	Residential Lighting Program	Line 3 * Line 21	$ 7,083,356.97	$ 16,776,656.40	$ 12,466,102.61	$ 13,287,540.35	$ 9,324,062.29
27	Neighborhood Energy Saver Program	Line 4 * Line 21	$ 1,764,970.77	$ 1,484,896.87	$ 1,352,751.03	$ 1,753,653.63	$ 1,523,082.68
28	Residential New Construction	Line 5 * Line 21	$ 2,019,892.95	$ 5,541,719.25	$ 6,351,766.01	$ 8,036,009.10	$ 9,980,291.02
29	Residential Energy Efficient Benchmarking	Line 6 * Line 21	$ 509,079.39	$ 147,324.46	$ -	$ -	$ -
30	Residential Home Advantage	Line 7 * Line 21	$ 58,154.32	$ -	$ -	$ -	$ -
31	Energy Education Program for Schools	Line 8 * Line 21	$ -	$ -	$ 600,176.12	$ 707,000.01	$ 714,841.32
32	Multi-Family	Line 9 * Line 21	$ -	$ -	$ 2,230,968.51	$ 1,747,403.44	$ 2,150,031.73
33	My Home Energy Report	Line 10 * Line 21	$ -	$ 59,966.69	$ 4,954,445.77	$ 5,032,402.60	$ 5,774,505.65
34	Residential Energy Assessments	Line 11 * Line 21	$ -	$ -	$ -	$ 1,211,452.08	$ 1,593,434.59
35	Save Energy and Water Kit	Line 12 * Line 21	$ -	$ -	$ -	$ 576,314.67	$ 760,056.35
36	Business Energy Report	Line 13 * Line 21	$ -	$ -	$ 63,433.37	$ 59,393.23	$ 17,383.70
37	Energy Efficiency for Business	Line 14 * Line 21	$ 7,245,768.80	$ 6,213,620.54	$ 5,310,541.74	$ 12,097,490.87	$ 18,597,886.97
38	Energy Efficient Lighting	Line 15 * Line 21	$ 860,297.81	$ 2,037,582.02	$ 1,514,714.78	$ 1,614,524.95	$ 1,132,935.88
39	Non-Res SmartSaver Performance	Line 16 * Line 21	$ -	$ -	$ -	$ -	$ 125,834.21
40	Small Business Energy Saver	Line 17 * Line 21	$ 2,877,586.82	$ 8,666,738.31	$ 8,341,529.15	$ 7,976,765.21	$ 7,499,722.72
41	EnergyWise	Line 18 * Line 22	$ 8,401,125.00	$ 8,507,206.67	$ 10,508,750.77	$ 11,747,962.62	$ 11,308,498.16
42	EnergyWise for Business	Line 19 * Line 22	$ -	$ -	$ 56,323.08	$ 958,898.92	$ 1,198,068.36
43	CIG DR	Line 20 * Line 22	$ 1,170,809	$ 1,192,957	$ 1,634,152	$ 1,392,232	$ 1,312,628
44	**Total Energy Efficiency & Demand Side Program Co**	Sum (Lines 21-39)	**$ 37,919,664**	**$ 55,750,865**	**$ 60,945,452**	**$ 73,219,542**	**$ 78,970,668**

(1) NC Allocations are based on annual weighted average, which are employed in the allocation of Utility Cost Test (UCT) results for PPI determination. This differs from the allocation used in Miller Exhibit 2, which allocates actual costs by month.

Evans Exhibit 4

Duke Energy Progress, LLC
January - December 2017 Actuals
January 2018 - December 2019 Estimates
Docket Number E-2, Sub 1174
North Carolina Found Revenues

	Actual/Reported KWH		Estimated KWH	
	2016	2017	2018	2019
Economic Development	40,751,172	217,748,650	-	-
Lighting				
Residential	21,158	18,164	18,164	18,164
Non Residential (Regulated)	328,140	304,084	304,084	304,084
MV to LED Credit - Residential (Regulated)	(460,649)	(456,768)	(107,448)	(77,014)
MV to LED Credit - Non-Residential (Regulated)	(105,415)	(105,982)	(24,931)	(17,869)
Total KWH	40,534,406	217,508,148	189,869	227,365
Total KWH Included	(216,766)	(240,502)	189,869	227,365
Total KWH Included (net of Free Riders 15%)	(184,251)	(204,427)	161,389	193,260
Annualized Found Revenue - Non Residential	$ 113,553	$ 106,296	$ 144,604	$ 146,565
Annualized Found Revenue - Residential	$ (279,063)	$ (297,693)	$ (57,423)	$ (59,570)

	2016	2017	2018	2019
Vintage 2015 - Non Res	$ -	-	-	-
Vintage 2016 - Non Res	$ 68,561	113,553	113,553	44,992
Vintage 2017 - Non Res		$ 72,644	106,296	106,296
Vintage 2018 - Non Res			$ 78,327	144,767
Vintage 2019 - Non Res				$ 79,389
Net Negative Found Revenues to Zero*	-	-	-	-
Subtotal - Non Res	**$ 68,561**	**$ 186,197**	**$ 298,176**	**$ 375,444**
Vintage 2015 - Res	$ -	-	-	-
Vintage 2016 - Res	$ (150,940)	(279,063)	(279,063)	(128,123)
Vintage 2017 - Res		$ (160,772)	(297,693)	(297,693)
Vintage 2018 - Res			$ (31,104)	(57,601)
Vintage 2019 - Res				$ (32,267)
Net Negative Found Revenues to Zero*	150,940	439,836	607,860	515,684
Subtotal - Residential	$ -	$ -	$ -	$ -
Total Found Revenues	**$ 68,561**	**$ 186,197**	**$ 298,176**	**$ 375,444**

* Eliminates the inclusion of total negative found revenues at the Residential level

Evans Exhibit 5

Duke Energy Progress
System Event Based Demand Response January 1, 2017 - December 31, 2017
Docket Number E-2, Sub 1174

Date	State	Program Name	Event Trigger	Customers Notified /Switches Dispatched	MW Reduction
1/8/2017	NC and SC	DSDR	Capacity Needs	-NA-	183
1/9/2017	NC	DEP EnergyWise Home	Economic Event	9,215/12,947	11.6
1/9/2017	NC and SC	DSDR	Capacity Needs	-NA-	200
3/16/2017	NC and SC	DSDR	Capacity Needs	-NA-	112
6/14/2017	NC and SC	EnergyWise Business	M&V / Economic Event	1872	2.4
7/13/2017	NC and SC	DEP DRA	Tariff - Minimum Event	19 Customers / 67 Sites	19
7/13/2017	NC and SC	EnergyWise Business	M&V / Economic Event	1915	2.9
7/21/2017	NC and SC	DEP DRA	Tariff - Minimum Event	19 Customers / 67 Sites	20
7/21/2017	NC and SC	EnergyWise Business	M&V / Economic Event	1838	2.3
8/17/2017	NC and SC	EnergyWise Business	M&V / Economic Event	1897	2.4
8/18/2017	NC and SC	DEP DRA	Tariff - Minimum Event	20 Customers / 70 Sites	22
8/18/2017	NC and SC	DSDR	Capacity Needs	-NA-	92
8/21/2017	NC and SC	DEP EnergyWise Home	Economic Event	159,244/205,016	120.5
8/22/2017	NC and SC	EnergyWise Business	M&V / Economic Event	1896	2.4
10/9/2017	NC and SC	DSDR	Capacity Needs	-NA-	144
10/11/2017	NC and SC	DSDR	Capacity Needs	-NA-	218
10/12/2017	NC and SC	DSDR	Capacity Needs	-NA-	247
10/23/2017	NC and SC	DSDR	Capacity Needs	-NA-	63

Notes:
- 'Customers Notified' is the number of participants notified to participate in the event
- 'Switches Dispatched' values represent the monthly active switch counts
- 'MW Reduction' values are based on the average across all hours of the event

A. Description

The Appliance Recycling Program ("Program") promoted the removal and responsible disposal of operating refrigerators and freezers from Duke Energy Progress (DEP) LLC's (the "Company") residential customers. The refrigerator or freezer must have a capacity of at least 10 cubic feet but not more than 30 cubic feet. The Program recycled approximately 95% of the material from the harvested appliances.

Audience

Eligible Program participants include the Company's residential customers who own operating refrigerators and freezers used in individually metered residences. Currently, this Program is closed to new participants.

B & C. Impacts, Participants and Expenses

2017 Year End Results	Annual Forecast	Actual	Variations
Savings (MWH)	3,979	0	-3,979
Savings (MW)	0.53	0.00	-0.53
Participants		0	
2017 Program Expenses		$5,591	

D. Qualitative Analysis

Highlights

No highlights to report.

Issues

No issues to report

Potential Changes

No changes at this time.

E. Marketing Strategy

No Marketing efforts were conducted.

F. Evaluation, Measurement and Verification

No evaluation activities are planned in 2017.

Save Energy and Water Kit

A. Description

The Save Energy and Water Kit Program launched in November of 2015 to offer residential customers energy efficient water fixtures and insulating pipe tape for use within their homes.

Customers receive a Business Reply Card (BRC) to return or they may call a toll-free number if they would like to participate. Participants receive a free kit with installation instructions and varying numbers of bath aerators, kitchen aerators, shower heads and pipe insulation tape, based on the size of their homes.

Energy Federation Incorporated (EFI) processes the BRCs, furnishes the measures, and assembles all kits. EFI also maintains the call center where customer calls are routed if they choose to redeem the offer via telephone instead of returning the BRC. EFI validate BRCs and phone calls in a database to ensure a customer's eligibility and to prevent a customer from participating multiple times.

The program has a website in place that customers can access to learn more about the program or to watch videos to aid in installating the kit measures.

Audience

The Program is available to customers residing in a single-family home with an electric water heater who have not received similar measures through another Company-offered energy efficiency program.

B & C. Impacts, Participants and Expenses

2017 Year-End Results	Forecasted	Actual	Variations
Savings (MWH)	14,907	29,898	14,991
Savings (MW)	1.19	8.56	7.37
Participants		463,854	
2017 Program Expenses		$ 889,269	

D. Qualitative Analysis

Highlights

In 2017, over 375,000 Business Reply Cards (BRC) were distributed to Duke Energy Progress customers in the Carolinas. Replying by mail or by phone, 42,071 customers accepted the offer and received kits. These kits delivered approximately 140,952 bath aerators, 42,071 kitchen aerators, 70,476 showerheads and 210,355 feet of pipe insulation.

Issues

The program was successfully launched without any issues regarding ordering, fulfillment or support of the program. EM&V data shows a higher percentage of gas water heater customers participated in the program in 2016 than expected.

Potential Changes

In 2017, the electric water heater propensity model was updated in order to reduce participation by customers with gas water heaters. In 2018, Duke Energy will expand redemption channels to include an online store for customers who prefer to enroll in the program online. Future phases of the online platform will allow customers to upgrade kit items by selecting specific finishes or styles.

E. Marketing Strategy

Due to the unique eligibility requirements of the program, all marketing has historically been done through an offer only Business Reply Card (BRC) approach. Customers who qualify are sent a BRC inviting them to participate. They can accept the offer by returning the postage paid reply card or by calling EFI's call center. In 2018, Marketing will expand to include direct email to market segments that are more inclined to engage in a digital transaction.

With the launch of the Online Store, Duke Energy will begin using targeted email campaigns. Customers that receive these emails will be subject to the same eligibility requirements as those that receive the BRC direct mailer.

F. Evaluation, Measurement and Verification

Evaluation work for the combined DEC/DEP Save Energy and Water program was completed in 2017. Evaluation activities combined participant surveys and engineering methods to quantify energy and demand impacts from the water measures provided in the kit. Participant surveys helped inform in-service rates, satisfaction with the kit measures, and free ridership and spillover. Verified results include gross energy savings per kit of 396.1 kWh versus ex-ante impacts of 432.0 kWh, for an energy realization rate of 92%. Program free ridership was 15% and spillover was estimated at 8%, for a NTG of 93%.

Energy Efficiency Education Program

A. Description

The Energy Efficiency Education Program ("Program") is an energy efficiency program available to students in grades K-12 enrolled in public and private schools who reside in households served by Duke Energy Progress in North and South Carolina. The current curriculum administered by The National Theatre for Children ("NTC") targets K-8 grade students.

The Program provides principals and teachers with an innovative curriculum that educates students about energy, resources, the relationship between energy and resources, ways energy is wasted and ways they can be more energy efficient. The centerpiece of the curriculum is a live theatrical production focused on concepts such as energy, renewable fuels and energy efficiency and performed by two professional actors. Teachers receive supportive educational materials for their classrooms and assignments for students to take home. The workbooks, assignments, and activities meet state curriculum requirements.

School principals are the main point of contact for scheduling their school's performance. Once the principal confirms the performance date and time, all materials are scheduled for delivery two weeks prior to the performance. Materials include school posters, teacher guides, and classroom and family activity books.

Students are encouraged to complete a home energy survey with their families (found in their classroom and family activity book, as well as online), to receive an Energy Efficiency Starter Kit. The kit contains specific energy efficiency measures to reduce home energy consumption. The kit is available at no cost to student households at participating schools.

Audience

Eligible participants include the Company's residential customers, with school-age children enrolled in public and private schools, who reside in households served by Duke Energy Progress.

B &C. Impacts, Participants and Expenses

2017 Year-End Results	Annual Forecast	Actual	Variation
Savings (MWH)	1,901	2,240	339
Savings (MW)	0.19	0.95	0.76
Participants		9,104	
2017 Program Expenses		$835,575	

D. Qualitative Analysis

Highlights

The Program, which is in its fourth year, has been well received by schools, teachers, students and parents thanks to its important message about energy efficiency and innovative delivery channel which reinforces the classroom material. The 2016-2017 school year, NTC offered two productions—the Conservation Caper, a 25-minute live production delivered to elementary school-aged students, and the Energy Agents, a 40-minute improvisational sketch comedy for middle school-aged students.

During the spring semester of the 2016-2017 school year, the Program visited 99 schools in North and South Caroina and reached over 31,576 students with the energy efficiency curriculum. Additionally, the Program distributed 5,824 Energy Efficiency Starter Kits to student households served by Duke Energy Progress. During the fall semester of the 2017-2018 school year, a total of 113 schools hosted 185 performances before approximately 43,378 students, resulting in the distribution of 3,762 kits. Overall, 9,104 Duke Energy customers received Energy Efficiency Starter Kits in 2017.

Once the energy efficiency survey is processed for an eligible customer, the Energy Efficiency Starter Kit is shipped for arrival within two to four weeks. To ensure customer satisfaction with the kit and the installation of items, an email reminder is sent monthly after successful kit delivery to encourage families to return their Business Reply Card (BRC). Qualified households that submit their energy efficiency surveys and return the BRC are automatically entered into the household contest drawing, sponsored by NTC.

Additionally, school and classroom contests encourage sign ups and NTC awards checks to schools with a large percentage of families returning their surveys. In the fall and spring of each year, a drawing is held selecting one school and one household contest winner. Principals, teachers and students may view their school's progress and compare the number of sign ups to other schools via the website.

Currently, the Program is reviewing additional materials for all student households, particularly those that have already received the current Energy Efficiency Starter Kit, to enhance the Program, increase customer satisfaction, and provide additional energy savings impacts for all customers.

E. Marketing Strategy

The Company works through the vendor to market to schools. The marketing channels may include but are not limited to the following:

- Direct mail (letters to school administrators)
- Email
- Program Website
- Events or assemblies
- Printed materials for classrooms
- Social media promotions

These marketing efforts engage students and their families in energy conservation behavior and provide energy saving opportunities through the Energy Efficiency Starter kits.

F. Evaluation, Measurement and Verification

An impact and process evaluation report for the Energy Efficiency Education Program was completed in the second quarter of 2017. The process evaluation of the Program included interviews with the program manager, implementer and teachers to assess program operations, and surveys from students's families to assess their awareness of and satisfaction with the Program and their follow through with installations and recommendations.

The impact evaluation verified gross energy savings and demand reductions of 276.4 kWh and .117 kW, respectively. Net impacts were 245.0 kWh and 0.104 kW. Free ridership for the program was estimated at 21% and spillover was 10%, which calculates to a NTG of 89%.

A. Description

The Energy Efficient Lighting Program partners with lighting manufacturers and retailers across North and South Carolina to provide marked-down prices at the register to DEP customers purchasing energy efficient lighting products. Starting in 2017, the Program removed CFLs and only offers LEDs and energy-efficient fixtures. The focus on LEDs aligns with changes in the market place and increases energy savings potential. Participation continues to be high, and the success of this Program can be attributed to high customer interest in energy efficiency, increased knowledge of the benefits associated with energy efficient lighting, and effective promotion of the Program.

As the Program moves into its eighth year, the Energy Efficient Lighting Program continues to incenivize customers to adopt a wide range of energy efficient lighting products, including LEDs and fixtures. Customer education is imperative to ensure customers are purchasing the right bulb for the application, to obtain high satisfaction with lighting products and to encourage subsequent purchases.

Audience

The Program is available to existing residential and non-residential customers. Customers simply shop for their lighting needs at a wide variety of retail locations. Incentives are provided at the point of purchase.

B & C. Impacts, Participants and Expenses

2017 YTD Results	Annual Forecast	Actual	Variations
Savings (MWH)	60,296	31,900	-28,396
Savings (MW)	9.90	4.60	-5.30
Participants		2,519,086	
2017 Program Expenses		$12,236,465	

D. Qualitative Analysis

Highlights

For the period of January to December 2017, the Program incentivized a total of 2,519,086 measures, including 66,344 CFLs (carry over of sales from 2016); 2,230,548 LEDs and; 222,194 fixtures. The DEP Energy Efficiency Program had 19 lighting retail channels actively participating in 2017. While the top five retail channels account for 73% of the Program sales, all retail channels allow access to the Program for a diverse and geographically wide population of DEP customers. The Program is designed to reach 90% of customers within 30 miles of a participating retail location.

The Program continues to operate efficiently with 85% of overall Program costs going directly to customers in the form of incentives. Additionally, a total of 99% of the Program costs are spent on implementation and administration of the Program, including incentives and management fees. Therefore, only 1% is spent on marketing, labor and other costs.

Issues

No issues at this time.

Potential Changes

The Program will continue to evaluate the market and adjust products and incentive levels as necessary, focusing on specialty applications and strategically targeting underserved customers through select channels and events.

E. Marketing Strategy

The Company will continue the Program marketing efforts in 2018 through the following:

- Point of Purchase materials at the participating retailer locations
- Duke Energy Progress and Program website
- General Awareness Campaigns
    - Bill Inserts
    - Email
    - Online Advertising
    - Paid advertising/mass media
    - Out of Home advertising
- Advertised events at key retailers including:
    - Direct mail
    - Email
    - Paid advertising/mass media (radio, newspaper, etc.)
    - Social media
    - In Store materials (fliers, bag stuffers, posters, banners, etc.)
- Community outreach events (home shows, sporting events, cultural events, etc.)

These marketing efforts are designed to create customer awareness of the Program, to educate customers on energy saving opportunities, and to emphasize the convenience of Program participation. Additionally, marketing efforts related to in-store events are designed to motivate customer participation.

F. Evaluation, Measurement and Verification

For the Retail Lighting evaluation, the combined DEC/DEP process and impact report is scheduled for completion in 2018. Both evaluations will consist of engineering estimates of the measures provided in the kits (DEC) or in retail channels (DEP).

EnergyWise Home Program

A. Description

EnergyWise Home ("Program") allows Duke Energy Progress, LLC ("Company") to install load control switches at the customer's premise to remotely control the following residential appliances.

- Central air conditioning or electric heat pumps
- Auxiliary strip heat on central electric heat pumps (Western Region only)
- Electric water heaters (Western Region only)

For each of the appliance options above, Program participants receive an initial one-time bill credit of $25 following the successful installation and testing of load control device(s) and an annual bill credit of $25 in exchange for allowing the Company to control the listed appliances.

Audience

The Program is available to all of the Company's residential customers residing in owner-occupied or leased, single-family, or multi-family residences.

B & C. Impacts, Participants and Expenses

2017 Year-End Results	Annual Forecast (YE)	Actual	Variations
Savings (MWH)	-NA-	-NA-	-NA-
Savings (MW) [1]	339.48	342.68	3.20
Participants `		342,675	
2017 Program Expenses		$13,004,957	

1 MW Savings at the meter include Summer MW for AC participants and Winter MW for Heat Strip and Water Heater Participants

D. Qualitative Analysis

Highlights

After receiving regulatory approval from both the North Carolina Utilities Commission and the South Carolina Public Service Commission late in 2008, the Company officially launched the Program in April of 2009. Comverge, which specializes in integrated demand response solutions, was awarded the contract for the load management system software and switch technology, and GoodCents was awarded the contract for enrollment, field implementation, and call center support.

The program has met or exceeded its customer acquisition and impact goals ever year since its inception. The program has achieved approximately 14% market penetration in eight years with over 168,000 participants and full shed load impacts of 347 MW summer and 13 MW winter at the meter.

Potential Changes

On December 21, 2017 the company filed a modification to the current Load Control Rider LC – SUM to allow customer-owned ''smart" thermostats to function as load control devices. This Bring Your Own Thermostat (BYOT) Measure will be available to residential customers who agree to allow Duke Energy to temporarily control their eligible thermostats via the internet.

E. Marketing Strategy

The Company continues to deploy Program marketing efforts through various channels that include but are not limited to the following:

- Door-to-door canvassing
- Outbound calling
- Duke Energy Progress website
- Email
- Direct mail (letters and postcards to qualifying customers)

Additional detailed program information is located at https://www.progress-energy.com/carolinas/home/save-energy-money/energy-efficiency-improvements/energy-wise/index.page?

F. Evaluation, Measurement and Verification

During the Collaborative Meeting on July 14, 2017, the Company presented the findings from the Summer 2016 evaluation of the Program. The evaluation installed loggers at a sample of participants' homes as well as utilizing a randomized control trial (RTC) approach to estimate impacts. Curtailing two distinct M&V groups on different days was a significant change in 2016. One group was activated for some events while the other was not, and therefore used as a control. Impacts were determined by a fixed effects regression analysis.

For the process evaluation, Navigant, the evaluator, conducted three surveys of EnergyWise participants within 24 hours of two of the Summer 2016 events and a placebo event, in which responding participants were asked the same questions on a comparable weather day when an event was not called.

Navigant is currently conducting the EM&V for the Winter program in the same manner used for the Summer of 2016 evaluation. Loggers were installed at a sample of participants' homes and a series of EM&V events have been conducted during the winter months. The next report will present the outcomes of this analysis.

A. Description

The Multifamily Energy Efficiency program ("Program") provides energy efficient lighting and water measures to reduce energy usage in multi-family properties. The Program allows Duke Energy Progress (the "Company") to target multi-family apartment complexes with an alternative delivery channel. Franklin Energy, the program administrator, or the property management staff installs measures in permanent fixtures. Franklin Energy is in charge of outreach, direct installations and customer care.

The Program offers LEDs including A-Line, globes and candelabra bulbs and water measures such as bath and kitchen faucet aerators, water saving showerheads and pipe wrap. Water measures are available to customers with electric water heating. All measures assist with reducing maintenance costs while improving tenant satisfaction by lowering energy bills.

The Program offers a direct install ("DI") service by Franklin Energy. Franklin Energy installs the lighting and water measures during scheduled visits. Crews carry tablets to keep track of what is installed in each apartment. Property managers also have the option to complete the installations during routine maintenance visits. The property maintenance crews track the number of measures they install and report back to Franklin Energy. Franklin Energy then validates the information and submits the results to the Company.

After the installations are completed, Quality Assurance ("QA") inspections are conducted on 20 percent of the properties that completed installations in a given month. The QA inspections are conducted by an independent third party.

Audience

The target audience is managers of properties with four or more units served on an individually metered residential rate schedule. In order to receive water measures, apartments must also have electric water heating.

B & C. Impacts, Participants and Expenses

2017 Year-End Results	Annual Forecast	Actual	Variations
Savings (MWH)	9,937	13,879	3,942
Savings (MW)	0.97	1.92	.94
Participants		297,837	
2017 Program Expenses		$2,516,608	

D. Qualitative Analysis

Highlights

In 2017, the Program completed installations at 170 properties, accounting for close to 16,101 units. The Program installed 297,837 measures with lighting measures representing 69 percent of the total number of installations and water measures representing 31 percent. The Program successfully transitioned to LEDs in 2017 and these are well received by both tenants and property owners.

Issues

There are no issues to report.

Potential Changes

In 2018, the Program will consider offering additional LED bulbs to serve track and recessed lighting fixtures. Additionally, the Program has received approval to remove the requirement that a property must have a minimum of four conjoined units from the Multi-family program tariff so that all units within a complex can be served.

E. Marketing Strategy

As program implementer, Franklin Energy is responsible for marketing and outreach to property managers. They primarily use outbound calls and on-site visits to understand a property manager's initial interest in the program. The Program also utilizes local apartment association memberships to access contact information for local properties and to attend association trade shows and events to promote the program. The Program was an exhibitor in the May 2017 AANC Conference in Raleigh, NC and generated over 200 leads for the region.

A Multi-Family Energy Efficiency public website landing page is available for property managers to learn more about the Program. A program brochure and a frequently asked question sheet are available for download.

Additionally, a Social Media campaign ran through May using Facebook ads to target property decision makers and trade groups in NC and SC zip codes. Following the campaign, results were positive with solid click thru rates on the Multifamily website, over 150 new page views, an increase in call center leads, and positive customer comments on Social Media.

Once property managers enroll, Franklin Energy provides a variety of marketing tools to create awareness of the Program among the tenants, including letters to each tenant informing them of what is being installed and when the installations will take place. Tenants also receive educational brochures after the installation is complete. The brochure includes a customer satisfaction survey to return to Duke Energy to provide valuable program feedback. An online version is also available.

At the conclusion of the installation, window clings are placed in strategic areas throughout the property. Placement of the window clings at a minimum will be at the common areas entry and each residential building on site (to the extent applicable). Using the window clings ensures that the program and Duke Energy are recognized long after the installation has taken place.

F. Evaluation, Measurement and Verification

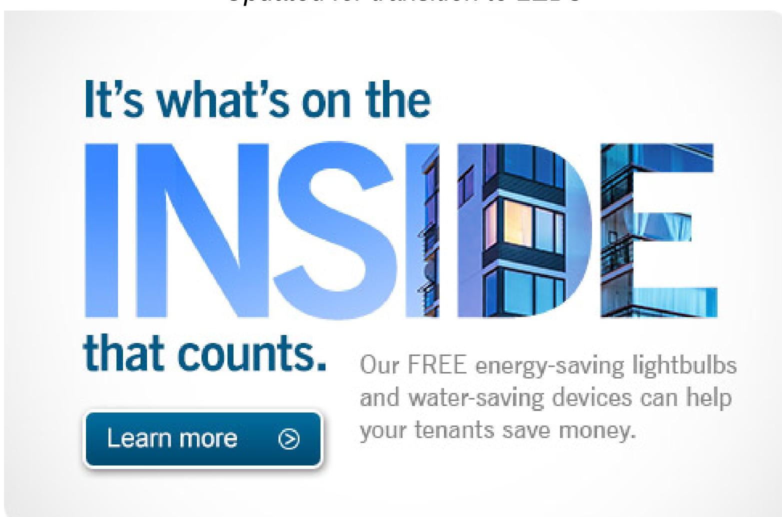
No evaluation activity in 2018 is planned at this time.

The key research objectives are to conduct impact and process evaluations, as well as a net-to-gross analysis. The evaluation will include interviews with program staff and customer surveys. An engineering-based analysis, augmented with on-site will be used to estimate the impacts of the program. Subject to change by the independent third-party evaluator, the analysis is expected to be supplemented by on-site field verification of program measures, and will be consistent with the International Performance Measurement and Verification Protocol (IPMVP) Option A.

Appendix

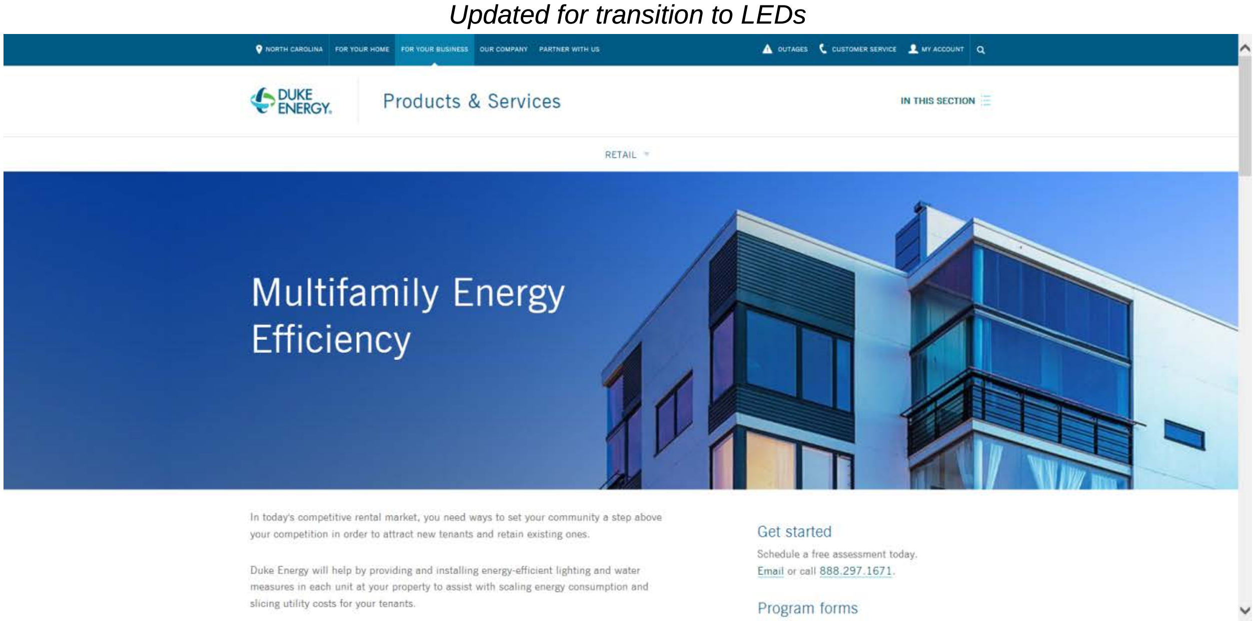
State Landing Page Promotion (Hero Banner)-

Updated for transition to LEDs



Program Web Page

Updated for transition to LEDs



Program Brochure-

Updated for transition to LEDs

Window Cling-

New for 2016

This property participated in Duke Energy's Multifamily Energy Efficiency program and now has energy-efficient products that benefit you.

DUKE ENERGY.

Tenat Leave Behind-

Updated for transition to LEDs

Multifamily Energy Efficiency Program

DUKE ENERGY.

Based on an assessment of your unit, these products were selected to offset your monthly energy usage:

Electric

Straight Line, Globe and Candelabra LED Lightbulbs

LEDs last longer and use up to 90 percent less energy than incandescent bulbs.

Water

(Water-saving products are only installed in properties that use electricity to heat water.)

Faucet aerators*

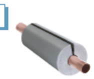
Faucet aerators installed in the kitchen and bathroom use up to 55 percent less water than standard faucet aerators.

Black handle allows for adjustable flow

Showerhead*

An energy-efficient 1.5-gpm showerhead will use less water than a regular showerhead, which means you can also use less energy to heat the water.

Adjustable flow



Pipe wrap*

Hot water pipe wrap reduces water and energy use by preventing heat loss while hot water travels through the pipes.

*Provided only to properties that use electricity to heat water.

For more information, contact the Multifamily Energy Efficiency Program at 888.297.1671 or dukeenergymultifamilyeep@franklinenergy.com. Or, visit duke-energy.com/multifamily.

Note that this program is administered by Franklin Energy, a contractor of Duke Energy with experience in the installation of home energy-saving products.

Customer Survey

Thank you for participating in this program. We'd like to know how we did installing your new energy-saving products. Please complete the below survey and mail it to us. The survey is also available online at duke-energy.com/multifamilysurvey.

Property name:

Address: Unit No.: City: State: ZIP:

Email:

I was notified in advance of this work. ❑ Yes ❑ No

I was at home while the technicians installed the products. ❑ Yes ❑ No

The technicians' ID badges were visible. ❑ Yes ❑ No ❑ N/A

I am interested in receiving additional information on energy efficiency. ❑ Yes ❑ No

What effect has your participation in the Multifamily Energy Efficiency Program had on your overall satisfaction with Duke Energy? ❑ Positive effect ❑ Negative effect ❑ No effect ❑ Don't know

Using a scale of 1 to 10, please rate your level of agreement with the following statements (circle your response):

	not at all satisfied									completely satisfied
Overall, I was satisfied with the Duke Energy Multifamily Energy Efficiency Program.	1	2	3	4	5	6	7	8	9	10
The technicians respected my property and left it in good condition.	1	2	3	4	5	6	7	8	9	10
The technicians treated me with courtesy.	1	2	3	4	5	6	7	8	9	10
The technicians were knowledgeable about the products and answered my questions.	1	2	3	4	5	6	7	8	9	10
The leave-behind materials are informative.	1	2	3	4	5	6	7	8	9	10

Comments:

DE_LeaveBehindLW_091316

Home Energy Improvement Program

A. Description

The purpose of this Program is to offer customers a variety of energy conservation measures that increase energy efficiency in existing residential dwellings. The Program utilizes a network of participating contractors to do the following: (1) to encourage the installation of high efficiency central air conditioning (AC) and heat pump systems with optional add on measures such as Quality Installation and Smart Thermostats, (2) to encourage attic insulation and sealing, (3) to encourage the installation of heat pump water heaters, and (4) to encourage high efficiency variable speed pool pumps.

Incentives are only applicable to measures installed by a contractor approved by Company, with the exception of high efficiency room air conditioners which may be self-installed.

Duke Energy contracts with a third party vendor for application processing, incentive payment disbursement, and customer/contractor support.

Audience

The Program is available to customers whose premise is at least one year old, who are served on a residential rate, and who meet the service delivery qualifications.

B & C. Impacts, Participants and Expenses

2017 Year-End Results	Annual Forecast	Actual	Variations
Savings (MWH)	2,371	7,001	4,630
Savings (MW)	0.94	1.88	0.94
Participants		26,222	
2017 Program Expenses		$7,007,594	

D. Qualitative Analysis

Highlights

The Program's tiered incentive structure continues to receive a positive reaction from customers as well as Trade Allies. Reporting continues to show that the increased incentive amounts for higher SEER equipment has encouraged customers to have higher efficiency equipment installed properly and managed well.

The Referral Channel, which provides free, trusted referrals to customers who are trying to find reliable qualified contractors, has sussessfully generated roughly 10,000 customer referrals through the first half of 2017. Customers whose referral generates a sale for the Trade Ally were asked to rate their experience with the Referral Channel. The Referral Channel achieved a 4.68 out of 5 rating during 2017 and expects to improve that score in 2018.

Variable speed pool pumps have also been successful offering, and the Company has been successful in recruiting contractors to support the new measure and is looking to expand coverage throughout the jurisdiction.

Issues

The participation of the Trade Ally network is vital to the success of the Program. The Program aims to transform the market by shifting the market away from some of the more commonly utilized practices which rely heavily on decentralized training and varying knowledge levels; imprecise, manual field calculations; Instead, the Program encourages Trade Allies to train and certify technicians to use quality diagnostic instruments and processes. The Company has not seen significant acceptance with the diagnostic-based measures because of the need for expensive equipment, the need to obtain additional industry certifications and to alter current business practices.

E. Marketing Strategy

Promotion of the Program is primarily targeted to HVAC and home performance contractors. Trade Allies are integral to the Program's success because they interface with the customer during the decision-making event.

Program information and Trade Ally enrollment links are available on the Program's website to educate customers about the Program and encourage participation. By increasing the overall awareness of the Program and the participation of Trade Allies, more customers will consider the benefits of the Program at time of purchase.

The Company implemented several customer marketing campaigns during 2017 to leverage channels such as bill inserts and email messaging. Other channels, such as a paid search and special offer direct mail campaigns with eligible Trade Allies, have also created awareness and reduced the customers' incrcemental costs associated with the purchase of an efficient product/service.

F. Evaluation, Measurement and Verification

Due to broader changes in the Program in 2016, and subsequent measure removals in 2017, there are no planned EM&V activities associated with the Program in 2018.

My Home Energy Report

A. Description

My Home Energy Report (MyHER) helps customers put their energy use in perspective with simple and easily understood graphics that compare customers' energy use with homes of similar size, age and heating source. The reports motivate customers to change their behaviors and reduce their consumption by presenting them with timely tips and program offers.

My Home Energy Report Interactive links customers to a portal where they can complete a home profile, set savings goals and track their progress, get answers to their personal energy questions from an energy expert, and share their energy saving tips with other customers. Customers can also see how much electricity they might use in the coming months based on their usage history.

Audience

Program participants are identified through demographic information and must reside in an individually-metered, single-family residence served on a residential rate schedule and must have at least 13 months of electric usage with the Company. These customres receive up to 8 paper reports per year. Electronic versions of the report are distributed 12 times a year for customers who have enrolled in My Home Energy Report Interactive and who have a registered email address with the Company.

Customers who live in an individually-metered, multi-family dwelling served on a residential rate schedule and who have at least 13 months of electric usage with the Company may also participate. Multi-family customers who have registered their email address with the Company receive 4 printed reports and 12 electronic reports throughout the year. Multi-family customers without a registered email address with the Company receive 6 printed reports throughout the year with a strong call to action to provide their email address to receive more energy efficiency tips and information through additional reports delivered.

B & C. Impacts, Participants and Expenses

2017 Year-End Results	Annual Forecast	Actual	Variations
Savings (MWH)	127,419	112,133	-15,286
Savings (MW)	34.62	18.99	-15.63
Participants		795,734	
2017 Program Expenses		$6,758,129	

D. Qualitative Analysis

As of December 31, 2017, over 708,000 DEP single-family customers and 88,000 multifamily customers were receiving the MyHER, and nearly 13,000 DEP single-family customers and 500 multifamily customers were enrolled in the MyHER Interactive portal.

E. Marketing Strategy

Since the MyHER paper report is an opt-out program, customers who meet the eligibility requirements automatically receive the report. Less than .001% of customers chose to opt out. The MyHER Interactive portal is an opt-in portal. Marketing for the portal includes email campaigns and messages in the paper report and on its envelope.

The paper and electronic versions of MyHER were refreshed in September 2017. The report now provides customers a view of their forecasted disaggregated usage so they will know where to focus their savings efforts. The report is also more crisp and streamlined with visuals added for all actions and tips.

F. Evaluation, Measurement and Verification

The next Evaluation, Measurement and Verification report is scheduled for 2019.

A. Description

The Home Energy House Call Program ("Program") is offered under the Energy Assessment Program where Duke Energy Progress, LLC (the "Company") partners with several key vendors to administer the Program.

The Program provides a free in-home assessment performed by an energy specialist certified by the Building Performance Institute ("BPI"). The BPI-certified energy specialist completes a 60- to 90-minute walk through of a customer's home and analyzes energy usage to identify energy savings opportunities. The energy specialist discusses behavioral and equipment modifications that use less energy. The customer also receives a customized report identifying actions the customer can take to increase their home's efficiency. The followring are examples of recommendations that might be included in the report:

- Turn off vampire load equipment when not in use.
- Use energy efficient lighting.
- Use a programmable thermostat to manage heating and cooling usage.
- Replace old equipment.
- Add insulation and seal the home.

In addition to a customized report, customers receive an energy efficiency starter kit with a variety of measures that can be directly installed by the energy specialist. The kit includes measures such as energy efficient lighting, a shower head, faucet aerators, outlet/switch gaskets, weather stripping and a booklet of energy saving tips.

Audience

Residential customers that own a single-family residence with central air, electric heat or an electric water heater and that have at least four months of billing history are eligible to participate in the Program.

B & C. Impacts, Participants and Expenses

2017 Year-End Results	Annual Forecast	Actual	Variations
Savings (MWH)	2,980	5,183	2,203
Savings (MW)	0.50	0.87	0.37
Participants		38,090	
2017 Program Expenses		$1,865,144	

D. Qualitative Analysis

Highlights

The program conducted 6,687 assessments and installed 31,403 additional LEDs in 2017. The program continues to focus on maximizing measures installed as well as cross promoting other Duke Energy programs and offerings.

Issues

The program continues to coordinate closely with the vendor to monitor incoming demand, to balance marketing and to ensure adequate appointment slots are available.

Potential Changes

The Program is continuing to optimize the online scheduling tool to enhance the customer experience and to evaluate the kit offerings to maximize savings and impacts as well as the customers' acceptance. Additionally, cost-effective approaches to including thermal imaging as part of the assessment, custom measures installations, kit upgrades, multifamily options, and post-assessment follow ups with recommendations and referrals are also being considered. Future modifications may also include changing the requirement that eligible customers have four months of billing history and offering a tiered audit option.

Currently, Program implementers are evaluating the need for a plan to obtain customer feedback proactively and identify improvement or EM&V opportunities.

E. Marketing Strategy

The Program continued to use a multichannel mareting approach including targeted mailings to pre-qualified residential customers, bill inserts, online promotions and online video. Examples of online messages, bill inserts and direct mail promotions are available in the appendix. For those who elect to receive offers electronically, email marketing is used to supplement direct mail. In between larger initiatives, such as bill inserts, the program utilizes direct mail which can easily be modified based on demand. Core messaging is simple and focuses on key benefits (a free energy assessment from Duke Energy can help save energy and money while also increasing comfort) and three easy steps (you call, we come over, you save).

Home Energy House Call program information and an online assessment request form are available at www.duke-energy.com.

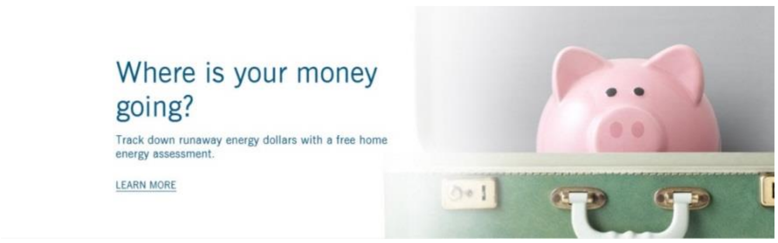
F. Evaluation, Measurement and Verification

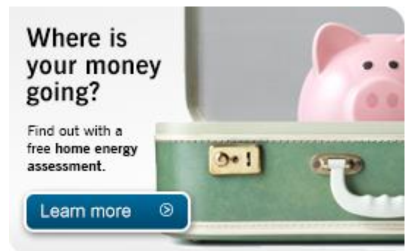
Due to the fact that the Program launched in 2016, no EM&V activity is planned in 2017. The first evaluation report for the program is tentatively scheduled for the second half of 2018.

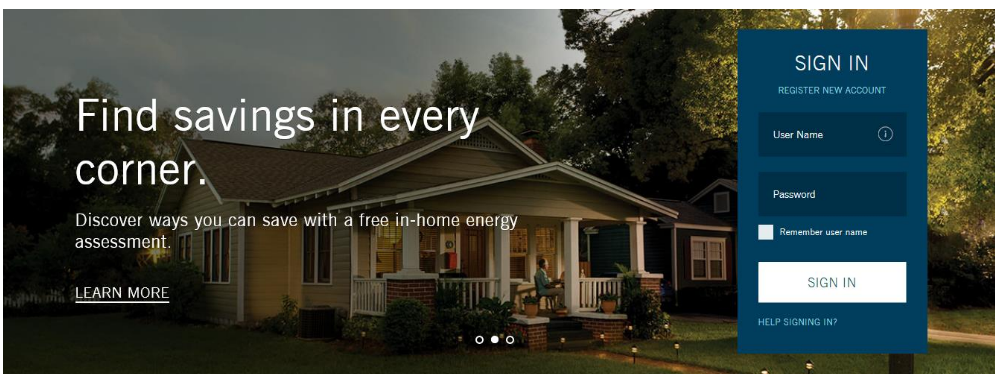
G. **Appendix**

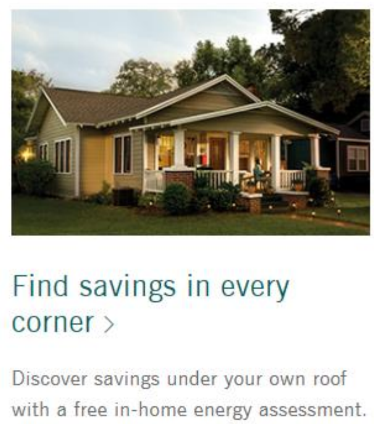
2017 :

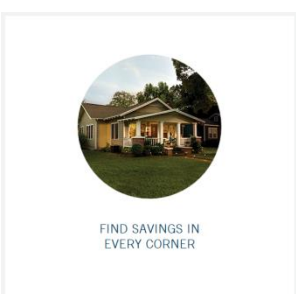
Online Banners:

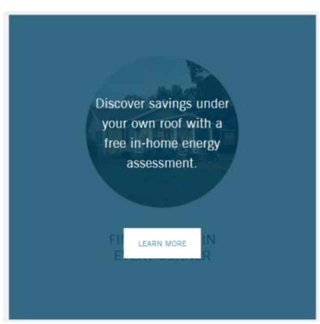


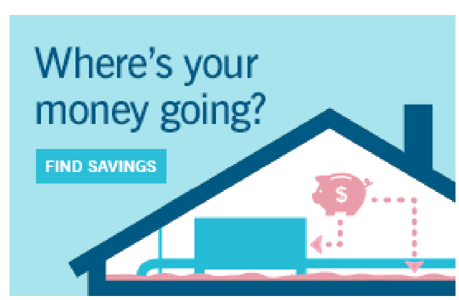












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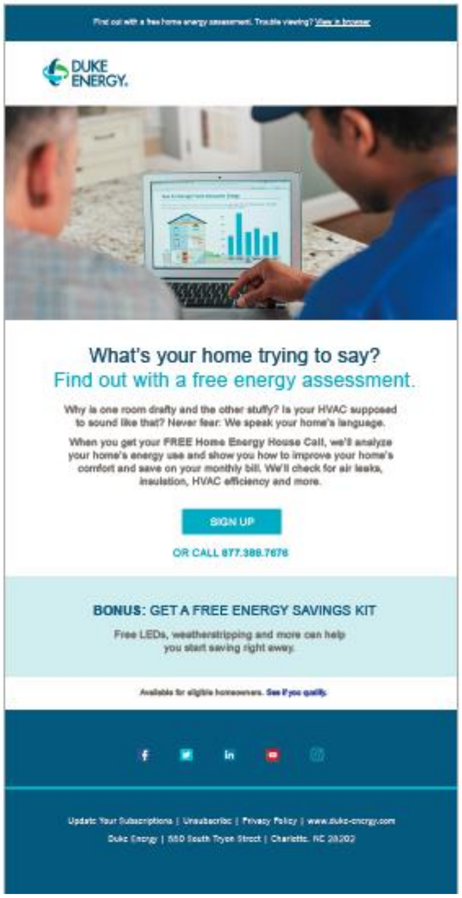
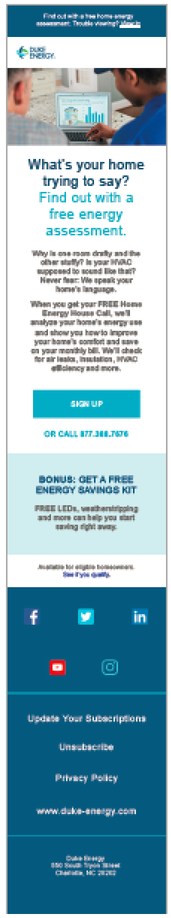
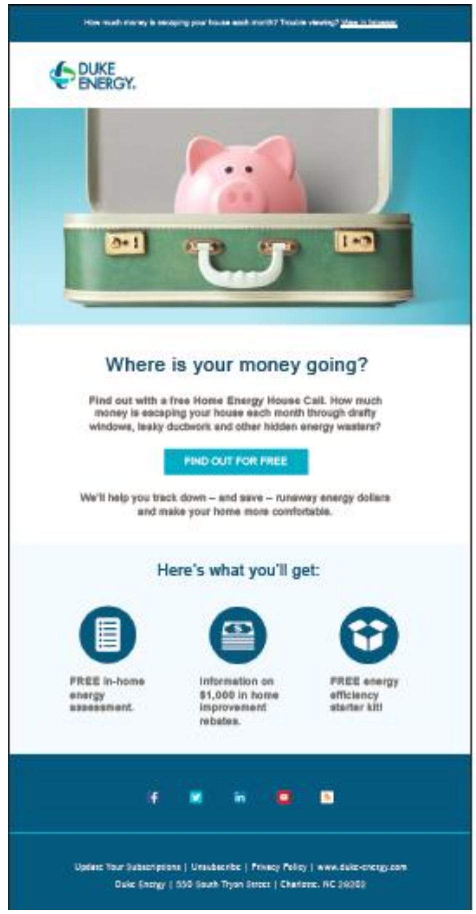
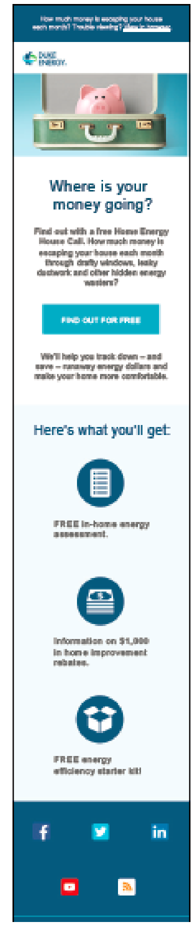
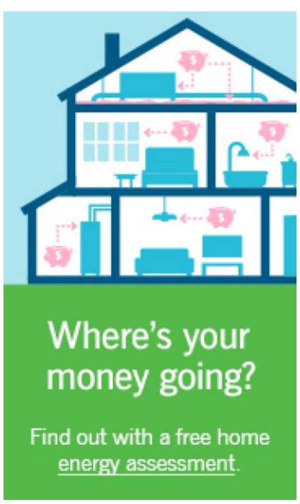
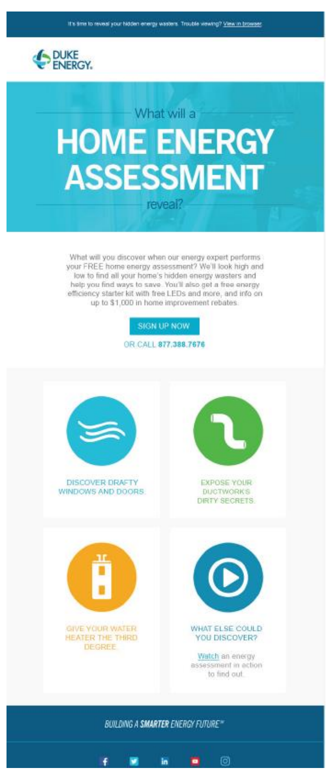

DUKE ENERGY.
What's your home trying to say?
Find out with a free energy assessment.
SIGN UP
OR CALL 877.388.7676
BONUS: GET A FREE ENERGY SAVINGS KIT
Free LEDs, weatherstripping and more can help you start saving right away.


What's your home trying to say?
Find out with a free energy assessment.
SIGN UP
BONUS: GET A FREE ENERGY SAVINGS KIT
Update Your Subscriptions
Unsubscribe
Privacy Policy
www.duke-energy.com


DUKE ENERGY.
Where is your money going?
FIND OUT FOR FREE
Here's what you'll get:

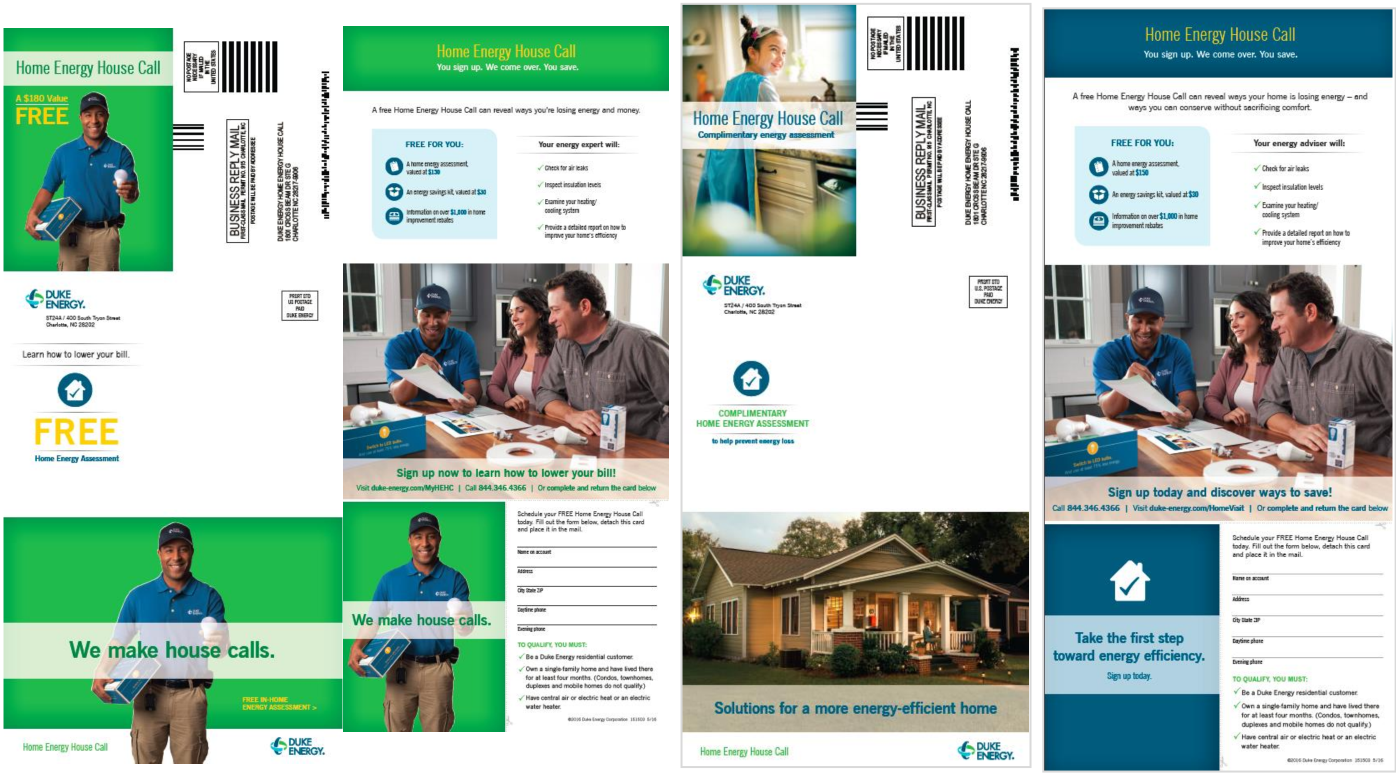

Where is your money going?
FIND OUT FOR FREE
Here's what you'll get:

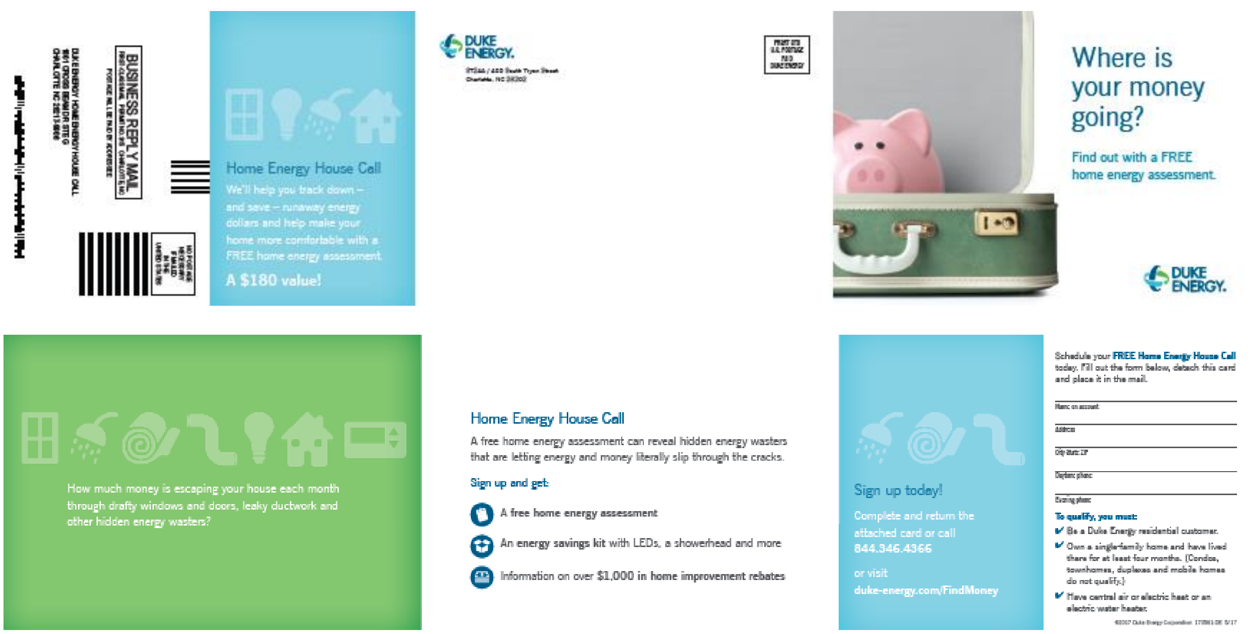

Where's your money going?
Find out with a free home energy assessment.

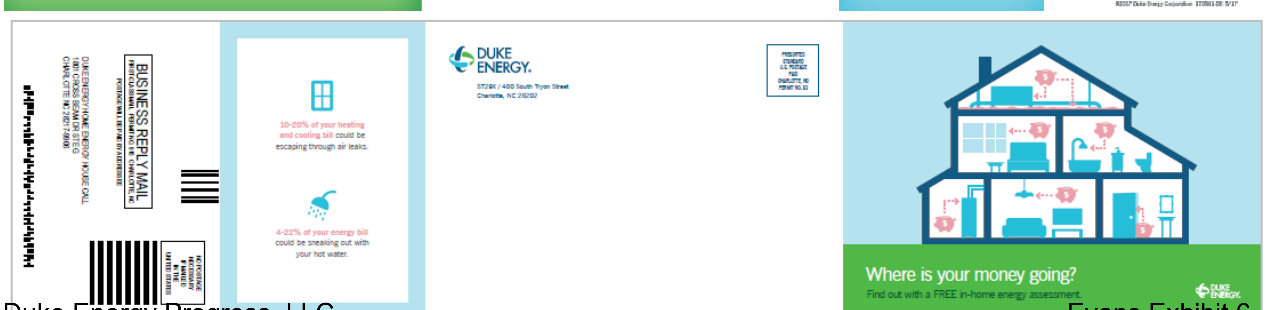

DUKE ENERGY.
What will a
HOME ENERGY ASSESSMENT
reveal?
SIGN UP NOW
BUILDING A SMARTER ENERGY FUTURE

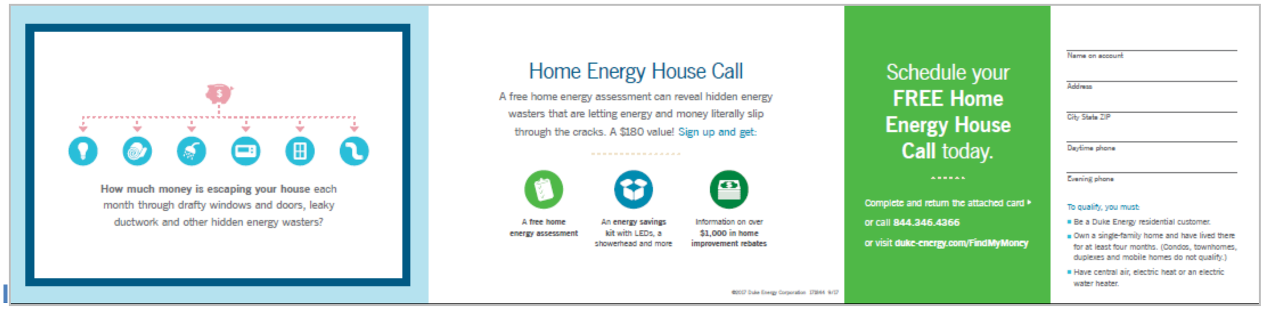
Residential Energy Assessments

Direct Mail:








How much money is escaping your house each month through drafty windows and doors, leaky ductwork and other hidden energy wasters?
Home Energy House Call
A free home energy assessment can reveal hidden energy wasters that are letting energy and money literally slip through the cracks. A $180 value! Sign up and get:
A free home energy assessment
An energy savings kit with LEDs, a showerhead and more
Information on over $1,000 in home improvement rebates
Schedule your FREE Home Energy House Call today.
Complete and return the attached card
or call 844.346.4366
or visit duke-energy.com/FindMyMoney
Name on account
Address
City State ZIP
Daytime phone
Evening phone
To qualify, you must:
Be a Duke Energy residential customer.
Own a single-family home and have lived there for at least four months. (Condos, townhomes, duplexes and mobile homes do not qualify.)
Have central air, electric heat or an electric water heater.

Bill I


Find savings in every corner.
Discover ways you can save with a FREE in-home energy assessment.


Home Energy House Call
Free in-home energy assessment and energy savings kit for eligible homeowners – $180 value!
Your FREE expert will:
Check for air leaks
Inspect insulation levels
Examine your heating/cooling system
Sign up today! Call 855.739.9114 or visit duke-energy.com/FreeAudit to see if you qualify.
DUKE ENERGY.
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Where is your money going?
How much money is escaping your house each month through drafty windows, leaky ductwork and other hidden energy wasters?
Find out for FREE.
DUKE ENERGY.


Home Energy House Call
We'll help you track down – and save – runaway energy dollars and help make your home more comfortable. You'll get:
✔ A free home energy assessment
✔ A free energy savings kit
✔ Info on up to $1,000 in home improvement rebates
Sign up today! Call 855.739.9114 or visit duke-energy.com//RunawayMoney to see if you qualify.
DUKE ENERGY.
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Where is your money going?
Find out with a FREE in-home energy assessment.


Learn how to prevent energy dollars from escaping your home with a free energy assessment.
A free home energy assessment* can reveal hidden energy wasters that are letting energy and money literally slip through the cracks. A $180 value! Sign up and get:
Free in-home energy assessment
Free energy savings kit
Info on up to $1,000 in home improvement rebates
*Available for eligible homeowners.
Schedule today at duke-energy.com/MyMoney or call 855.739.9114.
DUKE ENERGY.
©2017 Duke Energy Corporation 171845 HEHC DEC 9/17
30827-I-0149

Pandora


We make house calls
Get a FREE in-home energy assessment.
Learn more
DUKE ENERGY.


Home Energy House Call
844.DING.DONG
Learn more
DUKE ENERGY.

A. Description

The purpose of this Program is to incent new construction that falls within the 2012 North Carolina Residential Building Code to meet or exceed the 2012 North Carolina Energy Conservation Code High Efficiency Residential Option ("HERO"). If a builder or developer constructing to the HERO standard elects to participate, the Program offers the homebuyer an incentive guaranteeing the heating and cooling consumption of the dwelling's total annual energy costs. Additionally, the Program incents the installation of high-efficiency heating ventilating and air conditioning ("HVAC") and heat pump water heating ("HPWH") equipment in new residential construction.

Audience

The Program is available to builders and developers installing high-efficiency HVAC and HPWH equipment in new single family, manufactured, and multi-family residential housing units that are served under any of the Company's residential rate schedules.

The program is also available to builders and developers of new single family and multi-family residential dwellings (projects of three stories and less) that comply with all requirements of the 2012 HERO standard and are served under any of the Company's residential schedules. Manufactured housing, multi- family residential housing projects over three stories in height, and any other dwellings which do not fall within the 2012 North Carolina Residential Building Code, are not eligible for any whole-house incentives.

The Program also supports the initial homeowner for any home constructed to meet or exceed the HERO standard when the builder or developer elects to extend a heating and cooling energy usage guarantee to the homeowner. At the sole option of the builder or developer, homeowners may be offered a Heating and Cooling Energy Usage Limited Guarantee for homes with a HERS Index Score verified by a certified HERS rater calculating the heating and cooling energy usage that the home should use during an average weather year.

B & C. Impacts, Participants and Expenses

2017 Year-End Results	Annual Forecast	Actual	Variations
Savings (MWH)	9,586	14,181	4,595
Savings (MW)	4.15	6.11	1.96
Measures		5,142	
2017 Program Expenses		$11,678,412	

D. Qualitative Analysis

Highlights

The Program's move to a whole-house incentive structure that pays incentives to builders for HERO-compliant homes based solely on annual kWh savings continues to drive builders toward increasing savings. The Program requested approval from RESNET to offer 34 courses online for rater CEU's. The Program provided on-site instruction to over 250 builders and trade allies. In the future, the Program plans to implement a scorecard to rate the participating raters on various metrics.

Currently there are 431 builders and 24 approved raters participating. The top 10 builders in the Program contribute 40% of the savings. ICF is responsible for the operational oversight of Home Energy Raters and builders or developers participating in the Program.

	Whole-House Eligibility Requirement	Incentive
HERO	Meet 2012 NCECC HERO standards	$750
HERO plus HERS Score	Meet HERO standards and submit confirmed annual kWh savings from the Energy Summary Report.	$0.90/kWh
	Equipment Incentive Description	**Incentive**
Tier 1	AC or heat pump with SEER (Seasonal Energy Efficiency Ratio) of 14 or greater but less than 15. The HVAC system must meet the Quality Installation Standard of 90%. High Efficiency Heat Pumps: The unit(s) shall be a minimum SEER of 14 with ECM. High Efficiency Central AC: The unit(s) shall be a minimum SEER of 14 with ECM.	$250 per unit
	Quality Installation Standard (Optional for Tier 2).	$75 per unit
Tier 2	AC or heat pump with SEER of 15 or greater.	$300 per unit
Heat Pump Water Heater	ENERGY STAR® qualified HPWH(s) with minimum Energy Factor of 2.0.	$350 per unit

Issues

Air sealing in townhomes and multifamily projects continues to be a sticking point for many builders. While the North Carolina building code has specific requirements for fire-rated assemblies, there are different approaches being used to meet these requirements, and the acceptance and interpretations of these assemblies differs among code officials by jurisdiction. To assist builders, Program staff will work with various resources to identify code compliant separation wall assemblies and accepted air sealing methods. This information will provide builders and raters recommendations that will not only meet the code but also increase compliance with program standards.

Currently REM/Rate, a type of energy modeling software, is being used by most pariticipating raters. Program will be evaluating Ekotrope, a home energy rating and analysis software, that is currently developing HERO and NC baseline reference homes to use in a REM savings comparison analysis. Reference homes should be delivered in 2018 with Program analysis afterwards.

Potential Changes

The Program is considering modifying the incentives and eliminating non-cost-effective measures and measures that are no longer applicable. Those changes may include the following:

- Eliminate the existing tier structure for HVAC incentives;
- Remove incentives for HVAC equipment with a SEER of less than 15;
- Remove Quality Installation and Heat Pump Water Heater measures, as they are typically included when building to HERO standards and rarely implemented on a stand-alone basis.

E. Marketing Strategy

The Company drove awareness in 2017 through various marketing channels that include but are not limited to the following:

- Duke Energy Progress website
- Community outreach events/HBA Parade of Homes
- Social media promotions

These marketing efforts are designed to create customer awareness of builders participating in the Program and to educate customers on the quality, comfort and energy savings these homes offer. Please see the Appendix for examples.

F. Evaluation, Measurement and Verification

Process and impact evaluation activities began in second quarter of 2017. A final report will be completed in 2018.

The goal of the evaluation is to verify energy savings, demand savings, and savings from market effects attributable to the RNC program. The process evalution will focus on the new program processes and associated customer satisfaction as well as assessing their effectiveness and their impact on the broader RNC market.

The impact evaluation will consist of an analysis of participants' bills calibrated to building models. Net program savings will be determined through interviews with participant builders, non-participant builers and HERS raters.

G. Appendix

A. **Description**

The purpose of Duke Energy Progress's (DEP) Neighborhood Energy Saver program (the "Program") is to reduce energy usage through the direct installation of energy efficiency measures within the households of income-qualifying residential customers. The Program utilizes Honeywell Building Solutions, which was awarded the contract through a competitive bid process, to (1) to identify appropriate energy conservation measures through an on-site energy assessment of the residence, (2) to install a comprehensive package of energy conservation measures at no cost to the customer, and (3) to provide one-on-one energy education. Program measures address end-uses in lighting, refrigeration, air infiltration and HVAC applications.

Program participants receive a free energy assessment of their homes followed by a recommendation of energy efficiency measures to be installed at no cost to the resident. A team of energy technicians install applicable measures and provide one-on-one energy education about each measure, emphasizing the benefit of each and recommending behavior changes to reduce and control energy usage. The goal is to serve a minimum of 4,500 households each year.

Audience

The Program is designed for individually-metered residential homeowners and tenants within DEP. Implementation of the program is done in neighborhoods designated by DEP. Income-eligible neighborhoods must have at least 50% of households with income equal to or less than 200% of the poverty level set by the U.S. Department of Energy. Participants are only able to participate in the Program once.

B & C. Impacts, Participants and Expenses

2017 Year-End Results	Annual Forecast	Actual	Variations
Savings (MWH)	1,651	2,093	443
Savings (MW)	0.29	0.32	0.03
Participants		4,873	
2017 Program Expenses		$1,782,459	

D. Qualitative Analysis

Highlights

In 2017, the Program offered free walk-through energy assessments to 5 qualifying neighborhoods–Rockingham, NC; Sumter, SC; Clinton, NC; Goldboro, NC; and Raleigh, NC—serving 4,873 customers. Neighborhood events included support from community groups and speakers such as elected officials, community leaders and community action agency representatives.

Starting April 2017, the program transitioned from CFLs to LEDs.

The program has been very successful and widely accepted by the eligible Duke Energy Progress customers. Nearly 70 percent of the eligible customers in the neighborhoods where the program has been offered have participated.

Issues

The program continues to operate with minimal issues. The implementers are constantly striving to install the best quality measures and to use techniques that will motivate better customer behavior responses and participation.

Potential Changes

The program received approval to replace installing CFL's with LEDs in early 2017. This change was implemented in the field with the transition to the Clinton, NC neighborhood. The addition of measures, such as insulation, duct sealing, and HVAC tune up are being reviewed for inclusion.

E. Marketing Strategy

Current methods of marketing the program have been very successful in driving participation. The Company will continue the following marketing strategies in 2018:

- Direct mail (letters and postcards to qualifying customers)
- Secure local support from community leaders and organizations
- Community outreach events
- Publicized kickoff events
- Door-to-door canvassing

These marketing efforts are designed to create customer awareness of the Program, educate customers on energy saving opportunities and emphasize the convenience of Program participation.

F. Evaluation, Measurement and Verification

The impact and process evaluations for Neighborhood Energy Saver Program Year 2015 were completed in January 2017. The process evaluation included interviews with program management and field verification surveys conducted with customer participants.

The impact evaluation consisted of a review of deemed savings, installation verification and persistence, engineering estimates of annual per-customer savings, and a billing analysis. For the billing analysis, program participants in 2016 were used as a control group for comparison to participants in 2015 (treatment group). Note that a billing analysis that uses an appropriate comparison group incorporates the effects of free ridership and spillover, thus resulting in the program net savings estimates. In addition, a billing analysis captures savings due to behavioral changes.

Verified evaluation results include net energy savings per participant of 430 kWh, and summer and winter demand impacts of .298 kW and .340 kW, respectively.

No evaluation activity is expected until late 2018 with a final evaluation report scheduled for 2019.

A. Description

The Non-Residential Smart $aver Program (”Program”) provides incentives to Duke Energy Progress, LLC’s (“ DEP” or the “Company”) commercial and industrial customers to install high efficiency equipment in applications involving new construction and retrofits and to replace failed equipment.

Commercial and industrial customers can have significant energy consumption but may lack knowledge and understanding of the benefits of high efficiency alternatives. The Program provides financial incentives to reduce the cost differential between standard and high efficiency equipment so that customers see a quicker return on their investments into high efficiency equipment and so that the money they save on utility bills can be reinvested in their businesses. Incentives are determined based on the Company’s modeling of cost effectiveness over the life of the measure. In addition, the Program encourages dealers and distributors (or market providers) to stock and provide these high efficiency alternatives to meet increased demand for the products.

The Program provides incentives through prescriptive measures, custom measures and assessment/ technical assistance.

Prescriptive Measures:
Customers receive incentive payments after they install certain high efficiency equipment from the list of pre-defined measures, including lighting; heating, ventilating and air conditioning equipment; and refrigeration measures and equipment. A list of eligible equipment and measures and specific incentive amounts are available at the Program website: https://www.duke- energy.com/business/products/smartsaver.

Custom Measures:
The Smart $aver Custom Program is designed for customers with electrical energy-saving projects involving more complicated or alternative technologies or measures not covered by the Non-Residential Smart $aver Prescriptive Program. The intent of the Program is to encourage the implementation of energy efficiency projects that would not otherwise be completed without the Company’s technical or financial assistance.

Unlike the Non-Residential Smart $aver Prescriptive Program, the custom program requires pre-approval prior to the project initiation. Proposed energy efficiency measures may be eligible for customer incentives if they clearly reduce electrical consumption and/or demand.

The two approaches for applying for incentives in this Program are Classic Custom and Custom-to-Go, depending on the method by which energy savings are calculated. The documents required as part of the application process vary slightly as well.

Currently the application forms listed below are located on the Company’s website under the Smart $aver® Incentives (Business and Large Business tabs).

- Custom Application, offered in word and pdf format.
- Energy savings calculation support:
  - Classic Custom excel spreadsheet approach (> 700,000 kWh or no applicable Custom-to-Go calculator)
    - Lighting worksheet (excel)
    - Variable Speed Drive (VFD) worksheet (excel)
    - Compressed Air worksheet (excel)
    - Energy Management System (EMS) worksheet (excel)
    - General worksheet (excel), to be used for projects not addressed by or not easily submitted using one of the other worksheets
  - Custom-to-Go Calculator approach (< 700,000 kWh and applicable Custom-to-Go calculator)
    - HVAC & Energy Management Systems
    - Lighting
    - Process VFDs
    - Compressed Air

Energy Assessments and Design Assistance:
Incentives are available to assist customers with energy studies such as energy audits, retro commissioning, and system-specific energy audits for existing buildings and with design assistance such as energy modeling for new construction. Customers may use a contracted Duke Energy vendor to perform the work or they may select their own vendor. Additionally, the Program assists customers who identify measures that may qualify for Smart $aver Incentives with their applications. Pre-approval is required.

The Company contracts with AESC to perform technical reviews of applications. All other Program implementation and analysis is performed by Duke Energy employees or direct contractors.

Audience

This Program is designed for all of the Company's non-residential customers billed on an eligible Duke Energy Progress rate schedule.

B & C. Impacts, Participants and Expenses

2017 Year-End Results	Forecasted	Actual	Variations
Savings (MWH)	60,601	75,804	15,203
Savings (MW)	9.60	10.15	.56
Participants		1,757,525	
2017 Program Expenses		$21,820,773	

D. Qualitative Analysis

Highlights

The Program has continued to align the company's commercial energy efficiency portfolio in the two operating companies in the Carolinas. The prescriptive, custom, and assessment/technical assistance programs continue to generate substantial savings and customer satisfaction by leveraging internal staff focused on providing solutions to participants. Prescriptive measures foster high-volume participation for common retrofit projects, while custom programs seek ways to provide in-depth technical expertise required to bring in larger and more unique projects.

Currently, 2,044 energy-efficiency equipment vendors, contractors, engineers, architects and energy services providers in the Carolinas who are registered as a trade ally ("TA") with the Smart $aver® Non-residential Programs (Prescriptive and Custom, DEC and DEP). The Smart $aver® outreach team builds and maintains relationships with TAs in and around Duke Energy's service territory. Existing relationships continue to be cultivated while recruiting new TAs remains a focus. Duke Energy's efforts to engage TAs include the following activities:

- TA Search tool located on the Smart $aver® website
- Inspections of a sample of all projects to ensure quality control
- TAco-marketing including information about the Smart $aver Program in the TA's marketing efforts
- Online application portal training and support
- Midstream channel support
- TA year-end awards
- TA newsletter and monthly emails
- Technology- and segment-specific marketing collateral
- TA discussion group (20 trade allies that give input on the Program)
- TA training
- Sponsorship of TA events
- Online collateral toolkit for access to marketing materials

The TA outreach team educates TAs on the Program rules and the Smart $aver Program expectations for TA conduct. The Company engages the TAs in promoting the Program as well as targeting TAs more effectively based on market opportunities.

An online application portal launched in 2016 and allows applicants to apply for incentives and track projects' progress throughout the submission process. The Company continues to consider ways to expand participation through new channels that offer instant incentives thus reducing the price of energy efficient products at the time of purchase and reducing or eliminating the need for a separate incentive application. In 2016, the Program launched an online energy savings store and a midstream marketing channel.

The Program has developed multiple approaches to reaching a broad and diverse audience of business customers through incentive payment applications, paper and online options, and instant incentives offered through the midstream marketing channel and the online energy savings store.
The growth during 2017 was strong than in 2016 due to several key factors.

- Customers showed high interest in energy efficiency and had significant funds to invest when combined with the rebates which offset a portion of the cost. The Program saw the following increases in 2017 incentive payments:
    - Foodservice - 54% increase
    - HVAC - 89% increase
    - Lighting - 57% increase
    - Pumps and motors and IT equipment had first participant ever in 2017
- More applicants are using the online application, an easier way to apply
- Midstream marketing channels attracted more distributors to the Program
- Outreach continued to support TAs working with the Program
- Targeted marketing reached out to customers and TAs
- A dedicated team of customer service representatives answered customer questions via phone and email
- Large account managers and business energy advisors developed personal relationships with large and medium businesses and were able to identify and support new EE projects

Customers have several options to participate in the Program. The following chart summarizes 2017 participating customers by Program channel:

Program Option	Participating Customers*	% 2017 Repeat Customer
Paper and Online Application Form	1,395	66%
Midstream Marketing Channel	625	64%
Online Energy Savings Store	86	34%

*May include multiple facilities/sites for one customer.

During 2017, 2,343 incentives, consisting of 6,209 measures, were paid for Duke Energy Progress prescriptive measures. New application activity during this period was 2% higher than in 2016. During 2017, 35% of applications were submitted via the new online application portal. The average payment paid per application was $5,049. Duke Energy utilizes an internal database that allows the Program to self-administer applications and track data.

Many TAs participating in the application process reduce the customer's invoice by the amount of the Smart $aver® Prescriptive incentive and then receive reimbursement from Duke Energy. Customers often prefer this approach rather than paying the full cost of equipment upfront and receiving an incentive check from Duke Energy later.

The Duke Energy Business Savings Store on the Duke Energy website uses EFI, a the third-party that fulfills orders directly for the customers. The site gives customers the opportunity to take advantage of a limited number of prescriptive measure incentives by purchasing products from the on-line store at a purchase price reduced by the amount of the incentive. The discounts in the store are consistent with current incentive levels.

The midstream marketing channel provides instant prescriptive incentives to eligible customers at a participating distributor's point of sale. Approved midstream distributors validate eligible customers and the lighting, HVAC, food service and IT products they selected to purchase through an online portal and use that information to show customers the reduced price of high efficiency equipment. Upon purchase, the distributor reduces the customer's invoice for the eligible equipment by the amount of the prescriptive incentive. Distributors then provide the sales information to Duke Energy electronically for reimbursement. The incentives offered through the midstream channel are consistent with current Program incentive levels.

Since 2016, DEP has partnered with Energy Solutions to provide an online portal for distributors to manage paperless validation and the online application, two features expected to drive growth significantly. In 2017, approximately 67% of the impact from prescriptive measure were from participation through the midstream marketing channel. Because the Program currently has 205 distributors enrolled in the midstream aspect of the Program and continues to add more well-known distributors to this channel, DEP expects this channel to increase participation in prescriptive measures.

Smart $aver Custom participants continue to identify energy efficiency offers eligible under this Program. An average of 9 new pre-approval applications per month were received in 2017.

Smart $aver Custom Incentives Program uses a flat rate incentive. A flat rate incentive is available for both energy and demand savings.

The Program launched a fast track option in 2017 which gives customers the ability to pay to speed up the processing time for their applications to seven business days. This fee is passed through to the vendor for its cost to expedite the application. In 2017, the Program received 11 Fast Track applications.

The Program also helped launch a complementary program in 2017, Smart $aver Performance Incentives, which allows customers to apply for projects which are not suitable for Smart $aver Custom. Smart $aver Performance Incentives is filed as a stand-alone program but will initially be implemented in conjunction with Smart $aver Custom to reduce confusion for customers and TAs.

Issues

Feedback from participating customers and TAs is positive overall and provides some insight into program participation. Less than 5% of surveyed customers report dissatisfaction with the Program. Reasons for being dissatisfied include unhappiness with the 90-day time limit to submit an application, communication issues, and changes in the qualified products list that the Program references for eligibility. Less than 10% of surveyed TAs report dissatisfaction with the Program, with the most frequent reasons offered being that applications are too complex or incentive payments too slow. In response, the Program continues to work to improve communications, streamline application forms and processing, and promote channels that have simpler application processes and faster incentive payments. Some TAs cited competition with the vendor implementing Small Business Energy Saver, which is not intended in either programs' designs. Duke Energy also continues to reach out to customers who have not yet participated in the Smart $aver® Program to gather feedback as well.

Recently, the combination of the Program's incentives and the low cost of LED equipment has been very attractive for customers, and many have taken advantage of the opportunity to invest in LED upgrades. While significant opportunity for high efficiency lighting upgrades still exists, the excitement around LEDs has taken customers' attention away from EE opportunities outside of lighting. The Program has continued to promote non-lighting EE and encourage customers to go beyond lighting for efficiency. The Company continues to work with outside consultants and internal resources to develop strategies for leveraging equipment supply/value chains and for increasing awareness of non-lighting measures going forward.

The Smart $aver Custom Program application process is considered burdensome by some customers due to the individual and technically intensive review all projects applying for a custom incentives requires. Each year, the Program works to reduce the length of the application process, and the current process takes less than 20 days for all states/jurisdictions as a result.

The technical review often requires customers (or their vendors) to quantify the projected energy savings from the proposed project, a lengthy process that may require engineering expertise. Where necessary, this requirement will continue, thus ensuring that incentives are being paid for cost-effective verifiable efficiency gains. However, the Custom-to-Go suite and the online application portal have relieved some of this burden.

The custom program is subject to large fluctuations in performance due to the fact that a significant number of large projects can drive the majority of annual impacts.

Custom program performance remains limited by customers who are opted out of the EE Rider. Those customers are not eligible to participate, and any projects they may have completed are considered lost opportunities. The custom program is actively working with internal resources (large account managers and business energy advisors) to evaluate whether opting in to the EE Rider for a potential project is the best option for customers currently opted out.

Finally, the custom program continues to see changes in available technologies as specific measures become eligible for Smart $aver Prescriptive.

Potential Changes

In January 2017, DEP rebranded the Energy Efficiency for Business program to DEP Non-Residential Smart $aver Program. This will benefit the customers of North Carolina and South Carolina by offering consistent incentives across both programs. The change included the addition of more prescriptive technology groups, such as pumps & motors, process equipment, and information technology equipment, and included the removal of the incentive payment tiers.

Standards continue to change and new, more efficient technologies continue to emerge in the market. Duke Energy periodically reviews major changes to baselines, standards, and the market for equipment that qualifies for existing measures and explores opportunities to add measures to the approved Program so that it can provide incentives for a broader suite of energy efficient products. This work is ongoing, and a limited number of new measures and measure updates are expected to be made under the flexibility guidelines. For changes in existing measures, such as removing a measure or reducing the incentive amount, a 90-day grace period is extended to applications that were in process prior to the change. Measure that were removed recently include high performance and low watt T8 lamps and fixtures, pulse start metal halides, CFL reflector flood lamps, CFL high wattage lamps and CFL specialty lamp measures. Incentives were reduced for some LED measures, based on updated equipment cost data.

Measures that passed cost-effectiveness tests and were determined to be feasible for offer through the current prescriptive program channels and processes were added, as allowed, under the flexibility guidelines. These new measures included packaged terminal heat pumps, notched v-belts, high efficiency fans for commercial use outside of agricultural sector, residential Energy Star equipment for use in commercial settings (ex: refrigerators, clothes washers and dryers), LED lamp replacements for HID lamps and T5 fluorescent tubes, bi-level stairwell fixtures with integrated sensors, bi-level exterior occupancy sensors and several others.

Duke Energy is looking for new and innovative ways to reach out to customer segments that have had a lower rate of prescriptive incentive applications and considering options for partnering with other Duke Energy EE programs to cover gaps in the market. Along with the measure updates listed above, the Program is also considering offering new low-cost measures at no out-of-pocket costs to customers. Commission notification will be provided prior to offering these future measures.

The Program launched an optional new process for customers to pre-verify equipment eligibility for prescriptive incentives, giving customers certainty that their selected equipment qualifies for a prescriptive incentive prior to purchase and overcoming another barrier that can delay investment in EE projects. To date, 70 applications for pre-qualification have been received for customer projects in the Carolinas.

E. Marketing Strategy

The Company continued marketing the Program in 2017 through various marketing channels such as the following:

- Direct mail (letters and postcards to qualifying customers)
- Duke Energy Progress website
- Community outreach events
- Small Business Group outreach events
- Paid advertising/mass media
- Social media promotions
- TA outreach
- Account managers
- Segmentation managers

A table listing the marketing campaigns during the first half of 2017, with some samples of marketing graphics, are included as an appendix. These marketing efforts are designed to create awareness of the Program, to educate customers on energy saving opportunities, and to emphasize the convenience of Program participation.

Non-residential customers learn about programs via targeted marketing material and communications. TAs, who sell equipment and services to all sizes of nonresidential customers, pass along information about incentives also. Company account managers target large businesses or assigned accounts directly while the Company's business energy advisors reach out to unassigned small to medium business customers. The business energy advisors follow up on customer leads to assist with questions and to steer customers who are not already working with a TA to the referral tool. In addition, the business energy advisors contact customers with annual electrical costs between $60,000 and $250,000 to promote the Smart $aver Program.

Large Business Account Managers and Local Government and Community Relations, who identify potential opportunities as well as distribute program collateral and informational material to customers and TAs, comprise the internal marketing team. In addition, the Economic and Business Development groups also provide a channel to customers who are new to the service territory.

The Program launched a new marketing channel in 2017 called New Construction Energy Efficiency Design Assistance (NCEEDA) to identify projects for customers currently underserved in the small and medium business market. This channel utilizes the vendor Weidt Group to help find those opportunities, complete savings calculations as well as submit applications for the customer. As of January 20, 2018, 73 projects have enrolled in the DEP - NCEEDA offering, representing 8.1 million square feet of new construction along with 34 Smart $aver Custom project applications representing 9.2 million kilowatt hours of energy savings.

F. Evaluation, Measurement and Verification

Process and impact evaluation work began late in 2016, and a combined DEC and DEP final report will be presented in 2018.

The process evaluation included interviews with program management, TAs, and customer participants. Customer and TA interviews included gauging customer satisfaction, free-ridership and spillover.

The impact evaluation consisted of estimating annual energy and demand impacts associated with program participation. The primary activity involved an engineering-based analysis to estimate the impacts of the various program measures. The analysis was supplemented by on-site field verification of sampled participants, as well as database and deemed savings reviews.

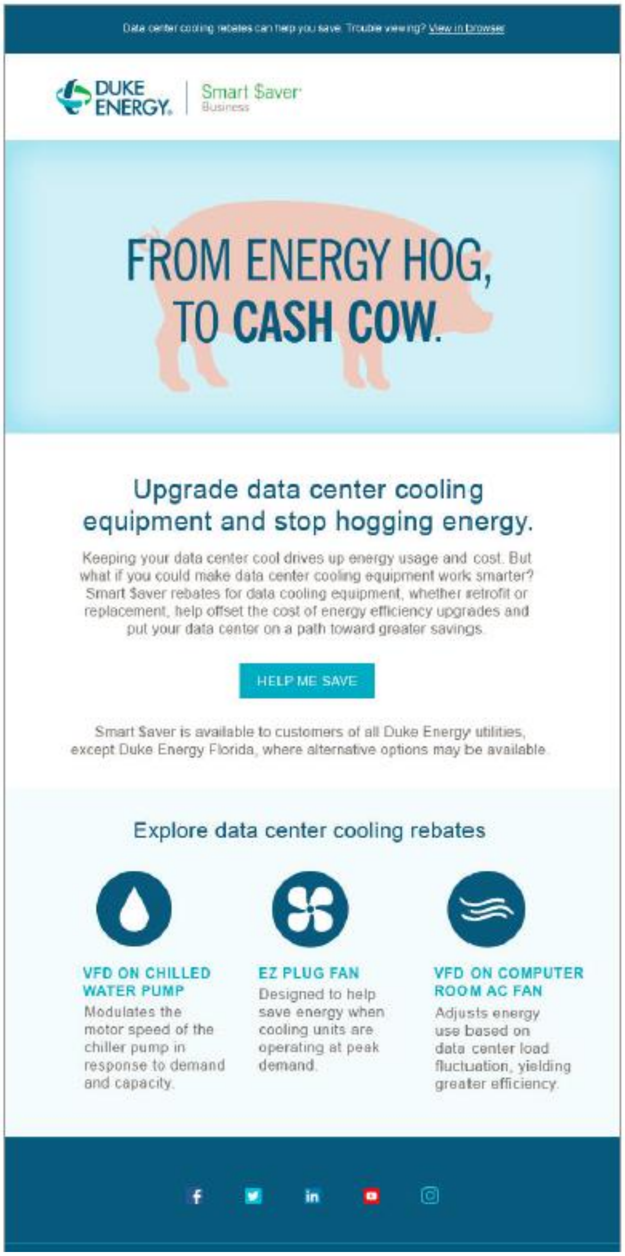
Appendix: Marketing schedule and examples

Month	Channel	Audience	Incentives Highlighted
July	Email, media campaign (digital display, social and preroll video)	Retail, Warehouse, Medical Restaurants, Commercial Real Estate*	ARC and VSD for Chillers
August	Email, media campaign (digital display, social and preroll video)	Data Centers, Commercial Real Estate*	Data Center Cooling
September	All marketing paused while teams responded for storm duty		
October	Email, Direct Mail, media campaign (digital, display, social and preroll video)	Restaurants, Healthcare, Education*	Demand Control Ventilation for Kitchen Exhaust
November	Email, media campaign (digital display, social and preroll video)	All customers*	Prequalification Channel
December	Email, media campaign (digital display, social and preroll video)	Manufacturing, Commercial Real Estate, Education, Water/Wastewater, Government, Retail, Healthcare*	Ductless Mini-splits

* Email also sent to the participating TAs.

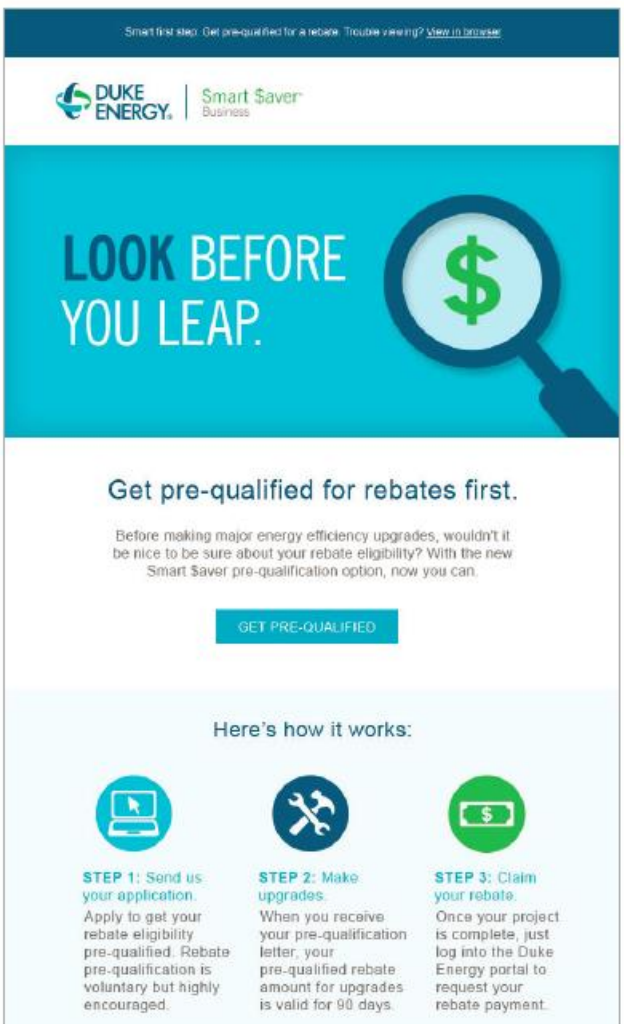
July ARC and VSD Campaign – Email

August Data Center Cooling Campaign – Email



October Demand Control Ventilation Campaign – Email and Direct Mail (DM below)

November Prequalification Campaign – Email



December Ductless Mini-split Campaign – Email

Media Campaign – Retargeting Ads

Media Campaign – Facebook Ad

A. Description

The Business Energy Report ("BER" or the "Program") is a periodic comparative usage report that compares a customer's energy use to a peer group's. Comparative groups are identified based on the customer's energy use, type of business, operating hours, square footage, geographic location, weather data and heating/cooling sources. Pilot participants received targeted energy efficiency tips in their report informing them of actionable ideas to reduce their energy consumption. The recommendations included information about other Company energy efficiency programs. Participants received at least six reports over the course of a year.

Audience

This Pilot was offered to approximately 12,500 customers served on an eligible Duke Energy Progress, LLC (the "Company") non-residential rate schedule, that are not opted out of the EE portion of the Rider, and that have at least 12 months of electric usage with the Company. Initial program participants were automatically enrolled in the Program and could request removal at any time.

B & C. Impacts, Participants and Expenses

2017 Year-End Results	Annual Forecast	Actual	Variations
Savings (MWH)	3,690	-	-3,690
Savings (MW)	0.60	-	-0.60
Participants		-	
2017 Program Expenses		$20,288	

D. Qualitative Analysis

As customers received subsequent reports and they learned more about their specific energy use compared to their peer group, their engagement increases. The report then provided customers with tools to reduce their usage in the form of targeted energy efficiency tips presenting actionable ideas. Customers were also encouraged to register for BER Interactive, an online portal that offered additional tips and information on their energy usage. Program participants were encouraged to contact the Company with questions and comments or to report corrections.

Highlights

The Company mailed letters to pilot participants on December 30, 2015, welcoming them to the program. Customers were provided a form and a business reply envelope to update information about the business such as business type, operating hours, square footage, own/lease, heating/cooling information, and a contact name. After providing customers an opportunity to respond, the first report was mailed to customers on February 17, 2016. A customer satisfaction online survey was conducted on October 2016. The survey was sent to 2,663 treatment group DEP customers and 2,911 control group DEP customers. There was a 4% response rate from both the treatment and control group, with a total of 117 completed surveys received from the treatment group and 112 received from the control group. Key findings indicated that 35% of DEP BER participants recalled receiving the reports. Overall, 76% of BER participants were satisfied with the reports. Customers liked the reports because they found them informative and they helped them manage their usage. Since February 2016, 10 reports were mailed to each participating customer.

In the course of the Company's efforts to effectively manage the Pilot, concerns arose regarding the long- term outlook of the Pilot and its ability to be deployed across the service territories. First, the preliminary internal energy savings analysis performed by the Company lead it to question the Pilot's ability to achieve the energy savings projections associated with the program, casting significant doubt as to the Pilot's ongoing cost effectiveness. Second, the BER program team became aware of future viability issues related to the vendor currently administering the Pilot. In light of these issues and in order to minimize the costs borne by our customers, the Company terminated the Pilot effective August 31, 2017.

E. Marketing Strategy

The Company communicated information about the Pilot via the customized proactive reports distributed through direct mail.

F. Evaluation, Measurement and Verification

Due to the termination of the pilot, no further EM&V activities are planned.

CIG Demand Response Automation

A. Description

Demand Response Automation ("Program") allows Duke Energy Progress, LLC ("Company") to install data acquisition and optional load control devices to remotely monitor and control the following electrical equipment:

- HVAC
- Lighting
- Standby generation
- Variable speed motors
- Non-critical, interruptible operations

Program participants agree to reduce their total metered demand by the seasonal contracted kilowatt (kW) amount during the time specified in the event notification. Participants may reduce their demand using any method, including the use of other power sources. In return, these businesses receive valuable incentives as follows:

1. A one-time participation incentive of $50/kW for demonstrated demand reduction during initial summer event(s) on the program,
2. Monthly credits of $3.25/kW for the contracted amount of curtailable demand, and
3. Performance credits of $6/kW for demand reduced during each curtailment event.

Audience

The Program is available to commercial, industrial and governmental customers with a service base that is capable of contracting for a minimum of 75 kW in curtailable demand. Some exclusions apply based on rate schedules and participation in other riders.

B & C. Impacts, Participants and Expenses

2017 Year- End Results	Forecasted	Actual	Variations
Savings (MWH)	-NA-	-NA-	-NA-
Savings (MW)	25.00	19.95	-5.05
Participants		71	
2017 Program Expenses		$1,509,454	

D. Qualitative Analysis

Highlights

Final EPA regulations continue to prevent many customers with older standby generators from participating in the program, however, no more negative impacts are anticipated for existing participants. The program should also continue to benefit from changes made to the DSM/EE Opt-In provisions at the beginning of 2016. Fourteen new participants joined the Program in 2017.

Potential Changes

No further changes to the program are anticipated.

E. Marketing Strategy

The Company continues to market the Program directly through Large Account Management and has expanded efforts to reach eligible unassigned customers through various channels that include but are not limited to the following:

- Direct mail (letters and postcards to qualifying customers)
- Duke Energy Progress website
- Email
- Video
- Trade event presence
- Promotion by the new Medium Business Energy Advisors team

Additional detailed program information is located at www.duke-energy.com/dra.

F. Evaluation, Measurement and Verification

The 2016 EM&V of this program was presented in the Collaborative meeting in July, 2017. The evaluation for the program had the following objectives: to replicate the DEP settlement algorithm, to validate the settlement impacts reported by DEP, to estimate verified impacts using a regression-based approach with day-of load adjustment, to estimate average kW event load shed per meter, by sector, and for the program as a whole. The 2016 analysis found the average load reductions were approximately 17.6 MW per summer event, approximately 300 kW per meter. Navigant, the EM&V evaluator, is currently conducting the analysis of PY2017.

A. Description

The Duke Energy Progress, LLC's (the "Company") EnergyWise Business (the "Program") is an energy efficiency and demand response program for non-residential customers that allows the Company to reduce the operation of participants' AC units to mitigate system capacity constraints and improve reliability of the power grid. The Program provides customers with options for how they would like to participate. In exchange for participation, the Company provides participants with an annual incentive applied directly to their bill.

Program participants can choose between a Wi-Fi thermostat or a load control switch which is professionally installed for free for each air conditioning or heat pump unit at the premise. In addition to choosing the equipment, the participants can also choose at what cycling level they would like to participate—30%, 50%, or 75%. During a conservation period, the Company sends a signal to the thermostat or switch to reduce the amount of time the unit is running by the percentage the participant selected. For participating at the 30% level, the customer receives a $50 annual bill credit for each unit, $85 for the 50% level, or $135 for the 75% level. Additionally, participants with a heat pump unit with electric resistance emergency/back up heat that choose the thermostat can also participate in a winter option which allows the Company to control the emergency/back up heat. For 100% control of the emergency/back up heat, the Company provides an additional $25 annual bill credit.

Participants choosing the thermostat have access to a portal that allows them to control their units from anywhere with internet access. They can set schedules, adjust temperature set points, and receive energy conservation tips and communications from the Company. In addition to the portal access, participants also receive notifications of upcoming conservation periods. These notifications allow participants to make adjustments to their schedules or notify their employees of the upcoming conservation period. Participants are allowed to override two conservation periods per year without penalty. They can activate an override before or during the conservation period.

Audience

The Program is available to existing non-residential customers that are not opted-out of the DSM Rider, have at least one air conditioner or heat pump that operates to maintain a conditioned space on weekdays during the calendar months of May through September, and are not served under Schedules LGS-RTP and SI, Riders NM, DRA, 57, 68 IPS, LLC or NFS. Also, customers must have an average minimum usage of 1,000 kWh during those same calendar months.

B & C. Impacts, Participants and Expenses

2017 Year-End Results	nnual Forecast	ctual	ariations
Savings (MWH)	38	,413	1,474
Savings (MW)	.8	.24	3.45
2017 Program Expenses		1,394,010	

D. Qualitative Analysis

Highlights

During 2017, the Program experienced tremendous growth. By the end of the year, the Program had enrolled 1,351 accounts and completed installation on 911 of them. The total number of installed devices as of the end of 2017 is 1,675. The door-to-door marketing (canvassing) efforts kicked off in 2016 continued to produce enrollments, installations, and positive customer interactions. Canvassing efforts in 2017 reached over 14,000 customers and are currently ongoing.

During the summer control season the Program completed 5 energy conservation events: June 14th, July 13th, July 21st, August 17th and August 22.

Issues

The Program experienced issues with customers canceling appointments and causing inefficiencies and increased cost. The program now reminds customers of appointments by leaving an appointment card with the scheduled installation date and requirements and following up by telephone 24 to 48 hours before the appointment to confirm.

Potential Changes

The Program will evaluate expanding the canvassing to additional markets in both North and South Carolina in 2018.

E. Marketing Strategy

In 2017, the Program has continued to use a dedicated canvassing vendor for door-to-door marketing in Raleigh, the greater Raleigh region, and Asheville. Additionally, the Program continues to see enrollments as a result of cross promotion efforts with the Small Business Energy Saver program and the Duke Energy Business Energy Advisors.

F. Evaluation, Measurement and Verification

During the Collaborative Meeting on July 14, 2017, the Company presented the findings from the first evaluation of the Program. Because the Program began in 2016, this first impact evaluation was planned as an engineering-based analysis. The evaluator, Opinion Dynamics (OD), recommended two changes to the Program: 1) Adopt more conservative HVAC average tonnage values and 2) increase promotion of higher cycling strategies among program enrollees.

For the energy efficiency savings, OD will use IPMVP Option C (utility billing analysis) to estimate impacts for calendar year 2017 using linear regression models to compare customer demand on event days with non-event days. For the process evaluation, OD will conduct program staff interviews, program data and document reviews, early participant interviews, non-participant and drop-out interviews. The final report is expected in 2018.

Non-Residential Smart $aver® Performance Incentive

A. Description

Duke Energy Progress, LLC's (the "Company") Non-Residential Smart $aver® Performance Incentives (the "Program") offers financial assistance to qualifying commercial, industrial and institutional customers to enhance their ability to adopt and install cost-effective electrical energy efficiency projects.

The Program encourages the installation of new high efficiency equipment in new and existing nonresidential establishments as well as efficiency-related repair activities designed to maintain or enhance efficiency levels in currently installed equipment. The Program provides incentive payments to offset a portion of the higher cost of energy efficient installations that are not eligible under either the Smart $aver® Prescriptive or Custom programs. The types of projects covered by the Program include projects with some combination of unknown building conditions or system constraints, or uncertain operating, occupancy, or production schedules The specific measures incentivized are stated in the agreement with the customer. The Program coordinates closely with the existing custom program team and shares resources for administrative review and payment processing. The Program requires pre-approval prior to project initiation. Only projects that demonstrate that they clearly reduce electrical consumption and/or demand are eligible for incentives.

The intent of the Program is to broaden participation in non-residential efficiency programs by being able to provide incentives for projects that previously were deemed too unpredictable to calculate an acceptably accurate savings amount, and therefore ineligible for incentives. This Program provides a platform to understand new technologies better.

The key difference between the Performance Incentive Program and the custom program is that the performance incentive customers get paid based on actual measure performance. A plan is developed to verify actual performance of the project upon completion and is the basis for the performance portion of the incentive.

The incentive is typically be paid out on the following schedule:

- Incentive #1: For the portion of savings that are expected to be achieved with a high degree of confidence, an initial incentive is paid once the installation is complete.
- Incentive #2: After actual performance is measured and verified, the performance-based part of the incentive is paid. The amount of the payout is tied directly to the savings achieved by the measures.

The Company contracts with Alternative Energy Systems Consulting, Inc. (AESC) to perform technical review of the applications. All other program implementation is performed by Duke Energy employees or direct contractors.

Audience

All of the Company's non-residential electric accounts billed on qualifying rate schedules are eligible, except accounts that are opted out of the rider.

B & C. Impacts, Participants and Expenses

2017 Year End Results	Annual Forecast [1]	Actual	Variations
Savings (MWH)	N/A	414	N/A
Savings (MW)	N/A	.06	N/A
Participants		1	
2017 Program Expenses		$147,647	

[1] Forecast values not included as Program was not included in original 2016 Projection Filing

D. Qualitative Analysis

Highlights

As new technologies are introduced and changes occur in the energy efficiency marketplace, performance incentives are the perfect tool to influence and reward customers who invest in energy efficiency. The Smart $aver Performance Incentives program was launched in January 2017. Efforts were made to encourage internal resources, trade allies, and vendors who sell energy efficient equipment to promote the Program and assist customers who could participate.

Launching a new program often takes time to create awareness and understanding of the new offering and to identify opportunities. In DEP, the Program is beginning to see an increase in interest with the enrollment of three (3) Performance projects with estimated savings of 902,000 kilowatt hours and several other promising projects in the pipeline. With a compelling value proposition and with internal resources and trade allies getting comfortable with this unique program offering, participation is expected to continue to increase.

Issues

No issues have arisen in the first year of this Program. However, program management is monitoring the following areas of interest:

- The preferred method for measuring and verifying a project's performance is accomplished by gathering, monitoring and analyzing customer billing history. However, if energy savings are not significant, an effective evaluation with billing information may not be possible. If this is the case, sub-metering is required at the customer's expense, and the time and expense may be a hurdle to participation.
- The Performance program cannot be offered to customers who are opted-out of the EE Rider. Performance projects can easily carryover into multiple calendar years because of the monitoring and verification requirement. The extended timeframe could make opting-in more difficult to justify to participate in the Program.
- From a customer perspective, the risk of measured energy savings being less than expected resulting in a smaller incentive payout may be undesirable.
- The Program is subject to large fluctuations in performance due to long project lead times, long monitoring and verification times, and the timeliness and size of the projects.

Potential Changes

The Company will continuously consider functional enhancements to enhance participation, processing speed, and program efficiency.

Beginning in Q4, the Performance team will offer, on a limited basis until it can be evaluated in action, a software tool that will allow a proactive view of building performance and, in turn, identify buildings that are good candidates for energy efficiency programs. This tool offers an indication of which buildings have the greatest potential for energy savings and where to focus time and resources.

E. Marketing Strategy

The 2017 marketing strategy for the Smart $aver Performance Incentive Program aligns closely with the Custom Program. The goal is to educate non-residential customers about the technologies incentivized through both programs, as well as the benefits of installing energy-efficient equipment. These efforts utilize a multi-channel approach, which will includes the following:

- Email
- Direct Mail (letters to qualifying customers)
- Duke Energy Progress website

- Webinars
- Small Business Group outreach events
- Paid advertising/.mass media
- Industry Associations
- Large Account Managers
- Business Energy Advisors
- Trade Ally Outreach

These marketing efforts are designed to create awareness of the Program, to educate customers on energy saving opportunities, and to emphasize the convenience of participating.

Non-residential customers are informed of programs via targeted marketing material and communications. Information about incentives is also distributed to trade allies, who in turn sell equipment and services to all sizes of non-residential customers. Large business or assigned accounts are targeted primarily through assigned Company account managers. Unassigned small to medium business customers are supported by the Company's business energy advisors. The business energy advisors follow up on customer leads to answer questions and steer customers who are not already working with a trade ally to the trade ally search tool. In addition, the business energy advisors contact customers with electrical costs between $60,000 and $250,000 to promote the Non-Residential Smart $aver Program.

The internal marketing channel is comprised of assigned Large Business Account Managers, Business Energy Advisors, and Local Government and Community Relations who all identify potential opportunities as well as distribute program collateral and informational material to customers and trade allies. In addition, the Economic and Business Development groups also provide a channel to customers who are new to the service territory.

F. Evaluation, Measurement and Verification

Since the Program was launched in January 2017, no evaluation activities are planned for 2018. Future evaluation timing will depend upon sufficient participation.

A. Description

The purpose of the Duke Energy Progress (the "Company")Small Business Energy Saver program (the "Program") is to reduce energy usage through the direct installation of energy efficient measures within qualifying non-residential customer facilities. All aspects of the Program are administered by a single Company-authorized vendor. Program measures address major end-uses in lighting, refrigeration, and HVAC applications.

Program participants receive a free, no-obligation energy assessment of their facility followed by a recommendation of energy efficiency measures that could be installed in their facility along with the projected energy savings, costs of all materials and installation, and the amount of the up-front incentive the Company. The customer makes the final determination of which measures will be installed after receiving the results of the energy assessment. The vendor schedules the installation of the energy efficiency measure at a convenient time for the customer, and electrical subcontractors perform the installation.

The Program is designed as a pay-for-performance offering, meaning that the vendor administering the Program is only compensated for energy savings achieved through the installation of energy efficiency measures.

Audience

The Program is available to non-residential customers that are not opted-out of the Company's EE/DSM rider and have an average annual demand of 180 kW or less per active account.

B & C. Impacts, Participants and Expenses

2017 Year-End Results	Annual Forecast	Actual	Variations
Savings (MWH)	33,569	45,712	12,143
Savings (MW)	6.40	9.13	2.73
Participants		40,204,005	
2017 Program Expenses		$8,798,633	

D. Qualitative Analysis

Highlights

Lime Energy is the Company-authorized vendor administering the Program in both DEC and DEP service areas. Though the Program has matured in the DEP service territory after 4 years of operation, customer interest remains strong with nearly 1,150 Small Business Energy Saver projects completed in 2017.

The Company administers a customer satisfaction survey to Program participants in DEP since 2014. Customers continue to respond very positively to the Program, with 85% of all 2017 survey participants rating their overall satisfaction with the Program experience at above an 8 on a scale of 10. Also, the majority of Program participants say that the Program has served to improve their perception of Duke Energy, with 85% of responders indicating that the Program has had a positive effect on their overall satisfaction with the Company.

In order to expand the Program offering to more small and medium business customers who will benefit from the direct install model and turn-key Program process, the Company filed a Program modification proposal in late 2016 with both the NC Utilities Commission and the Public Service Commission of SC to expand the Program's availability to include all non-residential customer accounts with an average annual demand of 180 kW or less, an increase from the previous eligibility limit of 100 kW annual average demand per account. This Program modification received regulatory approval in October 2016 and implemented shortly thereafter. Customers reacted very positively to this change in 2017, with 75 projects completed in DEP for newly eligible customers.

Issues

While LED lighting measures remain the primary driver of energy savings in the Program for the foreseeable future, the Company has been actively working with Lime Energy to increase refrigeration and HVAC measure adoption.

The Company began work last year to evaluate new HVAC measures to add to the Program, with the goal of offering customers more comprehensive energy efficiency projects. Program management took steps in 2017 to offer additional HVAC measures—other than system/unit replacements—that are suitable for the small and medium business market, such as HVAC tune-ups, rooftop HVAC unit controls, and HVAC unit optimization devices.

Potential Changes

The Company continues to evaluate the addition of incentivized measures which fit the direct install program model and are suitable for the small business market.

Also, the Company is currently evaluating potential changes to the Program incentive design, including exploring the concept of offering higher incentives to deep energy retrofit projects with multiple measure technologies. Ultimately, the Company would like for the Program to encourage customers to take on more comprehensive energy efficiency upgrades that maximize energy savings.

E. Marketing Strategy

The Program is marketed primarily using the following channels:

- Lime Energy field representatives
- Direct mail (letters and postcards to qualifying customers)
- Duke Energy Progress website
- Email & Duke Energy Business E-Newsletters
- Social media and search engine marketing
- Direct marketing & outreach via Program administrator
- Outreach via Duke Energy Business Energy Advisors
- Community events

All marketing efforts are designed to create awareness of the Program, to educate customers on energy saving opportunities, and to emphasize the convenience of participation for the target market.

F. Evaluation, Measurement and Verification

Evaluation activities began in 2017 for the next evaluation cycle, with a final report expected in 2018. New process evaluation activities included a customer journey mapping exercise to assess the qualitative experience of the customer and reveal key information such as loyalty, satisfaction, and frustrations with the Program. For the impact evaluation, new activities included revisiting the sampling methodology based on the current measures mix and customer facility size due to the higher demand consumption cap for participation (180 kW rather than 100 kW).

Evans Exhibit 7

Duke Energy Progress
Estimate - January 1, 2019 - December 31, 2019
Docket Number E-2, Sub 1174
Projected Program/Portfolio Cost Effectiveness - Vintage 2019

Program	UCT	TRC	RIM	PCT
Residential Programs				
· Appliance Recycling Program				
· Energy Education Program for Schools	1.62	2.24	0.63	
· Energy Efficient Lighting	1.79	2.58	0.61	8.39
· Home Energy Improvement	0.91	0.57	0.41	1.73
· Multi-Family	3.00	5.58	0.50	
· Neighborhood Energy Saver	0.46	1.55	0.28	
· Residential Energy Assessments	1.54	1.71	0.49	
· Residential New Construction	1.96	1.03	0.72	2.30
· Save Energy and Water Kit	12.43	27.29	0.70	
· Residential Home Advantage				
· My Home Energy Report	0.96	0.96	0.41	
· EnergyWise Home	9.28	58.30	9.28	
Residential Total	**2.79**	**2.70**	**0.77**	**11.17**
Non-Residential Programs				
· Energy Efficient Lighting	4.63	7.98	0.95	16.31
· Non-Residential Smart $aver	2.45	1.07	0.77	1.99
· Non-Residential Smart $aver Performance Incentive	3.75	0.92	0.75	2.18
· Small Business Energy Saver	2.57	1.60	0.70	3.71
· EnergyWise ® for Business	0.72	1.07	0.59	
· Commercial Industrial Governmental Demand Response	2.06	33.28	2.06	
Non-Residential Total	**2.41**	**1.56**	**0.84**	**3.04**
Overall Portfolio total	**2.63**	**2.12**	**0.84**	**4.76**

Duke Energy Progress
Changes to DSM/EE Cost Recovery Vintage 2017 True Up January 1, 2017 - December 31, 2017
Changes from Prior Filing Due to Application of M&V and Participation
System kWh and kW Impacts Net Free Riders at the Plant

Residential Programs

	Filed in Docket E-2, Sub 1145		Filed in Docket E-2, Sub xxxx		Overall Variance		E-2 Sub 1145	E-2 Sub xxxx	Delta	Variance due to Change in Impacts and Measure Mix		Variance due to Change in Participation		Sum of Variances	
Program Name	kWh	kW	kWh	kW	kWh	kW	System Participation		Participation	kWh	kW	kWh	kW	kWh	kW
Appliance Recycling Program	4,181,891	553	-	-	(4,181,891)	(553)	7,000	-	(7,000)	-	-	(4,181,891)	(553)	(4,181,891)	(553)
Energy Education Program for Schools	1,997,741	198	2,353,765	996	356,024	798	8,800	9,104	304	287,011	791	69,013	7	356,024	798
Energy Efficient Lighting	42,818,718	6,169	29,913,877	4,314	(12,904,841)	(1,855)	2,007,868	2,247,881	240,013	(18,023,238)	(2,592)	5,118,397	737	(12,904,841)	(1,855)
Home Energy Improvement Program	2,492,186	984	7,357,987	1,975	4,865,800	991	7,353	26,222	18,869	(1,529,557)	(1,536)	6,395,357	2,526	4,865,800	991
Neighborhood Energy Saver	1,734,973	305	2,200,240	335	465,266	31	4,500	4,873	373	321,456	5	143,810	25	465,266	31
ResEE Multi-Family	10,444,072	1,024	16,150,507	2,192	5,706,435	1,168	201,072	297,837	96,765	680,272	675	5,026,163	493	5,706,435	1,168
Residential Energy Assessments	3,132,060	524	5,447,736	910	2,315,676	386	25,375	38,090	12,715	746,297	124	1,569,379	262	2,315,676	386
Residential New Construction	10,074,721	4,362	13,996,035	6,022	3,921,314	1,660	4,750	9,732,077	9,727,327	(20,627,679,497)	(8,930,854)	20,631,600,811	8,932,513	3,921,314	1,660
Save Energy and Water Kit	15,666,920	1,254	25,021,451	8,377	9,354,531	7,123	316,437	463,854	147,417	2,055,839	6,538	7,298,692	584	9,354,531	7,123
Residential Home Advantage	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
My Home Energy Report	133,916,899	36,390	117,851,515	19,964	(16,065,384)	(16,427)	682,300	795,734	113,434	(38,329,388)	(22,477)	22,264,003	6,050	(16,065,384)	(16,427)
EnergyWise ® Home	-	22,039	-	33,428	-	11,389	11,066	17,760	6,694	-	(1,943)	-	13,332	-	11,389
Residential Programs Total	226,460,182	73,803	220,293,112	78,513	(6,167,070)	4,710	3,276,521	13,633,432	10,356,911	(20,681,470,805)	(8,951,268)	20,675,303,735	8,955,978	(6,167,070)	4,710

Non-Residential Programs

	Filed in Docket E-2, Sub 1145		Filed in Docket E-2, Sub xxxx		Overall Variance		E-2 Sub 1145	E-2 Sub xxxx	Delta	Variance due to Change in Impacts and Measure Mix		Variance due to Change in Participation		Sum of Variances	
Program Name	kWh	kW	kWh	kW	kWh	kW	System Participation		Participation	kWh	kW	kWh	kW	kWh	kW
Business Energy Reports	3,878,490	632	-	-	(3,878,490)	(632)	11,683	440	(11,243)	(146,070)	(24)	(3,732,420)	(608)	(3,878,490)	(632)
Energy Efficiency for Business	63,691,969	10,087	103,103,354	16,958	39,411,385	6,871	155,544	1,792,235	1,636,691	(630,781,155)	(99,269)	670,192,540	106,140	39,411,385	6,871
Energy Efficient Lighting	20,552,590	4,233	7,877,874	2,024	(12,674,716)	(2,209)	243,862	272,500	28,638	(15,088,281)	(2,706)	2,413,565	497	(12,674,716)	(2,209)
Non-Res SmartSaver Performance	-	-	435,108	58	435,108	58	-	1	1	-	-	435,108	58	435,108	58
Small Business Energy Saver	35,280,963	6,726	48,044,115	9,600	12,763,152	2,873	36,100,000	40,204,550	4,104,550	8,751,726	2,109	4,011,426	765	12,763,152	2,873
EnergyWise ® for Business	986,355	5,036	983,712	6,461	(2,643)	1,425	1,896	1,664	(232)	118,125	2,041	(120,768)	(617)	(2,643)	1,425
Commercial Industrial Governmental Demand Re	-	14,714	-	1,969	-	(12,745)	14,000	1,873	(12,127)	-	-	-	(12,745)	-	(12,745)
Non-Residential Programs Total	124,390,366	41,429	160,444,163	37,070	36,053,797	(4,359)	36,526,985	42,273,263	5,746,278	(637,145,655)	(97,849)	673,199,452	93,490	36,053,797	(4,359)
Distribution System Demand Response															
DSDR	49,324,829	312,017	35,518,685	334,505	(13,806,145)	22,488	-	-	-	N/A	N/A	-	-	N/A	N/A
Total Residential and Non-Residential Programs	400,175,377	427,249	416,255,960	450,088	16,080,582	22,839	39,803,506	55,906,695	16,103,189	(21,318,616,460)	(9,049,117)	21,348,503,187	9,049,468	29,886,727	350

NOTE - The actual per unit impacts are reflective of the following EM&V reports:

Program Name As Filed	Docket	Report Reference	Effective Date
EnergyWise	E-2, Sub 927	EM&V Report for the EnergyWise Home Program Summer 2016	6/5/2017
Small Business Energy Saver	E-2, Sub 1022	EM&V Report for the Small Business Energy Saver Program Duke Energy Progress and Duke Energy Carolinas	3/1/2016
EnergyWise for Business	E-2, Sub 1086	Duke Energy Carolinas and Progress EnergyWise for Business Programs Evaluation Report	1/1/2016
CIG-DR	E-2, Sub 953	2016 EM&V Report for the Duke Energy Progress Commercial, Industrial, and Governmental Demand Response Automation (DRA) Program	6/19/2017
Multifamily Energy Efficiency Program	E-2, Sub 1059	EM&V Report for the Duke Energy Multifamily Energy Efficiency Program	1/1/2015
EnergyWise	E-2, Sub 927	EM&V Report for the EnergyWise Home Demand Response Program; Winter PY2016/2017	7/6/2017
Energy Efficiency in Education	E-2, Sub 1060	Energy Efficiency Education in Schools Program Year 2015 - 2016 Evaluation Report	1/1/2015
MyHER	E-2,Sub 989	My Home Energy Report Program Evaluation	2/1/2015
Save Energy & Water Kit	E-2,Sub 1085	Save Energy and Water Kits 2016 Program Year Evaluation Report	11/1/2015
Non-Res Prescriptive	E-2, Sub 938	Duke Energy Carolina & Duke Energy Progress Non-Residential Prescriptive Program Evaluation Report	3/1/2017
Retail Lighting	E-2, Sub 950	Duke Energy Progress & Duke Energy Carolinas Energy Efficiency Lighting & Retail LED Programs Evaluation Report	4/1/2017

DE Progress DSM Opt-Out at December 31, 2016

North Carolina (excludes outdoor lighting)

Customer's Name	DSM
3141 PROPERTIES LLC	1
333 VENTURES LLC	2
3700 GLENWOOD LLC	1
4208 SIX FORKS ROAD LLC	2
81ST REGIONAL SUPPT COMMAND	1
A STUCKI COMPANY	1
ADVANCED PLASTIC EXTRUSION LLC	2
AG PROVISION LLC	3
AJINOMOTO USA INC	3
ALAMAC AMERICAN KNITS LLC	2
ALBANY ROAD-WYCLIFF LLC	2
ALCAMI CAROLINAS CORPORATION	6
ALL TRUSS LLC	1
ALLEN HARIM FOODS LLC	1
ALPLA INC	1
AMCOR FLEXIBLES INC	1
AMCOR RIGID PLASTICS USA LLC	1
AMERICAN AIRLINES GROUP INC	1
AMERICAN GROWLER INC	2
AMERICAN SKIN COMPANY INC	1
AMERICAN TEL & TEL CO	1
AMERICHEM INC	3
AMISUB OF NORTH CAROLINA INC	1
ANGUS BARN LTD	6
ANSON MACHINE WORKS	4
APAC TENNESSEE INC	3
APEX OIL CO INC/TERMINALS DIVI	5
APEX TOOL GROUP LLC	1
ARAUCO PANELS USA LLC	4
ARCADIA DAIRY FARMS INC	2
ARCHER DANIELS MIDLAND CO	1
ARCLIN USA INC	6
ARDAGH GLASS INC	4
ARDEN CORPORATION	4
ASHEBORO CITY OF	3
ASHEBORO ELASTICS CORP	3
ASHEVILLE BUNCOMBE TECH	22
ASHEVILLE CITY OF	8
ASHEVILLE DYING AND FINISHING	2
ASHEVILLE WASTE PAPER CO INC	5
ASTON PARK HEALTH CARE CENTER	1
AT & T MOBILITY	3
ATEX TECHNOLOGIES INC	2
ATLANTIC CORP OF WILM INC	7
ATLANTIC VENEER CORP	3

AUSTIN QUALITY FOODS INC	2
AUX KITCHEN LLC	1
B J CONSEW INC	1
B V HEDRICK GRAVEL & SAND CO	9
BAILEY FARMS INC	1
BALCRANK CORPORATION	1
BALDOR ELECTRIC CO	1
BARHAM FARMS INC	1
BARNES FARMING CORPORATION	8
BARTLETT MILLING CO	2
BB&T	2
BELK INC	7
BELLSOUTH TELECOMMUNICATIONS	12
BELT CONCEPTS OF AMERICA	1
BI-LO LLC	2
BILTMORE BAPTIST CHURCH	1
BILTMORE FARMS HOTEL GRP LLC	3
BILTMORE FOREST CNTRY CLUB INC	5
BJ'S WHOLESALE CLUB INC	8
BJT, INC	1
BLACK MTN CENTER	6
BLUE RIDGE PAPER PRODUCTS INC	29
BOISE CASCADE WOOD PRDCTS LLC	7
BOLIVIA LUMBER CO LLC	2
BONSAL AMERICAN INC	1
BORG WARNER TURBO SYSTEMS INC	2
BORGWARNER THERMAL SYSTEMS INC	1
BP SOLUTIONS GROUP INC	2
BRAIFORM ENTERPRISES INC	1
BRIER CREEK OFF #6 LLC	1
BRIER CREEK OFFICE # 1 LLC	1
BRIER CREEK OFFICE # 2 LLC	1
BRIER CREEK OFFICE # 5 LLC	1
BRIER CREEK OFFICE #4 LLC	1
BRM PARTNERS II LLC	1
BRM PARTNERS LLC	1
BROMLEY PLASTICS CORPORATION	1
BROOKS HOWELL RETIREMENT HOME	3
BROOKWOOD FARMS INC	5
BRUNSWICK CO	1
BRUNSWICK CO UTILITIES	1
BRUNSWICK COUNTY SCHOOLS	18
BSH HOME APPLIANCES	6
BUNCOMBE CO BD OF EDUCATION	2
BUNCOMBE COUNTY	2
BURCAM CAPITAL II LLC	1

BURLINGTON INDUSTRIES LLC	2
BUSINESS TELECOM INC	2
BUTLER MFG CO	5
CAMP DAVIS INDUSTRIAL PARK INC	6
CAMPBELL SOUP SUPPLY CO LLC	4
CAMPBELL UNIVERSITY	40
CAN AM SOUTH LLC	2
CANTON SAWMILL LLC	7
CAPE FEAR ACADEMY	2
CAPE FEAR COMMUNITY COLLEGE	13
CAPE FEAR COUNTRY CLUB	7
CAPE FEAR PUBLIC UTILITY AUTH	6
CAPEL INC	6
CAPITAL FUNDS INC	3
CAPITOL BROADCASTING CO	13
CARGILL INC	1
CARLIE C OPERATION CENTER INC	10
CAROLINA APPAREL GROUP INC	1
CAROLINA BAY OF WILMINGTON LLC	5
CAROLINA BEACH TOWN OF	1
CAROLINA COUNTRY CLUB	3
CAROLINA CRATE & PALLET INC	3
CAROLINA CUSTOM FINISHING LLC	1
CAROLINA DAIRY LLC	2
CAROLINA EGG CO INC	1
CAROLINA ELECTRONIC ASSEMBLERS	1
CAROLINA ICE INC	4
CAROLINA INNOVATIVE FOOD INGRE	3
CAROLINA PRESERVE BY DEL WEBB	4
CAROLINA TECHNICAL PLASTICS	3
CARQUEST OF SRONCE	2
CARTERET COMMUNITY COLLEGE	18
CARTERET GENERAL HOSPITAL	3
CARY TOWN OF	13
CARY VENTURE LTD PRTNRSHIP	14
CASCADES HOLDING US INC	4
CASCADES MOULDED PULP	1
CASE FARMS	8
CATALENT PHARMA SOLUTIONS LLC	16
CATERPILLAR INC	10
CECIL BUDD TIRE COMPANY LLC	3
CERTAINTEED CORPORATION	4
CERTAINTEED GYPSUM NC INC	3
CERTAINTEED INC	1
CFVH - BLADEN HEALTHCARE	11
CHATHAM CO	1

DE Progress DSM Opt-Out at December 31, 2016

North Carolina (excludes outdoor lighting)

CHATHAM CO BOARD OF EDUCATION	12
CHATHAM HOSPITAL INC	3
CHERRY HOSPITAL	21
CITY OF HENDERSON	2
CITY OF RALEIGH PARKS REC DEPT	11
CLIFFORD W ESTES CO INC	3
CLINTON CITY BD OF ED	8
CLINTON CITY OF	3
CLOVERLEAF COLD STORAGE CO	1
CMC CORPORATION	4
CMS FOOD SOLUTIONS INC	1
COAST LAMP MANUFACTORY	2
COASTAL CAR COMM COLL RES BLD	1
COASTAL CAROLINA COMM COLLEGE	13
COASTAL FEDERAL CREDIT UNION	1
COATINGS AND ADHESIVES CORP	7
COBB VANTRESS INC	1
COKER FEED MILL INC	1
COLONIAL CARTON CO	1
COLUMBUS COUNTY SCHOOLS	11
COLUMBUS REG HEALTHCARE SYSTEM	3
COMFORT TECH INC	1
COMPUTER DESIGN INC	1
CONESTOGA WOOD SPECIALTIES	2
CONSOLIDATED METCO INC	2
CONVEYOR TECHNOLOGIES OF SANFO	4
COOPER-STANDARD AUTOMOTIVE INC	2
CORE-MARK DISTRIBUTORS INC	2
CORNELIA NIXON DAVIS INC	4
CORNELIA NIXON DAVIS NURSING	1
CORNING INC	3
CORTEK	4
COSTCO	4
COTTLE STRAWBERRY NURSERY INC	8
COTY US LLC	5
COUNCIL TOOL CO INC	4
COUNTRY CLUB OF LANDFALL	17
COUNTY OF WAYNE	1
COURTYARD BY MARRIOTT	3
CPI USA NORTH CAROLINA LLC	1
CRABTREE PARTNERS LLC	1
CRAVEN CO BD OF ED	14
CRAVEN CO JUSTICE CENTER	2
CRAWFORD KNITTING INC	1
CROP PRODUCTION SERVICES INC	1
CROSS CANVAS COMPANY INC	3

CRUMPLER PLASTIC PIPE INC	4
CSX TRANSPORTATION	2
CTC FURNITURE DISTRIBUTORS INC	1
DAK AMERICAS LLC	3
DALIAH PLASTICS CORP	4
DAY INTERNATIONAL INC	2
DCI INC	1
DEERFIELD EPISCOPAL RETIREMENT	18
DENNISON, WYNDHAM V	1
DEPT OF HEALTH & HUMAN RESOURC	34
DESCO INDUSTRIES INC	4
DEVIL DOG MFG CO INC	2
DEWEY DEVELOPMENT INC	2
DH RESEARCH TRIANGLE, LLC	1
DIXIE PIPELINE COMPANY	4
DRPFC I LLC	5
DUKE UNIV HEALTH SYSTEM INC	26
DUKE UNIVERSITY MARINE LAB	1
DUNN CITY OF	2
DUPLIN GENERAL HOSP	1
DUPONT E I DE NEMRS	1
DYNAPAR CORP	3
E CAROLINA METAL TREATING INC	2
EAGLE SPORTSWEAR LLC	5
EARTH FARE INC	4
EATON CORPORATION	6
EDWARDS BROTHERS INC	2
EDWARDS WOOD PRODUCTS INC	6
ELAND INDUSTRIES INC	1
ELASTIC THERAPY INC	3
ELECTRO SWITCH CORPORATION	1
ELEMENTIS CHROMIUM INC	4
ELKAY SOUTHERN PLANT 2	1
ELKINS SAWMILL INC	3
EMC CORPORATION	4
EMERGEORTHO PA	1
ENERGIZER BATTERY MANUFACTURIN	1
ENTERCO LLC	1
ENVIVA PELLETS SAMPSON LLC	1
ENVIVA PORT OF WILMINGTON, LLC	4
EOS ACQUISITION I LLC	1
ERICO INC	1
EVERGREEN PACKAGING INC	4
EXPRESS FOOD GROUP LLC	1
EXTREME NETWORKS INC	1
FAYETTEVILLE TECH COMM COLL	2

DE Progress DSM Opt-Out at December 31, 2016

North Carolina (excludes outdoor lighting)

FCC (NC) LLC	1
FENNER DRIVES	1
FIRST BAPTIST CH OF ASHE INC	1
FIRST CITIZENS BANK	1
FIRST CITIZENS BANK & TRUST CO	5
FIRSTHEALTH FAMILY CARE CTR	1
FIRSTHEALTH OF THE CAROLINAS	20
FLETCHER BUSINESS PARK LLC	1
FLETCHER HOSPITALITY, LLC	1
FLOCO FOODS INC	2
FLOWSERVE US INC	1
FLYING J INC	1
FOOD LION LLC	166
FORTRON INDUSTRIES LLC	1
FOUNTAIN POWER BOATS INC	5
FOUR SEASONS MNGMT SVCS INC	6
FRANK THEATRES PARKSIDE COMMON	1
FRANKLIN BAKING COMPANY LLC	7
FRANKLIN COUNTY SCHOOLS	5
FRATERNITY/SORORITY LIFE	8
FRESH BUY INC	2
FRONTIER SPINNING MILLS	1
FUJIFILM DIOSYNTH BIOTEC USA	1
FUQUAY-VARINA TOWN OF	1
GALE FORCE SPORTS & ENTERTAIN	13
GALLOWAY RIDGE INC	17
GENERAL ELECTRIC CO	2
GENERAL INDUSTRIES INC	5
GENERAL PARTS DIST LLC	1
GENERAL SHALE BRICK INC	8
GENERAL TIMBER INC	4
GEORGIA PACIFIC CORP	2
GEORGIA PACIFIC WOOD PROD LLC	1
GH CRESCENT GREEN INC	1
GIBRALTAR PACKAGING GROUP INC	4
GILDAN YARNS LLC	1
GIVENS ESTATES INC	12
GIVENS HIGHLAND FARMS LLC	11
GKN DRIVELINE N AMERICA INC	4
GLAXOSMITHKLINE	6
GLEN RAVEN MILLS INC	1
GLENWOOD ASSET MANAGEMENT LLC	1
GLENWOOD HOSPITALITY ASSOC LLC	1
GLENWOOD PLACE VENTURES LLC	1
GLOBAL PACKAGING INC	1
GOLDSBORO CITY OF	2

GOLDSBORO HOUSING AUTHORITY	3
GOLDSBORO MILLING CO	13
GRANITE FALLS SWIM/ATHL CLUB	2
GREATER ASHEVILLE REG AIRPORT	1
GREDE II LLC	3
GRIFOLS THERAPEUTICS INC	6
H & H FURNITURE MFG INC	3
HALIFAX MEDIA HOLDINGS LLC	4
HANESBRANDS INC	2
HANSON AGGREGATES SE LLC	33
HANSON BRICK EAST LLC	1
HAPPY JACK INC	1
HARDEN ROAD ASSOCIATES	1
HARGER LIGHTNING & GROUNDING	1
HARNETT CO BD OF ED	23
HARNETT CO PUBLIC UTIL	6
HARNETT CO SHERIFF OFFICE	1
HARNETT HEALTH SYSTEM INC	19
HARRIS PRINTING CO INC	3
HARRIS TEETER INC	31
HASTY PLYWOOD CO	3
HAVELOCK CITY OF	1
HAYWOOD COUNTY LOCAL GOV	1
HAYWOOD REGIONAL MEDICAL CNTR	6
HEATMASTERS LLC	3
HERAEUS QUARTZTECH AMERICA LLC	1
HEXION INC	2
HIGHWOODS JOINT VENTURE	1
HIGHWOODS REALTY LP	27
HJH ASSOCIATES	1
HOG SLAT INC	3
HOLLY SPRINGS TOWN OF	1
HOME CARE PRODUCTS LLC	1
HOME DEPOT USA INC	9
HOPE COMMUNITY CHURH OF NC INC	1
HORNWOOD INC	3
HOUSE OF RAEFORD FARMS INC	11
HOUSING AUTH CITY OF RALEIGH	2
HUGHES FURNITURE INDUSTRIE INC	1
HULSING HOTELS INC	13
HUVEPHARMA INC	1
HYDRO TUBE ENTERPRISES INC	1
IAC TROY LLC	1
INGERSOLL-RAND	1
INGLES MARKETS INC	86
INN ON BILTMORE ESTATE INC	1

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INNOVATIVE LAMINATIONS CO	1
INTERNATIONAL BROADCAST BUREAU	1
INTERNATIONAL PAPER COMPANY	5
INVISTA S A R L	1
J & D WOOD INC	3
J P TAYLOR COMPANY LLC	4
J&J SNACK FOODS HANDHELDS CORP	2
JACKSONVILLE CITY OF	3
JACOB HOLM IND AMERICA INC	1
JOHN DEERE TURF CARE INC	3
JOHN O STEVENSON INC.	2
JOHNSTON CO BOARD OF EDUCATION	78
JOHNSTON CO PUBLIC UTILITIES	2
JOHNSTON MEM HOSPITAL AUTH	1
JORDAN LUMBER & SUPPLY INC	15
JOVC FOOD CORP INC	1
K MART CORP	7
KAYSER-ROTH HOSIERY INC	4
KENNAMETAL INC	2
KESSLER ASHEVILLE LLC	1
K-FLEX USA LLC	3
KILELEE, KATHRYN	1
KINGS HOLDINGS 4,LLC	3
KINGSLAND REALTY LLC	1
KLAUSSNER FURN IND INC	24
KOOPMAN DAIRIES INC	4
KORDSA INC	1
KROGER COMPANY	9
KRYOCAL, LLC	3
LAKE JUNALUSKA ASSEMBLY INC	51
LANCER INC	4
LAZAR INDUSTRIES LLC	4
LEAR CORPORATION	2
LEE BRICK & TILE COMPANY	7
LEE COUNTY COURT HOUSE	2
LEE IRON & METAL CO	3
LENOVO INTERNATIONAL	1
LEWIS SAUSAGE CO INC	1
LIBERTY HEALTHCARE SERVICES	1
LIFEWAY CHRISTIAN RESOURCES OF	43
LINAMAR NORTH CAROLINA INC	4
LINPRINT CO	1
LOCAL GOVERNMENT FED CREDIT UN	1
LOUISBURG COLLEGE INC	12
LOUISE WELLS CAMERON ART MUSEU	4
LOUISIANA PACIFIC CORP	3

LOW & BONAR INC	1
LOWES COMPANIES INC	34
LOWES FOODS LLC	26
LUMBERTON CELLULOSE LLC	4
M ADLER'S SON, INC	1
MAGNETI MARELLI USA INC	4
MANHATTEN AMERICAN	1
MANOR CARE OF PINEHURST INC	1
MANUFACTURING METHODS, LLC	1
MARS PETCARE US, INC	7
MARTIN MARIETTA MATERIALS INC	58
MAS US HOLDINGS INC	6
MATTHEWS & MATTHEWS INC	1
MAY FURNITURE INC	3
MCDOWELL LUMBER CO INC	11
MCGILL ENVIRONMENTAL SYS OF NC	1
MCLAMBS ABATTOIR AND MEATS INC	1
MCMURRAY FABRICS INC	7
MEASUREMENTS GROUP INC	4
MEDICAL ACTION INDUSTRIES INC	1
MEDICAL SPECIALTIES INC	1
MEMORIAL MISSION HOSPITAL INC	1
MEREDITH COLLEGE	6
MERTEK SOLUTIONS INC	1
METAL-CAD & STEEL FRAMING	1
METCHEM, LLC	1
METROPOLITAN SEWAGE DISTRICT	5
MHG ASHEVILLE AL LP	1
MICROSPACE COMM CORP	1
MILKCO INC	4
MINE SAFETY APPL CO INC	1
MISSION HEALTH SYSTEM INC	16
MISSION ST JOSEPH HEALTH SYS	1
MISSION ST JOSEPH HOSPITAL	1
MITCHELL CO BD OF ED	2
MMIC-TL INC PARTNERS LLC	1
MOEN INC	4
MONTGOMERY COUNTY OF	2
MOORE COUNTY	3
MOORE COUNTY SCHOOLS	18
MOORE MACHINE COMPANY	5
MOORE'S INLET LIMITED PRTNRSHP	1
MOUNTAIN PRODUCTS BRIDGEWE LLC	1
MOUNTAIRE FARMS INC	21
MT OLIVE PICKLE CO	11
MULE CITY SPEC FEED INC	2

MURPHY BROWN LLC	1
N C TELEVISION INC	1
N RALEIGH CHRISTIAN ACADEMY	2
N RALEIGH MEDICAL REALTY LLC	1
NASH BRICK CO INC	2
NASH COMMUNITY COLLEGE	8
NASH COUNTY	1
NASH COUNTY MANAGERS OFFICE	1
NASH ROCKY MOUNT BD OF ED	23
NATIONAL FOAM INC	2
NATIONAL SPINNING CO INC	6
NATIONAL WIPER ALLIANCE INC	1
NATURAL BLEND VEG DEHYDR LLC	1
NATURES EARTH PELLETS INC LLC	3
NC AQUARIUM	3
NC DEPT OF AGRICULTURE	3
NC FARM BUREAU FEDERATION	1
NC STATE FAIRGROUNDS	5
NC STATE PORTS AUTH	3
NC STATE PORTS AUTHORITY	4
NC STATE UNIVERSITY	146
NC STATE VETERANS HOME	2
NC WILDLIFE COMMISSION	1
NESBITT ASHEVILLE VENTURE LLC	2
NEW BELGIUM BREWING CO INC	1
NEW HANOVER CO BD OF ED	47
NEW HANOVER REGIONAL MED CTR	32
NG PURVIS FARMS INC	3
NHC PROPERTY MANAGEMENT	3
NOBLE OIL SERVICES	4
NOMACO INC	3
NOMACORC LLC	3
NORCRAFT COMPANIES LP	2
NORTH CAROLINA MFG CO INC	1
NORTH HILLS TOWER II LLC	3
NOVARTIS VACCINES & DIAGNOSTIC	1
NOVIPAX LLC	4
NOVO NORDISK PHARMACUTICAL INC	4
NOVOZYMES NORTH AMERICA INC	6
NYPRO ASHEVILLE INC	2
OFFICE OF INFOR TECH SVCS	4
OHM HOTELS RTP, LLC	1
OLDCASTLE LAWN & GARDEN INC	5
OLIVER RUBBER COMPANY	2
OMNI GROVE PARK LLC	21
ONSLOW CO BD OF COMM	2

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ONSLOW CO BD OF EDUC	4
ONSLOW MEMORIAL HOSPITAL AUTH	2
ONSLOW WATER AND SEWER AUTH	5
ORACLE AMERICA, INC	2
OWENS & MINOR	1
OXFORD CITY OF	1
P G & C INC	2
PACTIV LLC	1
PAK A SAK FOOD STORES	1
PALLET EXPRESS, INC	5
PALZIV NORTH AMERICA INC	1
PARADIGM ANALYTICAL	1
PARK COMMUNICATIONS LLC	2
PARK N SHOP FOOD MART INC	6
PARKDALE AMERICA LLC	2
PARRISH & RONE INC	1
PCS PHOSPHATE CO INC	3
PEAK 10 INC	3
PENDER CO BD OF ED	17
PENDER MEMORIAL HOSPITAL INC	7
PENICK VILLAGE IN	2
PENICK VILLAGE INC	10
PENTAIR VALVES &CONTROLS US LP	3
PENTAIR WATER POOL AND SPA INC	10
PEPSI BOTTLING VENTURES LLC	4
PEPSI COLA BOTTLING CO	1
PEPSI COLA OF WILMINGTON	2
PERDUE FARMS INC	23
PERSON CO BD OF ED	2
PETROLEUM TANK CO	2
PFIZER INC	10
PFRS CROSSROADS CORP	4
PH HS LLC	1
PHOENIX LTD PARTNERSHIP	1
PIEDMONT NATURAL GAS	1
PIEDMONT NATURAL GAS CO	1
PILGRIMS PRIDE CORPORATION	6
PILKINGTON	1
PINEHURST LLC	84
PIONEER HI BRED INC	4
PLASTEK IND INC (PA) NC	3
PLASTICARD PRODUCTS INC	1
POLYMER GROUP INC	3
POLYZEN INC	1
PORT CITY COMMUNITY CHURCH	3
PR II WADE PARK LLC	3

PRAXAIR INC	2
PRC NC LLC	2
PRECISION HYDRAULIC CYL INC	1
PRECISIONAIRE INC	3
PREMIERE FIBERS INC	4
PRESTAGE AGENERGY OF NC LLC	2
PRESTAGE FARMS INC	36
PRESTIGE FABRICATORS INC	3
PRESTON TAYLOR FOOD INC	1
PRINTLOGIC LLC	2
PRO PALLET SOUTH INC	1
PSNC ENERGY	1
PUBLIC SCHOOLS OF ROBESON CO	1
PUBLIX NORTH CAROLINA LP	3
QUALCOMM INC	1
QUALITY CHEMICAL LABORATRS LLC	2
QUALITY TEXTILE SERVICES INC	1
RAEFORD CITY OF	1
RAILROAD FRICTION PRODUCT CORP	4
RALEIGH CITY OF	6
RALEIGH FITNESS & WELLNESS	1
RALEIGH HOTEL OPERATOR INC	1
RALEIGH PRECISION PRODUCTS INC	1
RANDOLPH COUNTY	9
RAVEN ANTENNA SYSTEMS INC	1
RC CREATIONS, LLC	2
RD AMERICA LLC	1
RDU AIRPORT AUTHORITY	6
RED HAT INC	1
RED WOLF COMPANY, LLC	1
REDDY ICE CORP	2
REGAL CINEMAS	3
REGAL ENTERAINMENT GROUP	4
RESINART EAST INC	1
REVLON CONSUMER PRODUCTS CORP	3
REX HEALTH CARE INC	14
REX MOB PARTNERS LLC	1
RHEINFELDEN AMERICAS LLC	1
RICHMOND COUNTY	1
RICHMOND COUNTY BOARD OF COMM	2
RICHMOND COUNTY SCHOOLS	2
RICHMOND SPECIALTY YARNS LLC	2
RIDGECREST CONFERENCE CENTER	1
ROBESON COUNTY DSS	1
ROCKINGHAM CITY OF	1
RODECO CO	2

ROSTRA PRECISION CT INC	2
ROYAL TEXTILE MILLS INC	1
RUBY'S PROPERTIES II LLC	1
S AND J HOLDINGS LLC	1
S B SMITH & SON INC	3
S B SMITH & SON INC	1
S T WOOTEN CORPORATION	17
SAGE & EVANS INC	1
SAMPSON REGIONAL MEDICAL CTR	3
SANDHILLS COMM COLLEGE	12
SANFORD CITY OF	4
SANFORD LEE CO BD OF ED	39
SANFORD MILLING CO INC	2
SAPONA MFG CO INC	2
SAS INSTITUTE INC	43
SCHINDLER ELEVATOR CORP	2
SCOTLAND CONTAINER INC	2
SCOTLAND MANUFACTURING	1
SEARS ROEBUCK & CO	4
SENTRY FURNITURE LLC	1
SEPARATION TECHNOLOGIES LLC	2
SIGMA PHI EPSILON	1
SILAR LABORATORIES, INC.	1
SILER CITY TOWN OF	2
SILVER LINE PLASTICS CORP	11
SINCLAIR BROADCAST GROUP INC	1
SIX FORKS OFFICE, LLC	3
SKYLAND BEER DIST	3
SMITHFIELD PACKING CO INC	6
SMOKY MOUNTAIN MACHINING INC	3
SNEEDEN, NORMAN E	2
SNUG HARBOR MANAGEMENT LLC	1
SONOCO PRODUCTS CO	1
SOUTH RIVER EMC COMM ASST CORP	1
SOUTHCO INC OF NC	1
SOUTHEASTERN REGIONAL MED CTR	4
SOUTHERN BAG CORP	1
SOUTHERN FABRICATORS INC	4
SOUTHERN PINES TOWN OF	2
SOUTHERN PRODUCE DIST INC	8
SOUTHERN PRODUCTS & SILICA CO	6
SOUTHERN STATES CHEMICAL INC	3
SPANSET INC	1
SPECGX LLC	13
SPIRIT AEROSYSTEMS INC	2
SPORTS FACTORY LLC	3

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SPX FLOW TECHNOLOGY SYSTEMS	1
ST ANDREWS PRESBYTERIAN COLL	1
ST. DAVIDS SCHOOL	7
STAN JOHNSON & ASSOCIATES LLC	2
STANADYNE INC	2
STARPET INC	6
STATIC CONTROL COMP INC	11
STEEL & PIPE CORP	2
STEVEN ROBERTS ORIGINAL	2
STI POLYMER INC	1
SUN LIFE ASSURANCE CO OF CANAD	1
SUNBRIDGE REGENCY NC INC	2
SUNRISE SENIOR LIVING	1
SUPERIOR MODULAR PRODUCT INC	1
SUPERIOR PLASTICS EXTRUSION	1
SUPERTEX, INC	4
SURGERY CENTER OF PINEHURST	1
SURTRONICS	2
SVT VENTURES LP	10
SYRACUSE PLASTIC OF NC INC	1
TALBERT BUILDING SUPPLY INC	3
TARGET STORES	18
TCDC PARTNERSHIP, LLC	2
TE CONNECTIVITY CORPORATION	2
THE ATRIUM AT BLUE RIDGE, LLC	1
THE BILTMORE COMPANY	2
THE CHEESECAKE FACTORY	1
THE CHEMOURS COMPANY FC, LLC	7
THE COUNTRY CLUB OF NC INC	1
THE CYPRESS OF RALEIGH	7
THE HARRELSON BUILDING INC	1
THE NEWS REPORTER CO INC	1
THE QUARTZ CORP USA	17
THE UMSTEAD	1
THEO DAVIS SONS INC	1
THERMAL METAL TREATING INC	2
THIRD & GRACE LLC	2
THIRD STREET SCREEN PRNTNGINC	2
TIERPOINT LLC	3
TIPPER TIE INC	3
TOP TOBACCO CO	3
TOWN SQUARE WEST LLC	7
TRAM LUMBER LLC	3
TRAMWAY VENEERS INC	1
TRANS CAROLINA PRODUCTS LLC	1
TREEHOUSE FOODS INC	6

TRIANGLE AQUATIC CENTER	1
TRIANGLE BRICK CO	6
TRIANGLE TOWN CENTER, LLC	22
TRINITY MANUFACTURING INC	5
TROPHY ON MAYWOOD LLC	1
TROY LUMBER CO	17
TROY POLYMER INC	1
TUCSON CARY, LLC	1
TURN BULL LUMBER COMPANY	1
TYCO ELECTRONICS	1
TYSON FOODS INC	3
U S REIF 4700 FALLS NC LLC	1
UCHIYAMA MANUF AMERICA LLC	3
UNC AT ASHEVILLE	8
UNC INSTITUTE OF MARINE SCI	3
UNC PUBLIC TV OF NC	1
UNCW	26
UNILEVER MANUFACTURING US INC	6
UNILIN NORTH AMERICA LLC	4
UNILIN US MDF	3
UNIMIN CORPORATION	49
UNISON ENGINE COMPONENTS INC	3
UNITED STATES COLD STORAGE INC	6
UNIVERSAL HEALTHCARE N RAL INC	1
UNIVERSAL LEAF NORTH AMERICA	2
UNIVERSITY OF NC AT PEMBROKE	16
UNIVERSITY RESEARCH UNIT	1
US ARMY	1
US ARMY FORT BRAGG	3
US DEPT OF AIR FORCE	1
US FLUE CURED TOBACCO GROWERS	1
US MARINE CORP	1
US MARINE CORPS	1
US POST OFFICE	3
US VETERANS ADMIN HOSPITAL	3
USS NC BATTLESHIP COMM	2
UWHARRIE FRAME MFG LLC	2
UWHARRIE LUMBER CO	3
VALLEY PROTEINS INC	15
VANGUARD CULINARY GROUP LTD	1
VENEER TECHNOLOGIES INC	7
VENTURE CENTER LLC	4
VERTEX RAILCAR CORPORATION	2
VICTAULIC CO OF AMERICA	2
VILLARI BROS FOODS LLC	1
VONDREHLE CORP	6

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VULCAN CONST MATERIALS LP	21
W N WILDER CO INC	1
WADESBORO IGA INC	1
WAKE CO HOSP SYSTEM INC	4
WAKE COUNTY BOARD OF EDUCATION	207
WAKE COUNTY GENERAL SERVICES	16
WAKE STONE CORP	17
WAKEMED PROPERTY SERVICES	13
WAL MART PDC #6091	4
WALMART STORES INC	76
WARP TECHNOLOGIES INC	1
WARREN CO BD OF ED	5
WAYNE BAILEY INC	2
WAYNE CO PUBLIC SCHOOLS	1
WAYNE COMMUNITY COLLEGE	1
WAYNE COUNTY	4
WAYNE MEMORIAL HOSPITAL INC	9
WAYNESVILLE TOWN OF	1
WELLS FARGO BANK NA	2
WEST CRAVEN HIGH SCHOOL	3
WEST CRAVEN MIDDLE SCHOOL	1
WEST FRASER INC	5
WESTERN NC HEALTHCARE INNO III	1
WESTERN NC HEALTHCARE INNO LLC	1
WEYERHAEUSER NR COMPANY	5
WHITEVILLE FABRICS LLC	4
WILLIAM BARNET & SON INC	5
WILLIAMS PROPERTY GROUP INC	1
WILMINGTON CITY OF	2
WILMINGTON HOTEL ASSOC CORP	2
WILMINGTON INTL AIRPORT	2
WILMINGTON MACHINERY INC	1
WILSONART INTERNATIONAL	4
WNC PALLET & FOREST PRDCTS INC	5
WRDC LLC	1
WRIGHT FOODS INC	2
WRIGHT MACHINE & TOOL CO INC	1
YALE INDUSTRIAL PRODUCTS INC	1
YAMCO LLC	1
YMCA OF WESTERN NORTH CAROLINA	2
Total	**4,099**

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Customer's Name	EE
1922 SKIBO CROSS CREEK LLC	1
3141 PROPERTIES LLC	1
333 VENTURES LLC	2
3700 GLENWOOD LLC	1
4208 SIX FORKS ROAD LLC	2
5400 RALEIGH CRABTREE KKC	1
81ST REGIONAL SUPPT COMMAND	1
A STUCKI COMPANY	1
ADVANCED PLASTIC EXTRUSION LLC	2
AG PROVISION LLC	3
AIR SYSTEM COMPONENTS INC	1
AJINOMOTO USA INC	3
ALAMAC AMERICAN KNITS LLC	2
ALBANY ROAD-WYCLIFF LLC	2
ALCAMI CAROLINAS CORPORATION	6
ALL TRUSS LLC	1
ALLEN HARIM FOODS LLC	1
ALPLA INC	1
AMCOR FLEXIBLES INC	1
AMCOR RIGID PLASTICS USA LLC	1
AMERICAN AIRLINES GROUP INC	1
AMERICAN GROWLER INC	2
AMERICAN SKIN COMPANY INC	1
AMERICAN TEL & TEL CO	1
AMERICHEM INC	3
AMISUB OF NORTH CAROLINA INC	1
ANGUS BARN LTD	6
ANSON COUNTY WATER DEPT	1
ANSON COUNTY WTR SYSTEM	1
ANSON MACHINE WORKS	4
APAC TENNESSEE INC	3
APEX OIL CO INC/TERMINALS DIVI	5
APEX TOOL GROUP LLC	2
ARAUCO PANELS USA LLC	4
ARCADIA DAIRY FARMS INC	2
ARCHER DANIELS MIDLAND CO	1
ARCLIN USA INC	6
ARDAGH GLASS INC	4
ARDEN CORPORATION	4
ASHEBORO CITY OF	3
ASHEBORO ELASTICS CORP	3
ASHEVILLE BUNCOMBE TECH	22
ASHEVILLE CITY OF	8
ASHEVILLE DYING AND FINISHING	2

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ASHEVILLE WASTE PAPER CO INC	5
ASTON PARK HEALTH CARE CENTER	1
AT & T MOBILITY	3
ATEX TECHNOLOGIES INC	2
ATLANTIC CORP OF WILM INC	7
ATLANTIC VENEER CORP	3
AUSTIN QUALITY FOODS INC	2
AUX KITCHEN LLC	1
B J CONSEW INC	1
B V HEDRICK GRAVEL & SAND CO	9
BAILEY FARMS INC	1
BALCRANK CORPORATION	1
BALDOR ELECTRIC CO	1
BARHAM FARMS INC	1
BARNES FARMING CORPORATION	8
BARTLETT MILLING CO	2
BB&T	3
BELK INC	7
BELLSOUTH TELECOMMUNICATIONS	12
BELT CONCEPTS OF AMERICA	1
BI-LO LLC	2
BILTMORE BAPTIST CHURCH	1
BILTMORE FARMS HOTEL GRP LLC	3
BILTMORE FOREST CNTRY CLUB INC	5
BJ'S WHOLESALE CLUB INC	8
BJT, INC	1
BLACK MTN CENTER	6
BLUE RIDGE PAPER PRODUCTS INC	29
BOISE CASCADE WOOD PRDCTS LLC	7
BOLIVIA LUMBER CO LLC	2
BONSAL AMERICAN INC	1
BORG WARNER TURBO SYSTEMS INC	2
BORGWARNER THERMAL SYSTEMS INC	1
BP SOLUTIONS GROUP INC	2
BRAIFORM ENTERPRISES INC	1
BRIER CREEK OFF #6 LLC	1
BRIER CREEK OFFICE # 1 LLC	1
BRIER CREEK OFFICE # 2 LLC	1
BRIER CREEK OFFICE # 5 LLC	1
BRIER CREEK OFFICE #4 LLC	1
BRM PARTNERS II LLC	1
BRM PARTNERS LLC	1
BROMLEY PLASTICS CORPORATION	1
BROOKS HOWELL RETIREMENT HOME	3
BROOKWOOD FARMS INC	5

BRUNSWICK CO	1
BRUNSWICK CO UTILITIES	1
BRUNSWICK COUNTY SCHOOLS	18
BSH HOME APPLIANCES	6
BURCAM CAPITAL II LLC	1
BURLINGTON INDUSTRIES LLC	2
BUSINESS TELECOM INC	2
BUTLER MFG CO	5
CAMP DAVIS INDUSTRIAL PARK INC	6
CAMPBELL SOUP SUPPLY CO LLC	4
CAMPBELL UNIVERSITY	40
CAN AM SOUTH LLC	2
CANTON SAWMILL LLC	7
CAPE FEAR ACADEMY	2
CAPE FEAR COMMUNITY COLLEGE	13
CAPE FEAR COUNTRY CLUB	7
CAPE FEAR PUBLIC UTILITY AUTH	6
CAPEL INC	6
CAPITAL FUNDS INC	3
CAPITOL BROADCASTING CO	13
CARGILL INC	1
CARLIE C OPERATION CENTER INC	8
CAROLINA APPAREL GROUP INC	1
CAROLINA BAY OF WILMINGTON LLC	5
CAROLINA BEACH TOWN OF	1
CAROLINA COUNTRY CLUB	3
CAROLINA CRATE & PALLET INC	3
CAROLINA CUSTOM FINISHING LLC	1
CAROLINA DAIRY LLC	2
CAROLINA EGG CO INC	1
CAROLINA ELECTRONIC ASSEMBLERS	1
CAROLINA ICE INC	4
CAROLINA INNOVATIVE FOOD INGRE	3
CAROLINA PRESERVE BY DEL WEBB	13
CAROLINA TECHNICAL PLASTICS	3
CARQUEST OF SRONCE	2
CARTERET COMMUNITY COLLEGE	18
CARTERET GENERAL HOSPITAL	3
CARY TOWN OF	13
CARY VENTURE LTD PRTNRSHIP	14
CASCADES HOLDING US INC	4
CASCADES MOULDED PULP	1
CASE FARMS	8
CATALENT PHARMA SOLUTIONS LLC	17
CATERPILLAR INC	9

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CECIL BUDD TIRE COMPANY LLC	3
CERTAINTEED CORPORATION	4
CERTAINTEED GYPSUM NC INC	3
CERTAINTEED INC	1
CFVH - BLADEN HEALTHCARE	11
CHATHAM CO	1
CHATHAM CO BOARD OF EDUCATION	12
CHATHAM HOSPITAL INC	3
CHERRY HOSPITAL	21
CITY OF HENDERSON	2
CITY OF RALEIGH PARKS REC DEPT	11
CLIFFORD W ESTES CO INC	3
CLINTON CITY BD OF ED	8
CLINTON CITY OF	3
CLOVERLEAF COLD STORAGE CO	1
CMC CORPORATION	4
CMS FOOD SOLUTIONS INC	1
COAST LAMP MANUFACTORY	2
COASTAL CAR COMM COLL RES BLD	1
COASTAL CAROLINA COMM COLLEGE	13
COASTAL FEDERAL CREDIT UNION	1
COATINGS AND ADHESIVES CORP	7
COBB VANTRESS INC	1
COKER FEED MILL INC	1
COLONIAL CARTON CO	1
COLUMBUS COUNTY SCHOOLS	11
COLUMBUS REG HEALTHCARE SYSTEM	3
COMFORT TECH INC	1
COMPUTER DESIGN INC	1
CONESTOGA WOOD SPECIALTIES	2
CONSOLIDATED METCO INC	2
CONVEYOR TECHNOLOGIES OF SANFO	4
COOPER-STANDARD AUTOMOTIVE INC	2
CORE-MARK DISTRIBUTORS INC	2
CORNELIA NIXON DAVIS INC	5
CORNELIA NIXON DAVIS NURSING	1
CORNING INC	3
CORTEK	4
COSTCO	4
COTTLE STRAWBERRY NURSERY INC	8
COTY US LLC	5
COUNCIL TOOL CO INC	4
COUNTRY CLUB OF LANDFALL	17
COUNTY OF WAYNE	1
COURTYARD BY MARRIOTT	3

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CPI USA NORTH CAROLINA LLC	1
CRABTREE PARTNERS LLC	1
CRAVEN CO BD OF ED	14
CRAVEN CO JUSTICE CENTER	2
CRAWFORD KNITTING INC	1
CROP PRODUCTION SERVICES INC	1
CROSS CANVAS COMPANY INC	3
CRUMPLER PLASTIC PIPE INC	4
CSX TRANSPORTATION	2
CTC FURNITURE DISTRIBUTORS INC	1
DAK AMERICAS LLC	3
DALIAH PLASTICS CORP	4
DATACHAMBERS LLC	1
DAY INTERNATIONAL INC	2
DCI INC	1
DEERFIELD EPISCOPAL RETIREMENT	18
DENNISON, WYNDHAM V	1
DEPT OF HEALTH & HUMAN RESOURC	34
DESCO INDUSTRIES INC	4
DEVIL DOG MFG CO INC	2
DEWEY DEVELOPMENT INC	2
DH RESEARCH TRIANGLE, LLC	1
DIXIE PIPELINE COMPANY	4
DRPFC I LLC	5
DUKE UNIV HEALTH SYSTEM INC	26
DUKE UNIVERSITY MARINE LAB	1
DUNN CITY OF	2
DUPLIN GENERAL HOSP	3
DUPONT E I DE NEMRS	10
DYNAPAR CORP	3
E CAROLINA METAL TREATING INC	2
EAGLE SPORTSWEAR LLC	4
EARTH FARE INC	3
EATON CORPORATION	6
EDWARDS BROTHERS INC	2
EDWARDS WOOD PRODUCTS INC	6
ELAND INDUSTRIES INC	1
ELASTIC THERAPY INC	3
ELECTRO SWITCH CORPORATION	1
ELEMENTIS CHROMIUM INC	4
ELKAY SOUTHERN PLANT 2	1
ELKINS SAWMILL INC	3
EMC CORPORATION	4
EMERGEORTHO PA	1
ENERGIZER BATTERY MANUFACTURIN	1

ENTERCO LLC	1
ENVIVA PELLETS SAMPSON LLC	1
ENVIVA PORT OF WILMINGTON, LLC	4
EOS ACQUISITION I LLC	1
ERICO INC	1
EVERGREEN PACKAGING INC	4
EXPRESS FOOD GROUP LLC	1
EXTREME NETWORKS INC	1
FAYETTEVILLE TECH COMM COLL	2
FCC (NC) LLC	1
FENNER DRIVES	1
FIRST BAPTIST CH OF ASHE INC	1
FIRST CITIZENS BANK	1
FIRST CITIZENS BANK & TRUST CO	5
FIRSTHEALTH FAMILY CARE CTR	2
FIRSTHEALTH OF THE CAROLINAS	39
FLETCHER HOSPITALITY, LLC	1
FLOCO FOODS INC	2
FLOWSERVE US INC	1
FLYING J INC	1
FOOD LION LLC	180
FORTRON INDUSTRIES LLC	1
FOUNTAIN POWER BOATS INC	5
FOUR SEASONS MGNT SVCS INC	1
FOUR SEASONS MNGMT SVCS INC	6
FRANK THEATRES PARKSIDE COMMON	1
FRANKLIN BAKING COMPANY LLC	7
FRANKLIN COUNTY SCHOOLS	5
FRATERNITY/SORORITY LIFE	8
FRESH BUY INC	2
FRONTIER SPINNING MILLS	1
FUJIFILM DIOSYNTH BIOTEC USA	1
FUQUAY-VARINA TOWN OF	1
FURNITURE FAIR INC	3
GALE FORCE SPORTS & ENTERTAIN	13
GALLOWAY RIDGE INC	17
GENERAL ELECTRIC CO	2
GENERAL INDUSTRIES INC	5
GENERAL PARTS DIST LLC	1
GENERAL SHALE BRICK INC	8
GENERAL TIMBER INC	4
GEORGIA PACIFIC CORP	2
GEORGIA PACIFIC WOOD PROD LLC	1
GH CRESCENT GREEN INC	1
GIBRALTAR PACKAGING GROUP INC	4

GILDAN YARNS LLC	1
GIVENS ESTATES INC	12
GIVENS HIGHLAND FARMS LLC	11
GKN DRIVELINE N AMERICA INC	4
GLAXOSMITHKLINE	6
GLEN RAVEN MILLS INC	1
GLENWOOD ASSET MANAGEMENT LLC	1
GLENWOOD HOSPITALITY ASSOC LLC	1
GLENWOOD PLACE VENTURES LLC	1
GLOBAL PACKAGING INC	1
GOLDSBORO CITY OF	2
GOLDSBORO HOUSING AUTHORITY	3
GOLDSBORO MILLING CO	13
GRANITE FALLS SWIM/ATHL CLUB	2
GREATER ASHEVILLE REG AIRPORT	1
GREDE II LLC	3
GRIFOLS THERAPEUTICS INC	6
H & H FURNITURE MFG INC	3
HALIFAX MEDIA HOLDINGS LLC	4
HANESBRANDS INC	2
HANSON AGGREGATES SE LLC	33
HANSON BRICK EAST LLC	1
HAPPY JACK INC	1
HARDEN ROAD ASSOCIATES	1
HARGER LIGHTNING & GROUNDING	1
HARNETT CO BD OF ED	24
HARNETT CO PUBLIC UTIL	6
HARNETT CO SHERIFF OFFICE	1
HARNETT HEALTH SYSTEM INC	19
HARRIS PRINTING CO INC	3
HARRIS TEETER INC	31
HASTY PLYWOOD CO	3
HAVELOCK CITY OF	1
HAYWOOD COUNTY LOCAL GOV	1
HAYWOOD REGIONAL MEDICAL CNTR	6
HCL AMERICA INC	1
HEATMASTERS LLC	3
HERAEUS QUARTZTECH AMERICA LLC	1
HEXION INC	2
HIGHWOODS JOINT VENTURE	1
HIGHWOODS REALTY LP	27
HJH ASSOCIATES	1
HOG SLAT INC	3
HOLLY SPRINGS TOWN OF	1
HOME CARE PRODUCTS LLC	1

HOME DEPOT USA INC	9
HOPE COMMUNITY CHURH OF NC INC	2
HORNWOOD INC	3
HOUSE OF RAEFORD FARMS INC	11
HOUSING AUTH CITY OF RALEIGH	2
HUGHES FURNITURE INDUSTRIE INC	1
HULSING HOTELS INC	13
HUVEPHARMA INC	1
HYDRO TUBE ENTERPRISES INC	1
IAC TROY LLC	1
IMMEDION LLC	3
INGERSOLL-RAND	1
INGLES MARKETS INC	86
INN ON BILTMORE ESTATE INC	1
INNOVATIVE LAMINATIONS CO	1
INTERNATIONAL BROADCAST BUREAU	1
INTERNATIONAL PAPER COMPANY	6
INVISTA S A R L	1
J & D WOOD INC	3
J A MCNEILL & SONS	1
J C HOWARD FARMS LLC	7
J P TAYLOR COMPANY LLC	4
J&J SNACK FOODS HANDHELDS CORP	2
JACKSONVILLE CITY OF	4
JACOB HOLM IND AMERICA INC	1
JOHN DEERE TURF CARE INC	3
JOHN O STEVENSON INC.	2
JOHNSTON CO BOARD OF EDUCATION	80
JOHNSTON CO PUBLIC UTILITIES	2
JOHNSTON MEM HOSPITAL AUTH	1
JORDAN LUMBER & SUPPLY INC	15
JOVC FOOD CORP INC	1
K MART CORP	8
KAYSER-ROTH HOSIERY INC	4
KENNAMETAL INC	2
KESSLER ASHEVILLE LLC	1
K-FLEX USA LLC	3
KILELEE, KATHRYN	1
KINGS HOLDINGS 4,LLC	3
KINGSLAND REALTY LLC	1
KLAUSSNER FURN IND INC	24
KOOPMAN DAIRIES INC	4
KORDSA INC	1
KROGER COMPANY	9
KRYOCAL, LLC	3

DE Progress EE Opt-Out at December 31, 2017
North Carolina (excludes outdoor lighting)

LAKE JUNALUSKA ASSEMBLY INC	51
LANCER INC	4
LAZAR INDUSTRIES LLC	4
LEAR CORPORATION	2
LEE BRICK & TILE COMPANY	7
LEE COUNTY COURT HOUSE	1
LEE IRON & METAL CO	5
LENOVO INTERNATIONAL	1
LEWIS SAUSAGE CO INC	1
LIBERTY COMMONS WARREN CO LLC	1
LIBERTY HEALTHCARE SERVICES	3
LIFEWAY CHRISTIAN RESOURCES OF	43
LINAMAR NORTH CAROLINA INC	4
LINPRINT CO	1
LOCAL GOVERNMENT FED CREDIT UN	1
LORD CORPORATION	2
LOUISBURG COLLEGE INC	12
LOUISE WELLS CAMERON ART MUSEU	4
LOUISIANA PACIFIC CORP	3
LOW & BONAR INC	1
LOWER CAPE FEAR WATER & SEWER	1
LOWES COMPANIES INC	25
LOWES FOODS LLC	26
LUMBERTON CELLULOSE LLC	4
M ADLER'S SON, INC	1
MAGNETI MARELLI USA INC	4
MANHATTEN AMERICAN	1
MANOR CARE OF PINEHURST INC	1
MANUFACTURING METHODS, LLC	1
MARS PETCARE US, INC	7
MARTIN MARIETTA MATERIALS INC	58
MAS US HOLDINGS INC	6
MATTHEWS & MATTHEWS INC	1
MAY FURNITURE INC	3
MCDOWELL LUMBER CO INC	11
MCGILL ENVIRONMENTAL SYS OF NC	1
MCLAMBS ABATTOIR AND MEATS INC	1
MCMURRAY FABRICS INC	7
MEASUREMENTS GROUP INC	4
MEDICAL ACTION INDUSTRIES INC	1
MEDICAL SPECIALTIES INC	1
MEMORIAL MISSION HOSPITAL INC	1
MEREDITH COLLEGE	6
MERTEK SOLUTIONS INC	1
METAL-CAD & STEEL FRAMING	1

DE Progress EE Opt-Out at December 31, 2017
North Carolina (excludes outdoor lighting)

METCHEM, LLC	1
METHODIST UNIVERSITY	3
METROPOLITAN SEWAGE DISTRICT	5
MHG ASHEVILLE AL LP	1
MICROSPACE COMM CORP	1
MINE SAFETY APPL CO INC	1
MISSION HEALTH SYSTEM INC	16
MISSION ST JOSEPH HEALTH SYS	1
MISSION ST JOSEPH HOSPITAL	1
MITCHELL CO BD OF ED	2
MMIC-TL INC PARTNERS LLC	1
MOEN INC	4
MONTGOMERY COUNTY OF	2
MOORE COUNTY	3
MOORE COUNTY SCHOOLS	18
MOORE MACHINE COMPANY	5
MOORE'S INLET LIMITED PRTNRSHP	1
MOUNTAIN PRODUCTS BRIDGEWE LLC	1
MOUNTAIRE FARMS INC	21
MT OLIVE PICKLE CO	17
MULE CITY SPEC FEED INC	2
MURPHY BROWN LLC	1
N C TELEVISION INC	1
N RALEIGH MEDICAL REALTY LLC	1
NASH BRICK CO INC	2
NASH COMMUNITY COLLEGE	8
NASH COUNTY	1
NASH COUNTY MANAGERS OFFICE	1
NASH ROCKY MOUNT BD OF ED	23
NATIONAL FOAM INC	2
NATIONAL SPINNING CO INC	5
NATIONAL WIPER ALLIANCE INC	1
NATURAL BLEND VEG DEHYDR LLC	1
NATURES EARTH PELLETS INC LLC	3
NC DEPT OF AGRICULTURE	3
NC FARM BUREAU FEDERATION	1
NC STATE FAIRGROUNDS	5
NC STATE PORTS AUTH	12
NC STATE PORTS AUTHORITY	17
NC STATE UNIVERSITY	146
NC STATE VETERANS HOME	2
NC WILDLIFE COMMISSION	1
NESBITT ASHEVILLE VENTURE LLC	2
NEW BELGIUM BREWING CO INC	1
NEW HANOVER CO BD OF ED	20

DE Progress EE Opt-Out at December 31, 2017

North Carolina (excludes outdoor lighting)

NEW HANOVER REGIONAL MED CTR	32
NG PURVIS FARMS INC	3
NHC PROPERTY MANAGEMENT	1
NOBLE OIL SERVICES	4
NOMACO INC	3
NOMACORC LLC	3
NORCRAFT COMPANIES LP	2
NORTH CAROLINA MFG CO INC	1
NORTH HILLS TOWER II LLC	3
NOVARTIS VACCINES & DIAGNOSTIC	1
NOVIPAX LLC	4
NOVO NORDISK PHARMACUTICAL INC	4
NOVOZYMES NORTH AMERICA INC	6
NYPRO ASHEVILLE INC	2
OFFICE OF INFOR TECH SVCS	4
OHM HOTELS RTP, LLC	1
OLDCASTLE LAWN & GARDEN INC	5
OLIVER RUBBER COMPANY	2
OMNI GROVE PARK LLC	21
ONSLOW CO BD OF COMM	2
ONSLOW CO BD OF EDUC	4
ONSLOW MEMORIAL HOSPITAL AUTH	2
ONSLOW WATER AND SEWER AUTH	5
ORACLE AMERICA, INC	2
OWENS & MINOR	1
P G & C INC	2
PACTIV LLC	1
PAK A SAK FOOD STORES	1
PALLET EXPRESS, INC	4
PALZIV NORTH AMERICA INC	1
PARADIGM ANALYTICAL	1
PARK COMMUNICATIONS LLC	2
PARK N SHOP FOOD MART INC	6
PARKDALE AMERICA LLC	2
PARRISH & RONE INC	1
PCS PHOSPHATE CO INC	3
PEAK 10 INC	3
PENDER CO BD OF ED	17
PENDER MEMORIAL HOSPITAL INC	7
PENICK VILLAGE IN	2
PENICK VILLAGE INC	10
PENTAIR VALVES &CONTROLS US LP	3
PENTAIR WATER POOL AND SPA INC	10
PEPSI BOTTLING VENTURES LLC	4
PEPSI COLA BOTTLING CO	1

PEPSI COLA OF WILMINGTON	2
PERDUE FARMS INC	23
PERSON CO BD OF ED	2
PETROLEUM TANK CO	2
PFIZER INC	12
PFRS CROSSROADS CORP	4
PH HS LLC	1
PHOENIX LTD PARTNERSHIP	1
PIEDMONT NATURAL GAS	1
PIEDMONT NATURAL GAS CO	1
PILGRIMS PRIDE CORPORATION	6
PILKINGTON	1
PINEHURST LLC	84
PINEHURST MEDICAL CLINIC	1
PIONEER HI BRED INC	4
PLASTEK IND INC (PA) NC	3
PLASTICARD PRODUCTS INC	1
POLYMER GROUP INC	3
POLYZEN INC	1
PORT CITY COMMUNITY CHURCH	3
PR II WADE PARK LLC	3
PRAXAIR INC	2
PRC NC LLC	2
PRECISION HYDRAULIC CYL INC	3
PRECISIONAIRE INC	3
PREMIERE FIBERS INC	4
PRESTAGE AGENERGY OF NC LLC	2
PRESTAGE FARMS INC	36
PRESTIGE FABRICATORS INC	3
PRESTON TAYLOR FOOD INC	1
PRINTLOGIC LLC	2
PRO PALLET SOUTH INC	1
PSNC ENERGY	1
PUBLIC SCHOOLS OF ROBESON CO	1
PUBLIX NORTH CAROLINA LP	2
QUAIL HAVEN OF PINEHURST LLC	1
QUALCOMM INC	1
QUALITY CHEMICAL LABORATRS LLC	2
QUALITY TEXTILE SERVICES INC	1
RAEFORD CITY OF	1
RAILROAD FRICTION PRODUCT CORP	4
RALEIGH CITY OF	6
RALEIGH FITNESS & WELLNESS	1
RALEIGH HOTEL OPERATOR INC	1
RANDOLPH COUNTY	9

RAVEN ANTENNA SYSTEMS INC	1
RC CREATIONS, LLC	2
RD AMERICA LLC	1
RDU AIRPORT AUTHORITY	6
RED HAT INC	1
RED WOLF COMPANY, LLC	1
REDDY ICE CORP	2
REGAL CINEMAS	2
REGAL ENTERAINMENT GROUP	4
RESINART EAST INC	1
REVLON CONSUMER PRODUCTS CORP	3
REX HEALTH CARE INC	14
REX MOB PARTNERS LLC	1
RHEINFELDEN AMERICAS LLC	1
RICHMOND COUNTY	1
RICHMOND COUNTY BOARD OF COMM	2
RICHMOND COUNTY SCHOOLS	2
RICHMOND SPECIALTY YARNS LLC	2
RIDGECREST CONFERENCE CENTER	6
ROBESON COUNTY DSS	1
ROCKINGHAM CITY OF	1
RODECO CO	2
ROSTRA PRECISION CT INC	2
ROYAL TEXTILE MILLS INC	1
RUBY'S PROPERTIES II LLC	1
S AND J HOLDINGS LLC	1
S B SMITH & SON INC	3
S B SMITH & SON INC	1
S T & F PRECISION INC	1
S T WOOTEN CORPORATION	17
SAMPSON REGIONAL MEDICAL CTR	3
SANDERSON FARMS INC	1
SANDHILLS COMM COLLEGE	12
SANFORD CITY OF	4
SANFORD LEE CO BD OF ED	15
SANFORD MILLING CO INC	2
SAPONA MFG CO INC	2
SAS INSTITUTE INC	43
SCHINDLER ELEVATOR CORP	2
SCOTLAND CONTAINER INC	2
SCOTLAND MANUFACTURING	1
SEARS ROEBUCK & CO	4
SENTRY FURNITURE LLC	1
SEPARATION TECHNOLOGIES LLC	2
SIGMA PHI EPSILON	1

DE Progress EE Opt-Out at December 31, 2017

North Carolina (excludes outdoor lighting)

SILAR LABORATORIES, INC.	1
SILER CITY TOWN OF	2
SILVER LINE PLASTICS CORP	11
SINCLAIR BROADCAST GROUP INC	1
SIX FORKS OFFICE, LLC	3
SKYLAND BEER DIST	3
SMITHFIELD PACKING CO INC	6
SMOKY MOUNTAIN MACHINING INC	3
SNEEDEN, NORMAN E	2
SNUG HARBOR MANAGEMENT LLC	1
SONOCO PRODUCTS CO	1
SOUTH RIVER EMC COMM ASST CORP	1
SOUTHCO INC OF NC	1
SOUTHEASTERN CONTAINER INC	1
SOUTHEASTERN REGIONAL MED CTR	4
SOUTHERN BAG CORP	1
SOUTHERN FABRICATORS INC	4
SOUTHERN PINES TOWN OF	3
SOUTHERN PRODUCE DIST INC	8
SOUTHERN PRODUCTS & SILICA CO	6
SOUTHERN STATES CHEMICAL INC	3
SPANSET INC	1
SPECGX LLC	13
SPIRIT AEROSYSTEMS INC	2
SPORTS FACTORY LLC	3
SPX FLOW TECHNOLOGY SYSTEMS	1
ST ANDREWS PRESBYTERIAN COLL	1
ST. DAVIDS SCHOOL	7
STAN JOHNSON & ASSOCIATES LLC	2
STANADYNE INC	2
STARPET INC	6
STATIC CONTROL COMP INC	11
STEEL & PIPE CORP	2
STEVEN ROBERTS ORIGINAL	2
STI POLYMER INC	1
SUN LIFE ASSURANCE CO OF CANAD	1
SUNBRIDGE REGENCY NC INC	2
SUNRISE SENIOR LIVING	1
SUPERIOR MODULAR PRODUCT INC	1
SUPERIOR PLASTICS EXTRUSION	1
SUPERTEX, INC	4
SURGERY CENTER OF PINEHURST	1
SURGICAL CARE AFFILIATES	1
SURTRONICS	2
SVT VENTURES LP	10

DE Progress EE Opt-Out at December 31, 2017

North Carolina (excludes outdoor lighting)

SYRACUSE PLASTIC OF NC INC	1
TALBERT BUILDING SUPPLY INC	2
TARGET STORES	18
TCDC PARTNERSHIP, LLC	2
TE CONNECTIVITY CORPORATION	2
THE ATRIUM AT BLUE RIDGE, LLC	1
THE BILTMORE COMPANY	2
THE CHEESECAKE FACTORY	1
THE CHEMOURS COMPANY FC, LLC	7
THE COUNTRY CLUB OF NC INC	1
THE CYPRESS OF RALEIGH	7
THE HARRELSON BUILDING INC	1
THE NEWS REPORTER CO INC	1
THE QUARTZ CORP USA	17
THE UMSTEAD	1
THEO DAVIS SONS INC	1
THERMAL METAL TREATING INC	2
THIRD & GRACE LLC	2
THIRD STREET SCREEN PRNTNGINC	2
TIERPOINT LLC	3
TIPPER TIE INC	3
TOP TOBACCO CO	3
TOWN SQUARE WEST LLC	7
TRAM LUMBER LLC	3
TRAMWAY VENEERS INC	1
TRANS CAROLINA PRODUCTS LLC	1
TREEHOUSE FOODS INC	6
TRIANGLE AQUATIC CENTER	1
TRIANGLE BRICK CO	6
TRIANGLE TOWN CENTER, LLC	19
TRINITY MANUFACTURING INC	5
TROY LUMBER CO	17
TROY POLYMER INC	1
TUCSON CARY, LLC	1
TURN BULL LUMBER COMPANY	1
TYCO ELECTRONICS	1
TYSON FOODS INC	3
U S REIF 4700 FALLS NC LLC	1
UCHIYAMA MANUF AMERICA LLC	3
UNC AT ASHEVILLE	8
UNC INSTITUTE OF MARINE SCI	3
UNC PUBLIC TV OF NC	1
UNCW	29
UNILEVER MANUFACTURING US INC	6
UNILIN NORTH AMERICA LLC	4

DE Progress EE Opt-Out at December 31, 2017

North Carolina (excludes outdoor lighting)

UNILIN US MDF	3
UNIMIN CORPORATION	49
UNISON ENGINE COMPONENTS INC	3
UNITED STATES COLD STORAGE INC	6
UNIVERSAL HEALTHCARE N RAL INC	1
UNIVERSAL LEAF NORTH AMERICA	3
UNIVERSITY OF NC AT PEMBROKE	16
UNIVERSITY RESEARCH UNIT	1
US ARMY	1
US ARMY FORT BRAGG	3
US DEPT OF AIR FORCE	1
US FLUE CURED TOBACCO GROWERS	1
US MARINE CORP	1
US MARINE CORPS	1
US POST OFFICE	3
US VETERANS ADMIN HOSPITAL	3
USS NC BATTLESHIP COMM	2
UWHARRIE FRAME MFG LLC	2
UWHARRIE LUMBER CO	3
VALLEY PROTEINS INC	15
VANGUARD CULINARY GROUP LTD	1
VENEER TECHNOLOGIES INC	7
VENTURE CENTER LLC	4
VERTEX RAILCAR CORPORATION	2
VICTAULIC CO OF AMERICA	2
VONDREHLE CORP	6
VULCAN CONST MATERIALS LP	26
W N WILDER CO INC	1
WADESBORO IGA INC	1
WAKE CO HOSP SYSTEM INC	4
WAKE COUNTY BOARD OF EDUCATION	210
WAKE COUNTY GENERAL SERVICES	16
WAKE STONE CORP	17
WAKEMED PROPERTY SERVICES	13
WAL MART PDC #6091	4
WALMART STORES INC	76
WALNUT CREEK AMPHITHEATER	5
WARP TECHNOLOGIES INC	1
WARREN CO BD OF ED	5
WAYNE BAILEY INC	2
WAYNE CO PUBLIC SCHOOLS	1
WAYNE COMMUNITY COLLEGE	1
WAYNE COUNTY	4
WAYNE MEMORIAL HOSPITAL INC	9
WAYNESVILLE TOWN OF	1

DE Progress EE Opt-Out at December 31, 2017

North Carolina (excludes outdoor lighting)

WELLS FARGO BANK NA	2
WEST CRAVEN HIGH SCHOOL	3
WEST CRAVEN MIDDLE SCHOOL	1
WEST FRASER INC	5
WESTERN NC HEALTHCARE INNO III	1
WESTERN NC HEALTHCARE INNO LLC	1
WEYERHAEUSER NR COMPANY	5
WHITEVILLE FABRICS LLC	4
WILLIAM BARNET & SON INC	5
WILLIAMS PROPERTY GROUP INC	1
WILMINGTON CITY OF	2
WILMINGTON HOTEL ASSOC CORP	2
WILMINGTON ICE VENTURES LLC	1
WILMINGTON INTL AIRPORT	2
WILMINGTON MACHINERY INC	1
WILSONART INTERNATIONAL	4
WNC PALLET & FOREST PRDCTS INC	5
WRDC LLC	1
WRIGHT FOODS INC	2
WRIGHT MACHINE & TOOL CO INC	1
XELLIA PHARMACEUTICALS USA LLC	1
YALE INDUSTRIAL PRODUCTS INC	1
YAMCO LLC	1
YMCA OF WESTERN NORTH CAROLINA	2
Total	**4,165**

Duke Energy Progress, Inc

Industrial and Commercial Accounts that Opted In (2017)

Customer's Name	EE	DSM	Grand Total
Elastic Therapy, Inc.	0	2	2
Elastic Therapy, Inc.	0	1	1
Vulcan Construction Materials	0	3	3
Carlie C Operation Center, Inc.	0	4	4
Carteret General Hospital	0	3	3
Target Stores	11	0	11
Bjt, Inc	1	0	1
Sandhills Comm College	9	0	9
Belk Inc	1	0	1
Campbell University	1	0	1
General Industries Inc	1	0	1
The Harrelson Building Inc	1	0	1
Jovc Food Corp Inc	1	0	1
P G & C Inc	1	0	1
H & H Furniture Mfg Inc	1	0	1
Ohm Hotels Rtp, Llc	1	0	1
Haywood Regional Medical Cntr	1	0	1
Steel & Pipe Corp	1	0	1
Total			**44**

EM&V Activities

Planned Evaluation, Measurement and Verification (EM&V) Activities through the rate period (Dec. 31, 2018)

Evaluation is a term adopted by Duke Energy Progress (DEP), and refers generally to the systematic process of gathering information on program activities, quantifying energy and demand impacts, and reporting overall effectiveness of program efforts. Within evaluation, the activity of measurement and verification (M&V) refers to the collection and analysis of data at a participating facility/project. Together this is referred to as "EM&V."

Refer to the accompanying Evans Exhibit 11 chart for a schedule of process and impact evaluation analysis and reports that are currently scheduled.

Energy Efficiency Portfolio Evaluation

DEP has contracted with independent, third-party evaluation consultants to provide the appropriate EM&V support, including the development and implementation of an evaluation plan designed to measure the energy and demand impacts of the residential and non-residential energy efficiency programs.

Typical EM&V activities:

- Develop evaluation action plan
- Process evaluation interviews
- Collect program data
- Verify measure installation and performance through surveys and/or on-site visits
- Program database review
- Impact data analysis
- Reporting

The process evaluation provides unbiased information on past program performance, current implementation strategies and opportunities for future program improvements. Typically, the data collection for process evaluation consists of surveys with program management, implementation vendor(s), program partner(s), and participants; and, in some cases, non-participants. A statistically representative sample of participants will be selected for the analysis.

The impact evaluation provides energy and demand savings resulting from the program. Impact analysis may involve engineering analysis (formulas/algorithms), billing analysis, statistically adjusted engineering methods, and/or building simulation models, depending on the program and the nature of the impacts. Data collection may involve surveys and/or site visits. A statistically representative sample of participants is selected for the analysis. Duke Energy Progress intends to follow industry-accepted methodologies for all measurement and verification activities, consistent with International Performance Measurement Verification Protocol (IPMVP) Options A, C or D depending on the measure.

The field of evaluation is constantly learning from ongoing data collection and analysis, and best practices for evaluation, measurement and verification continually evolve. As updated best practices are identified in the industry, DEP will consider these and revise evaluation plans as appropriate to provide accurate and cost-effective evaluation.

Demand Response Program Evaluation

DEP has contracted with independent, third-party evaluation consultants to provide an independent review of the evaluation plan designed to measure the demand impacts of the residential and non-residential demand response programs and the final results of that evaluation.

Typical EM&V activities:

- Collect program data
- Process evaluation interviews
- Verify operability and performance through on-site visits
- Collect interval data
- Program database review
- Benchmarking research
- Dispatch optimization modeling
- Impact data analysis
- Reporting

The process evaluation provides unbiased information on past program performance, current implementation strategies and opportunities for future improvements. Typically, the data collection for process evaluation consists of surveys with program management, implementation vendor(s), program partner(s), and participants; and, in some cases, non-participants. A statistically representative sample of participants will be selected for the analysis.

The impact evaluation provides demand savings resulting from the program. Impact analysis for EnergyWise involves a simulation model to calculate the duty cycle reduction, and then an overall load reduction. Impact analysis for CIG-DR involves statistical modeling of an M&V baseline load shape for a customer, then modeling the event period baseline load shape and comparing to the actual load curve of the customer during the event period.

The field of evaluation is constantly learning from ongoing data collection and analysis, and best practices for evaluation, measurement and verification continually evolve. As updated best practices are identified in the industry, DEP will consider these and revise evaluation plans as appropriate to provide accurate and cost-effective evaluation.

DEP DSM/EE Programs - Anticipated EM&V Schedule

Program Name	NC Docket	SC Docket	Short name	2018 3rd Quarter	2018 4th Quarter	2019 1st Quarter	2019 2nd Quarter	2019 3rd Quarter	2019 4th Quarter
Commercial Demand Response	Docket No. E-2, Sub 953	Docket 2010-41-E	CIG DR				REP (2018)		
Distribution System Demand Response	Docket No. E-2, Sub 926	Docket 2009-190-E	DSDR						
Nonresidential Smart $aver EE Products & Assessment (Prescriptive)	Docket No. E-2, Sub 938	Docket 2009-190-E	EEB					PROC/IMP	
Nonresidential Smart $aver EE Products & Assessment (Custom)	Docket No. E-2, Sub 938	Docket 2009-190-E	EEB	REP					
EnergyWise	Docket No. E-2, Sub 927	Docket 2009-190-E	EW	REP (S2017) REP (W2017/2018)		REP (S2018)		REP (W2018/2019)	
EnergyWise for Business	Docket No. E-2, Sub 1086	Docket 2015-163-E	EWB	REP (2017)			REP (2018)		
Energy Efficiency Education	Docket No. E-2, Sub 1060	Docket 2014-420-E	K12	PROC/IMP	REP (2017/2018)				
Residential Energy Assessment	Docket No. E-2, Sub 1094	Docket 2016-82-E	REA	REP					
Lighting (Retail)	Docket No. E-2, Sub 950	Docket 2010-41-E	LP						
Multi-Family Energy Efficiency	Docket No. E-2, Sub 1059	Docket 2014-419-E	MF	PROC/IMP	REP				
My Home Energy Report	Docket No. E-2, Sub 989	Docket 2011-180-E	MyHER			REP			
Neighborhood Energy Saver	Docket No. E-2, Sub 952	Docket 2009-190-E	NES			PROC	IMP	REP	
Residential New Construction	Docket No. E-2, Sub 1021	Docket 2015-237-E	RNC						
Residential Save Energy & Water Kit	Docket No. E-2 Sub 1085	Docket 2015-322-E	SEW			PROC/IMP	REP		
Small Business Energy Saver	Docket No. E-2, Sub 1022	Docket 2015-163-E	SBES	REP					

LEGEND	
PROC	Process surveys/interviews (customers or other) for purposes of report that follows
IMP	Impact data collection (onsites, billing data) and analysis for purposes of report that follows
REP	Evaluation, Measurement & Verification Report

NOTE: THESE DATES ARE SUBJECT TO CHANGE

NAVIGANT

2016 EM&V Report for the Duke Energy Progress Commercial, Industrial, and Governmental Demand Response Automation (DRA) Program

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Duke Energy Progress

Prepared by:

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DUKE ENERGY®

June 19, 2017

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2016 EM&V Report for the Duke Energy Progress Commercial, Industrial, and Governmental Demand Response Automation (DRA) Program

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Attached as separate documents:
Appendix A: Event Day Load Profile and Baseline Plots (.pdf document)
Appendix B: Analysis Data Tables & Graphics (.xlsx document)

EXECUTIVE SUMMARY

The Commercial, Industrial, and Governmental Demand Response Automation (DRA) program is part of the portfolio of demand-side management and energy efficiency (DSM/EE) programs initiated by Duke Energy Progress (DEP) in 2009. DRA offers participating companies and agencies a financial incentive to reduce their electricity consumption when called upon by DEP. This report covers evaluation, measurement, and verification (EM&V) activities for the seventh year of DRA, Program Year 2016 (PY2016).

This EM&V report is intended to verify program impacts as per the requirements established by the North Carolina Utilities Commission and the Public Service Commission of South Carolina. Major objectives of the evaluation were as follows:

- Verify the demand reduction calculated by DEP's method of baseline estimation as described in the *Demand Response Automation Rider DRA-7 (North Carolina) and DRA-8 (South Carolina)* filed by DEP [1]
- Produce a set of verified program impacts by customer and for the program as a whole using the most accurate baseline method identified in PY2010 and PY2011
- Provide an estimate of program capability at a range of different temperatures using the estimated impacts

Program Summary

The DRA program offers participating companies and agencies a financial incentive to reduce their electricity consumption for up to 8 hours at a time on only a few system peak days in either the summer or winter months. PY2016 is the first year since PY2013 in which DEP did not call system-wide winter DRA events. Under the program, DEP's technology vendor (Comverge) installs two-way communications equipment to remotely monitor and record interval loads. Customer load curtailments are commonly provided through the use of onsite generation or from shutting down manufacturing processes. Curtailments might also include modifications in the use of heating, ventilation, and air conditioning (HVAC) systems, lighting, and other building loads.

In PY2016, 18 customers were registered as participants in DEP's DRA program, representing 46 unique sites and 59 meters. Of the 59 meters that were registered as participants in PY2016, 26 are at commercial sites and three are at governmental sites (water treatment and detention facilities). Thirty meters are at industrial sites, 16 of which belong to a single manufacturing company. For brevity, the very large industrial participant (with 16 meters) is referred to in this report as the "VLIP."

An overview of the participating customers and average reported DR impacts for summer events is presented in Table 1.

[1] North Carolina Rider, DRA-7: https://www.duke-energy.com/_/media/pdfs/rates/gp2ncriderdradep.pdf?la=en
South Carolina Rider, DRA-8: https://www.duke-energy.com/_/media/pdfs/for-your-home/rates/electric-sc/gp1scriderdra.pdf?la=en

Table 1. Summary of Participating Companies and Agencies

Sector	Customer Type	Number of Customers	Number of Sites	Number of Meters	Avg. Reported Reduction per Meter (kW)
Commercial	Warehouse/ Distribution	1	1	1	620
Industrial	Manufacturing	7	17	30	248
Governmental	Government Institution	1	1	1	2,813
Governmental	Water Treatment	2	2	2	832
Commercial	Grocery	3	21	21	270
Commercial	Office	3	3	3	354
Commercial	Hospital/Medical	1	1	1	0
	Total Program	**18**	**46**	**59**	**N/A**

Source: DEP DRA program database

Evaluation Methods

The PY2016 evaluation consisted of an impact evaluation only. The methods used for the evaluation are summarized below.

1. **Replication of DEP-Reported Impacts**

   The evaluation team used interval data for all participant meters and event schedule data to calculate a baseline for each event and each participant meter. These baselines were all calculated using the algorithm Duke Energy uses to report program impacts and calculate participant incentives for settlement purposes.

2. **Verification of Program Impacts**

   Navigant estimated verified impacts by comparing a regression-estimated baseline to actual event day demands. The team estimated baselines using individual customer regressions. This approach is the result of a set of tests conducted as part of the PY2011 and PY2012 evaluation to determine the most accurate approach for estimating impacts, as well as incremental improvements implemented by the evaluation team over the years of the evaluation.

3. **Estimation of Program Capability**

   The evaluation team estimated DRA program capability by applying meter-specific regression-estimated parameters to a range of possible temperatures, and then applying to these notional baselines the average percentage reduction achieved by the meter across all summer PY2016 events. This analysis delivers an estimate of the program impacts that might be expected at each of the outdoor temperatures in the range tested.

Key Findings

Three DRA events were called during the summer of PY2016, involving 59 unique customer meters.

This section outlines the key findings of this impact evaluation.

Key Impact Findings

The key impact evaluation findings are:

- **Verified impacts were slightly less than reported impacts.** The realization rate for the summer DR impacts for PY2016 was 96%, with an average of approximately 17.6 MW of DR contributed by the program.
- **Participation[2] remains inconsistent between events.** The average total event impacts for the summer of PY2016 were highest for the second event (19.4 MW), but substantially lower for the first and third events (16.7 MW). The reduced impact in the first and third events was due primarily to non-participation by major program contributors.
- **Total program impact decreased in PY2016 compared to PY2015.** The average event impact declined from about 20.5 MW in PY2015 to about 17.6 MW in PY2016. Duke Energy staff indicate that changes in US Environmental Protection Agency (EPA) regulations regarding onsite generators are a major contributor to this change and that changes in these regulations have resulted in the loss to the program of participants accounting for 5 MW of contracted DR.

The EM&V analysis found average load reductions of approximately 17.6 MW per summer event—approximately 300 kW per meter, or 96% of the figure reported[3] by Duke Energy in its DRA program database (Table 2). On average, the relative precision associated with the baselines used to develop estimated impacts, during event periods, was +/- 1.3% at the 90% confidence level.

Table 2. Verified Load Reductions and EM&V Verification Rate – Summer

Load Reduction Category	Event kW			Avg. Total Reduction Over Summer Events
	2016-06-23	2016-07-08	2016-07-26	
Reported (Duke Energy Database)	17,849	20,576	16,639	18,355
Verified	16,720	19,410	16,748	17,626
Relative Precision (Verified Impacts +/-)	1.2%	1.2%	1.4%	1.3%
Verified Realization Rate (Verified Reductions/Reported Reductions	94%	94%	101%	96%

Sources: DEP DRA program database and Navigant analysis

The evaluation team found that, as in previous years' evaluations, the VLIP's demand was highly variable across many of its meters in the summer of 2016. On many non-holiday weekdays demand for a given meter was close to zero and on others in the range of hundreds of kilowatts. These volatile patterns of use cause the estimated baselines and impacts for each of the individual meters to be less reliable than for other meters with a more consistent pattern of demand.

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[2] Event-specific participation refers to enrolled participants delivering more than 0 kW of DR for a given event. An enrolled customer meter has participated in only two of three events if that meter has contributed more than 0 kW on only two of the three events.

[3] Reported impacts are those impacts calculated by DEP using the DRA baseline algorithm.

Navigant successfully replicated the DEP settlement baseline and reported impacts for every meter/event pair but two. The evaluation team was unable to replicate the impacts reported for one meter on two events because no data was available for this meter for a substantial portion of the summer including those events. DEP assumed an impact of 100 kW for both events affected by the meter malfunction (the reported impact for the event for which data does exist is approximately 105 kW).

As in previous program year evaluations, a set of plots of event day load profiles—by meter—is included in Appendix A (separate document). These plots provide the average hourly demand, the load-adjusted regression baseline, and a non-load-adjusted regression baseline for each event and for each participating meter. These plots also highlight the evaluated event period and the period used to calculate the day-of load adjustment. The evaluation team has found this set of plots to be extremely useful for its analysis and would recommend examining them after (or while) reading the report below.

1. INTRODUCTION

The Commercial, Industrial, and Governmental (CIG) Demand Response Automation (DRA) program is part of the portfolio of demand-side management and energy efficiency (DSM/EE) programs initiated by Duke Energy Progress (DEP) in 2009. DRA offers participating companies and agencies a financial incentive to reduce their electricity consumption for up to 8 hours at a time on a few peak days.

This report covers evaluation, measurement, and verification (EM&V) activities for the seventh year of the DRA program, Program Year 2016 (PY2016). EM&V is a term adopted by DEP and refers generally to the assessment and quantification of the energy and peak demand impacts of an EE or DR program. For DR, estimating reductions in peak demand is the primary objective, as energy impacts are generally negligible.

1.1 Objectives of the Evaluation

This EM&V report is intended to verify program impacts as per the requirements established by the North Carolina Utilities Commission and the Public Service Commission of South Carolina. Major objectives of the evaluation were as follows:

- Verify the demand reduction calculated by DEP's method of baseline estimation as described in the *Demand Response Automation Rider DRA-7 (North Carolina) and DRA-8 (South Carolina)* filed by DEP [4]
- Produce a set of verified program impacts by customer and for the program as a whole using the most accurate baseline method identified for the largest industrial participant (determined in PY2011) and for the balance of participants' meters (based on PY2010's analysis)
- Use the verified program impacts estimated in 2016 to produce an estimate of program capability across a range of possible temperatures

1.2 Program Overview

The DRA program was developed in response to DEP's determination that a curtailable load program would be a valuable resource for the company and an additional service offering for customers that would complement DEP's existing load curtailment riders. The program seeks to increase DEP's DR resources by improving customer receptiveness to curtailment programs through increased awareness of load reduction potential and restructuring of the incentives and non-compliance charges used for current DR programs.

The DRA program offers participating companies and agencies a financial incentive to reduce their electricity consumption for up to 8 hours at a time on only a few system peak days annually. Under the program, DEP's technology vendor (Comverge) installs two-way communications equipment to remotely monitor and record interval loads.

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[4] North Carolina Rider, DRA-7: https://www.duke-energy.com/_/media/pdfs/rates/gp2ncriderdradep.pdf?la=en
South Carolina Rider, DRA-8: https://www.duke-energy.com/_/media/pdfs/for-your-home/rates/electric-sc/gp1scriderdra.pdf?la=en

Eligibility. To qualify for the program, DEP commercial and industrial customers must be able to curtail 75 kW. Importantly, all industrial customers and any commercial customers that use more than 1 million kWh per year must also elect to forego the opportunity to opt out of the rider that funds DEP's DSM/EE programs. By foregoing the opt out, customers become eligible for DSM/EE incentives and commit to pay the rider for a period of 3 years.[5] Effective January 1, 2016, the time period in which customers commit to pay the rider was reduced from 10 years to 3 years.

Incentives. The program provides three types of participant incentives:

- **A one-time participation incentive of $50 per demonstrated kW.** Intended to enhance customer acquisition and to support customer investment related to program participation, including purchase and installation of automated controls
- **A monthly availability credit of $3.25 per contracted kW.** Intended to provide steady payment streams and ensure readiness
- **An event performance credit of $6 per curtailed kW.** Intended to increase resource reliability through an emphasis on event compliance

This three-part incentive structure was selected to benefit customers for responding to more events and to ensure that DEP pays for performance but limits its costs when few events are called. As a pay for play program, it ensures that customers will receive more incentives when the need for peak reduction is high.

1.3 Reported Program Participation and Savings

In PY2016, 18 customers were registered as participants in DEP's DRA program, representing 46 unique sites and 59 meters. Of the 59 meters, 26 are at commercial sites and three are at governmental sites (water treatment and detention facilities). Thirty meters are at industrial sites, 16 of which belong to a single manufacturing company. For brevity, the very large industrial participant (with 16 meters) is referred to in this report as the VLIP.

An overview of the participating customers is presented in Table 3, including number of meters and sites by customer type and the average demand reduction reported by DEP over the three summer events by customer type.

[5] Prior to January 1, 2016, the required commitment was 10 years.

Table 3. Summary of Participating Customers

Sector	Customer Type	Number of Customers	Number of Sites	Number of Meters	Avg. Reported Reduction per Meter (kW)[6]
Commercial	Warehouse/Distribution	1	1	1	639
Industrial	Manufacturing	7	17	30	217
Governmental	Government Institution	1	1	1	2,874
Governmental	Water Treatment	2	2	2	735
Commercial	Grocery	3	21	21	279
Commercial	Office	3	3	3	257
Commercial	Hospital/Medical	1	1	1	0
	Total Program	**18**	**46**	**59**	**N/A**

Source: DEP DRA program database

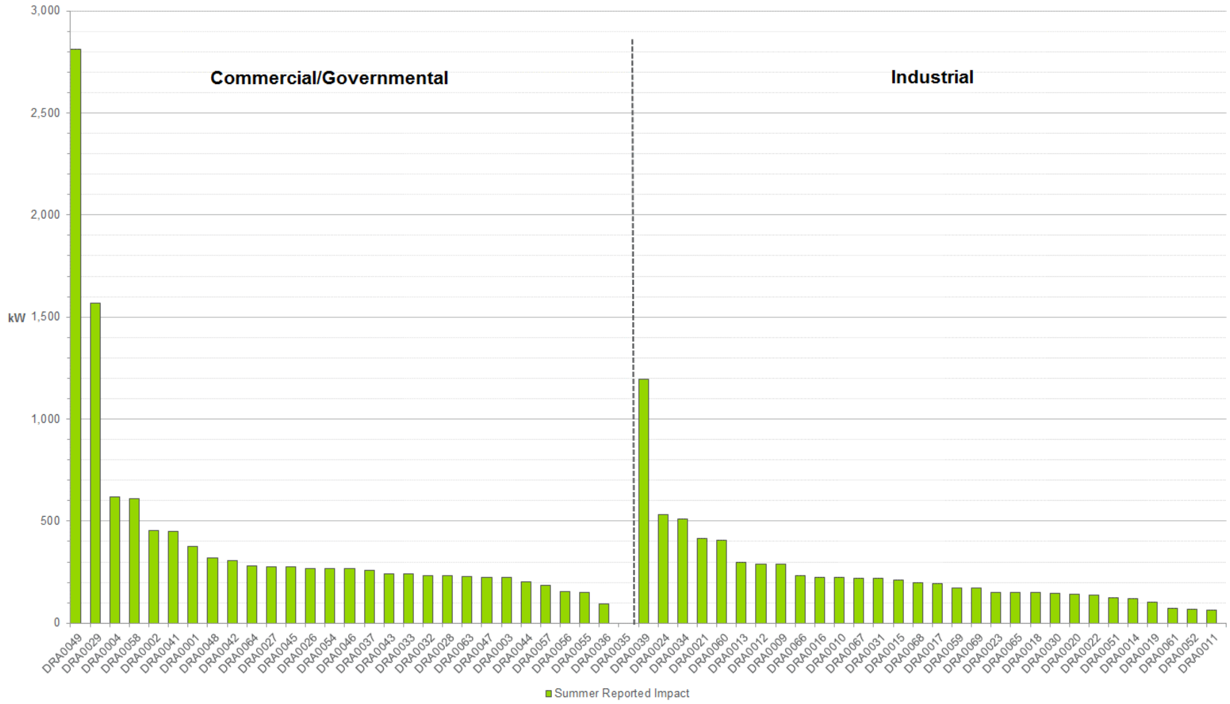
The average reported impacts shown above are the average only of the impacts for event/participant pairs where DEP reported a non-zero impact. The Hospital/Medical customer type included only 1 meter that was a major program contributor in 2015, but contributed no reported impacts in 2016.

PY2016 average reported[7] event curtailments at individual meters ranged from 65 kW to over 2,800 kW, as shown in Figure 1. In this chart, meters are segregated by sector: commercial/governmental and industrial.

[6] Average reported demand by customer type is calculated as the average by customer type of the average individual meter impacts across events in which participants achieved some DR. Because these values are based only on compliant reported DR achievement, a total calculated based on the values in this table will overstate the total reported average DR achieved across the three events. This value is reported in Table 2 and **Error! Reference source not found.**.

[7] Note that as per the convention of this report, reported impacts refer to the settlement impacts estimated using the DEP baseline algorithm and not the regression-estimated verified impacts.

Figure 1. Reported Load Reductions (kW) by Meter



Source: DEP DRA program database

2. EVALUATION METHODS

This section describes the methods and data used by the evaluation team to conduct the PY2016 impact evaluation of the CIG DRA program.

Estimating impacts of DR events is generally a matter of first estimating a counter-factual baseline of what a customer's load would have been during the hours of the curtailment event had the event not been called. Actual measured loads are then subtracted from this baseline to estimate load reductions. The baseline estimation methods used by DEP and by the evaluation team are discussed below.
The evaluation team used the following data in its analysis:

- Quarter-hourly interval data for 59 DRA program participants between November 1, 2015 and September 30, 2016
- Quarter-hourly observations of temperature data from National Oceanic and Atmospheric Administration (NOAA) weather stations
- Event logs supplied by DEP indicating the date, and start and end time of each event, as well as the time at which participants were notified of an imminent event.

Using this data, the evaluation team conducted three principal sets of analyses:

1. **Replication of the savings calculations provided by DEP**, which estimated baselines using the three qualifying non-excluded days immediately prior to an event.
2. **Estimation of the impact of events for all meters** using a regression-derived baseline. Unlike in some previous program years, day-of-load adjustments could not be applied to the baselines. Day-of-load adjustments are possible when participants are notified on the date of the event. Notification was provided day-ahead for all three events in 2016.
3. **Estimation of the program's capability under a range of different temperatures.** This capability was estimated by applying the parameters estimated in #2 to a range of temperatures and to the PY2016 impacts (as a percentage of estimated baseline).

Evaluations of DSM/EE programs commonly estimate a net-to-gross (NTG) ratio based on the evaluated percentage of demand reductions that may be ascribed either to free ridership (which reduces the NTG ratio) or program spillover (which increases the NTG ratio). Free ridership is typically defined as the percentage of demand reductions that would have occurred anyway, absent the presence of the program. Participant spillover is typically defined as incremental demand reductions undertaken by a program's participants though not directly incented or promoted by the program administrator.

In the case of DR programs such as DRA, there is no reason to expect that a customer would curtail loads during the event periods (the timing of which would be unknown to the customer absent participation in the program) without being enrolled in the program. Furthermore, because demand reductions are estimated relative to an estimated baseline that captures expected participant behavior absent an event, the analysis inherently accounts for free ridership and participant spillover; that is, absent the DRA program, none of the observed demand reductions would have taken place. Based on the above considerations, the evaluation team considers the NTG ratio for the impact analysis of the DRA program to be 1.0.

2.1 Replication of the DEP Savings Calculations

DEP estimated load reductions using a baseline calculation method developed internally by DEP and described in *Demand Response Automation Rider DRA-7 (North Carolina) and DRA-8 (South Carolina)*[8] filed by DEP. The evaluation team replicated DEP's algorithm to confirm the results reported by DEP.

The DEP algorithm[9] generates a baseline for calculating program impacts on event days based on the three non-excluded (holidays, weekends, and curtailment days) and qualifying days immediately prior to an event day. A day is deemed as qualifying if average demand during curtailment event hours on that day is at least 50% of the average of the three non-excluded days. If one of the first three non-excluded days prior to the event is deemed to be non-qualifying, the next prior non-excluded day is used. If there are not three qualifying days out of the 10 non-excluded days prior to the event, the algorithm reverts to using the three most immediate non-excluded days prior to the event.

The average demand over the three selected days during the hours corresponding to those in which the event was called is the baseline used to calculate impacts and participant incentive payments. The reported impact is calculated as the difference between the average baseline over the event period and the average actual demand over that period, excluding the first 15 minutes of the event.

2.2 Estimation of Regression-Based Baseline for Calculating Verified Impacts

The evaluation team estimated verified impacts as the difference between actual average demand over the time span of the event (excluding the first 15 minutes) and the regression-estimated average baseline demand.

To estimate the baseline, the team estimated the following regression for each meter in the summer, including only non-holiday and non-event weekdays:

Equation 1. Individual Meter Regression Specification

$$y_t = \alpha + \sum_{i=0}^{95} \beta_i Quarterhour_{i,t} + \sum_{i=0}^{95} \gamma_i Quarterhour_{i,t} CDH_t + errors_t$$

Where:

y_t	=	The average demand (kW) observed at the given meter in the quarter hour of sample *t*.
$Quarterhour_{i,t}$	=	96 dummy variables, each one equal to 1 if quarter hour *t* is *i*-th quarter hour of the day (for example, if quarter hour t is between midnight and 12:15 a.m., $Quarterhour_0$ is equal to 1 and0 otherwise or if quarter hour t is between 1:00 p.m. and 1:15 p.m. then $Quarterhour_{52}$ is equal to 1 and 0 otherwise).

[8] North Carolina Rider, DRA-7: https://www.duke-energy.com/_/media/pdfs/rates/gp2ncriderdradep.pdf?la=en
South Carolina Ricer, DRA-7: https://www.duke-energy.com/_/media/pdfs/for-your-home/rates/electric-sc/gp1scriderdra.pdf?la=en

[9] The details of the DEP algorithm are described in more detail in Appendix A of the PY2010 report.

CDH_t = The cooling degree hours in quarter hour of sample *t*.

Navigant applied the estimated coefficients from the regression above to the observed values of the variables on each event day to generate a baseline. The team calculated the verified impact as the difference between the average baseline demand and the average actual demand following the first 15 minutes of the event (i.e., the evaluated curtailment period).

The relative precision of the estimated impact for each event was estimated as the sum (across participants) of standard error of the average baseline-predicted value during event periods. Since separate regressions were estimated for each participant, the aggregate standard error used to estimate relative precision assumes independence across different participants' baselines (i.e., there are no covariances between any two participants' baselines). The average program-level relative precision was estimated by taking the average of the program-level relative precision estimated for each event.

2.3 Estimation of Program Capability

Estimated program capability is Navigant's estimate of the DR impact of the CIG DRA program at a variety of different outdoor temperatures. The evaluation team estimated program capability by:

- Estimating baselines for a range of different temperatures
- Applying the average percentage impact for each of the actual PY2016 events (by season) to the estimated baseline[10]

[10] In previous years a middle step existed in this process, one by which customer baseloads were adjusted based on the average of the day-of adjustments applied across the actual program year events. Since event notification was day-ahead for all PY2016 events, no day-of adjustments were applied, and the evaluation team omitted this step.

3. NAVIGANT ALSO ESTIMATED UPPER AND LOWER BOUNDS BY USING THE UPPER AND LOWER LIMITS OF THE ACTUAL PY2016 PERCENTAGE LOAD IMPACTS.PROGRAM IMPACTS

This chapter describes the findings from the evaluation team's analysis of load reduction impacts for the DRA program for PY2016.

DEP called three events during the summer of 2016, involving 59 unique customer meters. The EM&V analysis found average load reductions[11] of approximately 17.6 MW per summer event—approximately 300 kW per meter, or slightly less than the 18.4 MW figure reported[12] by DEP in its DRA program database (Table 4).[13]

Table 4: Verified Load Reductions and EM&V Verification Rate

Load Reduction Category	Event kW			Avg. Total Reduction Over Summer Events
	2016-06-23	2016-07-08	2016-07-26	
Reported (Duke Energy Database)	17,849	20,576	16,639	18,355
Verified	16,720	19,410	16,748	17,626
Relative Precision (Verified Impacts +/-)	1.2%	1.2%	1.4%	1.3%
Verified Realization Rate (Verified Reductions/Reported Reductions	94%	94%	101%	96%

Sources: DEP DRA program database and Navigant analysis

[11] Note that the average load reduction per event is the average of only non-zero load reductions achieved. For example, if two meters contributed 100 kW each and a third meter did not achieve any DR (i.e., actuals were above baseline) the average verified impact for this event would be reported as 100 kW.

[12] Reported impacts are those impacts calculated by DEP using the DRA baseline algorithm.

[13] As noted previously, reported impacts are those impacts calculated by DEP using the DRA baseline algorithm. Verified impacts are based on a regression baseline. Both sets of impacts are net values, implicitly assuming an NTG ratio of 1.0. See Section 2 for further discussion.

Other significant findings of the impact evaluation, by topic areas, are as follows:

Approved Baseline Methodology

- **Finding 1:** Navigant successfully replicated the DEP settlement baseline and reported impacts for every meter/event pair but two. Equipment malfunction meant that no data was available for one meter over two events.

Verified Impacts

- **Finding 2:** Using the regression-derived baseline, the evaluation team verified that participants as a whole achieved an average of 17.6 MW of demand reduction during summer events, approximately 96% of that reported and 95% of that contracted.
- **Finding 3:** Total program impacts decreased in PY2016 compared to PY2015. DEP staff indicate that changes in US Environmental Protection Agency (EPA) regulations regarding onsite generators is a major contributor to this change since PY2015.

The remainder of this chapter is divided into three sections:

- **Section 3.1 – Replication of DEP-Reported Impacts.** Replication of the DEP settlement algorithm.
- **Section 3.2 – Verified Impacts .** Impacts estimated using the regression baseline method described above.
- **Section 3.3 – Program Capability.** Estimated program capability across a range of different temperatures.

3.1 Replication of DEP-Reported Impacts

As noted above, part of the task assigned to the evaluation team was to replicate the DEP algorithm to confirm the validity of the results reported by DEP.

Navigant successfully replicated the DEP settlement baseline and reported impacts for every meter/event pair but two. The evaluation team was unable to replicate the impacts reported for one meter on two events because no data was available for this meter for a substantial portion of the summer including those events. DEP assumed an impact of 100 kW for both events affected by the meter malfunction (the reported impact for the event for which data does exist is approximately 105 kW).

The meter issue affected the events on June 23 and July 8 of summer PY2016 but the issue was corrected before the event on July 26. Navigant estimated the verified impacts for DRA0019 on the affected event days by applying the event-specific realization rate of the meter for the unaffected event to the DEP-reported impacts for the two events for which data is missing.

3.2 Verified Impacts

All verified impacts discussed below are based on the regression model without a symmetric day-of load adjustment. The evaluation team found that baselines with day-of-load adjustments delivered the most accurate estimated impacts, on average, in the PY2010 and PY2011 evaluations; however, these are not possible when participants are notified the day prior to an event date.

DEP called three events during the summer of 2016, involving 59 unique customer meters. The EM&V analysis found average load reductions of 17.6 MW per event—approximately 300 kW per meter, or approximately 96% of the 18.4 MW figure reported by DEP in its DRA program database (Table 5).[14]

Table 5. Verified Load Reductions and EM&V Verification Rate (By Customer Type)

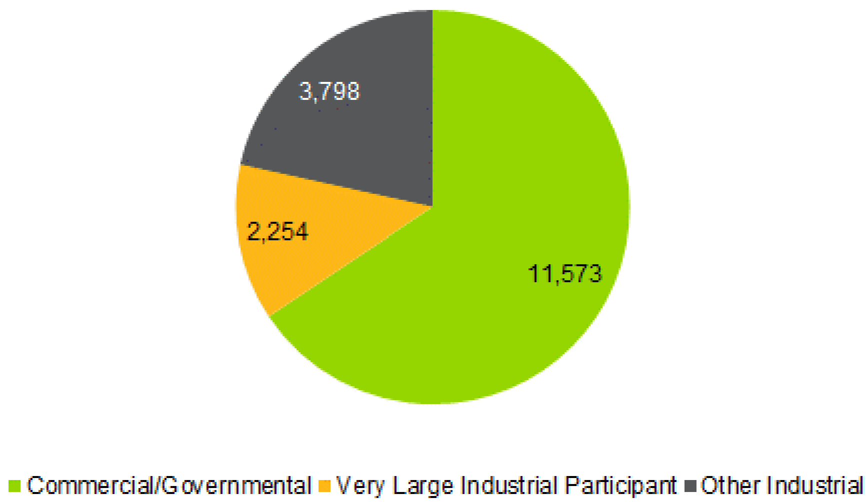
Load Reduction Category	Event kW			Avg. Total Reduction Over Summer Events
	2016-06-23	2016-07-08	2016-07-26	
Reported (Duke Energy Database)	17,849	20,576	16,639	18,355
Verified				
Com/Gov't	11,194	12,388	11,138	11,573
VLIP	2,100	2,754	1,909	2,254
Other Ind.	3,425	4,269	3,701	3,798
Verified – Total	**16,720**	**19,410**	**16,748**	**17,626**
Verified Realization Rate (Verified Reductions/Reported Reductions	**94%**	**94%**	**101%**	**96%**

Sources: DEP DRA program database and Navigant analysis

For summer 2016, the EM&V team verified that the 29 commercial/governmental meters realized an average total of 11,573 kW of load reductions, accounting for approximately 66% of the total kW reduction; the 16 industrial meters belonging to the VLIP realized an average total of 2,254 kW of load reductions, which accounts for approximately 13% of the total kW reduction. The balance of load reductions—3,798 kW or 22% of the total—were made up by meters located at industrial sites not belonging to the VLIP. This distribution is shown in Figure 2.

[14] As noted previously, reported impacts are those impacts calculated by DEP using the DRA baseline algorithm. Verified impacts are net values, implicitly assuming an NTG ratio of 1.0. See Section 2 for further discussion.

Figure 2. Share of Total Verified kW Reduction: Commercial/Governmental vs. Industrial



Sources: DEP DRA program database and Navigant analysis

The following discussion provides a summary of load impact findings based on a linear-regression baseline method identified by the evaluation team as the most accurate for predicting customers' loads (see PY2011 and PY2012 evaluation reports for more detail). The team estimated load reductions for individual participants for each event. Average verified program savings were then calculated as the average across each of the three summer events across all 59 participants' meters.

DEP had reported summer program impacts to be approximately 99% of the aggregate contracted load reductions, or 18.4 MW. The EM&V analysis verified 96% of these reductions. The average contracted, DEP-reported, and verified load curtailment for each participant meter is shown in Table 6.

This table includes a count of the number of events for which each meter contributed non-zero DR impacts. The average contracted, reported, and verified impacts shown in Table 6 are the averages only of events for which the given participant was contracted and in which that participant participated. This means that the sum of the average impacts in this table will not match the average of the total impacts reported in Table 5, which are the average of the total impacts across all participants for each event.

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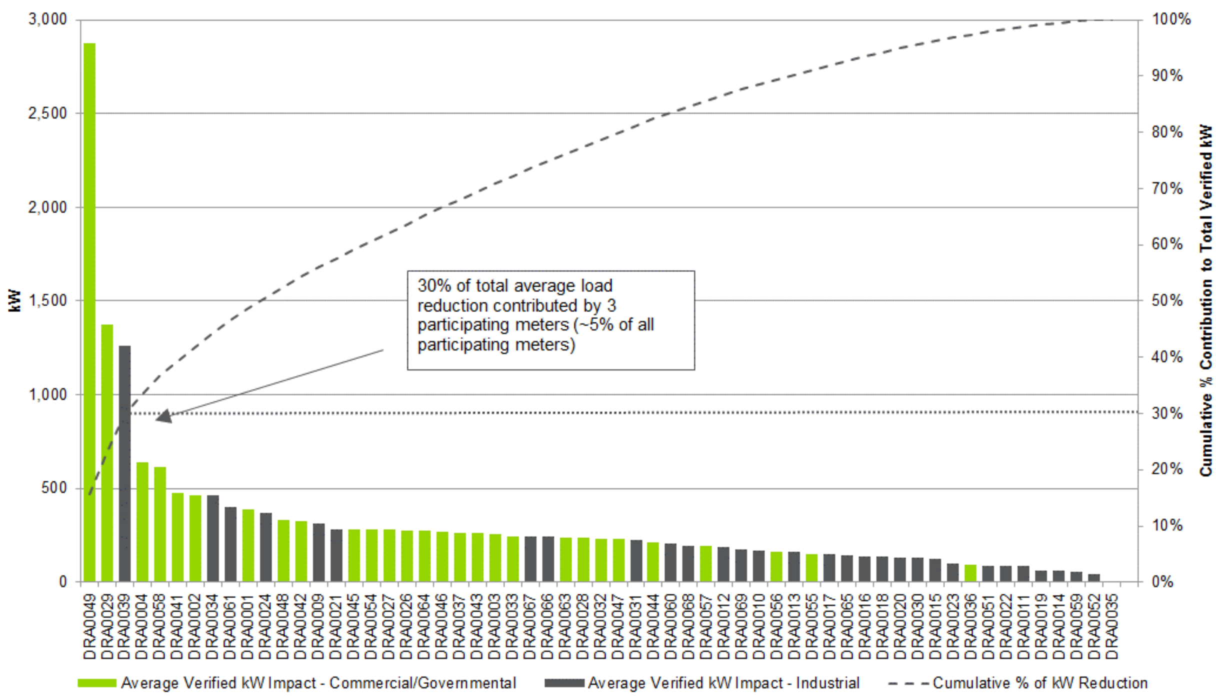
Table 6. Average Contracted, Reported, and Verified Loads by Meter

Commercial/Governmental					Industrial				
Participant Site	Contracted kW	DEP Reported kW	Verified kW	# Events Participated	Participant Site	Contracted kW	DEP Reported kW	Verified kW	# Events Participated
DRA0001	383	377	387	3	DRA0009	450	289	316	3
DRA0002	383	453	466	3	DRA0010	75	224	170	3
DRA0003	150	224	257	3	DRA0011	75	65	84	2
DRA0004	490	620	639	3	DRA0012	300	290	187	2
DRA0026	209	270	279	3	DRA0013	75	296	160	2
DRA0027	220	278	281	3	DRA0014	75	119	59	3
DRA0028	183	231	238	3	DRA0015	150	212	126	2
DRA0029	900	1569	1375	3	DRA0016	200	225	139	3
DRA0032	200	234	234	3	DRA0017	200	196	152	3
DRA0033	204	240	245	3	DRA0018	180	149	135	3
DRA0035	1817	0	0	0	DRA0019	100	102	64	3
DRA0036	75	95	95	3	DRA0020	75	142	132	3
DRA0037	203	259	266	3	DRA0021	200	413	284	3
DRA0041	415	449	475	3	DRA0022	75	139	85	3
DRA0042	249	306	327	2	DRA0023	75	151	100	3
DRA0043	240	243	264	3	DRA0024	300	531	369	2
DRA0044	163	204	210	3	DRA0030	75	144	131	3
DRA0045	209	275	284	3	DRA0031	225	219	222	2
DRA0046	207	267	268	1	DRA0034	980	510	463	3
DRA0047	177	226	232	3	DRA0039	1,050	1196	1260	3
DRA0048	345	318	333	3	DRA0051	135	124	88	3
DRA0049	2,500	2813	2874	3	DRA0052	75	70	43	3
DRA0054	275	269	283	3	DRA0059	209	174	207	3
DRA0055	275	151	152	3	DRA0060	413	407	401	3
DRA0056	160	156	163	3	DRA0061	75	72	59	3
DRA0057	198	187	193	3	DRA0065	142	149	144	3
DRA0058	500	609	616	3	DRA0066	217	235	241	3
DRA0063	250	229	239	3	DRA0067	205	221	242	3
DRA0064	209	281	277	2	DRA0068	172	199	194	3
					DRA0069	167	172	177	3

Sources: DEP DRA program database and Navigant analysis

Verification rates at the portfolio level are driven by findings for individual meters. Three of the 59 participating meters in 2016[15] account for approximately one-third of all summer reductions and thus drive overall summer findings. Figure 3 ranks the meters by the amount of verified kW reduction in descending order, illustrating the decrease in load reductions between the largest and smallest contributors in the program.

Figure 3. Cumulative Percentage of Total Verified kW Reduction



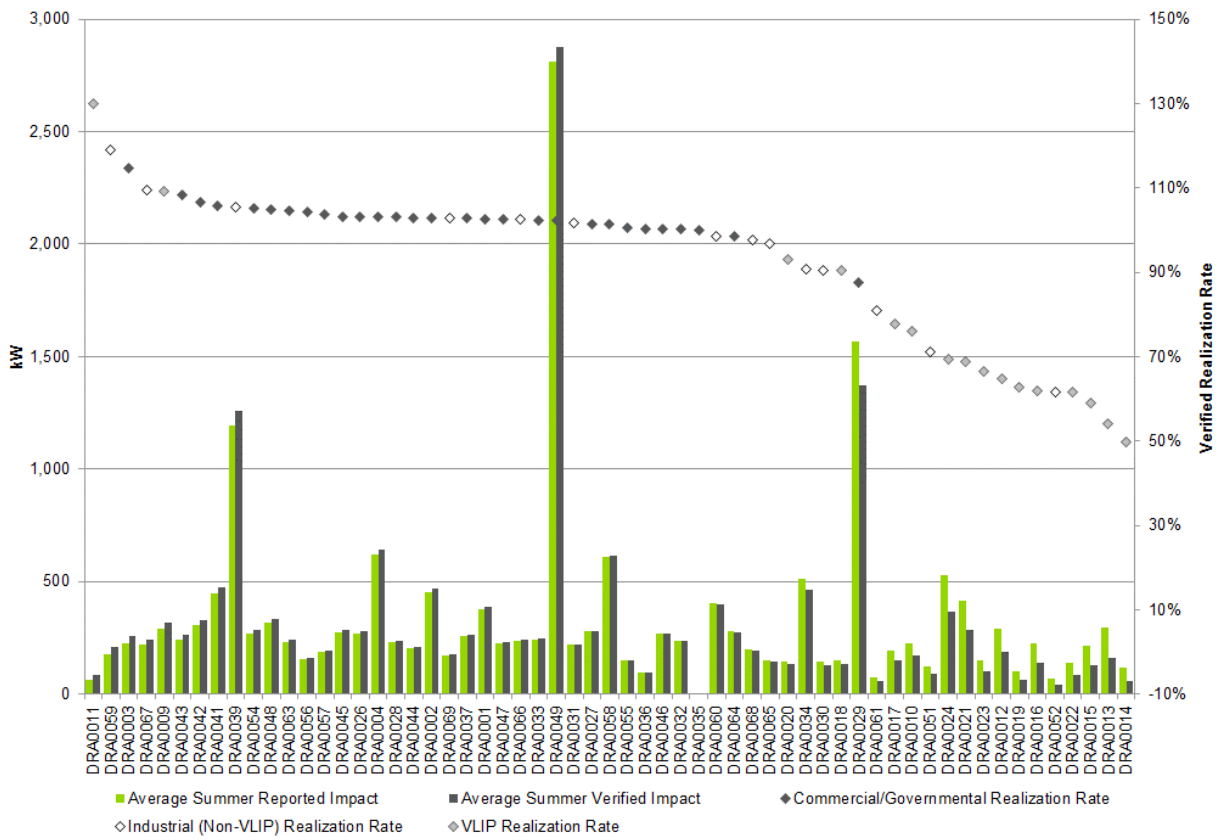
Sources: DEP DRA program database and Navigant analysis

These results can be re-examined by plotting the reported and verified demand reductions and verified realization rate (average verified kW across three events divided by average reported kW across three events) once they have been sorted by verified realization rate (see Figure 4). In this figure, the black diamonds represent commercial/governmental realization rates, the gray diamonds represent the VLIP's realization rates, and the white diamonds represent the non-VLIP industrial realization rates.

As may be seen in Figure 4, the average verified summer realization rate for all but one of the commercial and governmental meter sites is above 90%. In contrast, the average verified summer realization rate of more than two-thirds of the VLIP meters is below 90%.

[15] The three meters that are driving overall results include two governmental (a prison and a water treatment plant) sites and one industrial (manufacturing) site.

Figure 4. Reported and Verified DR and Verified Realization Rate

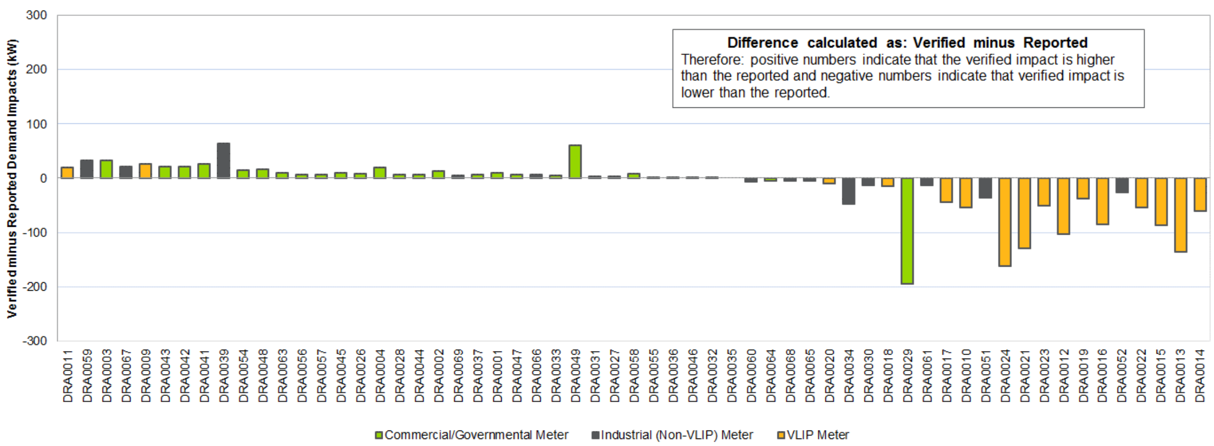


Sources: DEP DRA program database and Navigant analysis

Recall that the verified realization rate is the (regression-estimated) verified impact divided by the (DEP algorithm calculated) reported impact. The regression approach estimates a baseline using average seasonal relationships whereas the DEP approach relies entirely on the three most recent non-excluded qualifying days to calculate a baseline.

To better understand the results implied by the realization rates presented above, it is important to also observe the magnitude of the difference (in kW instead of as a percentage) between the DEP-reported impacts and the verified impacts. For this reason, the evaluation team presents the average difference (across the seasonal events) between the verified summer impact and the reported summer impact for each meter in Figure 5. To aid understanding, these have been sorted in this figure by realization rate in the same manner as in Figure 4

Figure 5. Differences in Impact Estimates: Regression vs. DEP Settlement Method



Sources: DEP DRA program database and Navigant analysis

3.3 Program Capability

Navigant estimated summer program capability for temperatures between 75°F and 100°F by applying the average percentage reduction estimated for the three PY2016 events to the average predicted baseline at each temperature in the range. The approach used to estimate program capability is discussed in more detail in Section 2.3. This capability calculation is based on the three events in PY2016 for which event impacts were estimated and thus provides an estimate of capability that implicitly assumes that participant performance in this summer is representative of participant capability going forward.

To put an upper and lower bound on estimated program capability, Navigant tested the sensitivity of its estimate of program capability at each temperature to two of the principal inputs: the estimated load adjustment and the estimated impact as a percentage of baseline.

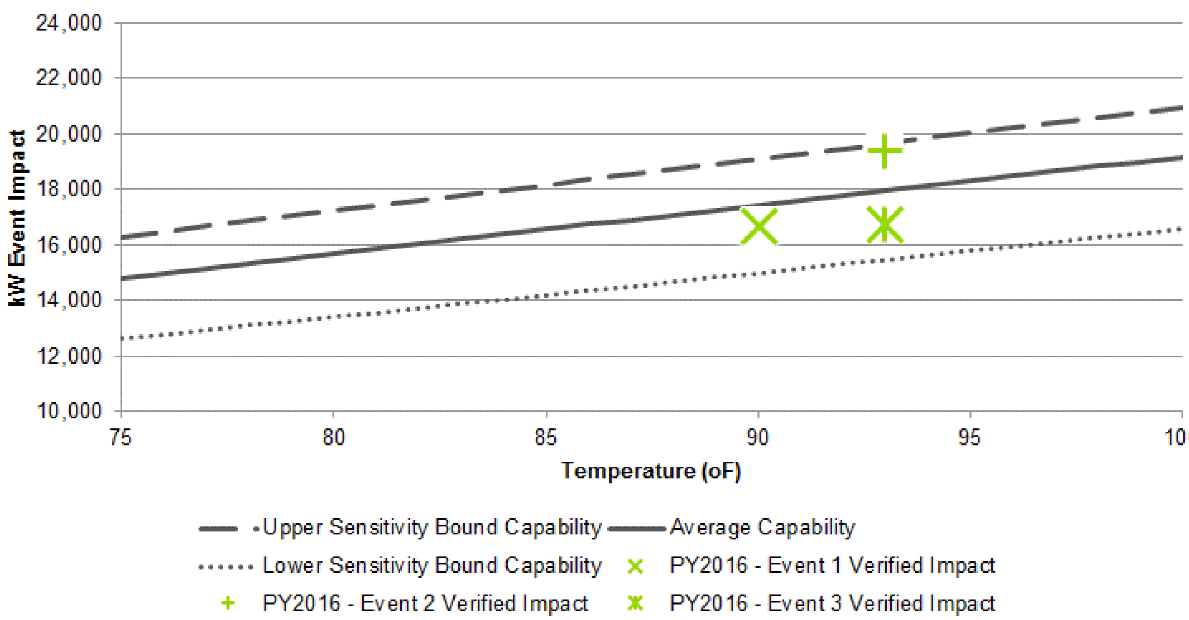
For the upper sensitivity bound capability, the evaluation team estimated each meter's capability across the range of temperatures (75°F to 100°F) by applying the highest (instead of average) demand impact (as a percentage of the baseline) estimated across the PY2016 events for each meter to the baseline at each temperature (75°F to 100°F).

For the lower sensitivity bound capability, Navigant estimated each meter's capability across the range of temperatures (75°F to 100°F in summer) by applying the lowest (instead of average) demand impact (as a percentage of the baseline) estimated across the PY2016 events for each meter to that meter's baseline at each temperature (75°F to 100°F).

Given the fluctuation in participation from event to event, for the purposes of calculating capability (for averages, minimums, and maximums), Navigant has assumed that non-participation in an event is equivalent to an impact of zero.

Average summer program capability and upper and lower sensitivity bounds of that capability are plotted in Figure 6. The upper sensitivity bound capability is plotted as a dashed line; the average capability is plotted as a solid line; and the lower sensitivity bound capability is plotted as a dotted line. The temperature and verified impact combination for the first PY2016 event (June 16) is marked with an "X"; the temperature and impact combination for the second PY2016 event (July 8) is marked with a cross; and the temperature and impact combination for the third PY2015 event (July 26) is marked with a star ("X" with a vertical bar).

Figure 6. DRA Program Capability by Temperature



Sources: DEP DRA program database and Navigant analysis

The implication of Figure 6 is that, given the participants enrolled in the program in PY2016 and the variability of their operational days, the program could be expected, on average, to deliver an impact of over 19 MW on a 100°F day. If conditions are optimal and all participant meter sites are operational and participating that day, the program could deliver as much as nearly 21 MW on a 100°F day.

The lines plotted in Figure 6 are not least-squares fitted lines based on the three plotted points. The points (historical impacts) and lines (forecast capability) shown in this chart are a function not only of outdoor temperature but also of participation. The details of the approach used to calculate capability may be found immediately above and in Section 2.3.

4. CONCLUSIONS

This section of the evaluation report presents the evaluation team's principal findings and conclusions.

DRA DR impacts are down in PY2016 compared with PY2015. Although the total number of enrolled meters has not changed, one of those meters—a hospital and previously one of the most significant contributors to program achievement—did not contribute any DR this year.

The key impact evaluation findings are:

- **Verified impacts were slightly less than reported impacts.** The realization rate for the summer DR impacts for PY2016 was 96%, with an average of approximately 17.6 MW of DR contributed by the program.
- **Participation[16] was inconsistent between events.** The average total event impacts for the summer of PY2016 were highest for the second event (19.4 MW), but substantially lower for the first and third events (16.7 MW) The reduced impact in the first and third events was due primarily to non-participation by major program contributors.
- **Total program impact decreased in PY2016 compared to PY2015.** The average event impact declined from about 20.5 MW in PY2015 to about 17.6 MW in PY2016. DEP staff indicate that changes in US EPA regulations regarding onsite generators are a major contributor to this change and that changes in these regulations have resulted in the loss to the program of participants accounting for 5 MW of contracted DR.

[16] Event-specific participation refers to enrolled participants delivering more than 0 kW of DR for a given event. An enrolled customer meter has participated in only two of three events if that meter has contributed more than 0 kW on only two of the three events.

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Appendix A - Event Day Load Profile and Baseline Plots

Prepared For:

Duke Energy Progress

Prepared by:

Navigant Consulting

June 19, 2017

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Primary contributing authors:

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Program ID: DRA0001
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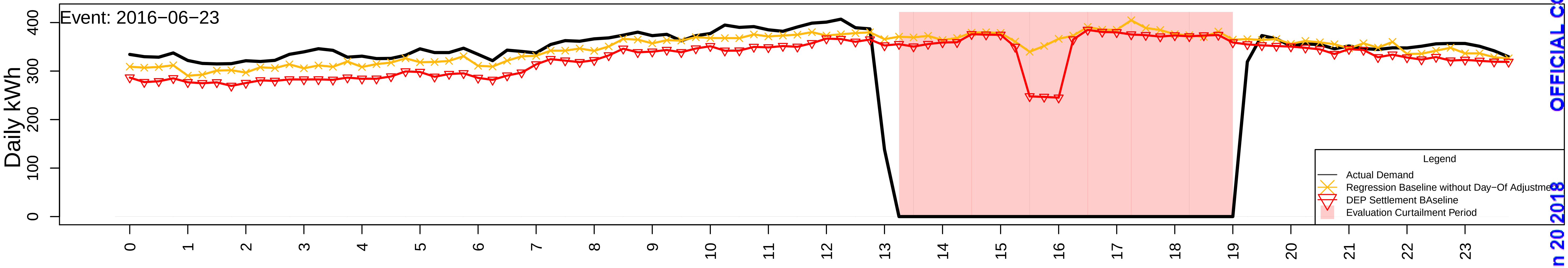
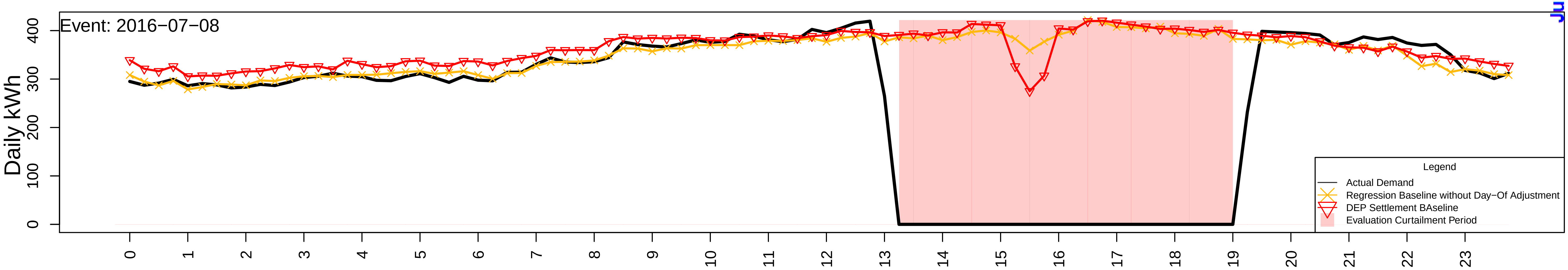
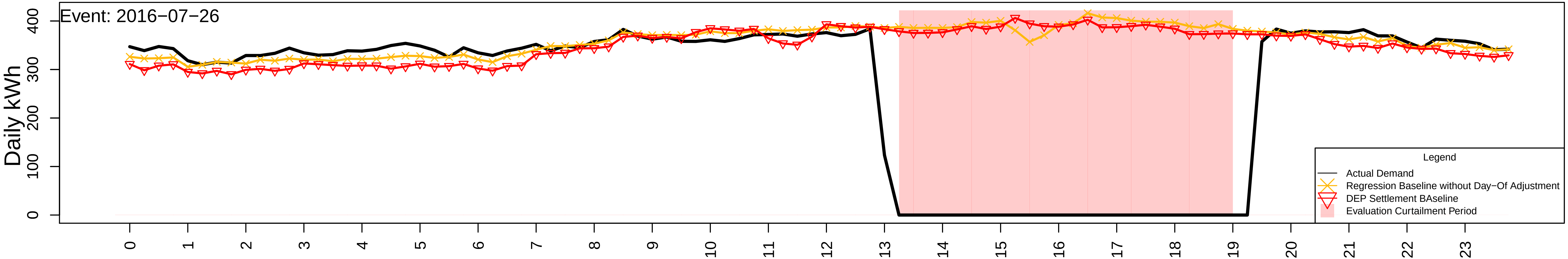
Load Reduction Source : Generator







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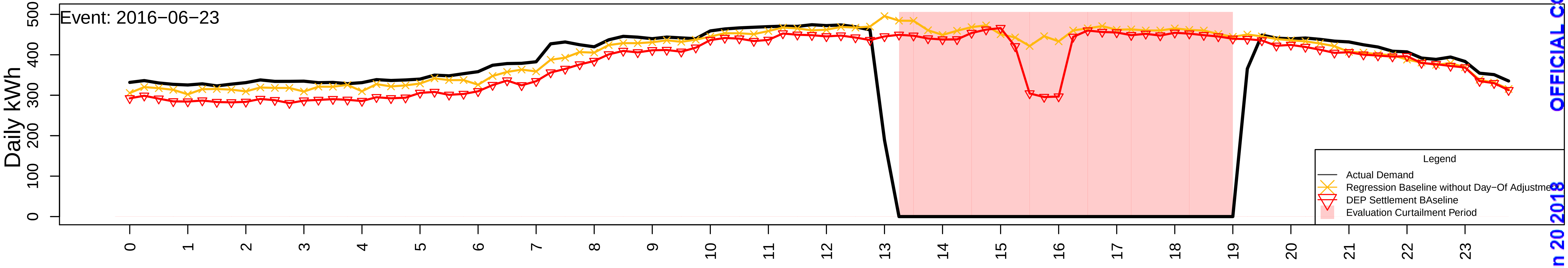

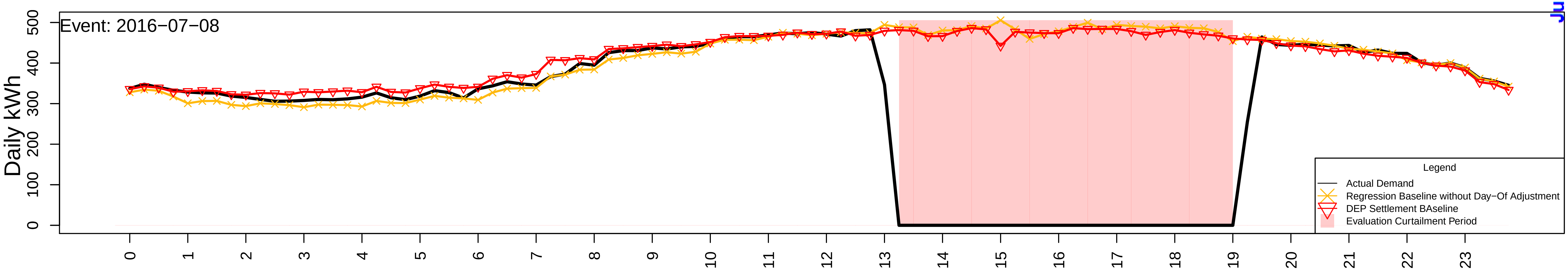

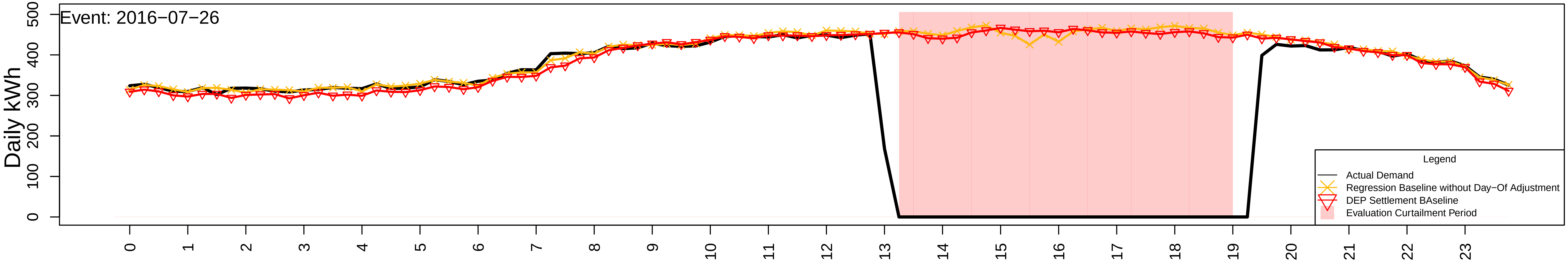

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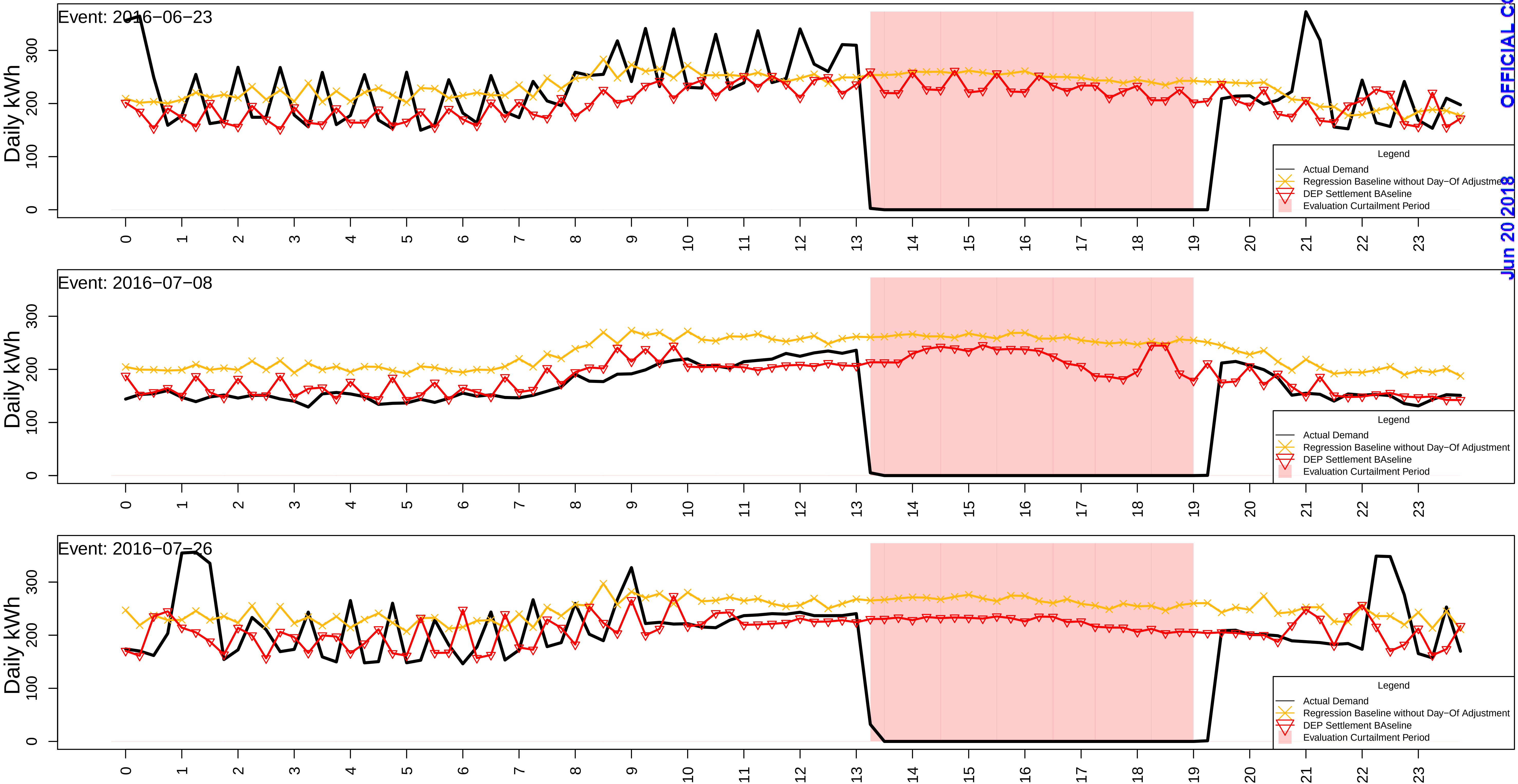

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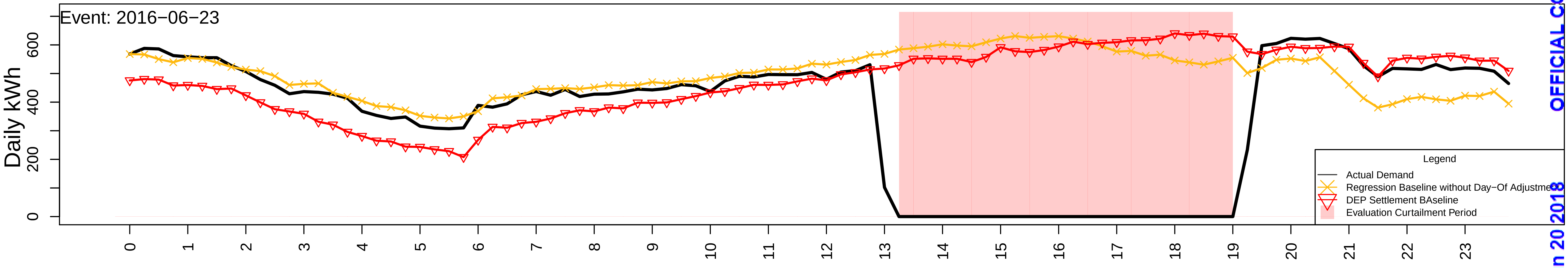

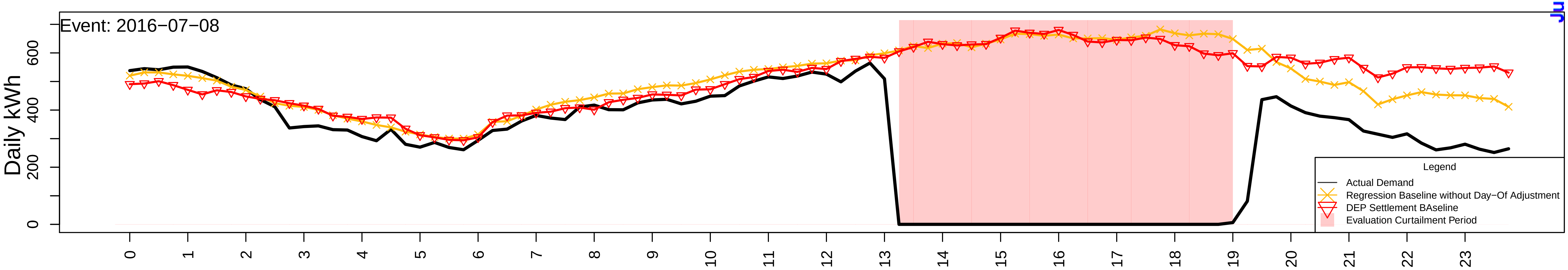

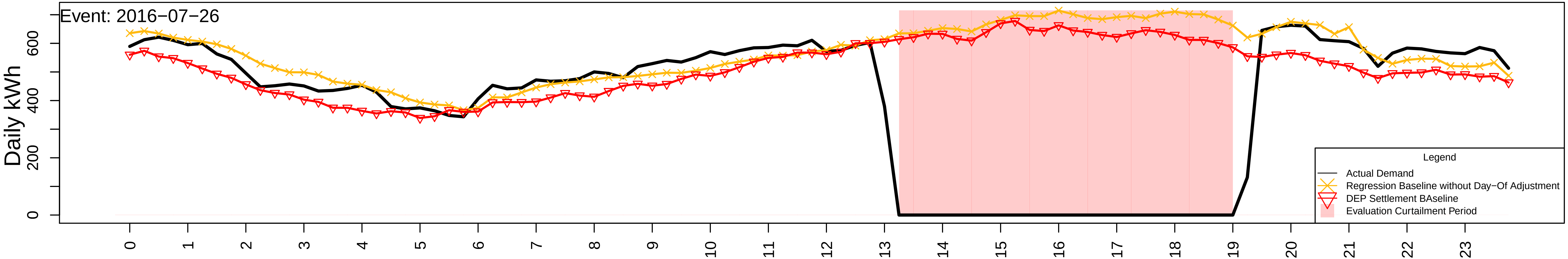

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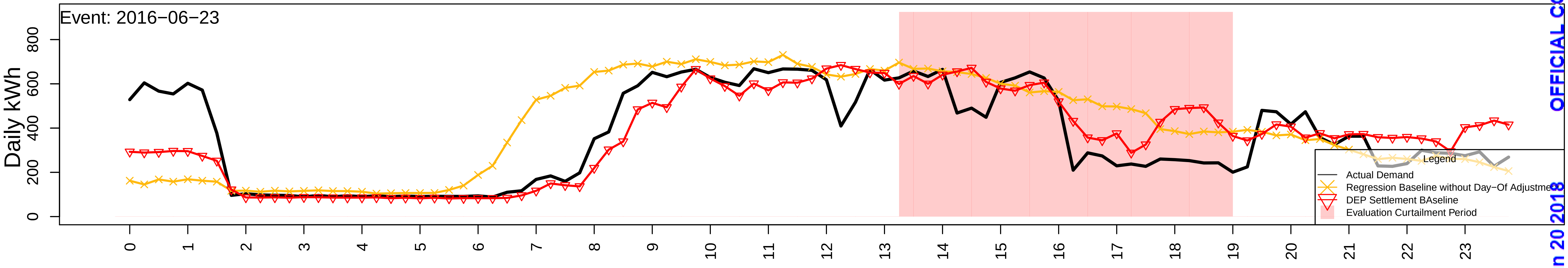

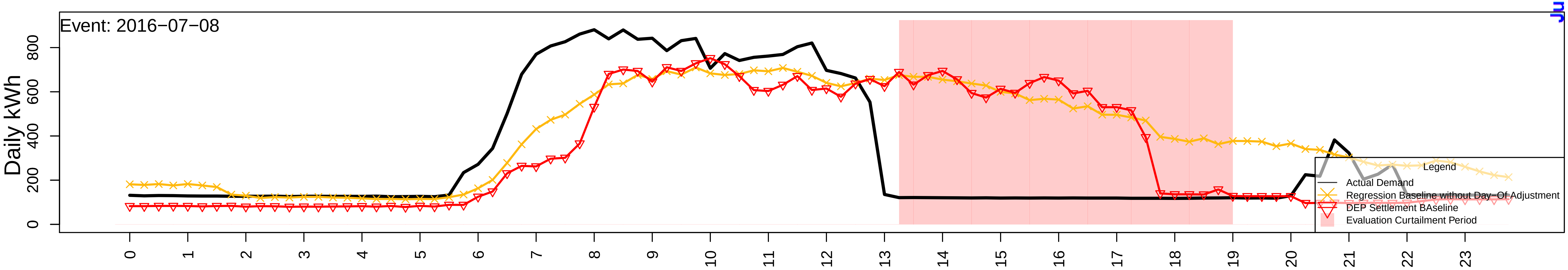

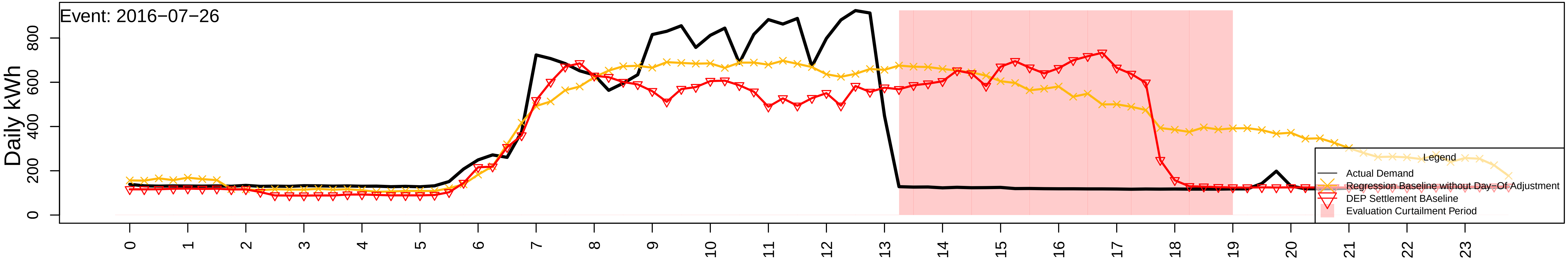

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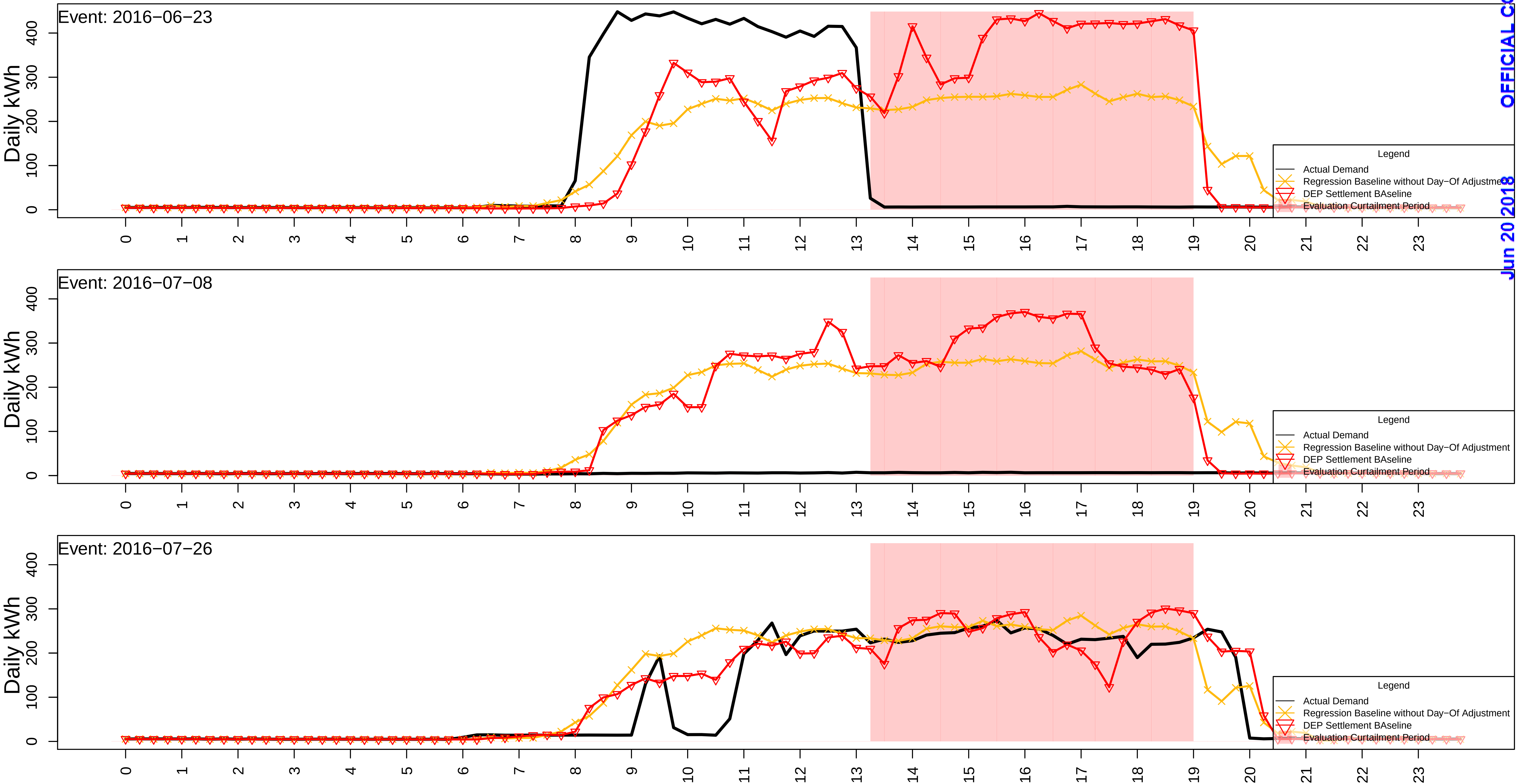

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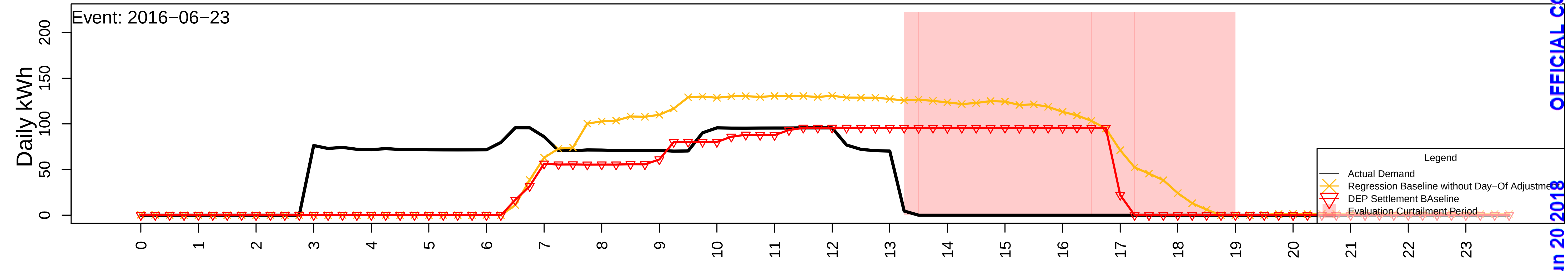

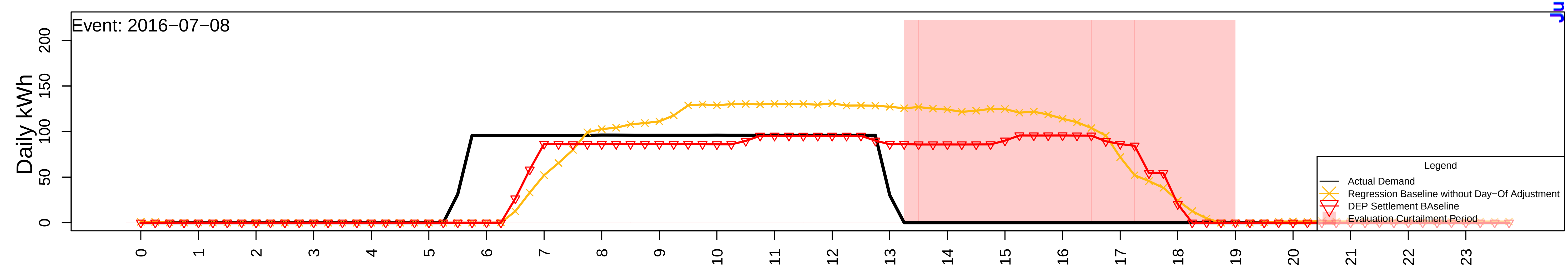

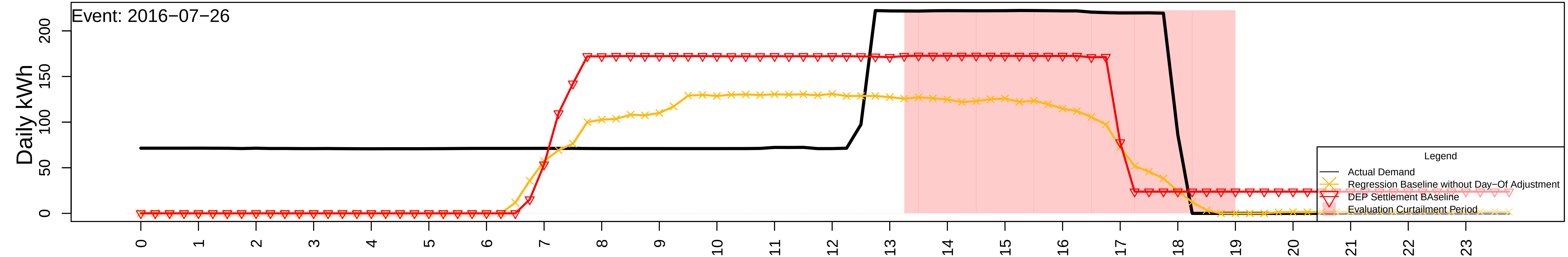

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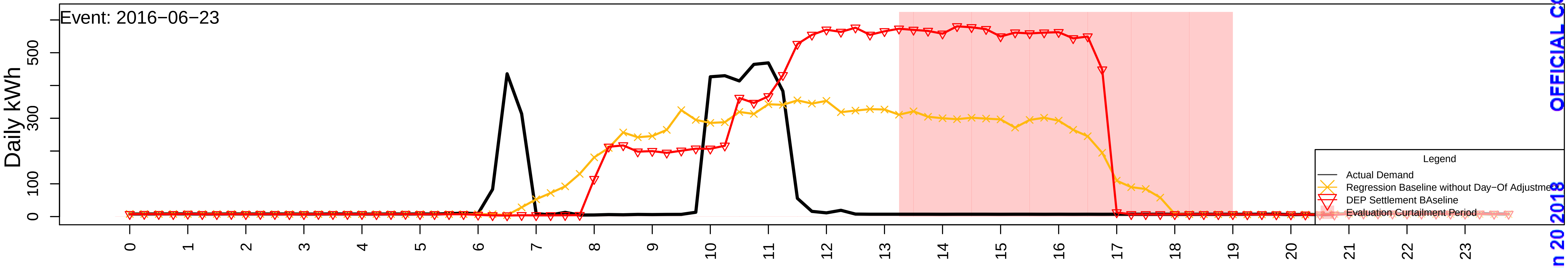

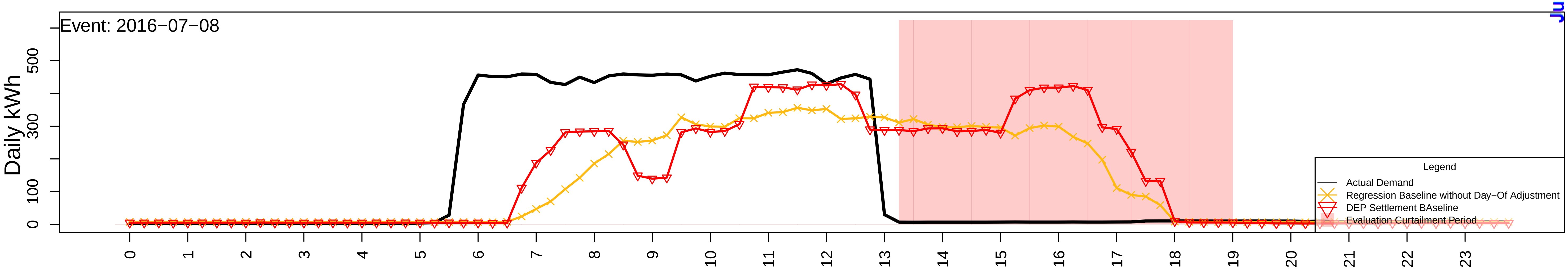

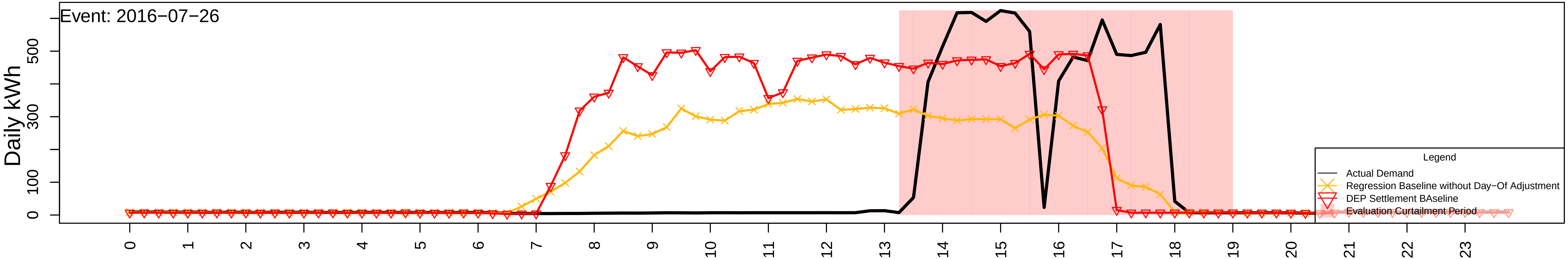

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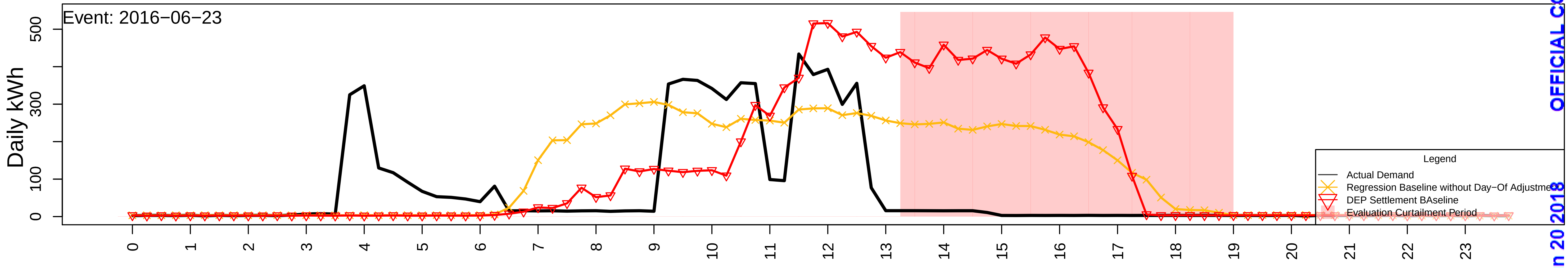

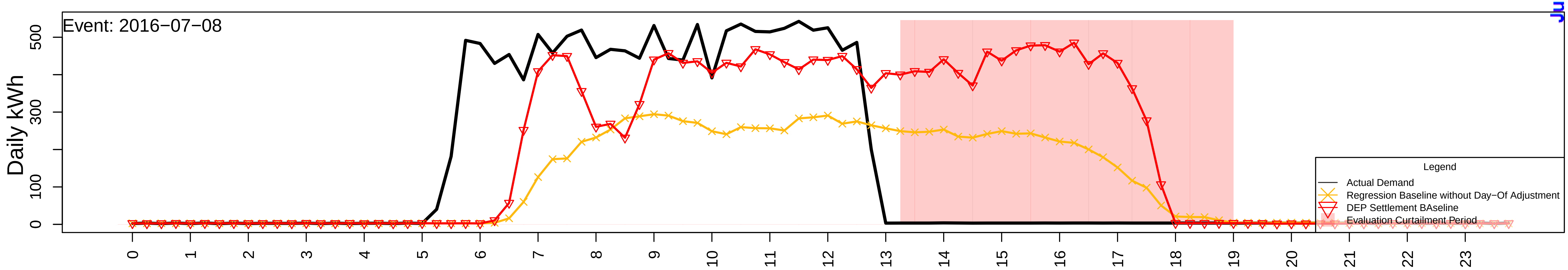

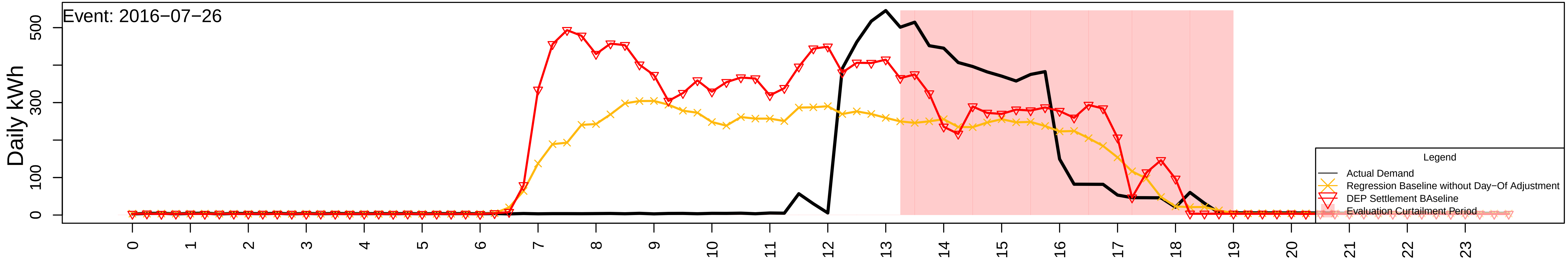

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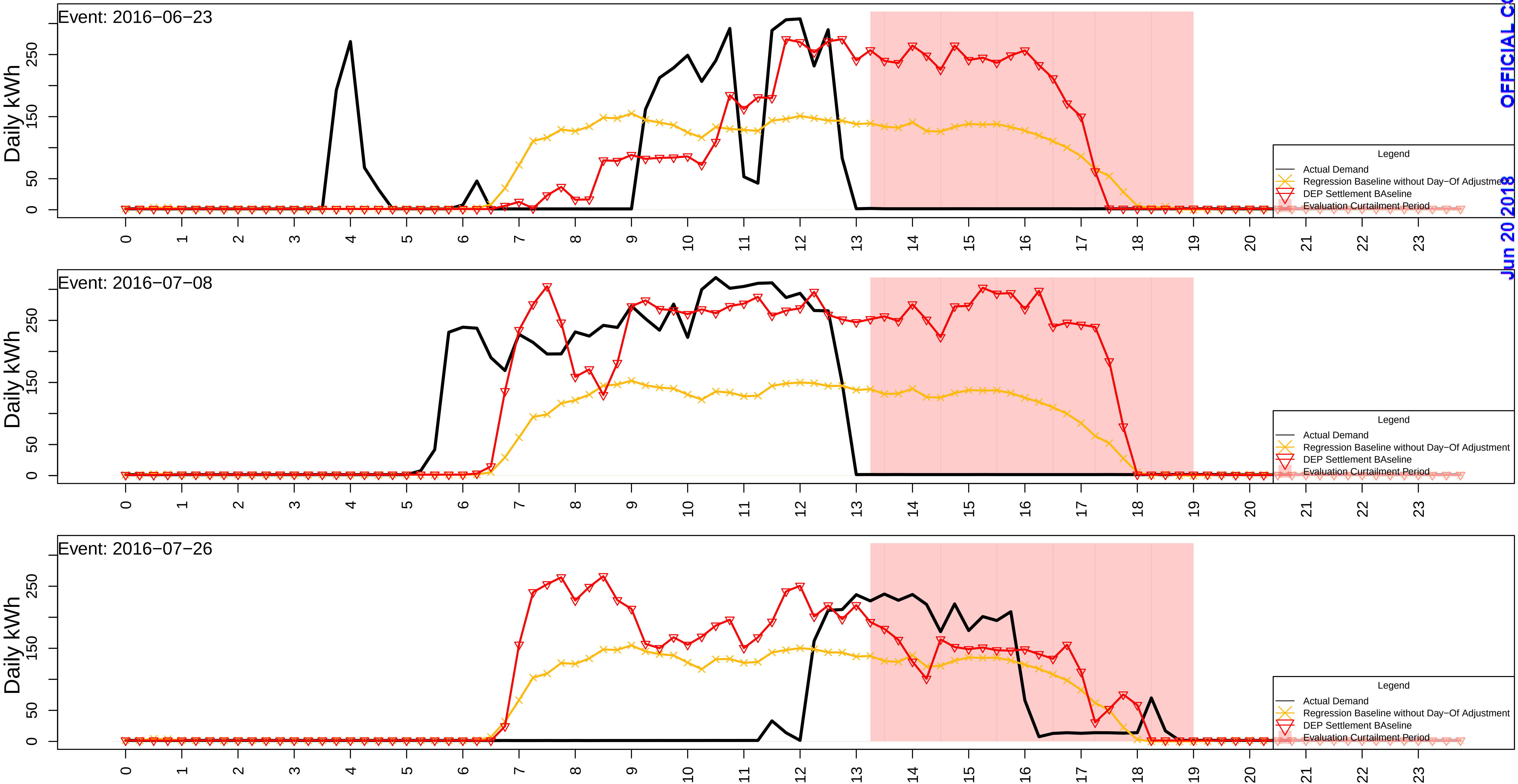

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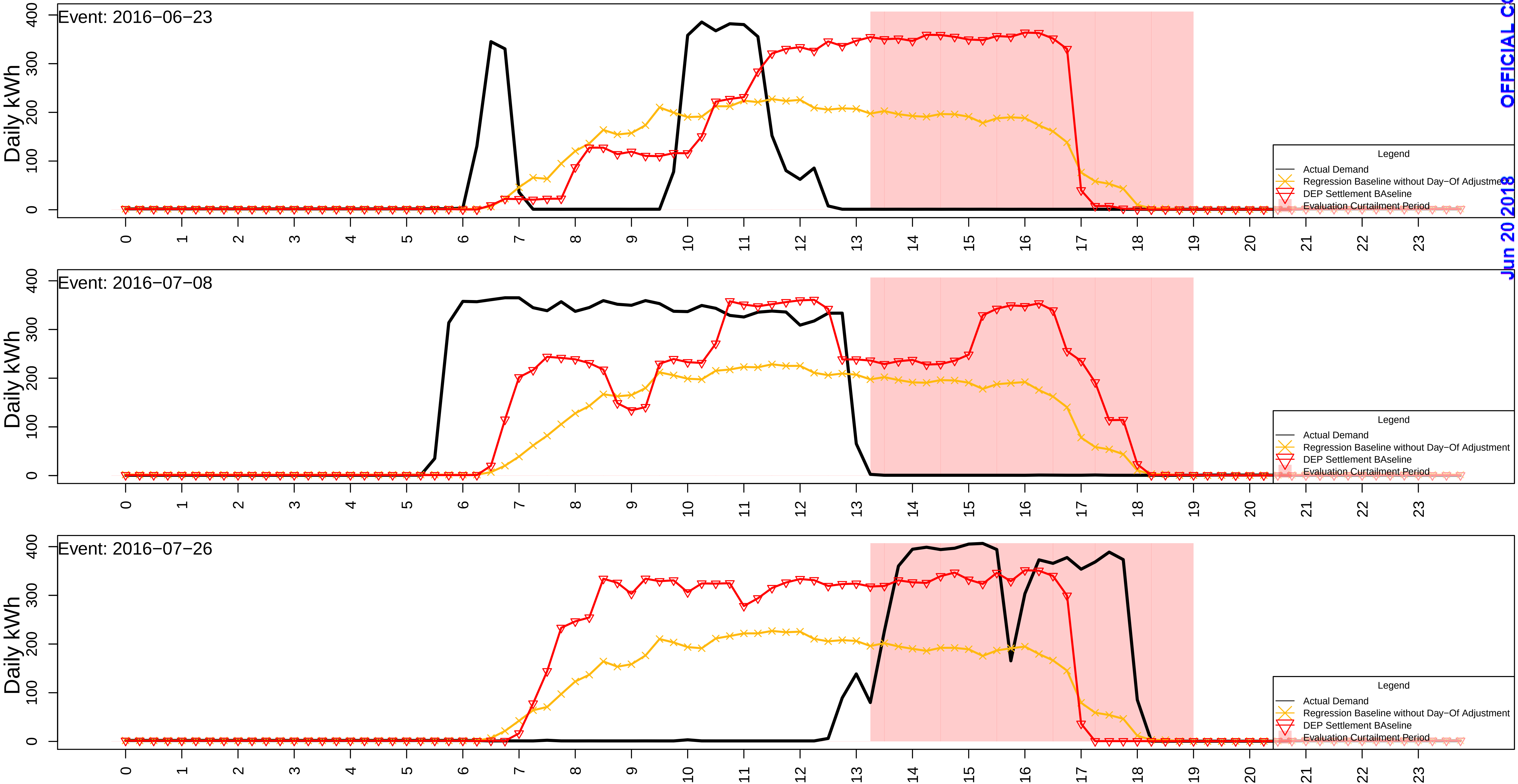

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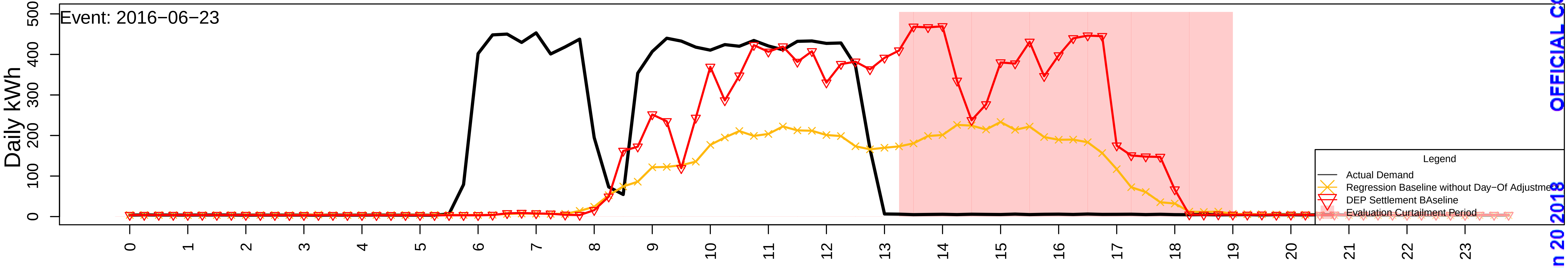

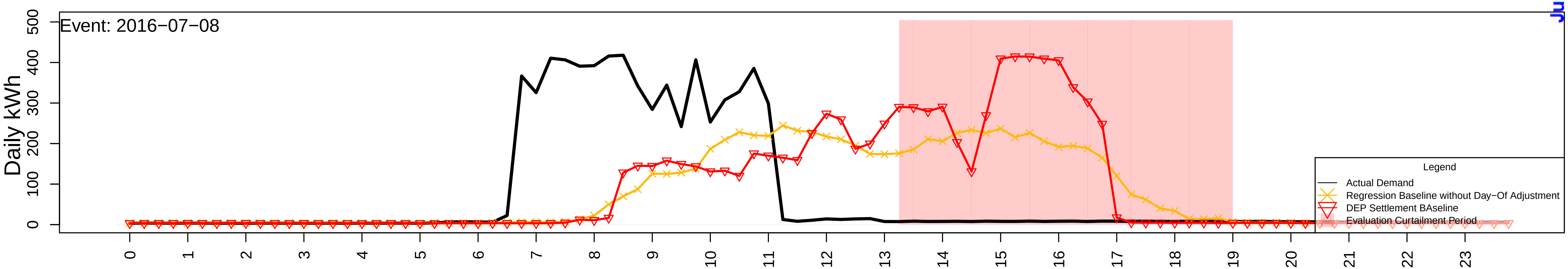

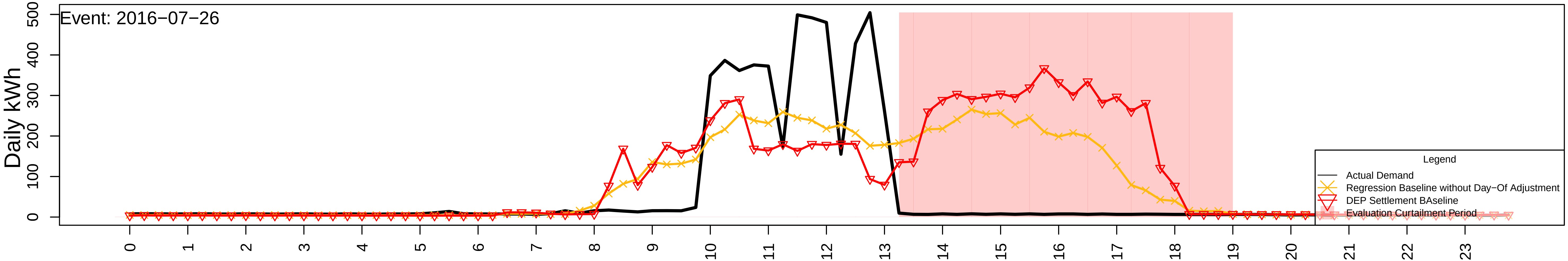

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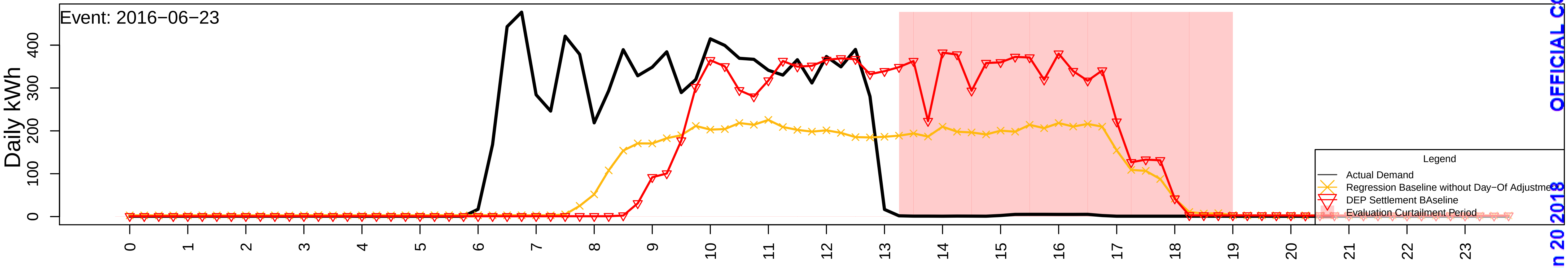

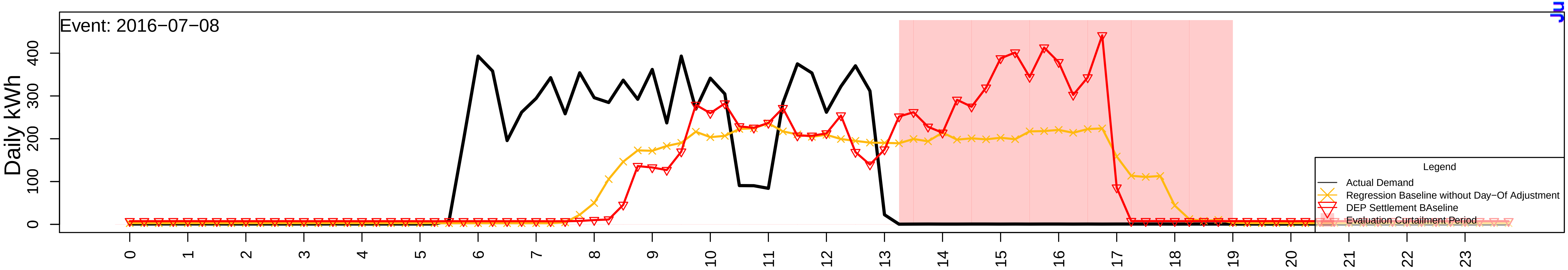

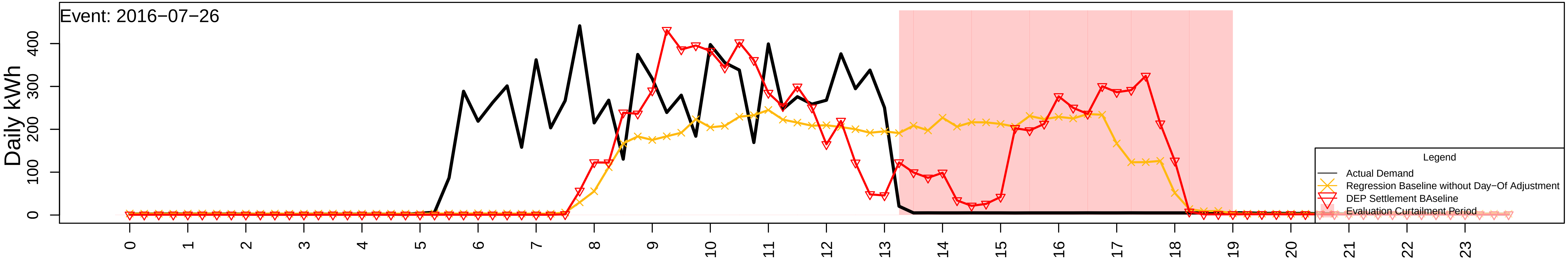

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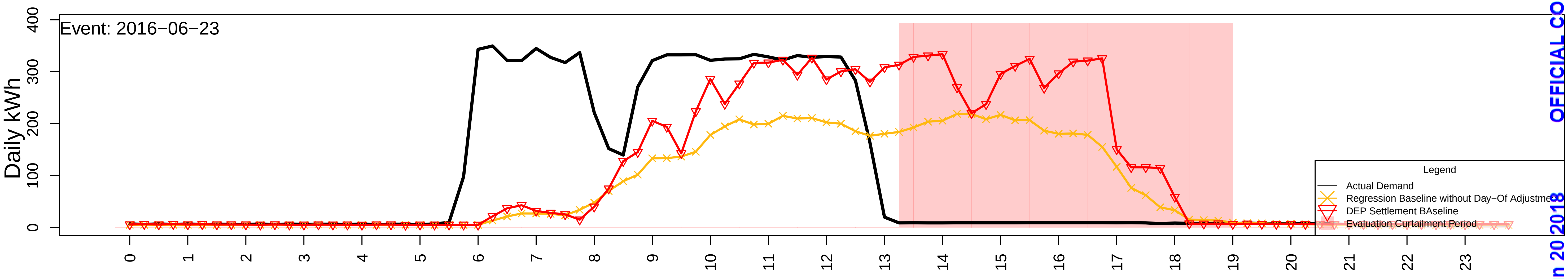

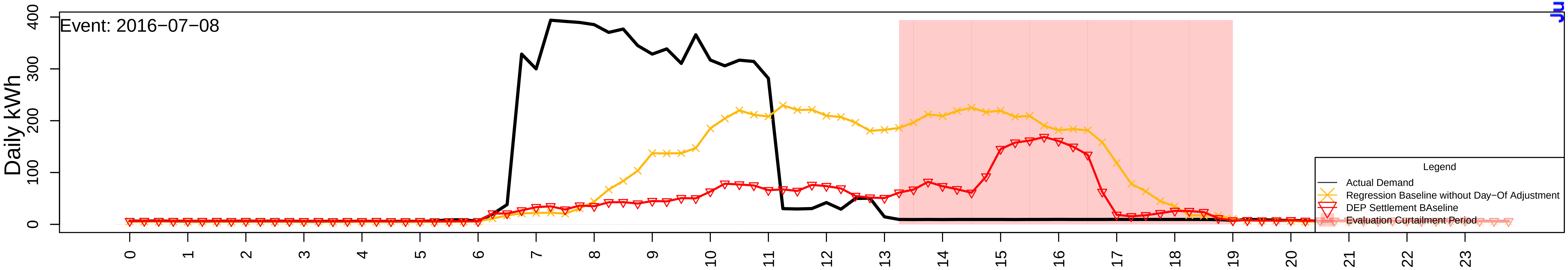

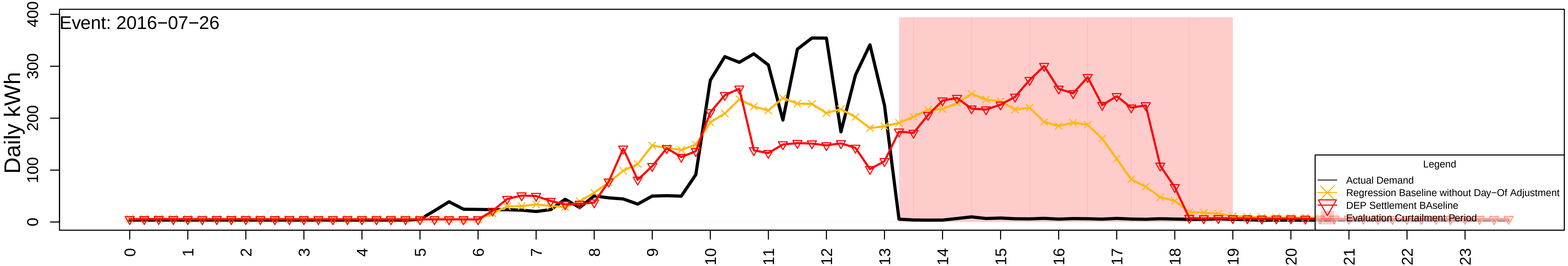

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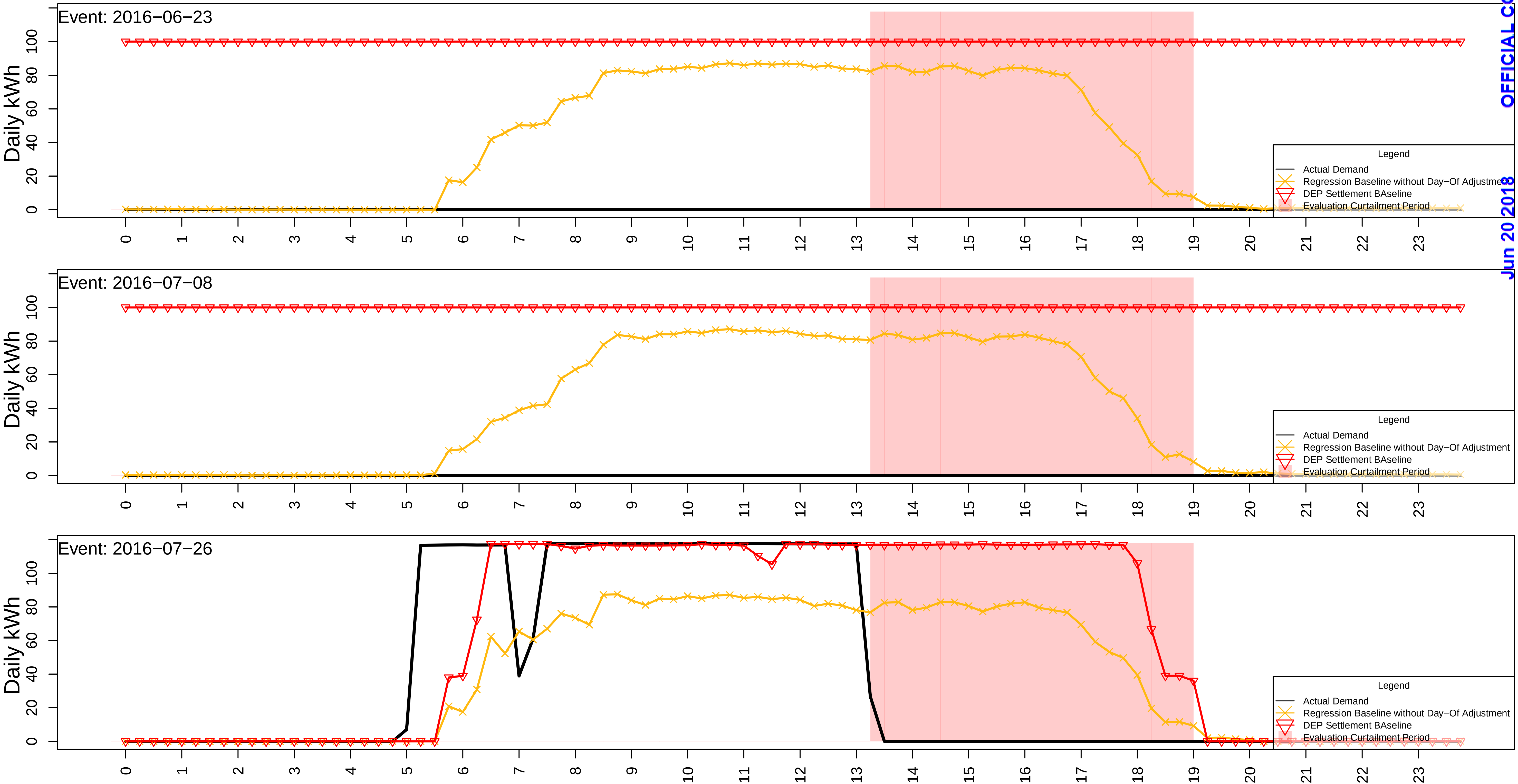

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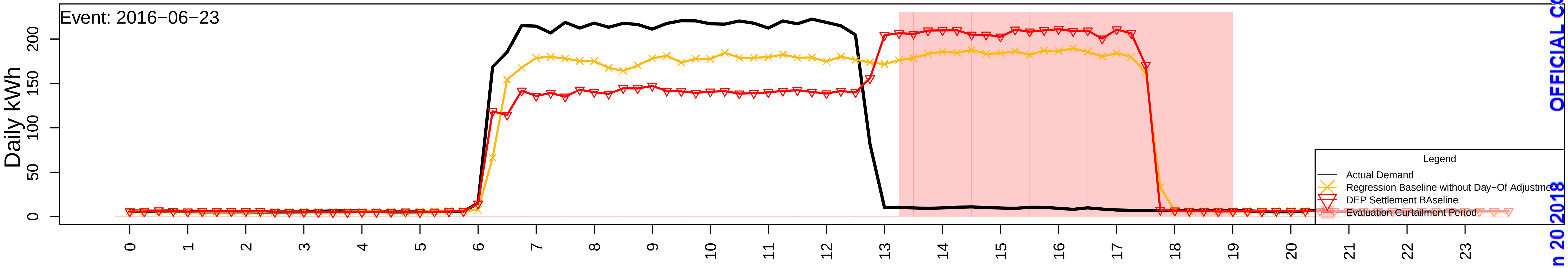

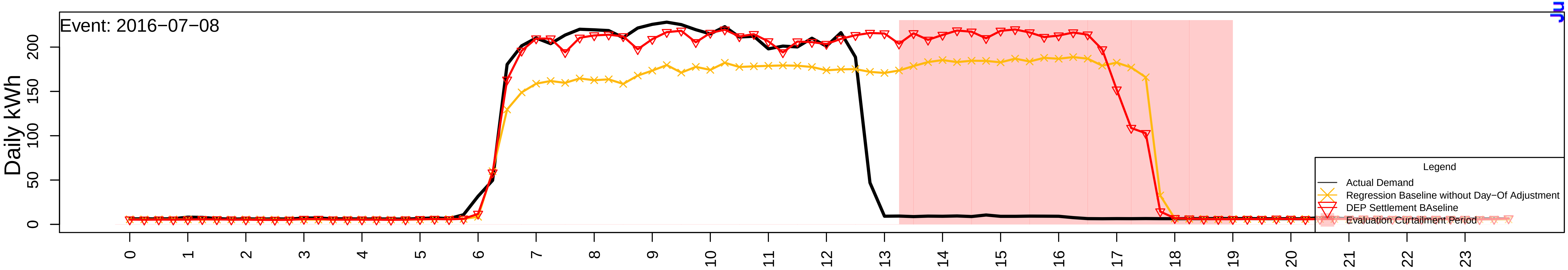

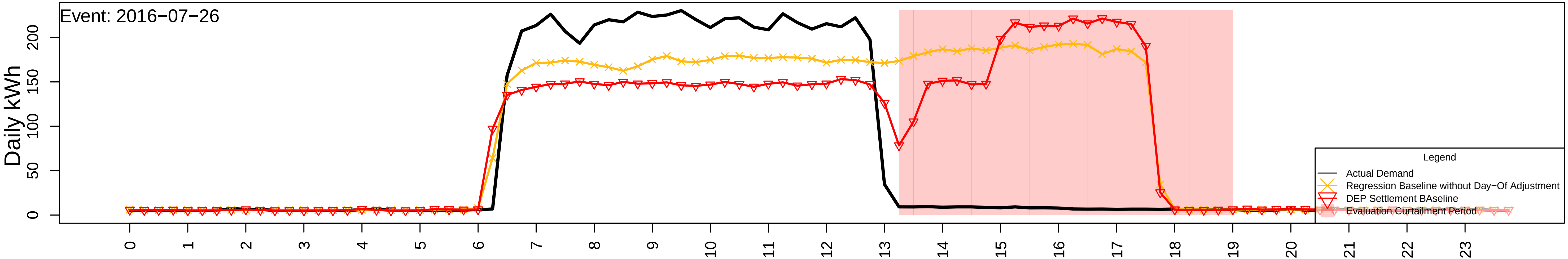

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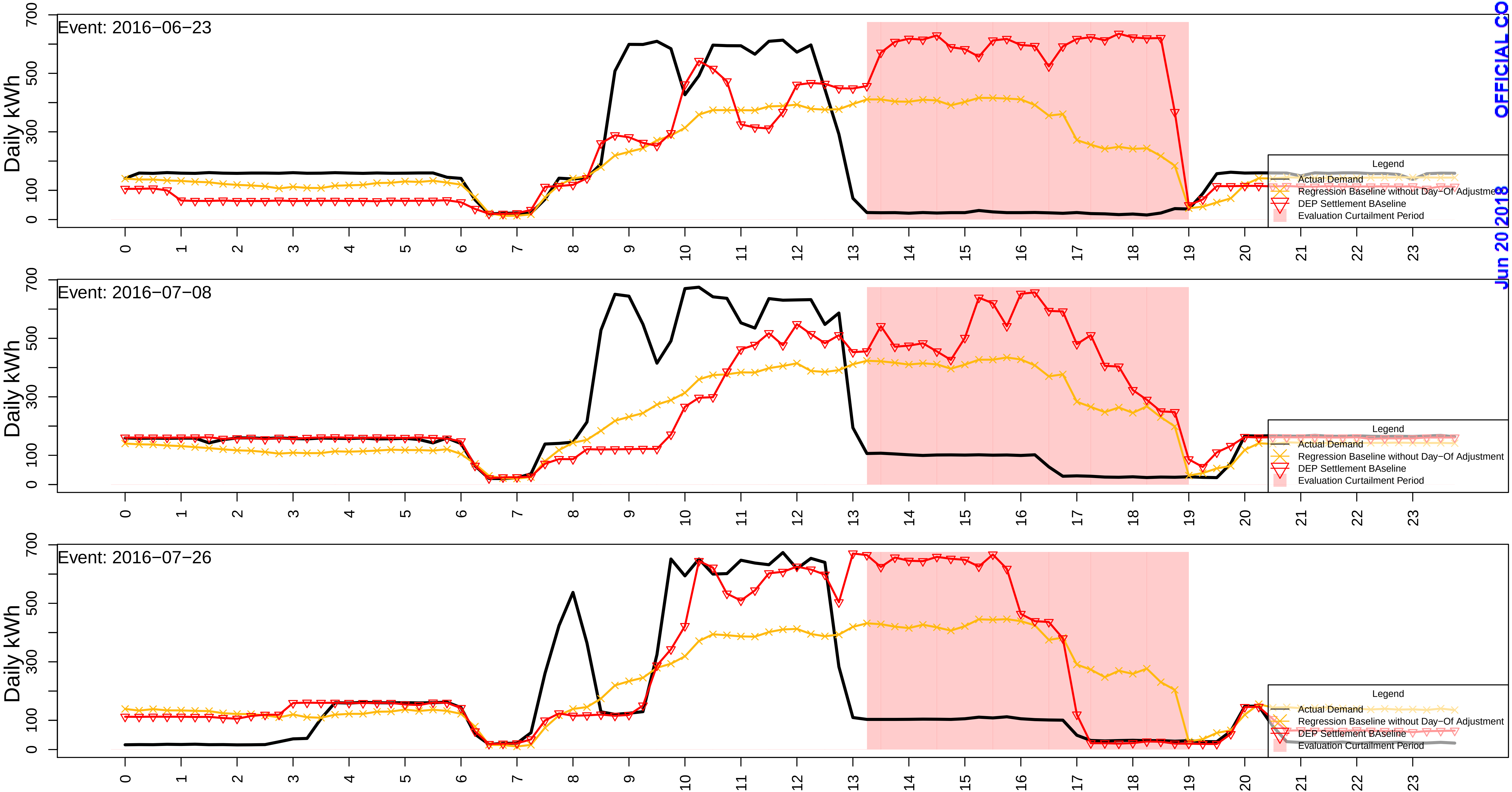

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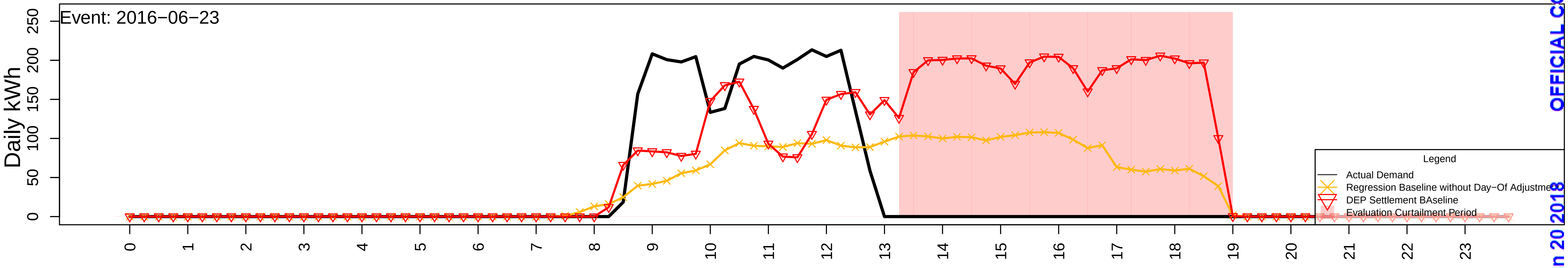

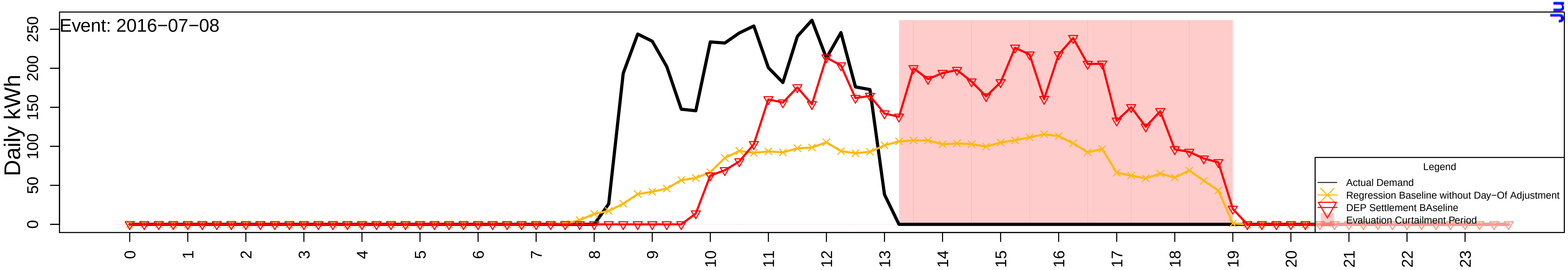

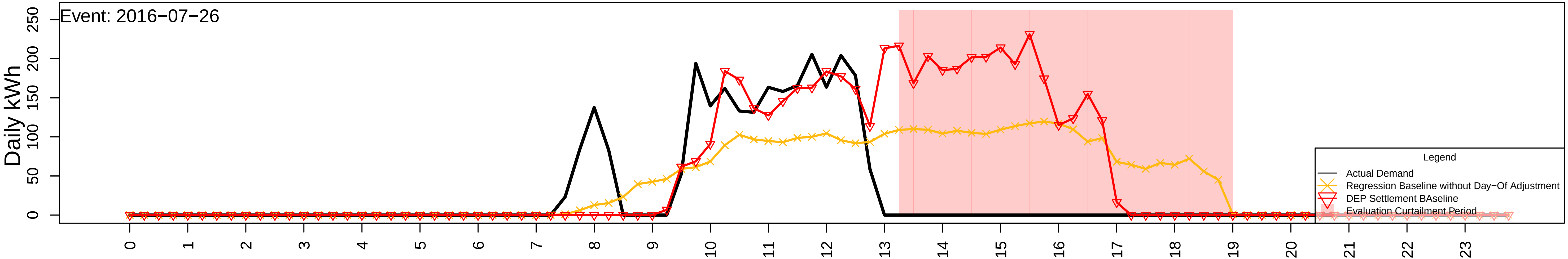

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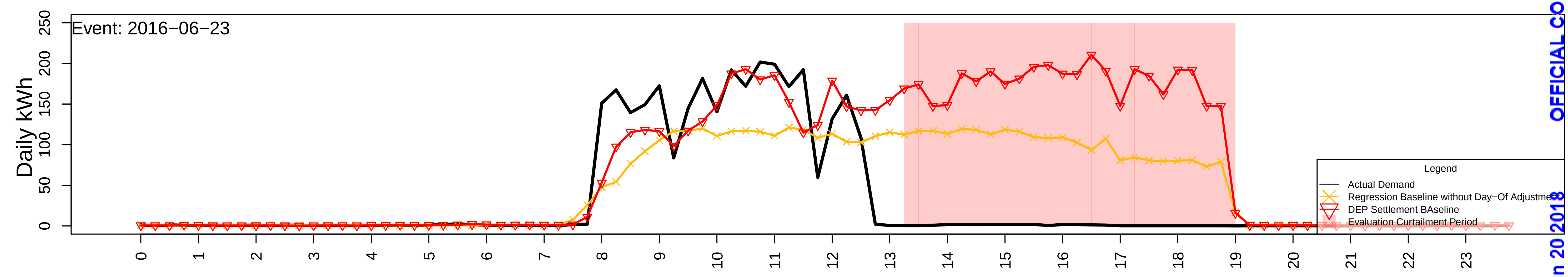
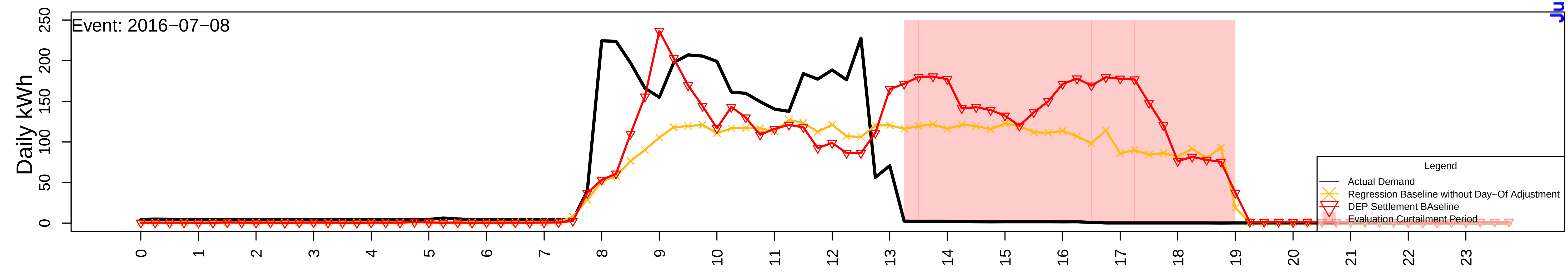
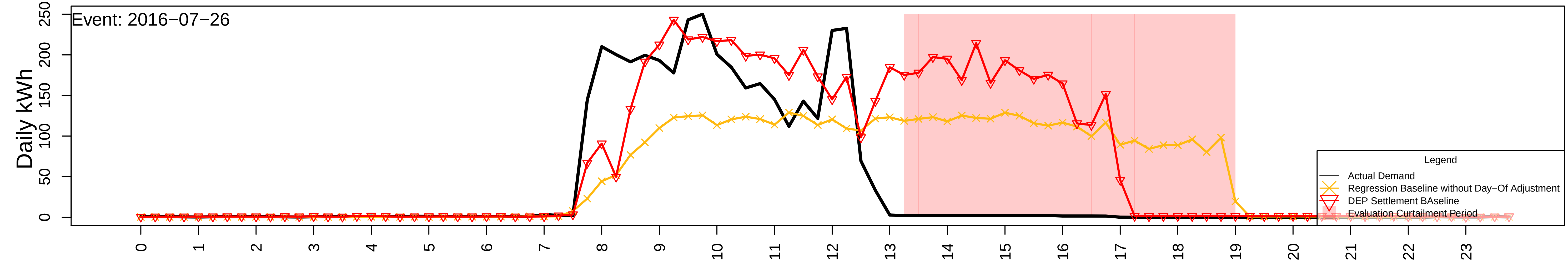
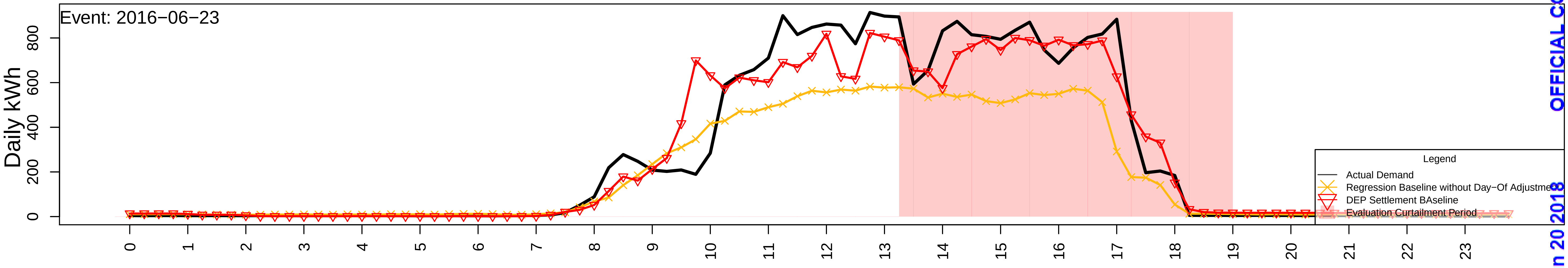
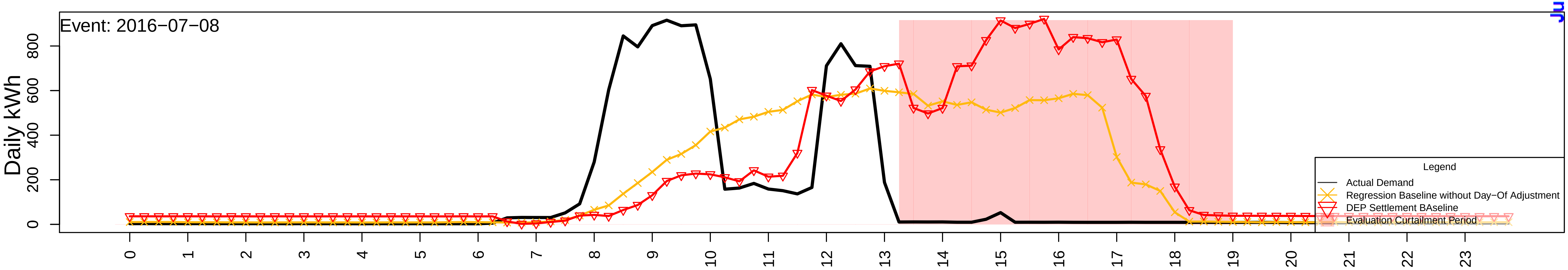


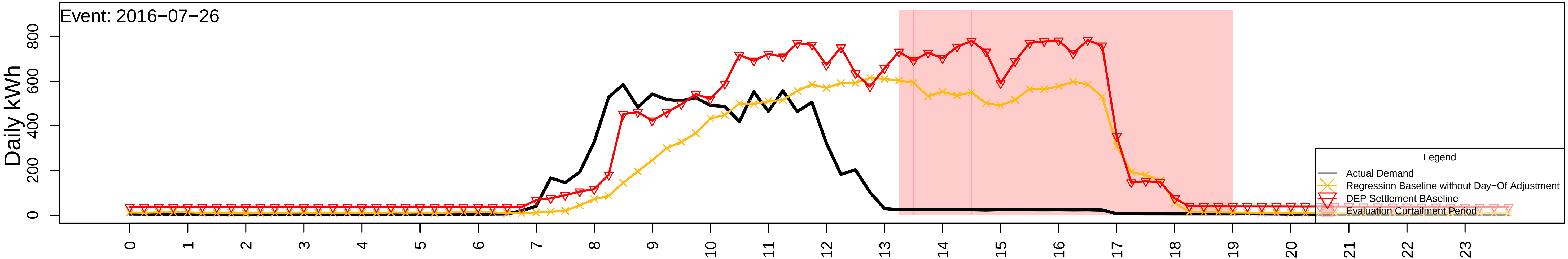




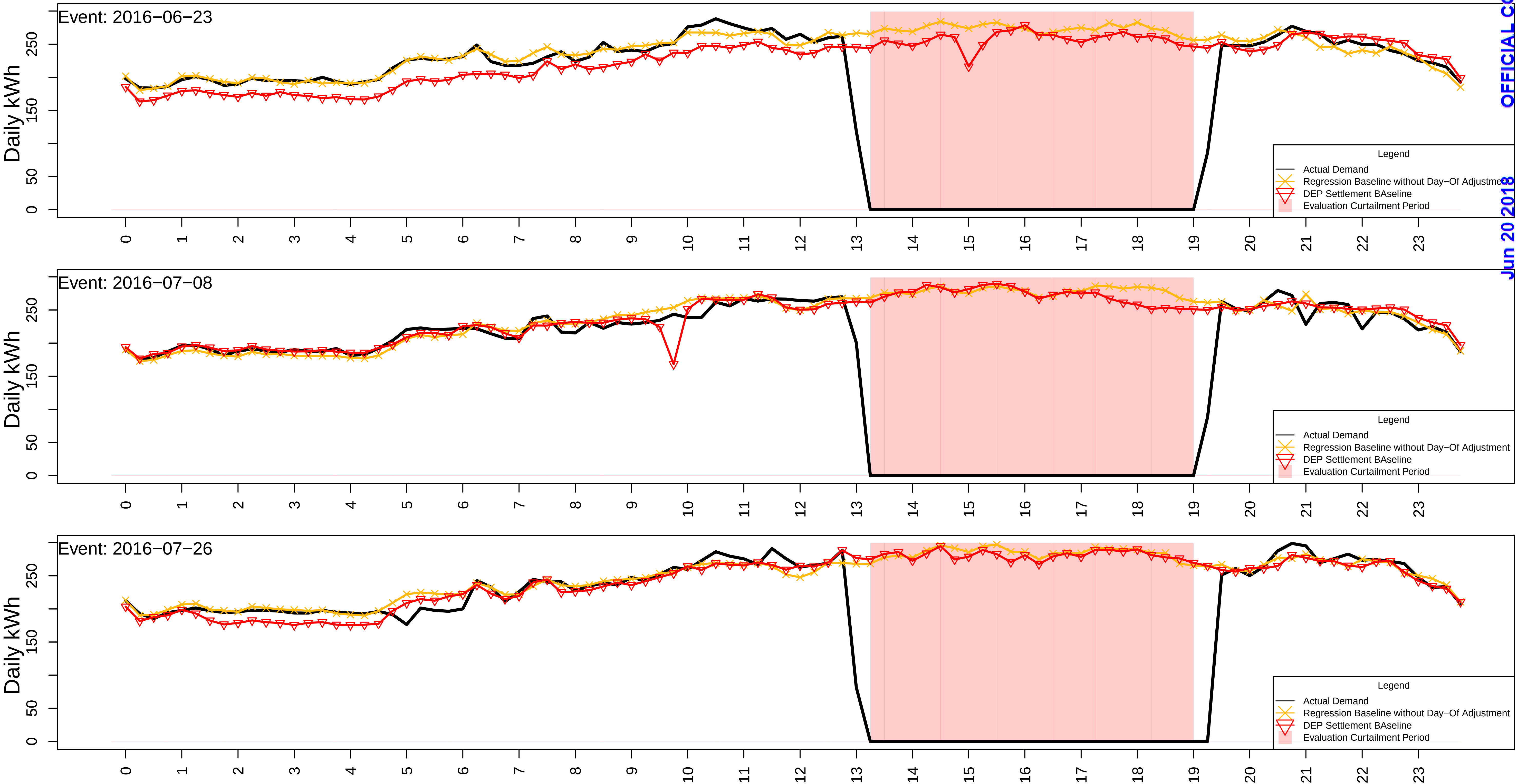
Program ID: DRA0024
Segment : Industrial
Load Reduction Source : Process



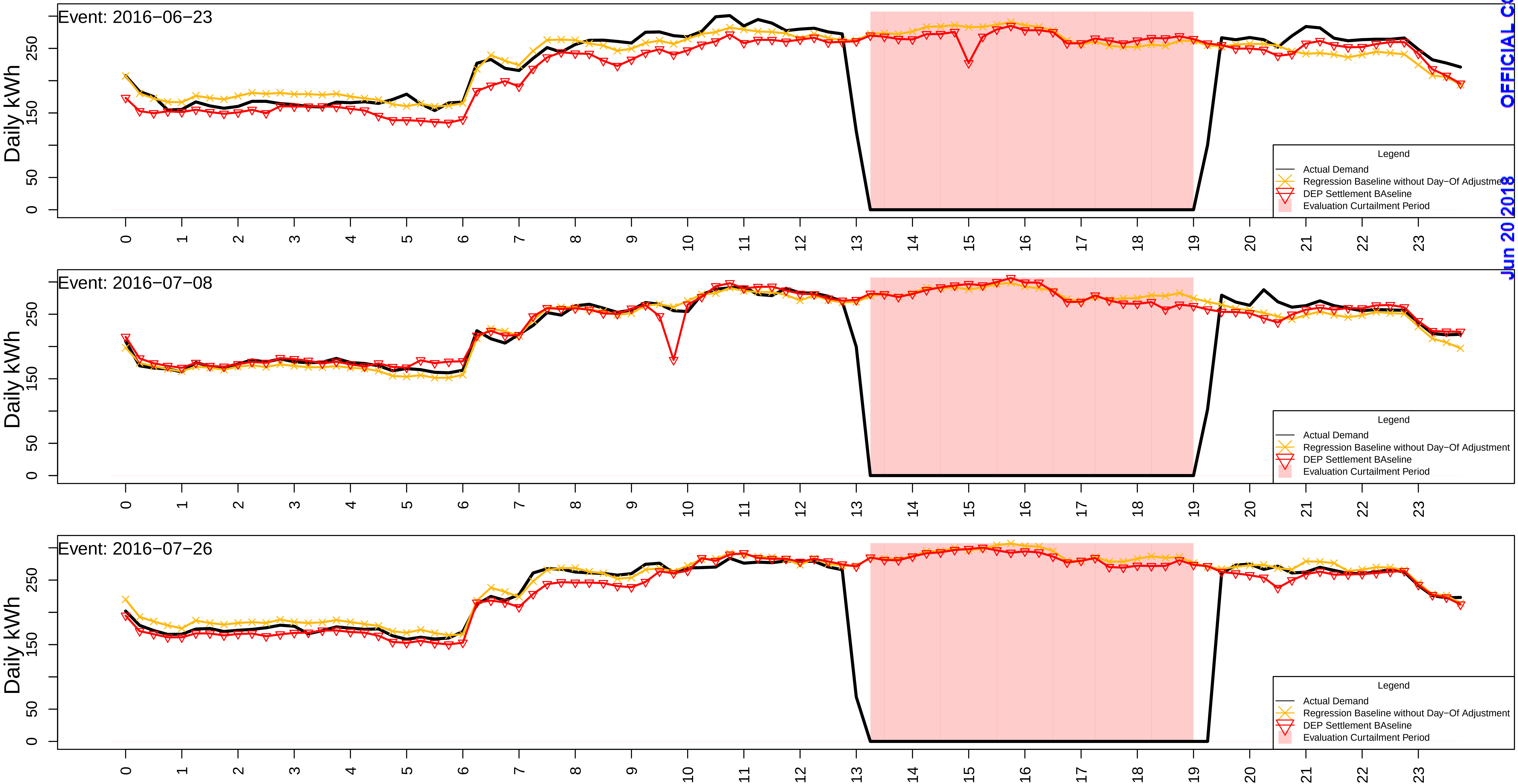




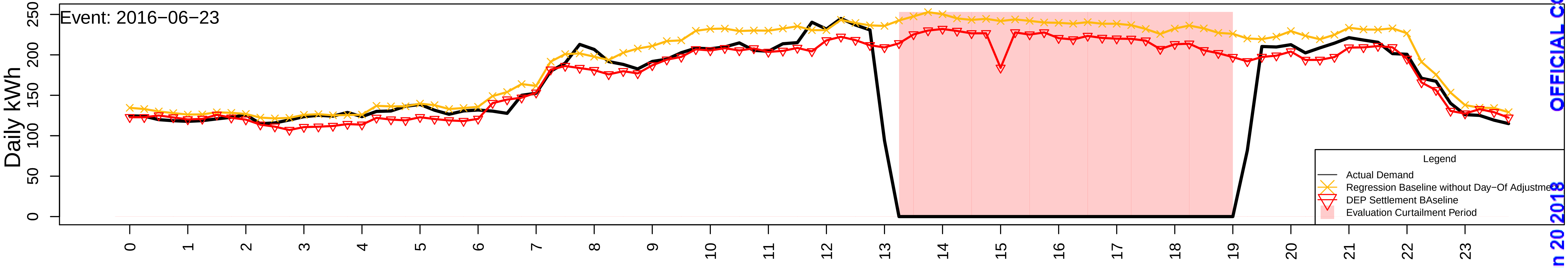
Program ID: DRA0026
Segment : Commercial
Load Reduction Source : Generator

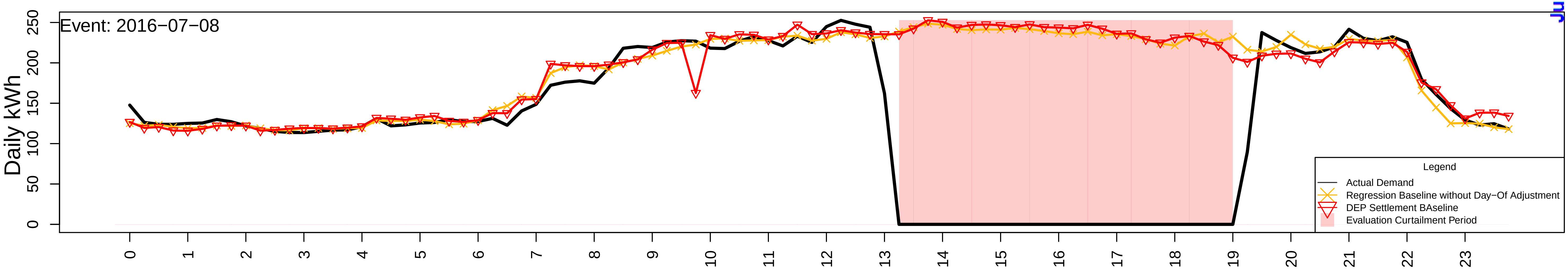


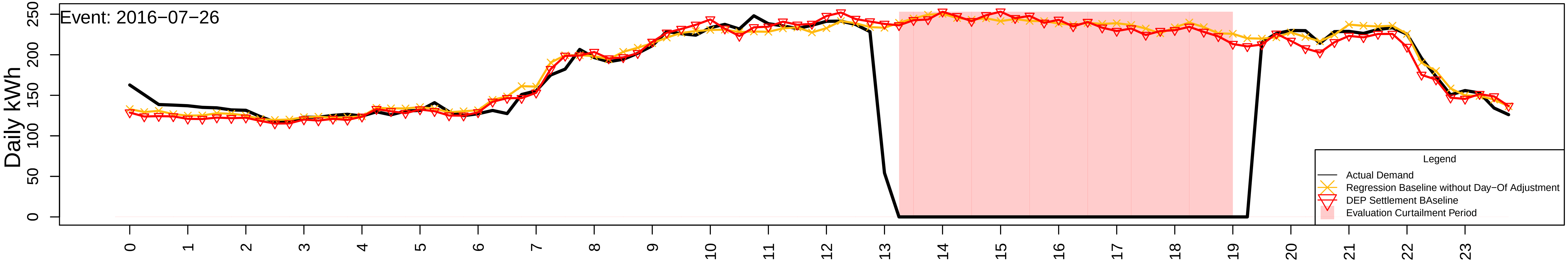
Program ID: DRA0027
Segment : Commercial
Load Reduction Source : Generator



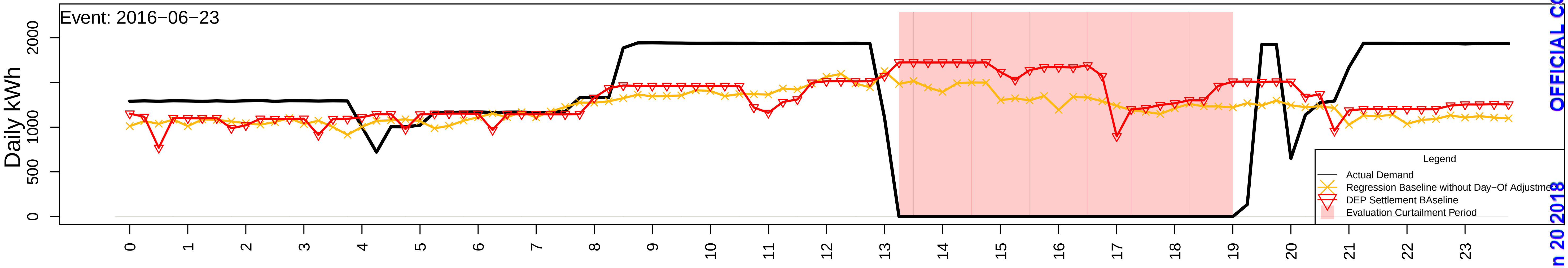
Program ID: DRA0028
Segment : Commercial
Load Reduction Source : Generator

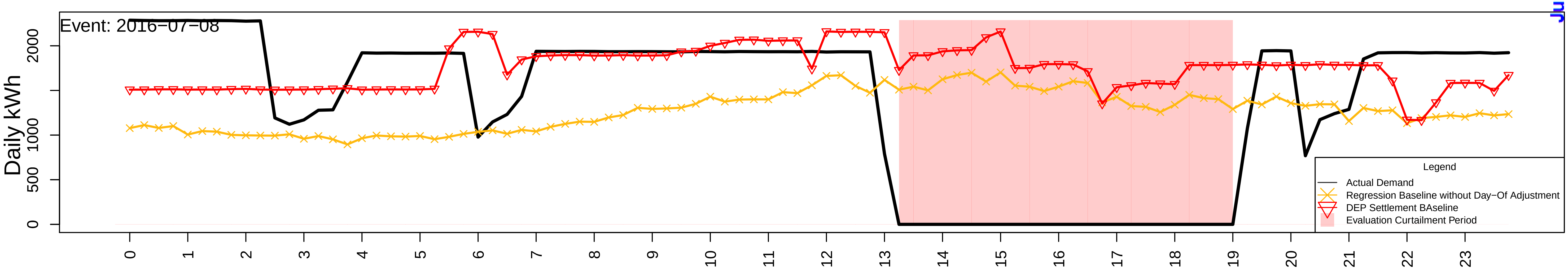


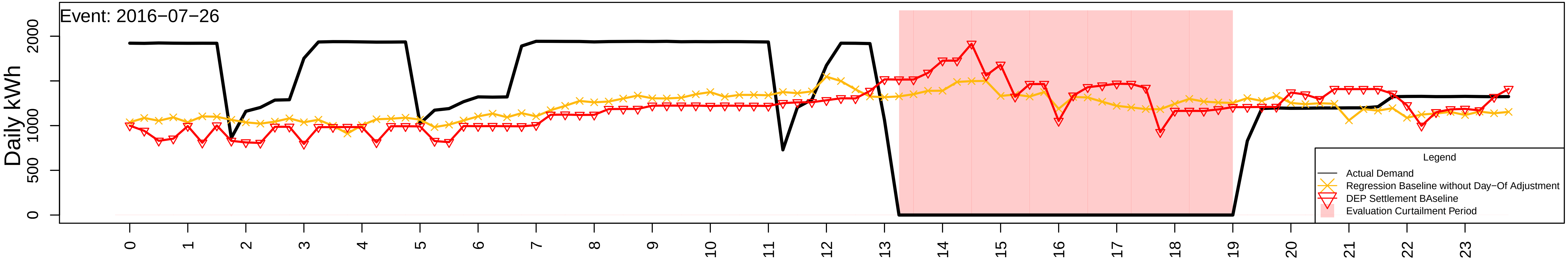




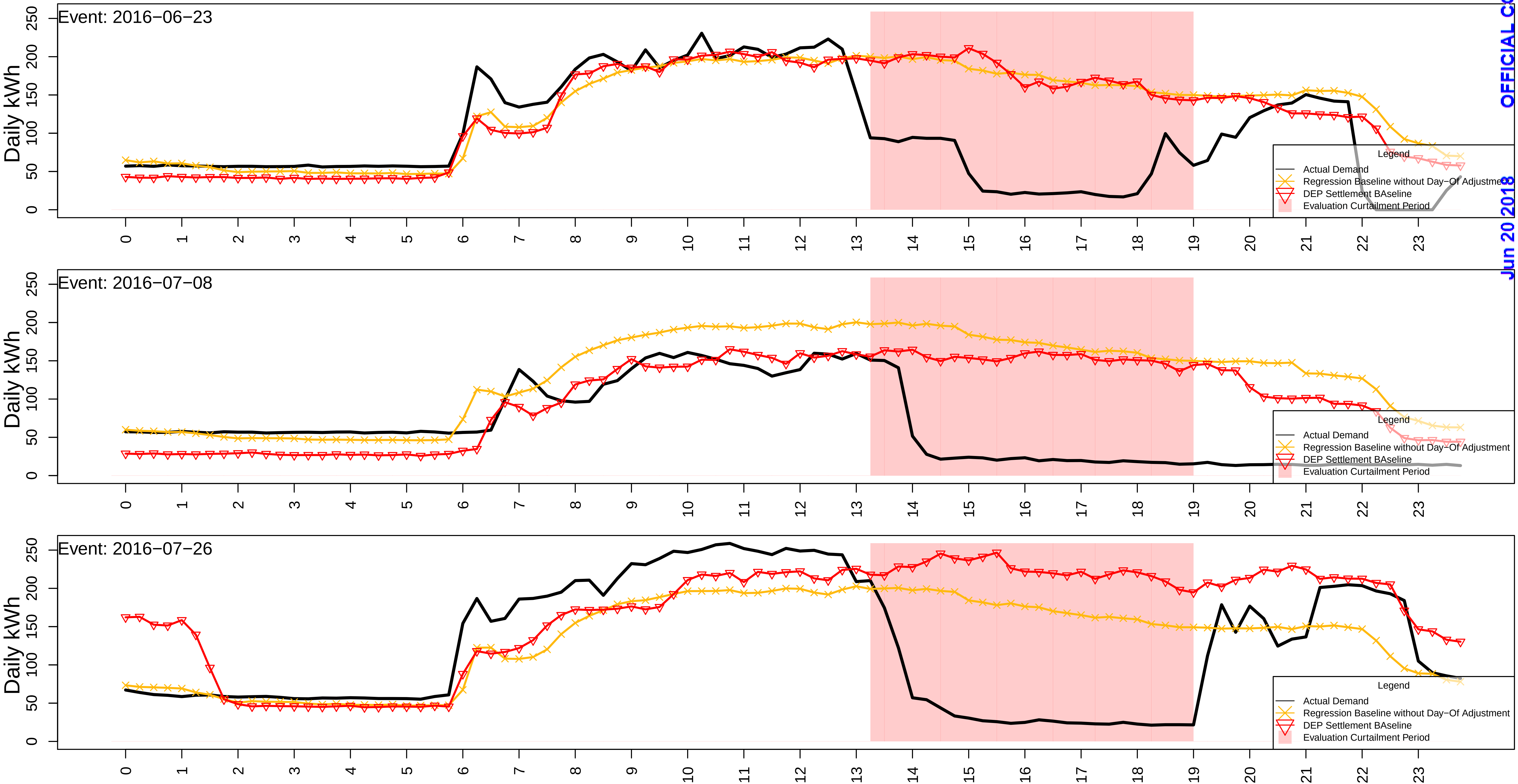
Program ID: DRA0029
Segment : Governmental
Load Reduction Source : Generator



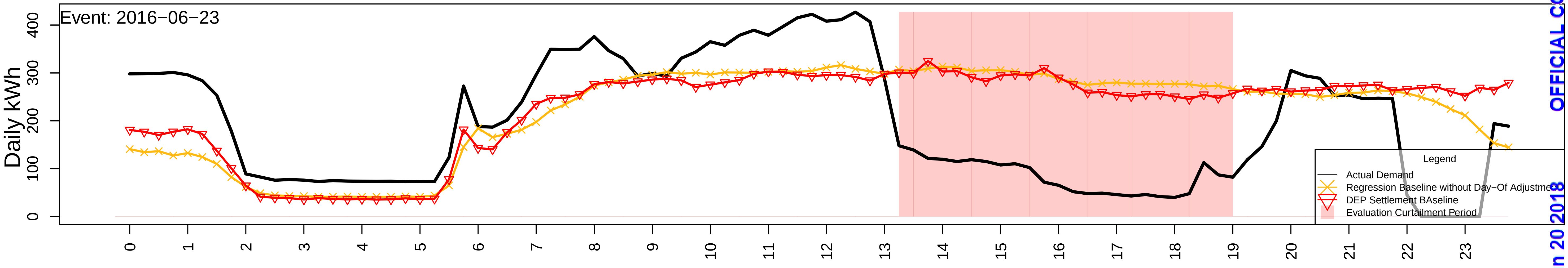


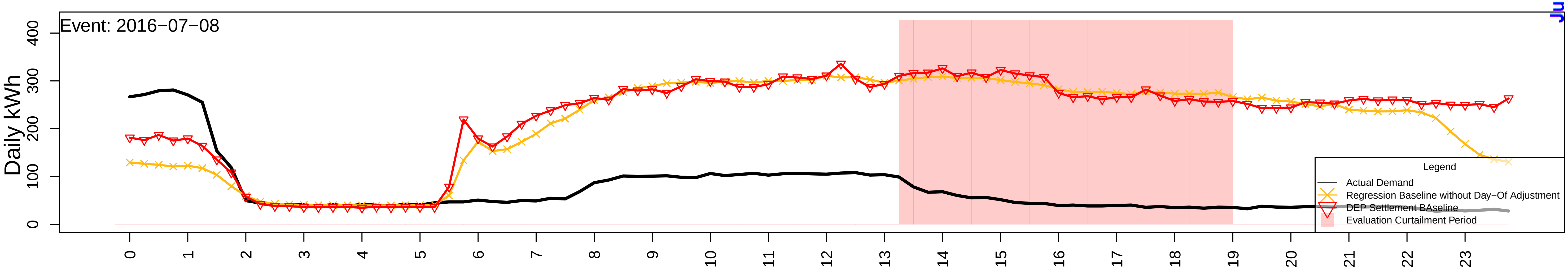


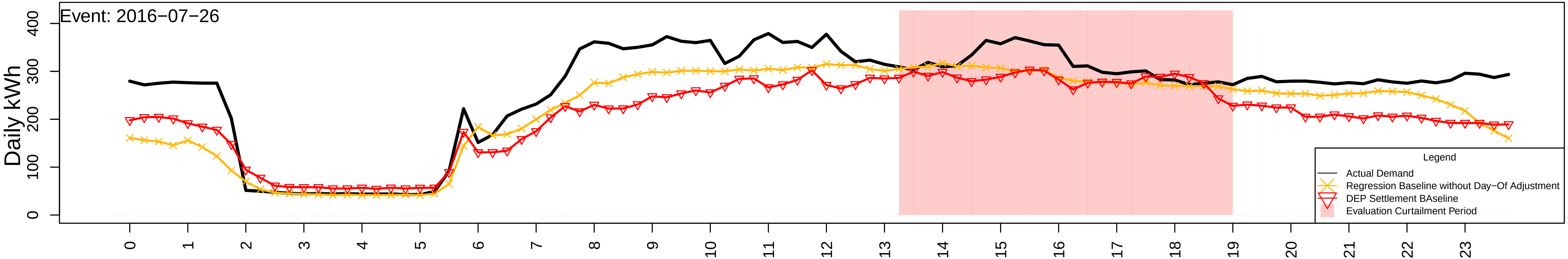
Program ID: DRA0030
Segment : Industrial
Load Reduction Source : Process



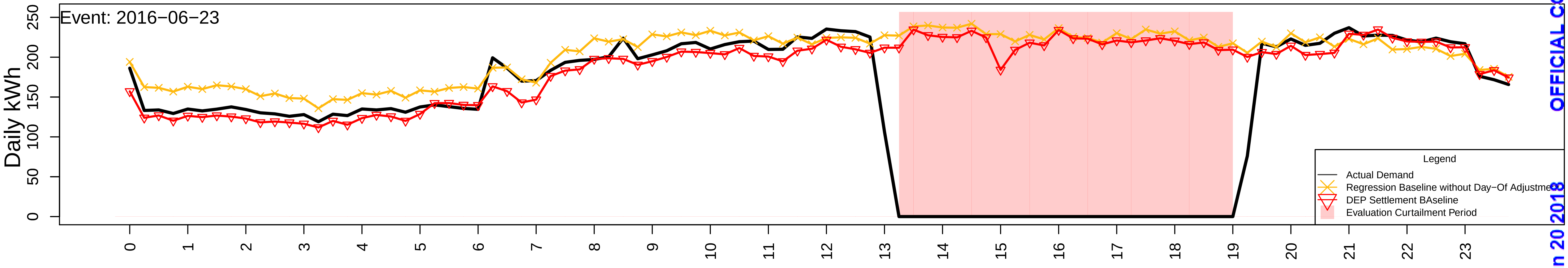
Program ID: DRA0031
Segment : Industrial
Load Reduction Source : Process

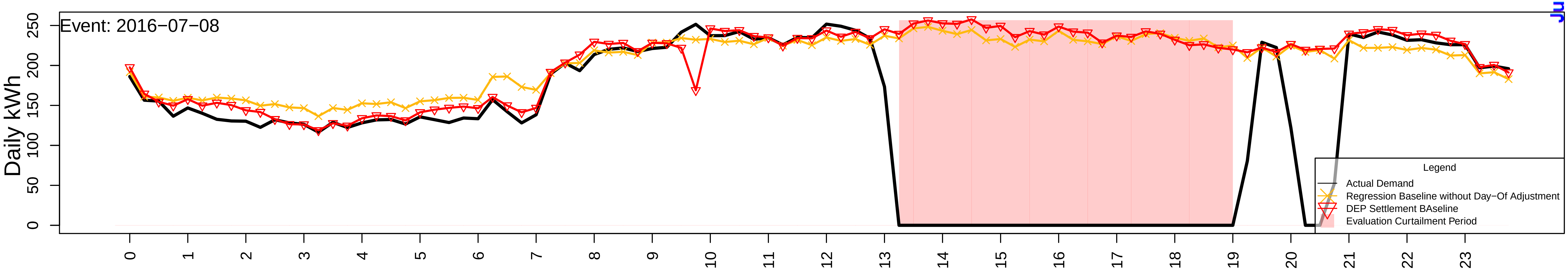


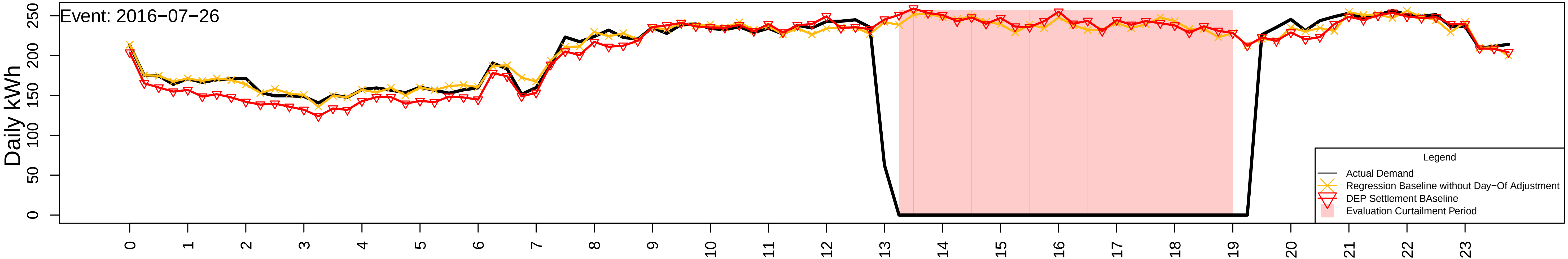




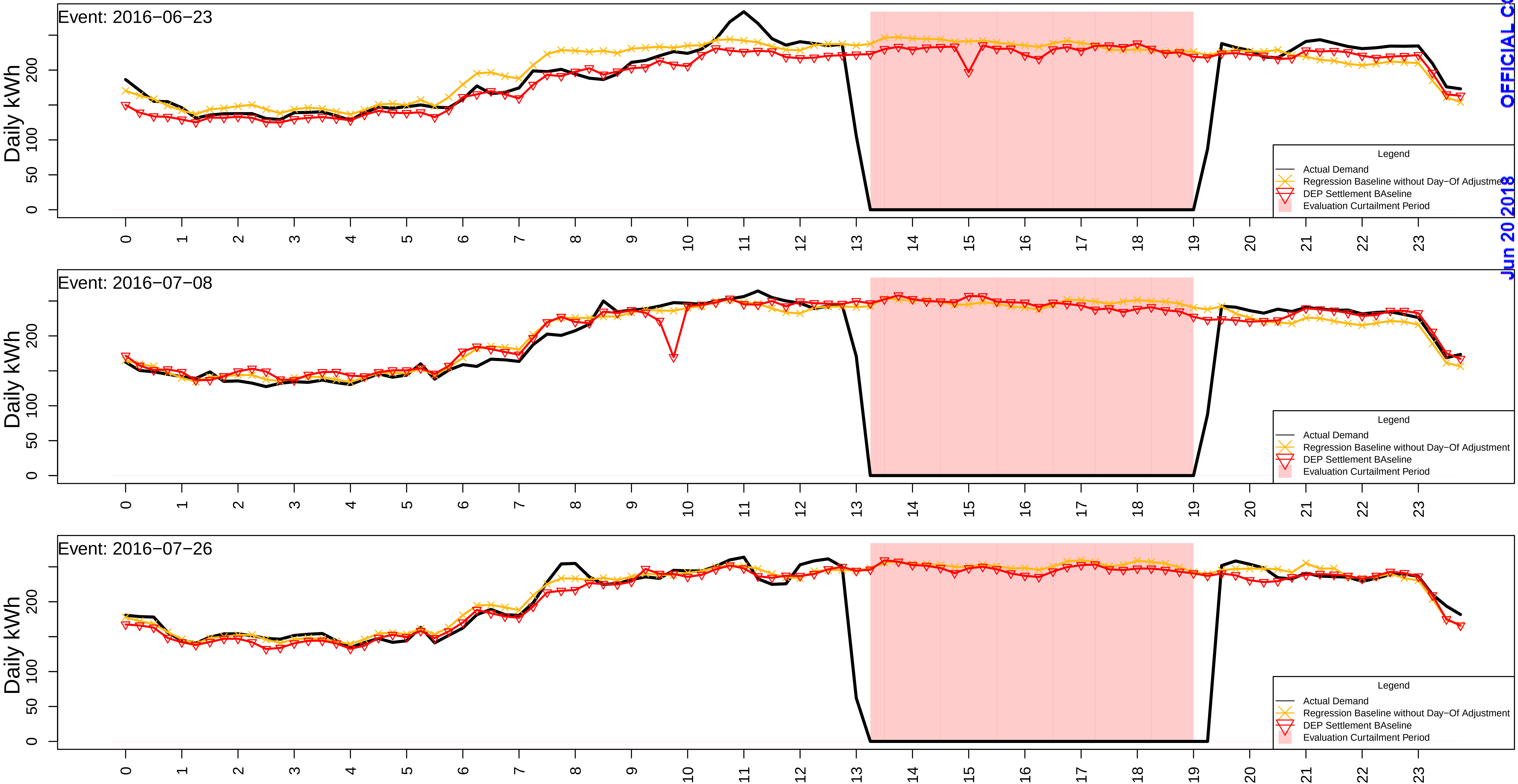
Program ID: DRA0032
Segment : Commercial
Load Reduction Source : Generator



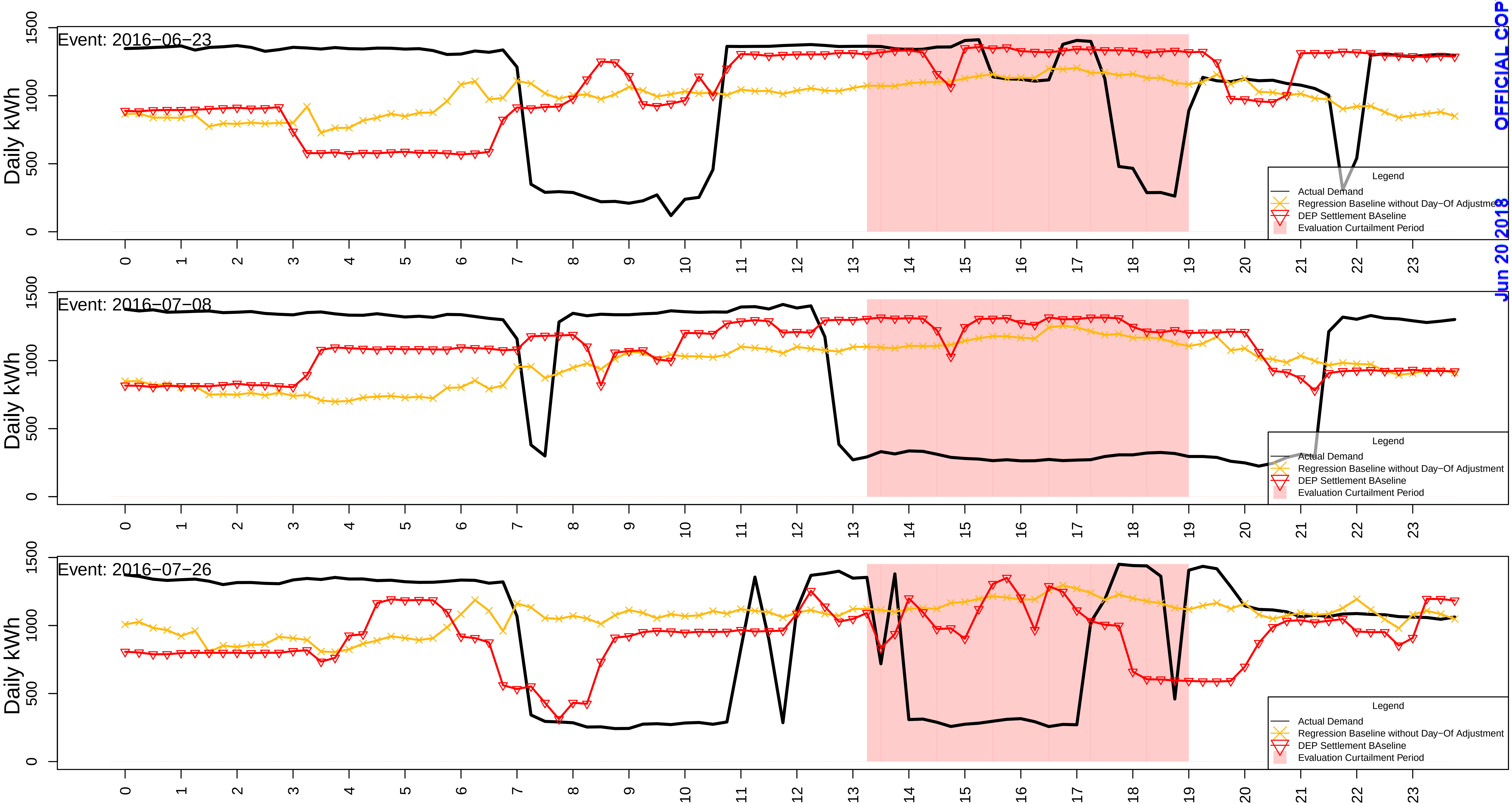




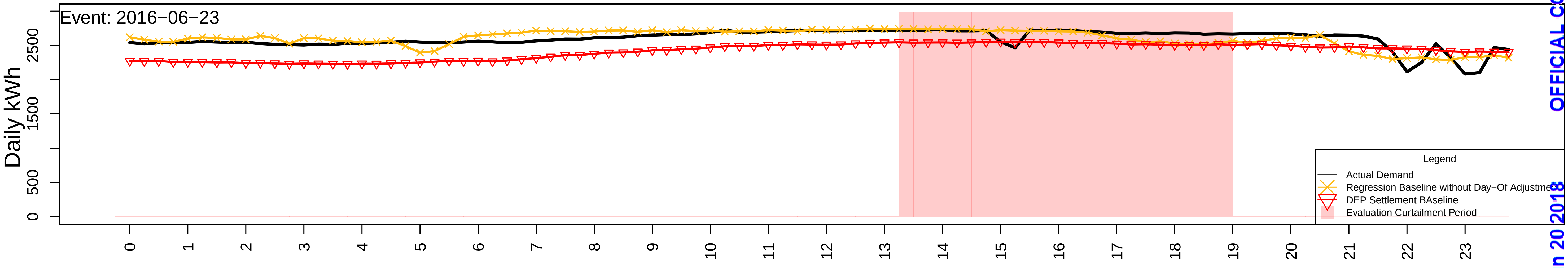
Program ID: DRA0033
Segment : Commercial
Load Reduction Source : Generator

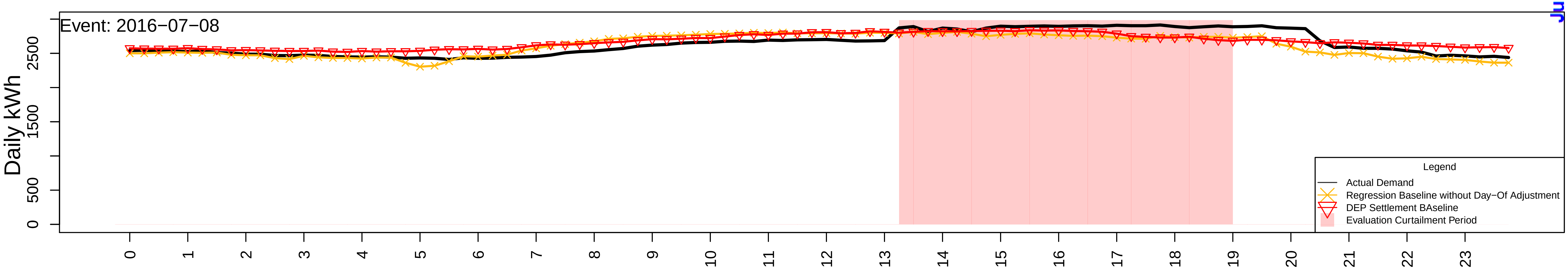


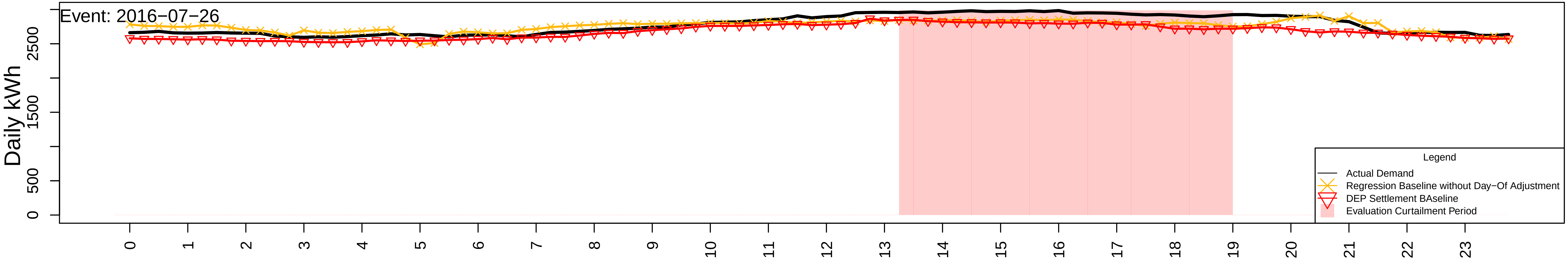
Program ID: DRA0034
Segment : Industrial
Load Reduction Source : Process



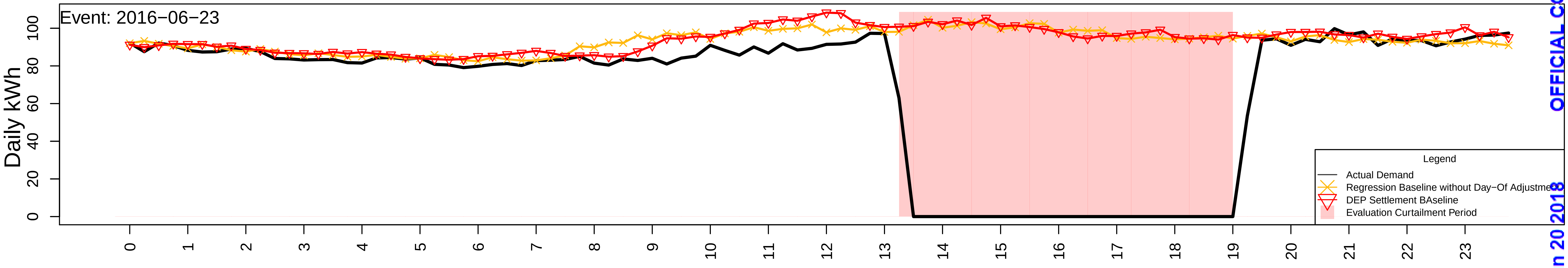
Program ID: DRA0035
Segment : Commercial
Load Reduction Source : Generator

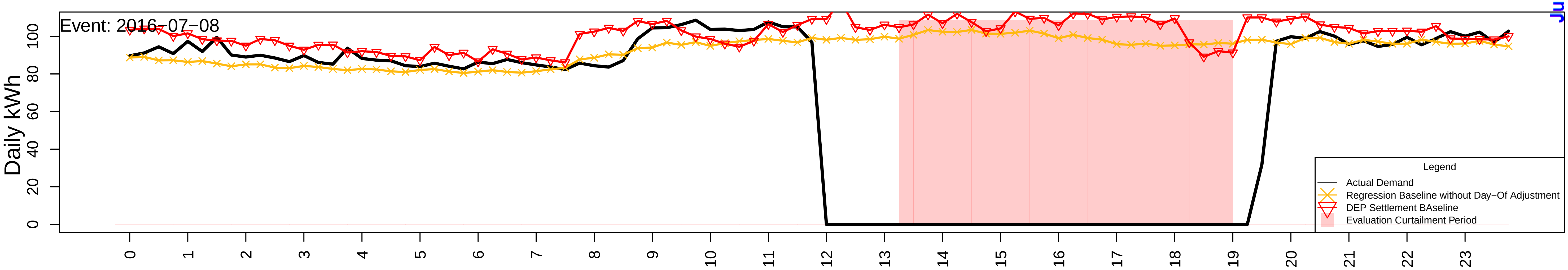


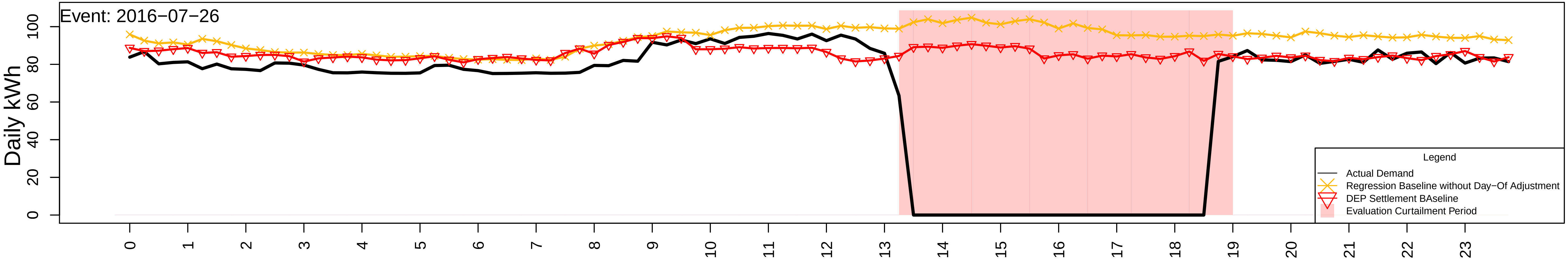




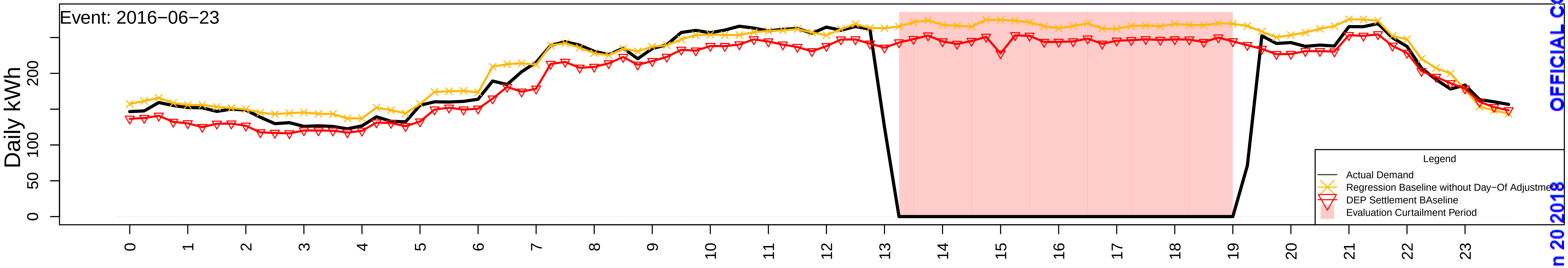
Program ID: DRA0036
Segment : Governmental
Load Reduction Source : Generator

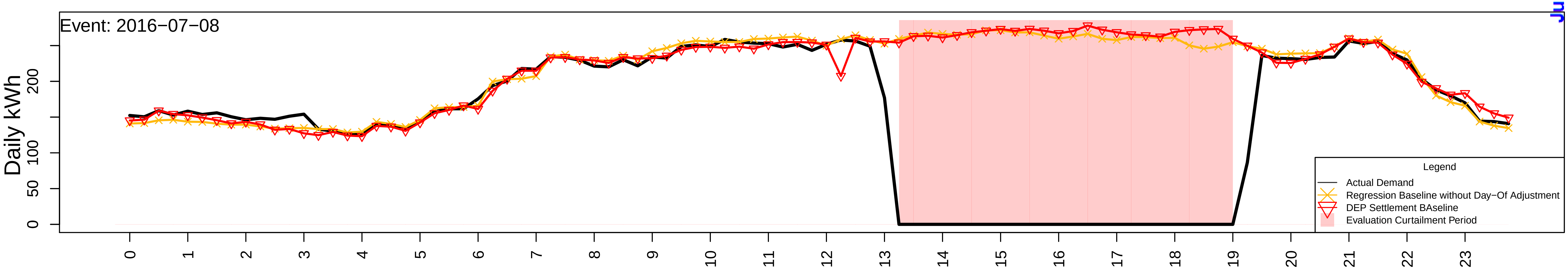


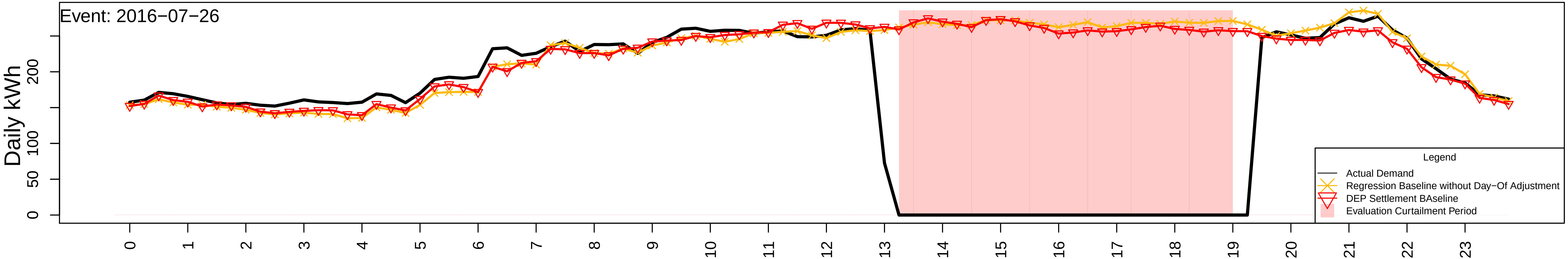




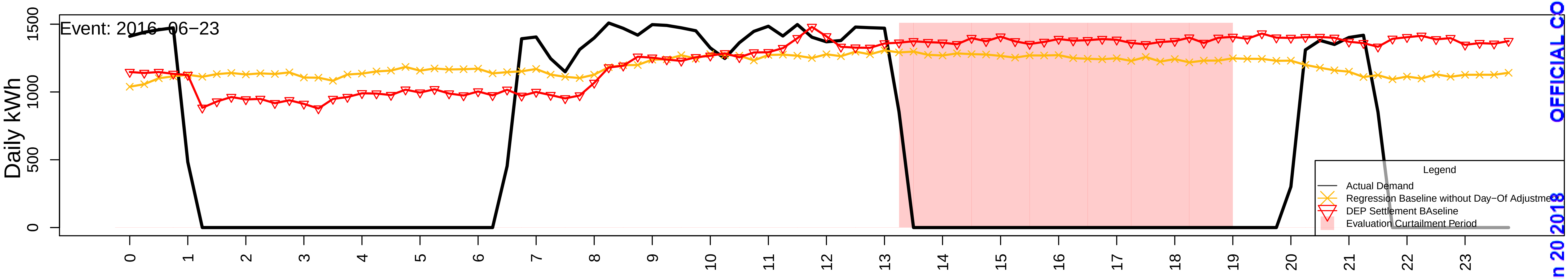
Program ID: DRA0037
Segment : Commercial
Load Reduction Source : Generator

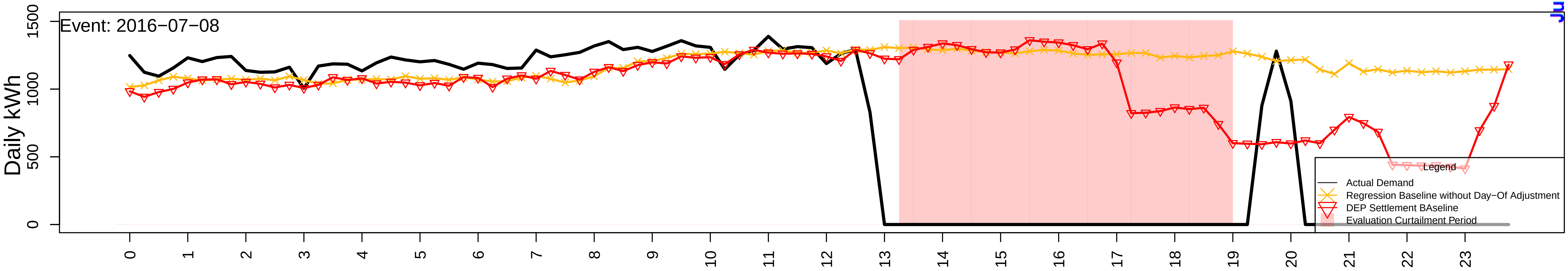


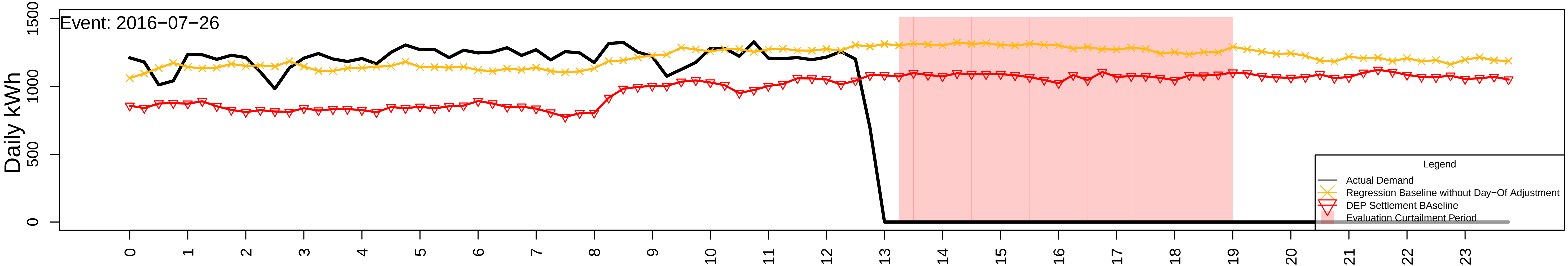




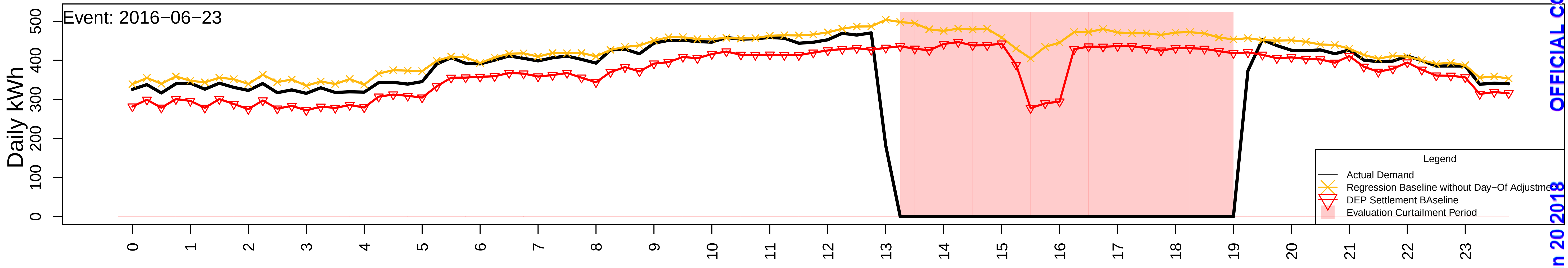
Program ID: DRA0039
Segment : Industrial
Load Reduction Source : Generator

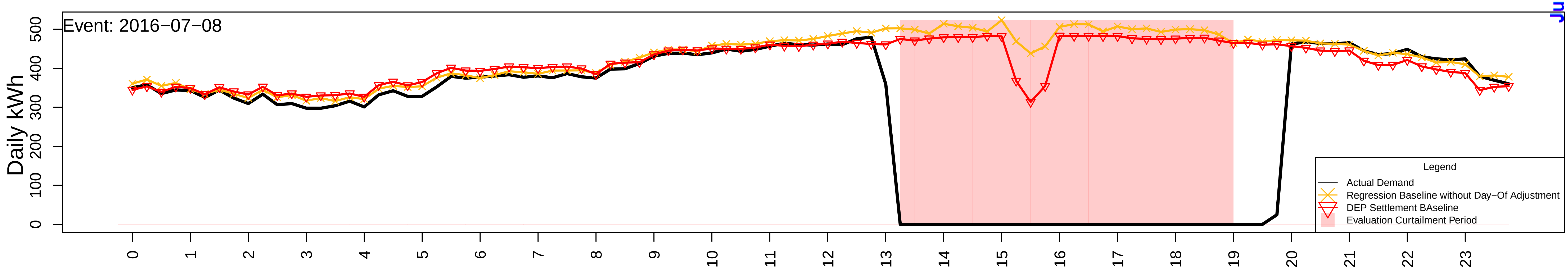


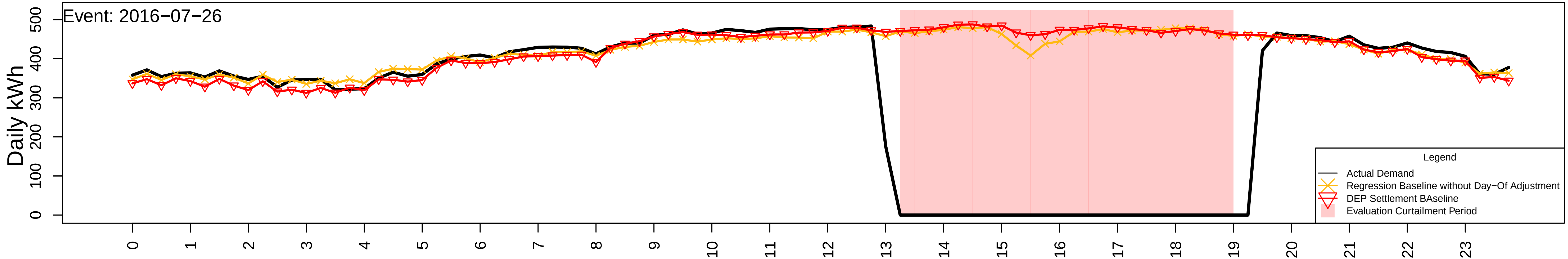




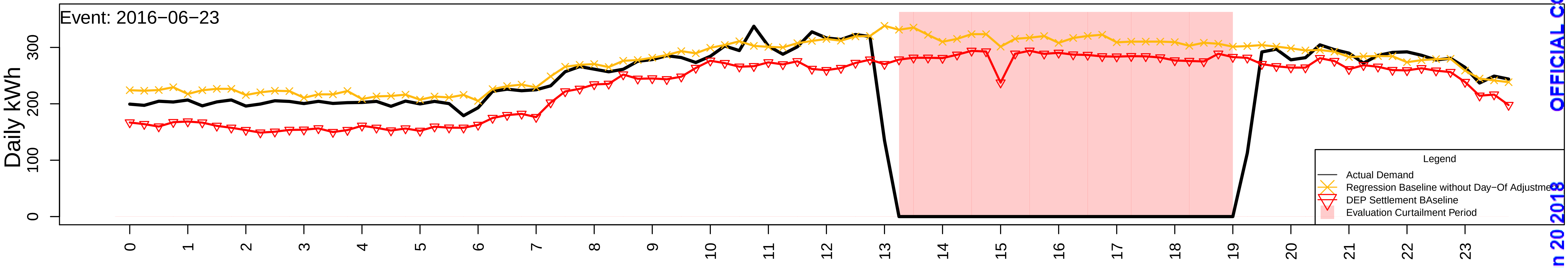
Program ID: DRA0041
Segment : Commercial
Load Reduction Source : Generator

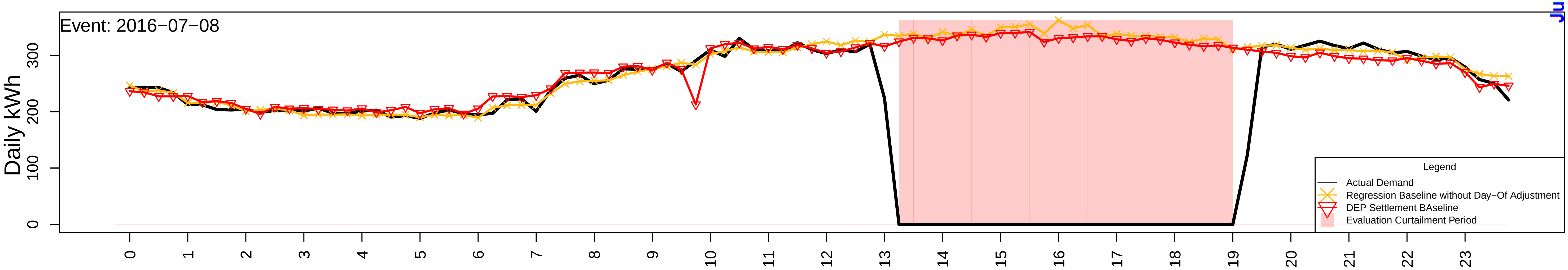


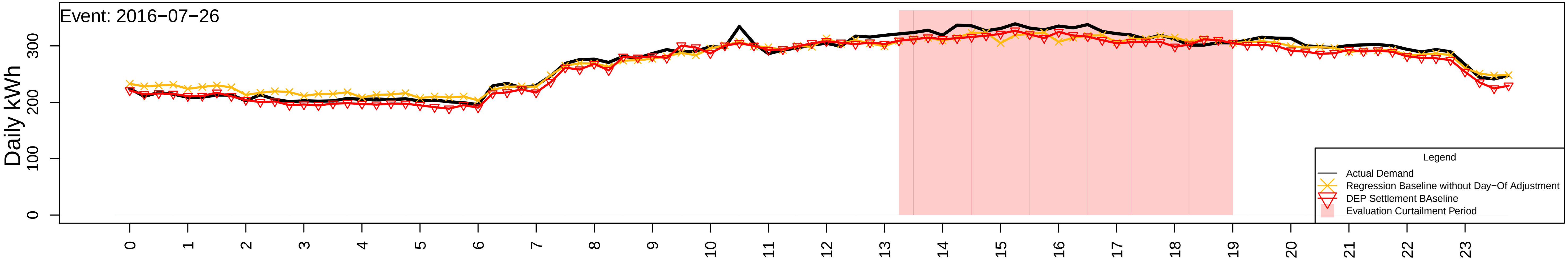




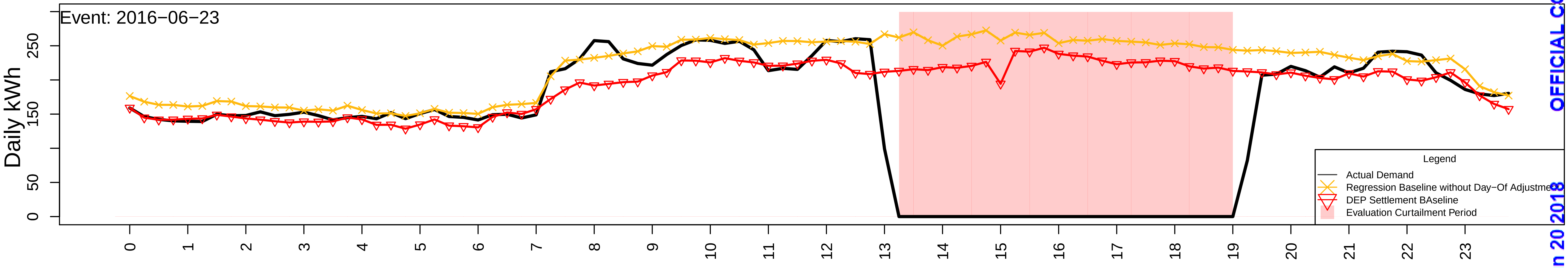
Program ID: DRA0042
Segment : Commercial
Load Reduction Source : Generator

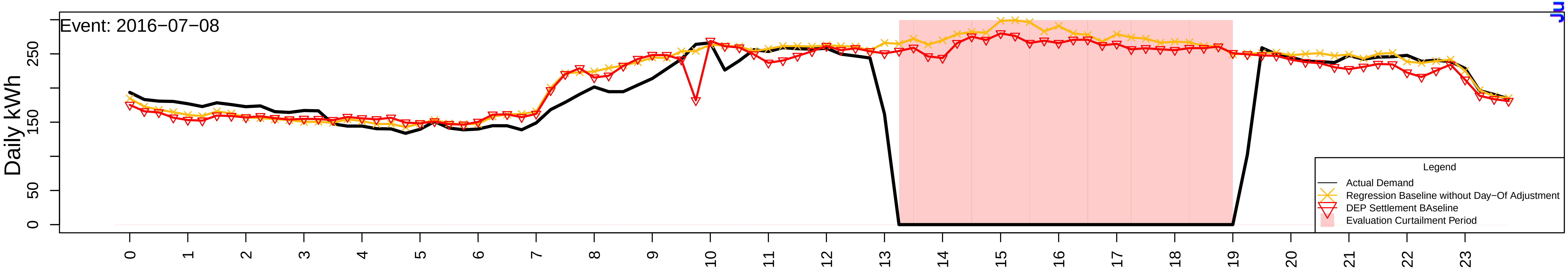


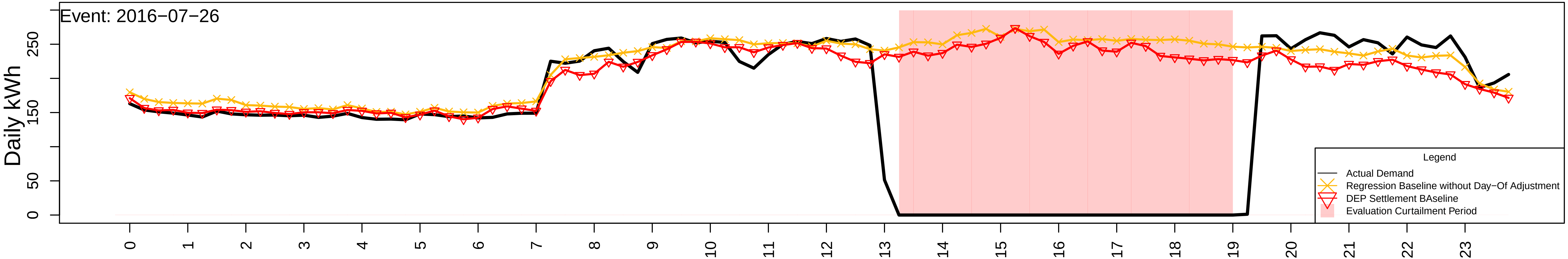




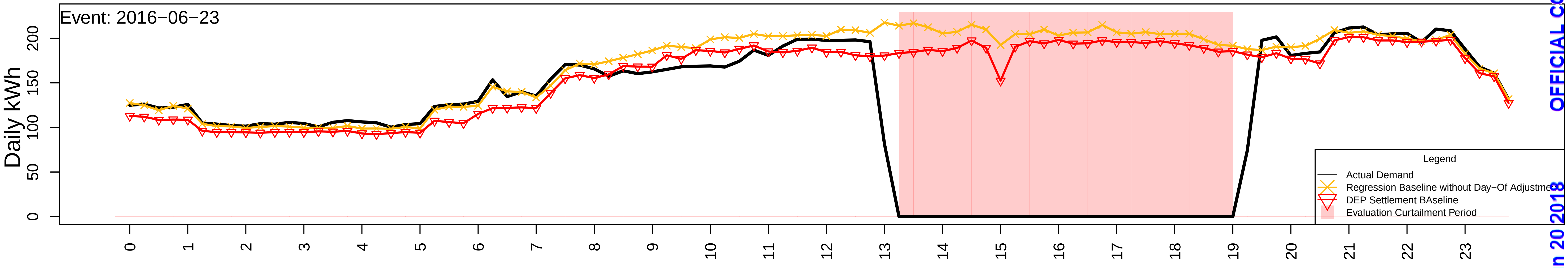
Program ID: DRA0043
Segment : Commercial
Load Reduction Source : Generator

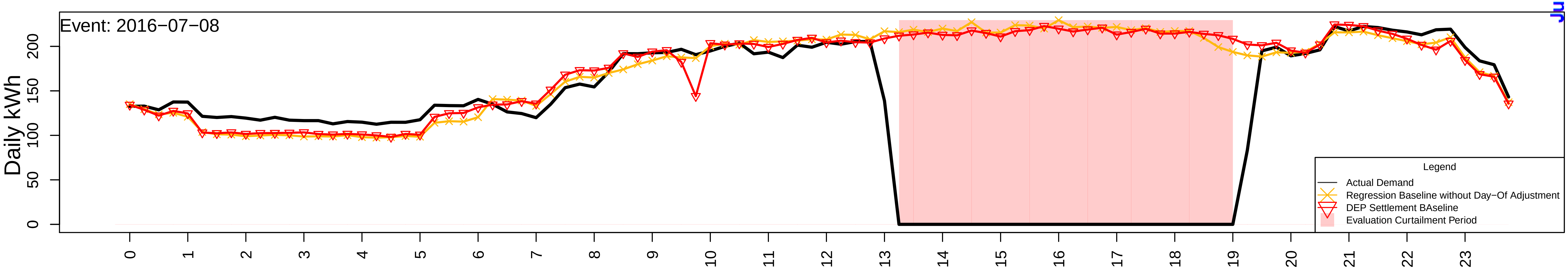


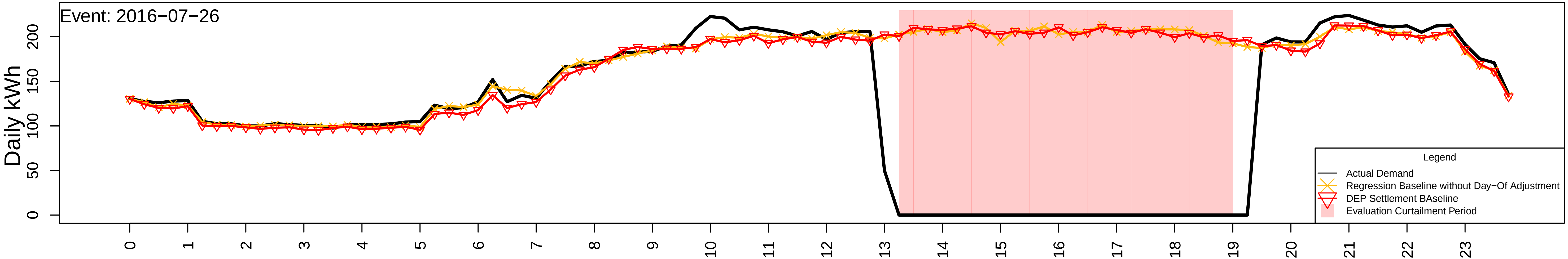




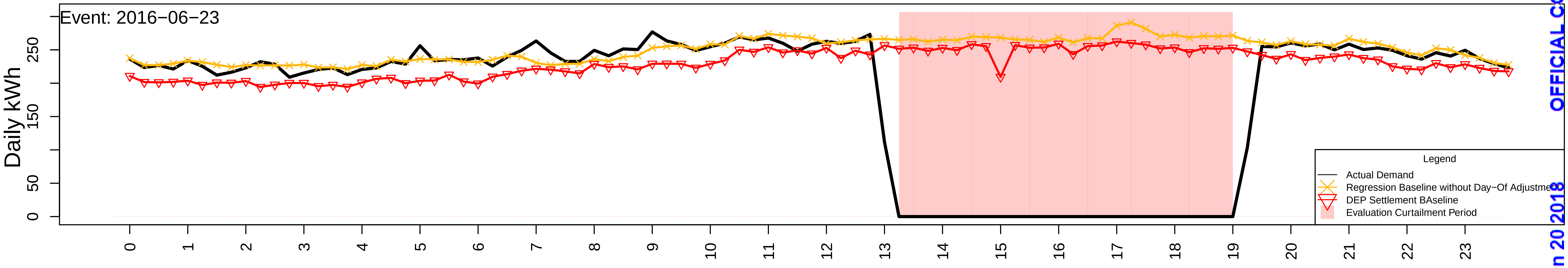
Program ID: DRA0044
Segment : Commercial
Load Reduction Source : Generator

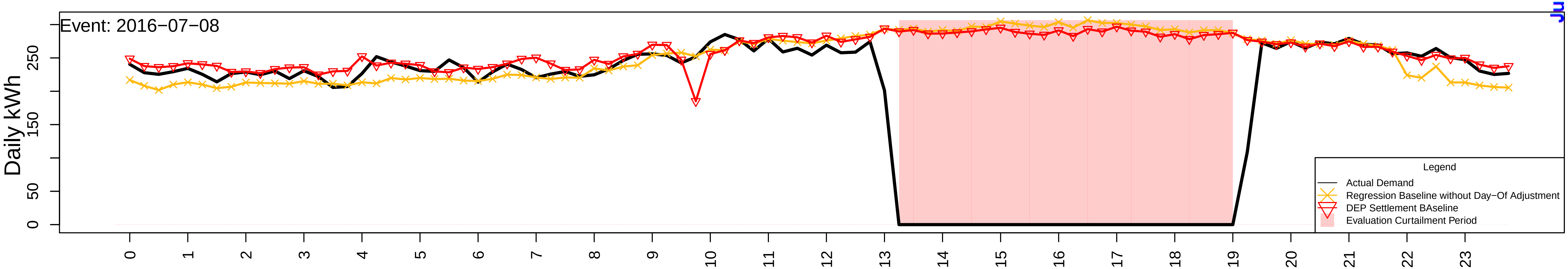


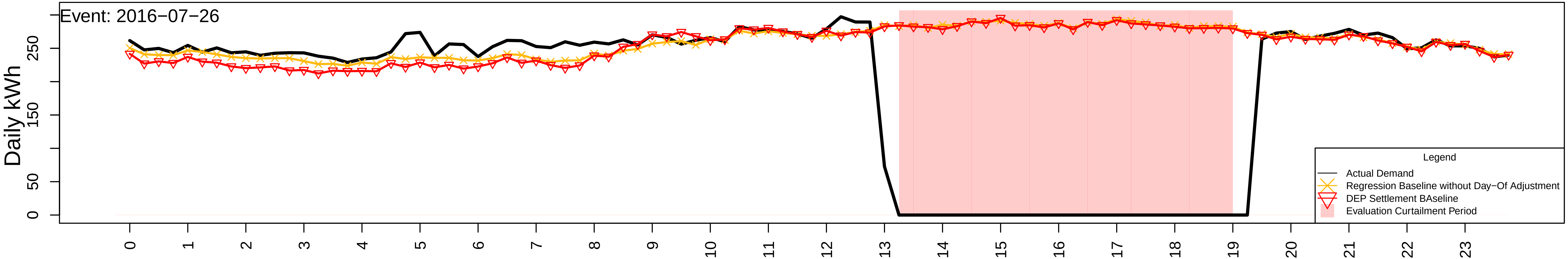




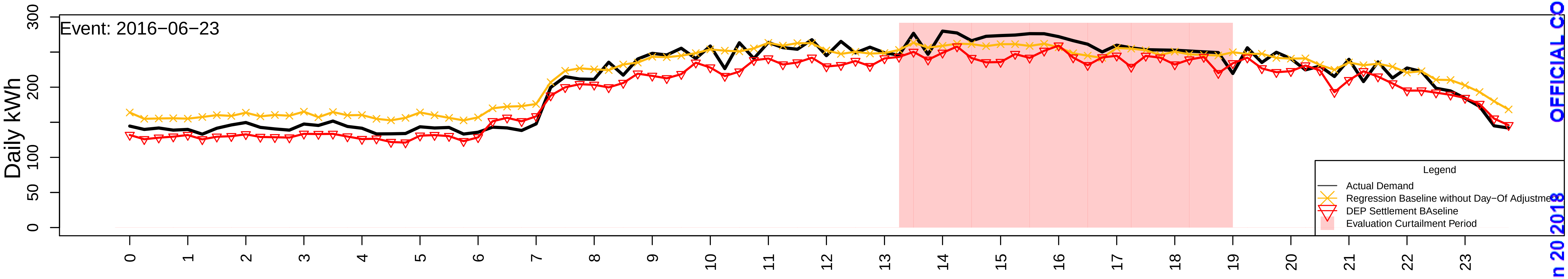
Program ID: DRA0045
Segment : Commercial
Load Reduction Source : Generator

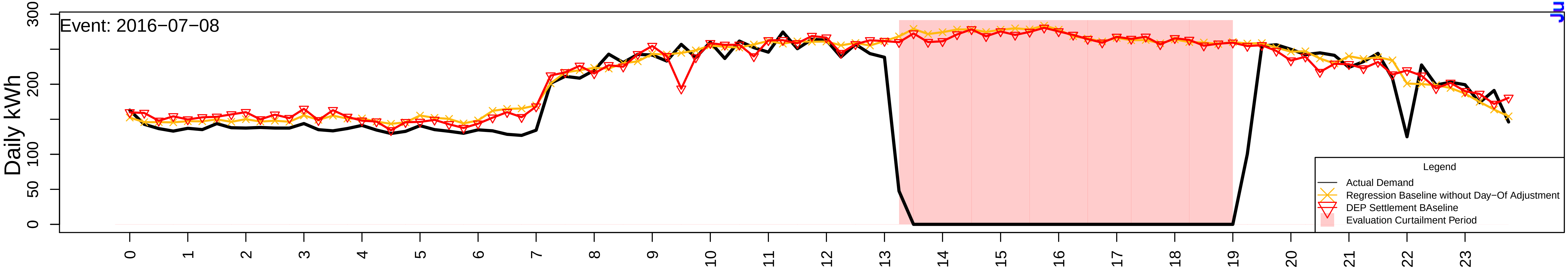


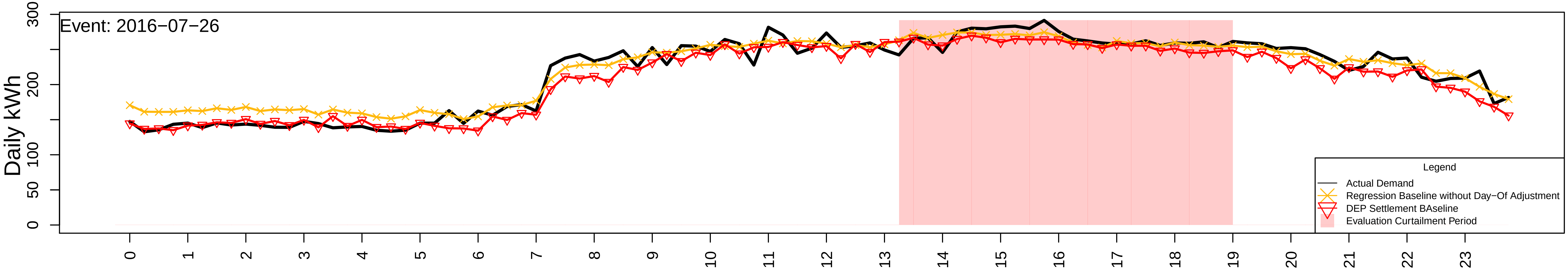




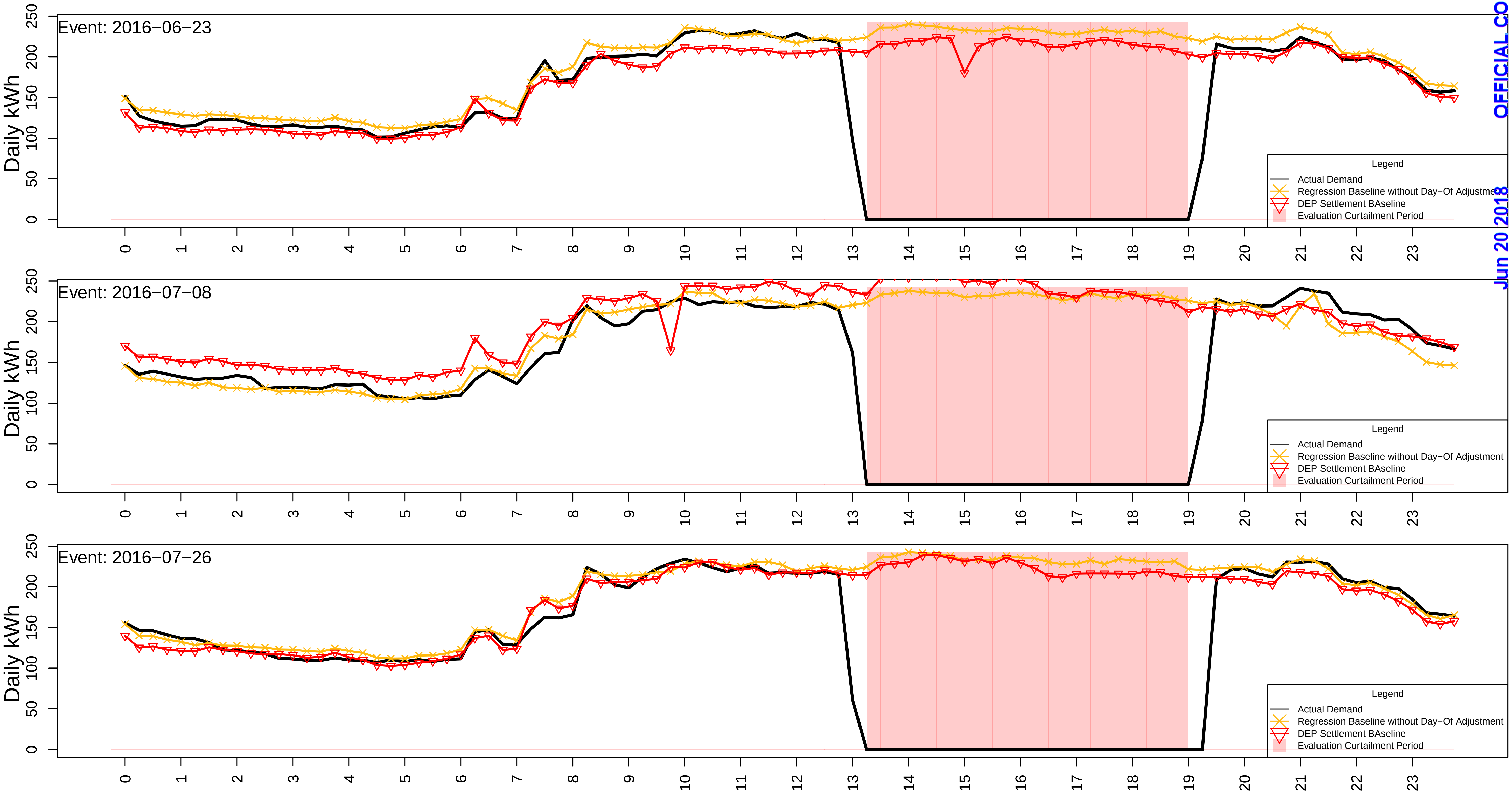
Program ID: DRA0046
Segment : Commercial
Load Reduction Source : Generator



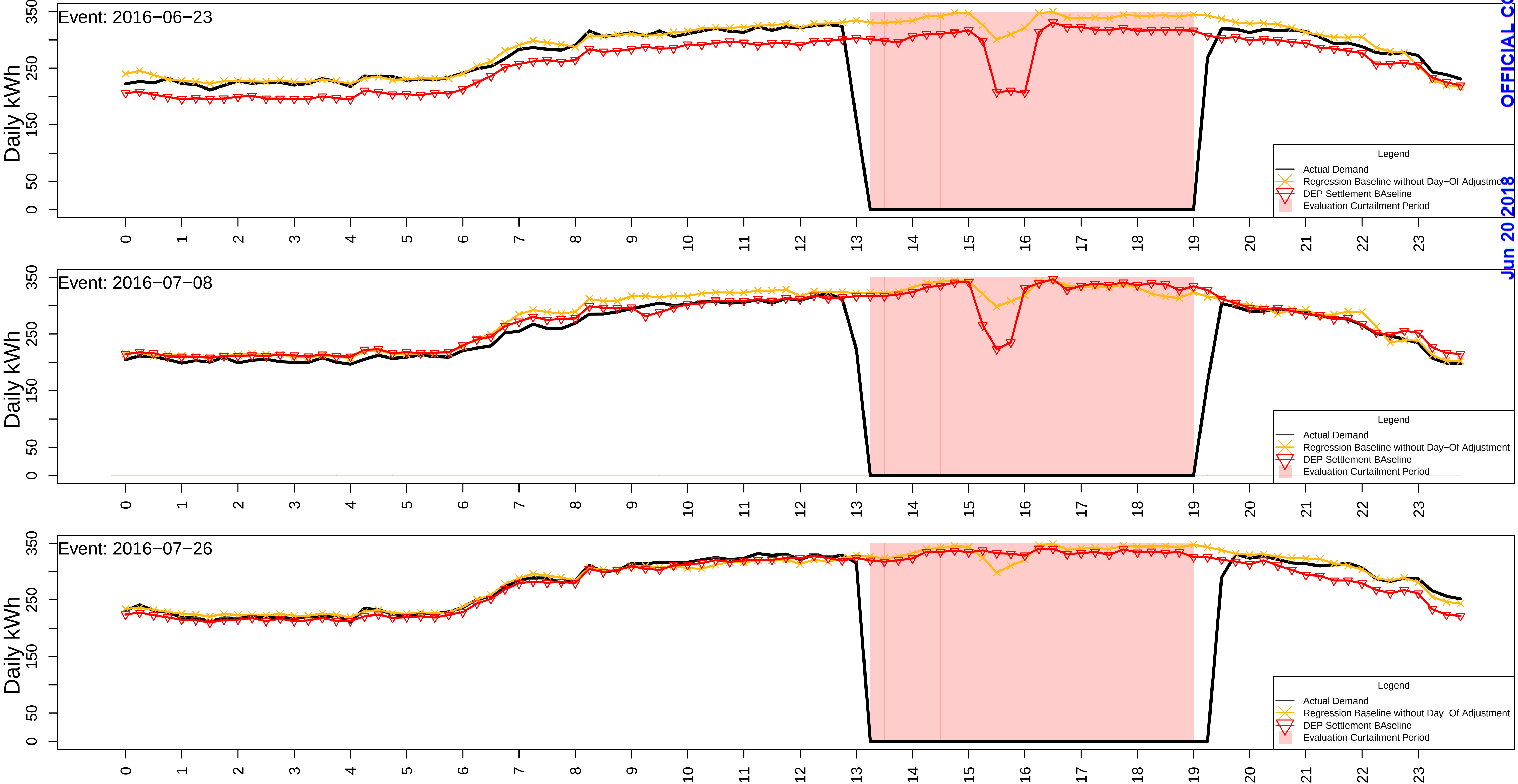




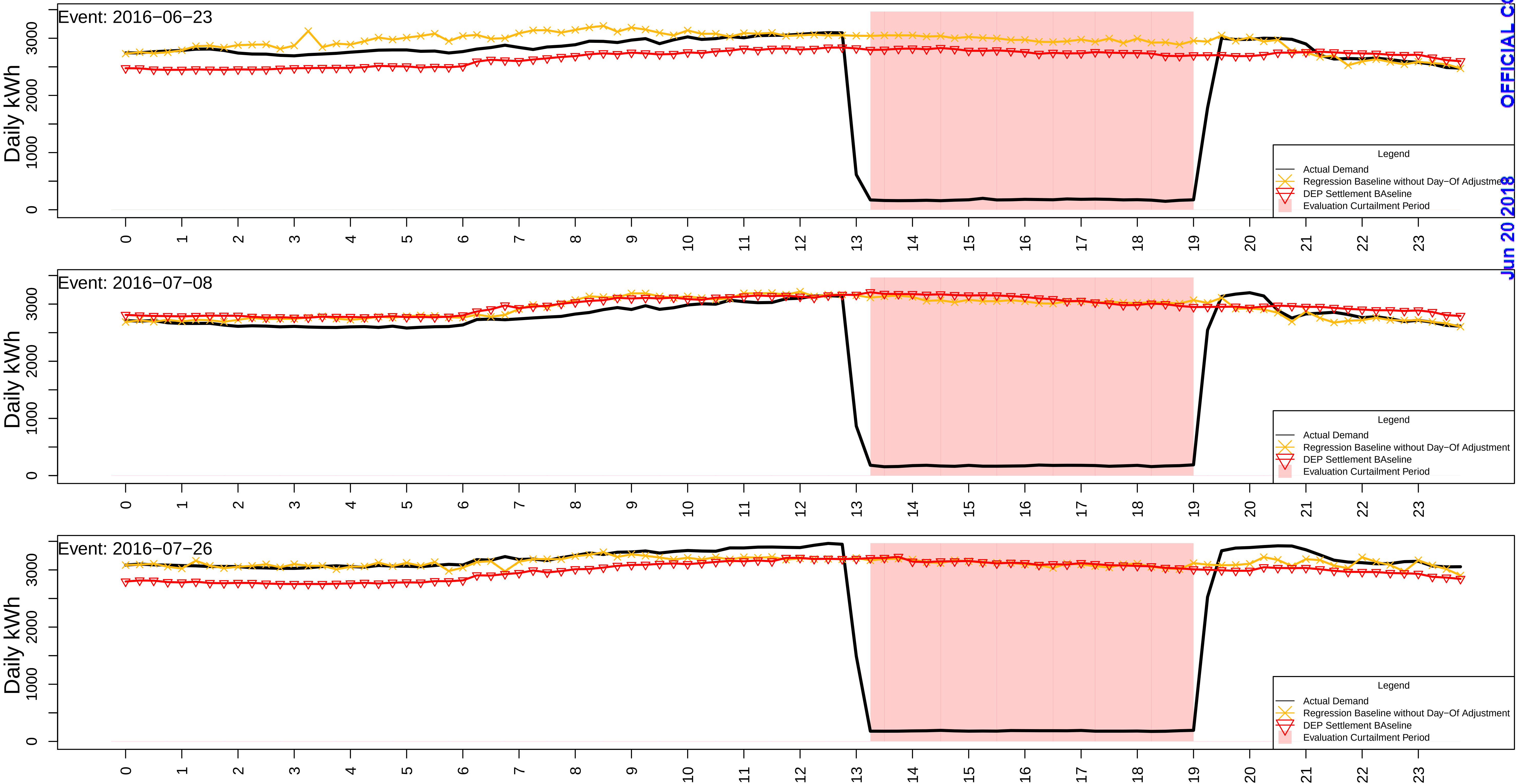
Program ID: DRA0047
Segment : Commercial
Load Reduction Source : Generator



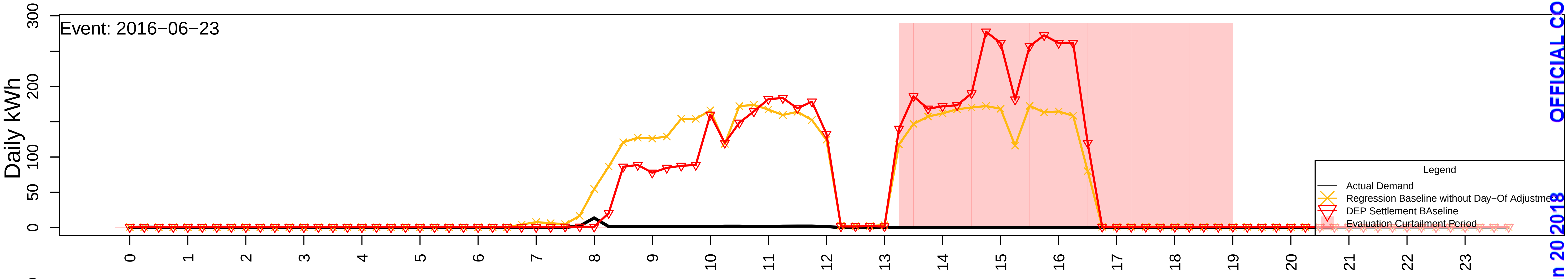
Program ID: DRA0048
Segment : Commercial
Load Reduction Source : Generator

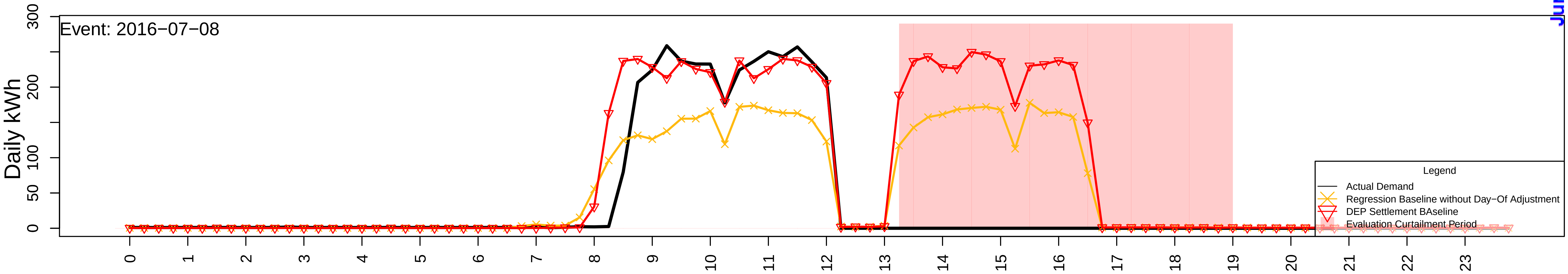


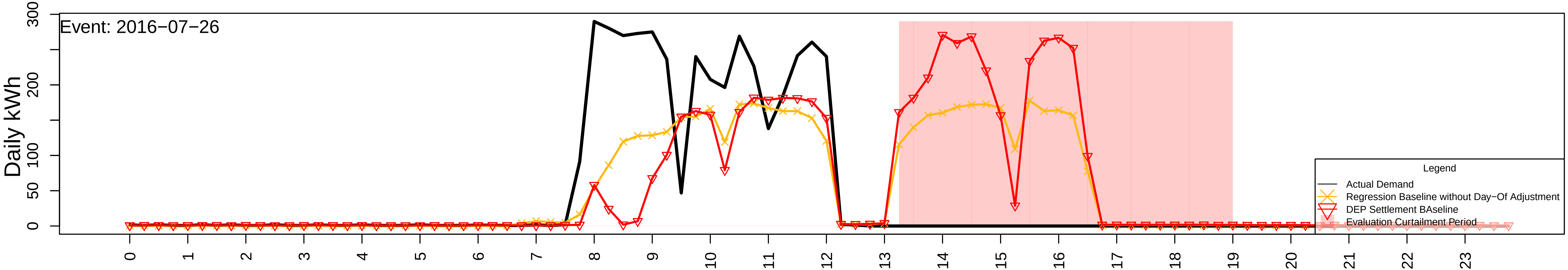
Program ID: DRA0049
Segment : Governmental
Load Reduction Source : Generator



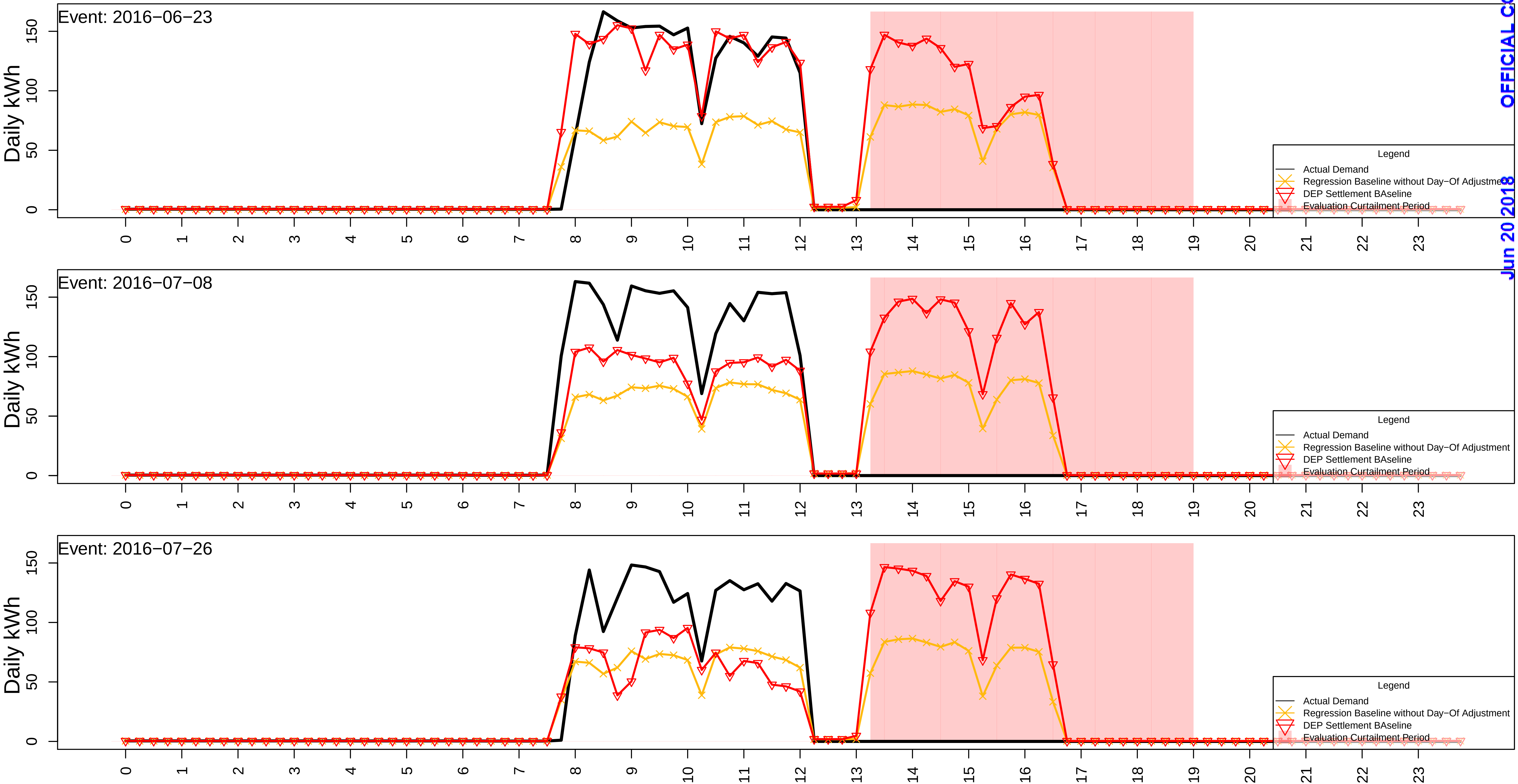
Program ID: DRA0051
Segment : Industrial
Load Reduction Source : Process



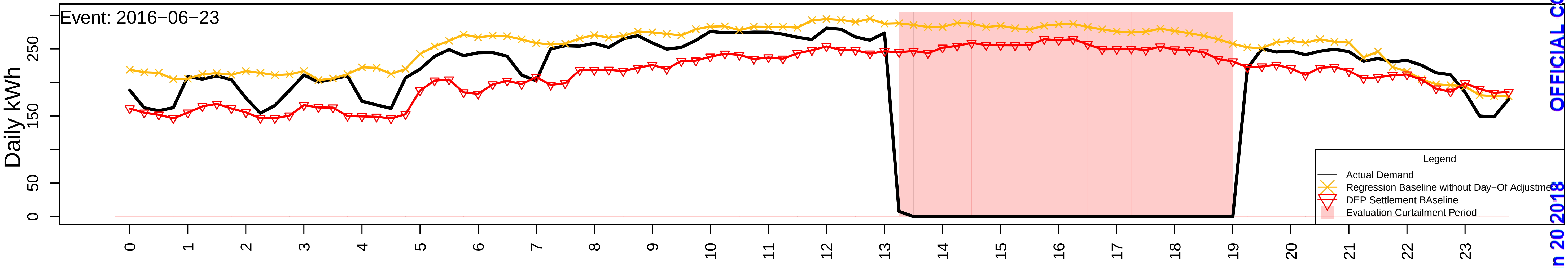


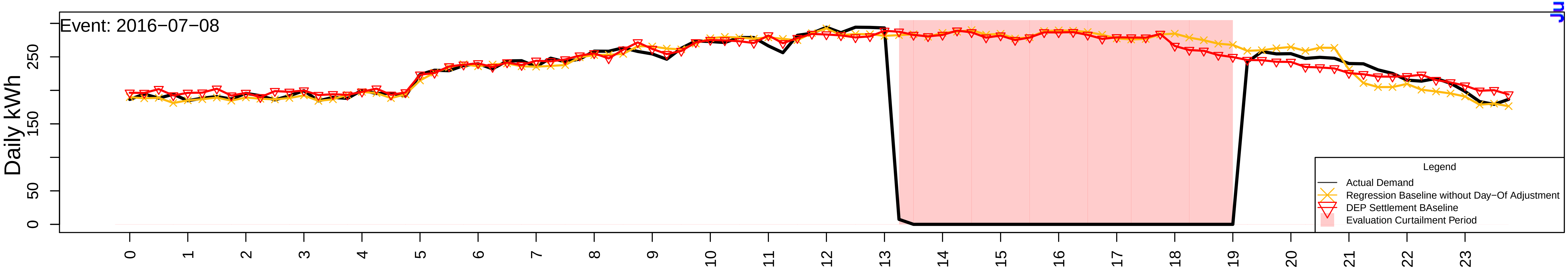


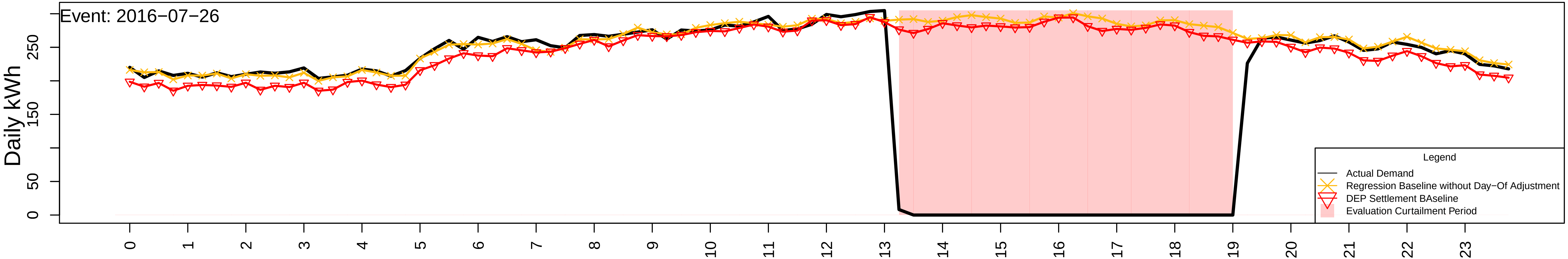
Program ID: DRA0052
Segment : Industrial
Load Reduction Source : Process



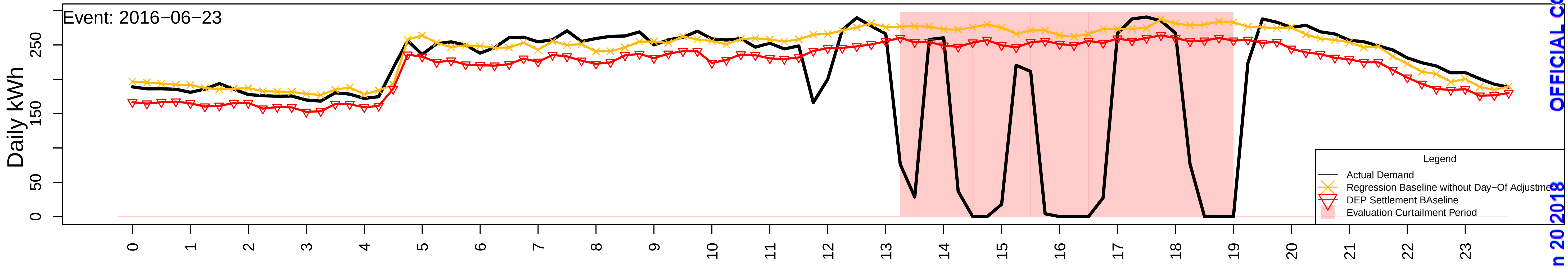
Program ID: DRA0054
Segment : Commercial
Load Reduction Source : Generator

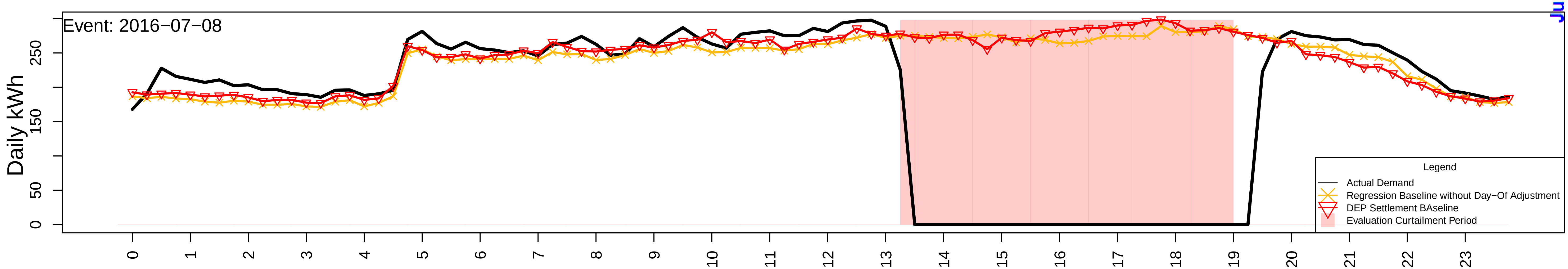


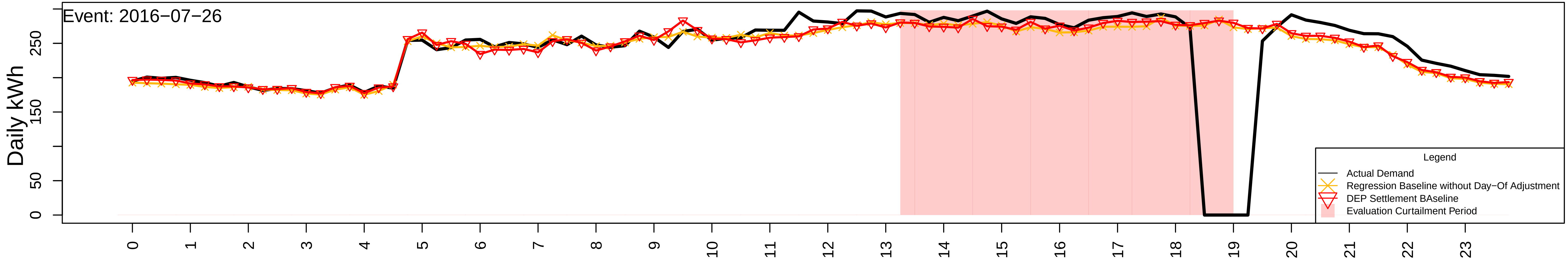




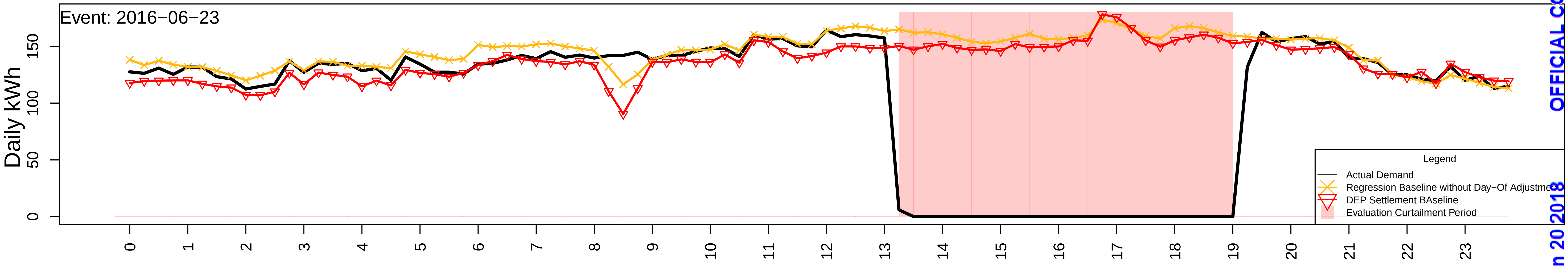
Program ID: DRA0055
Segment : Commercial
Load Reduction Source : Generator

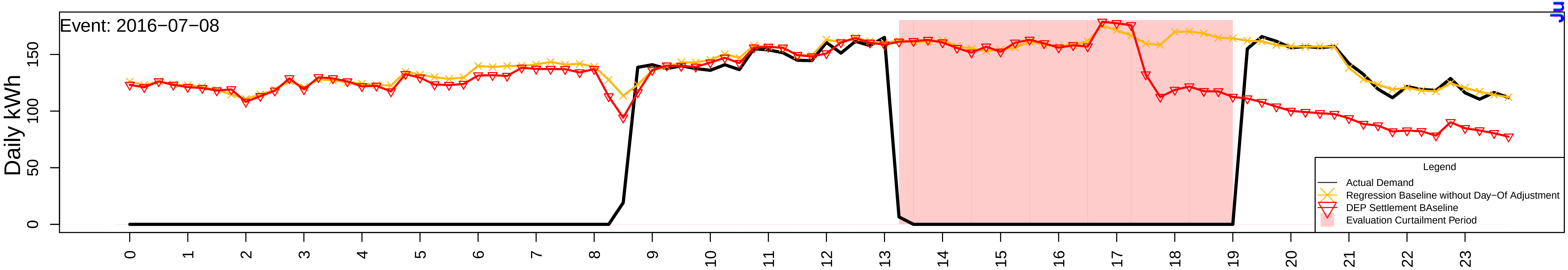


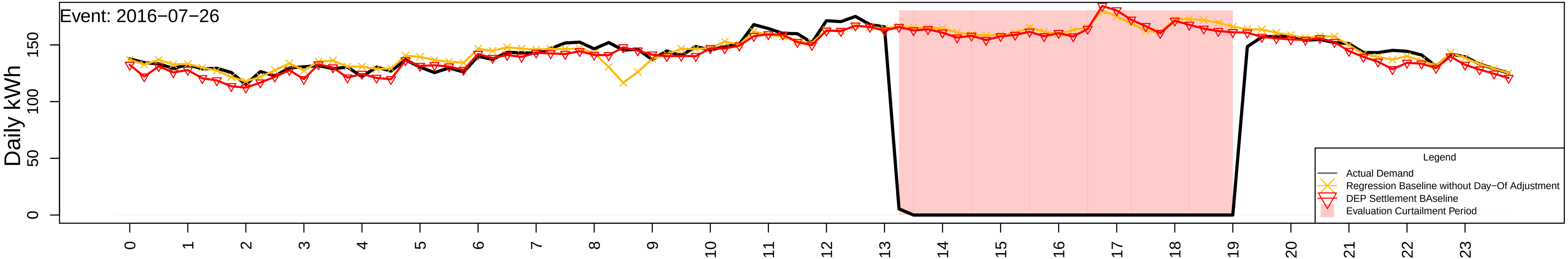




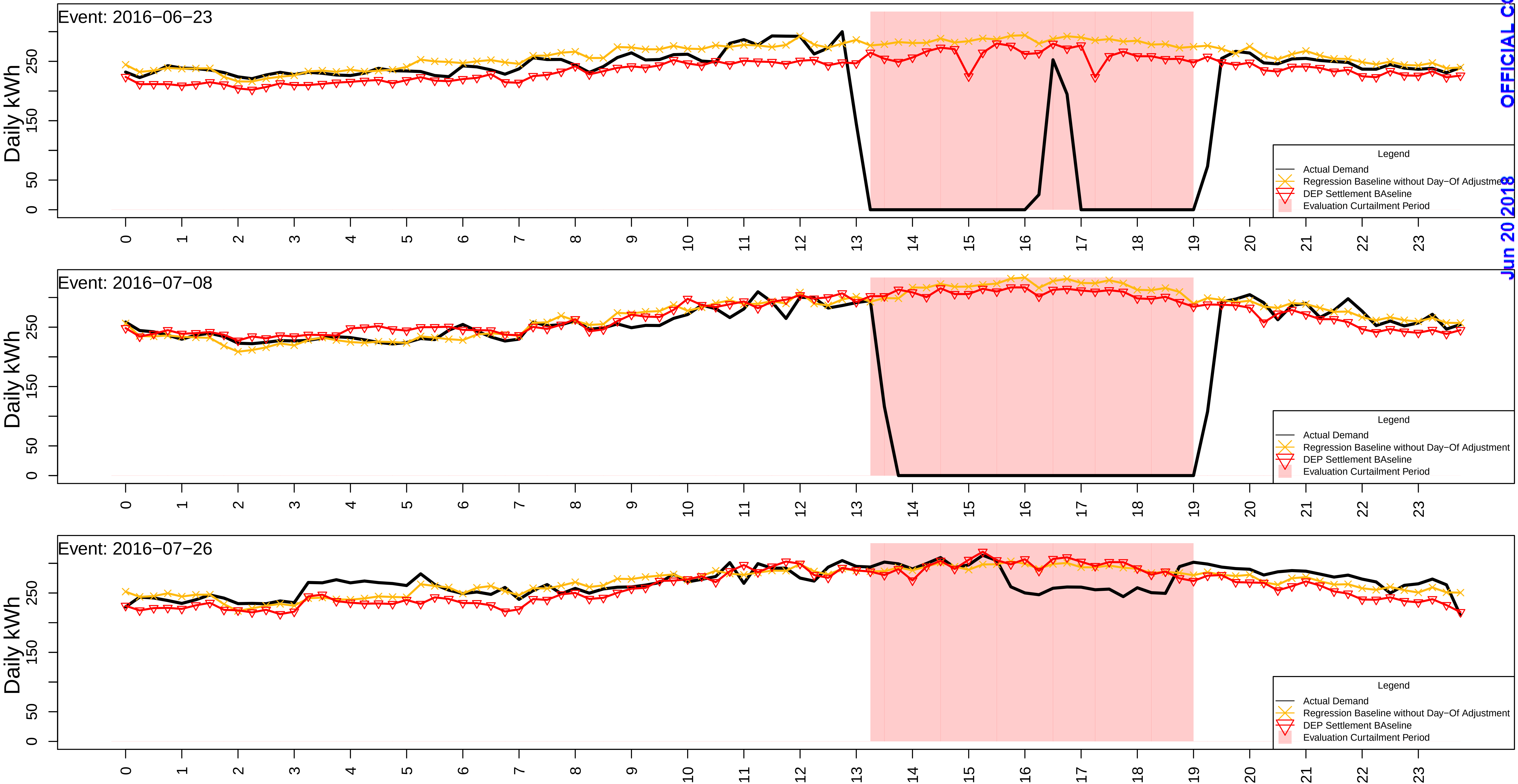
Program ID: DRA0056
Segment : Commercial
Load Reduction Source : Generator



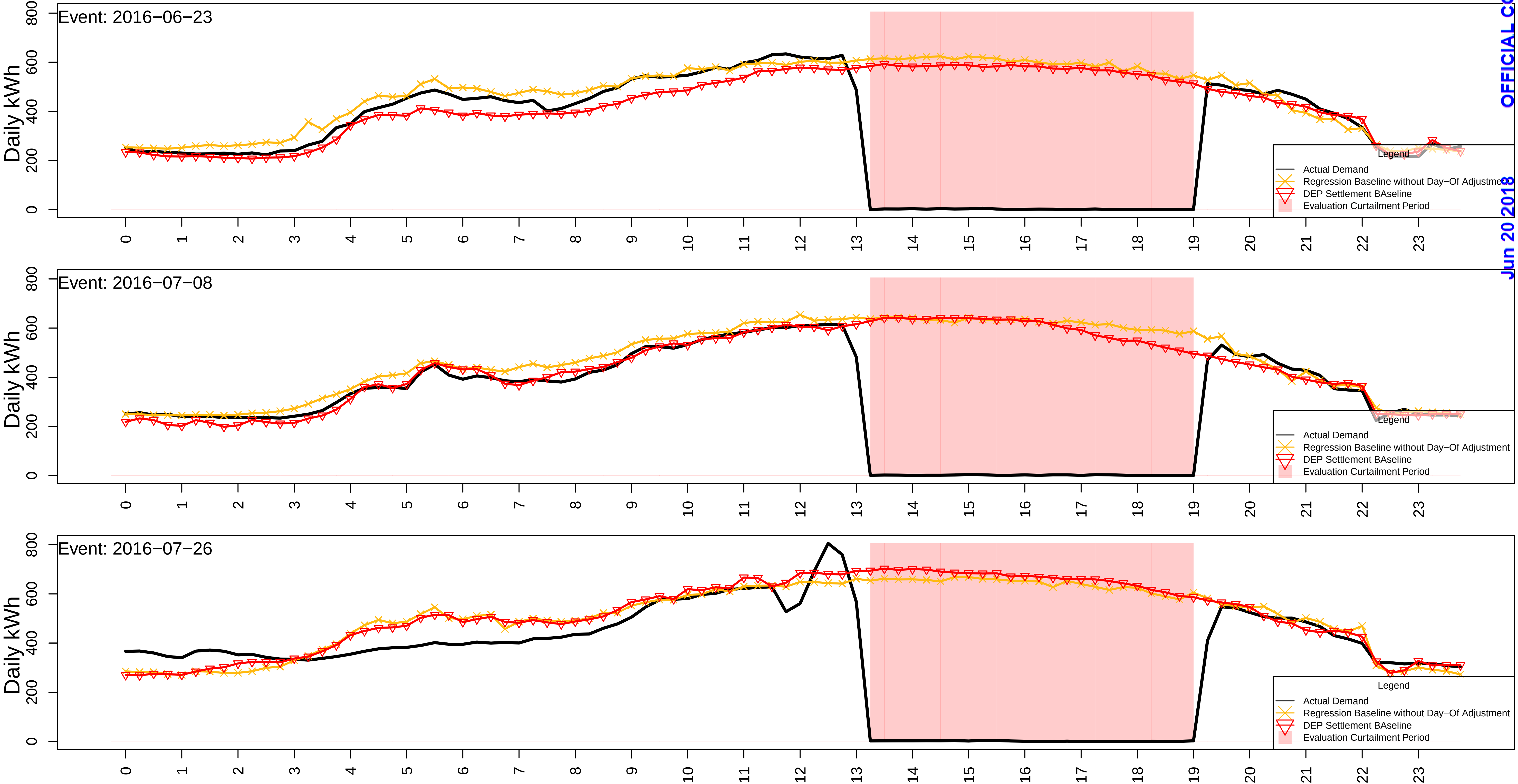




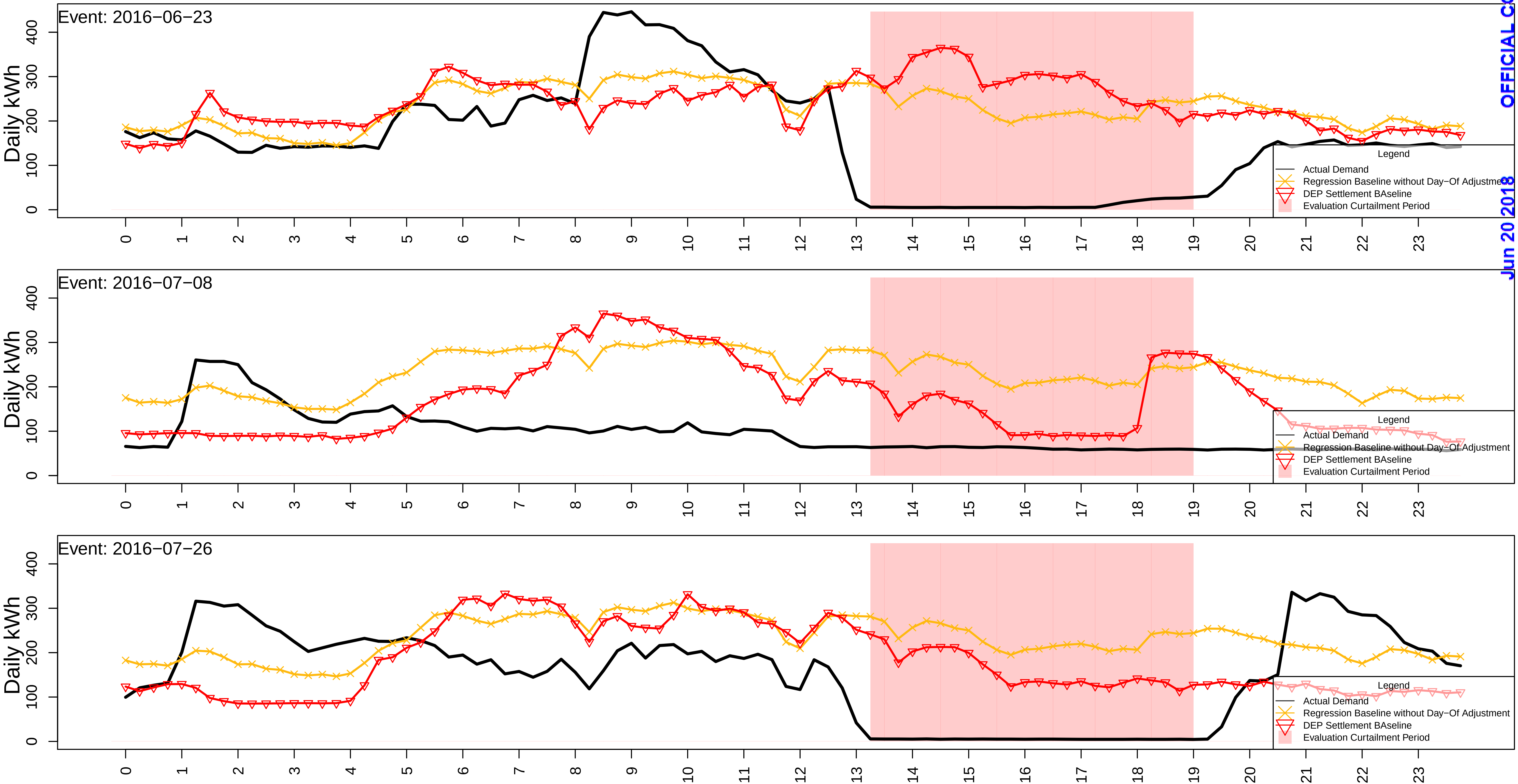
Program ID: DRA0057
Segment : Commercial
Load Reduction Source : Generator



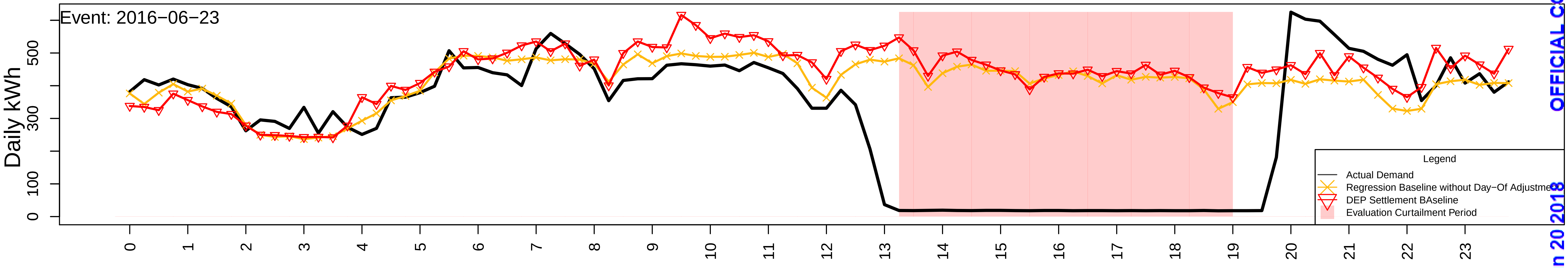
Program ID: DRA0058
Segment : Commercial
Load Reduction Source : Generator

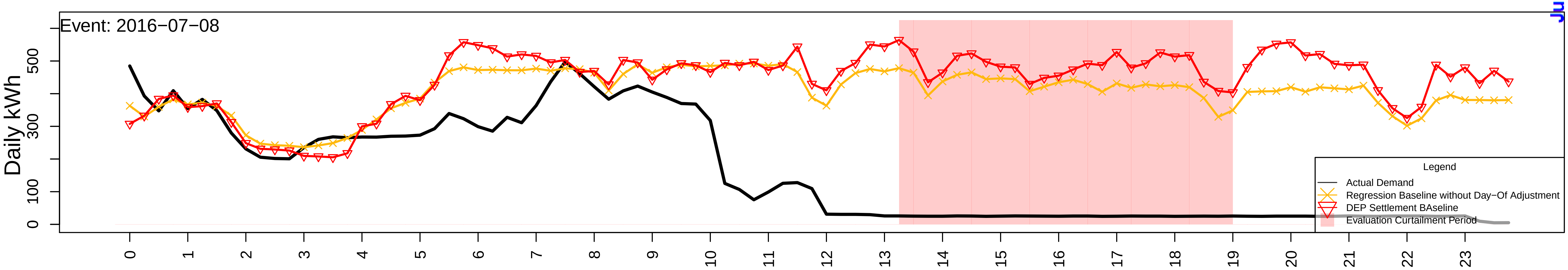


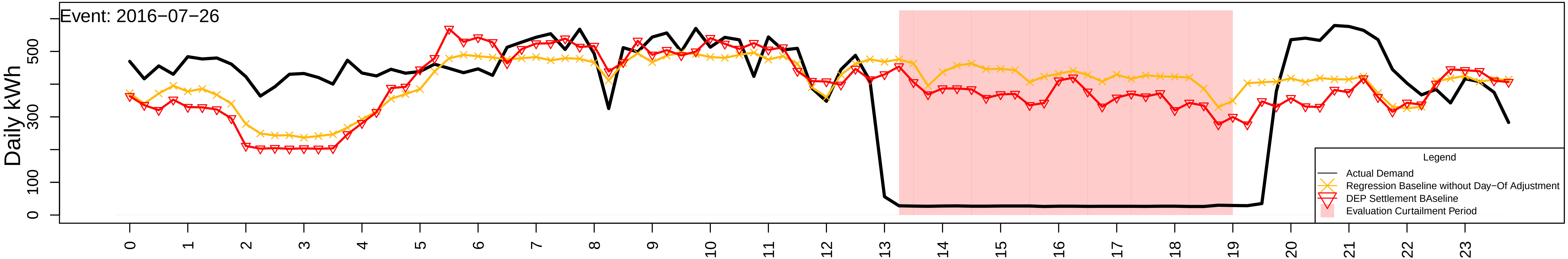
Program ID: DRA0059
Segment : Industrial
Load Reduction Source : Process



Program ID: DRA0060
Segment : Industrial
Load Reduction Source : Process







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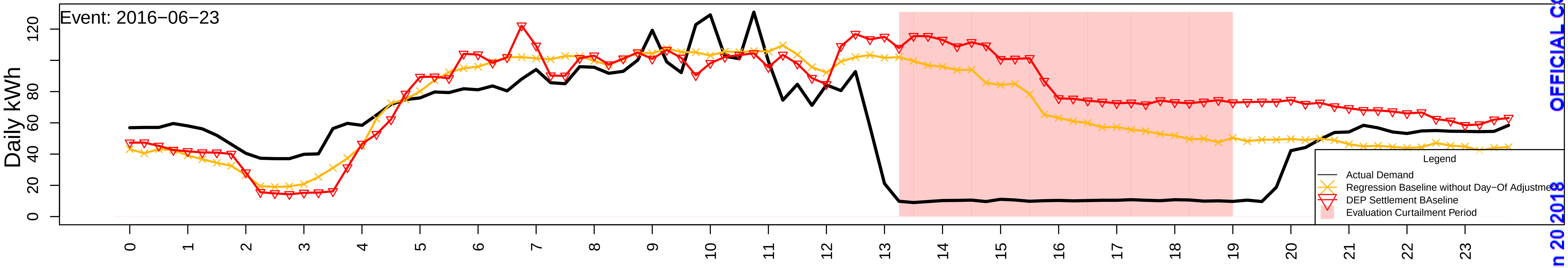

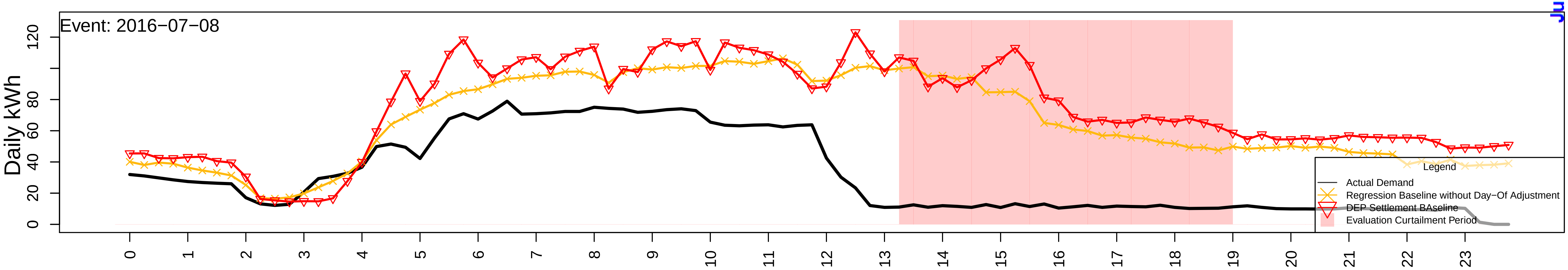

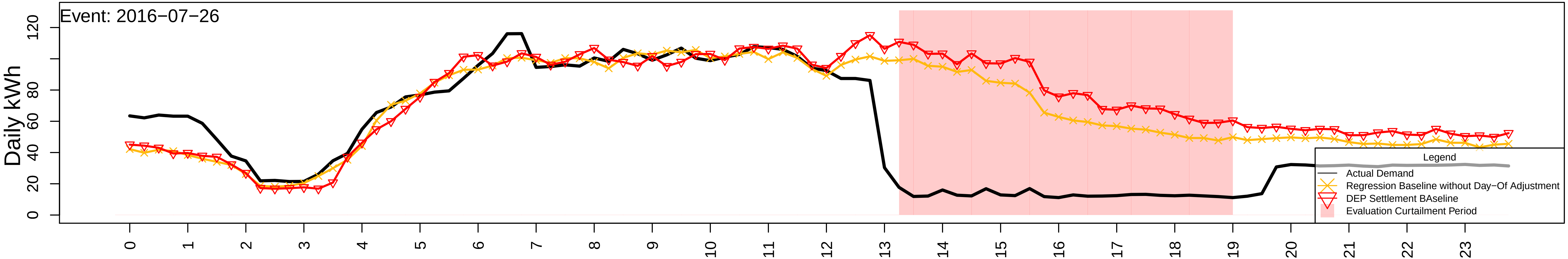

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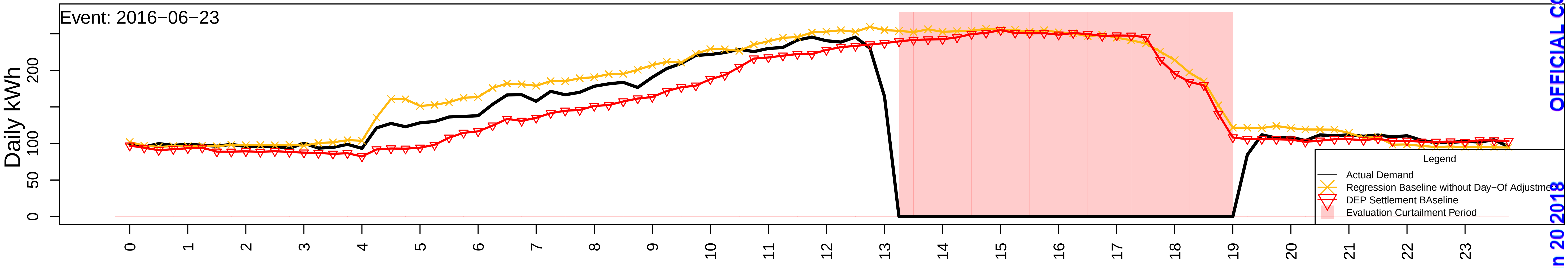

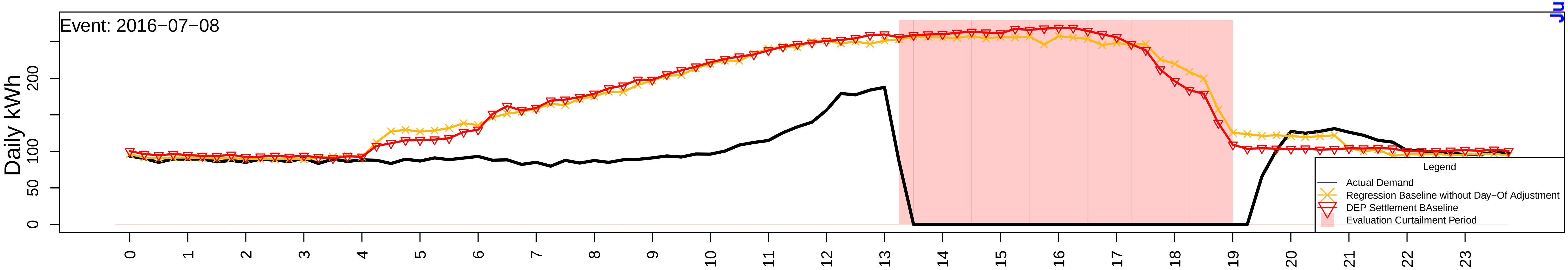

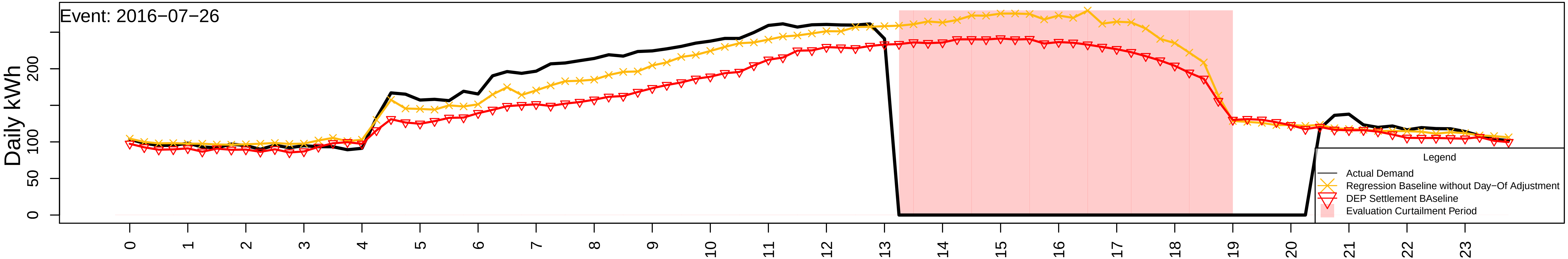

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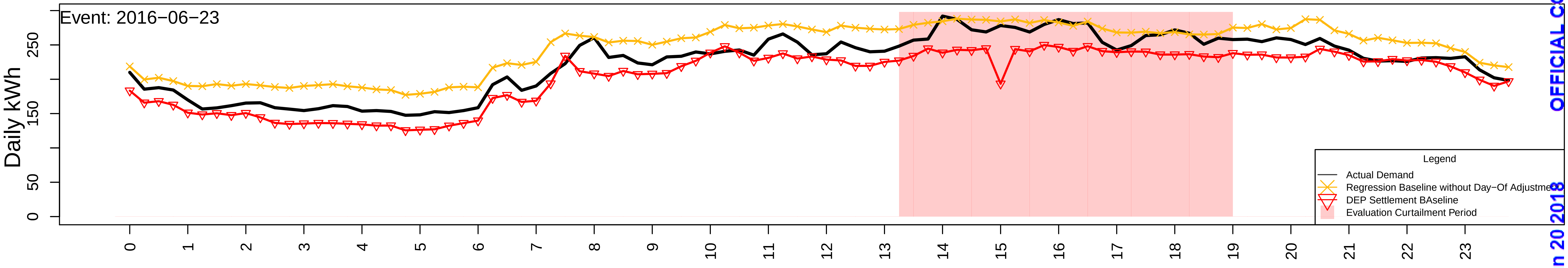

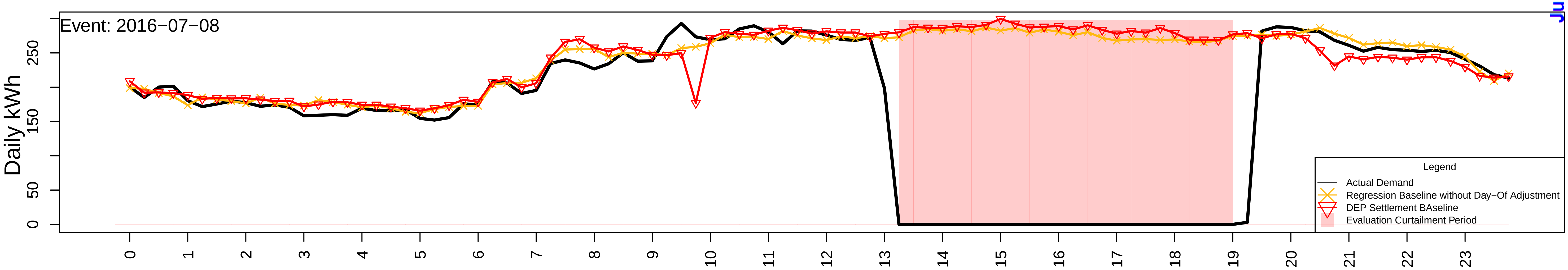

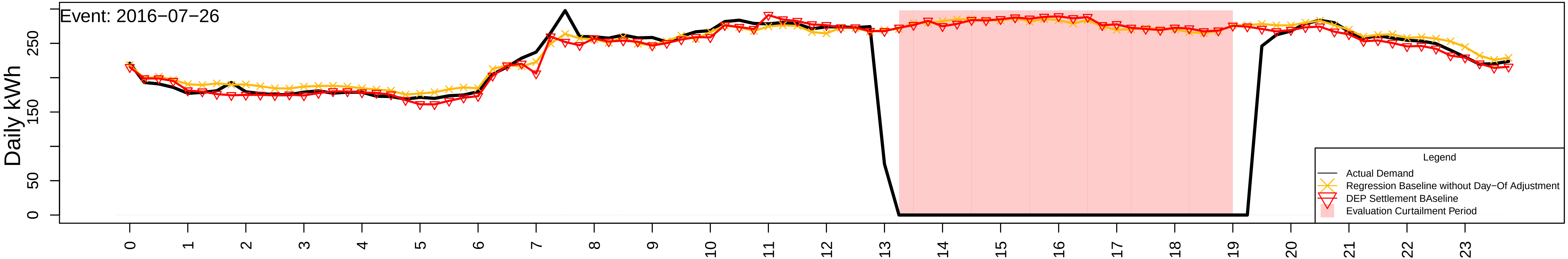

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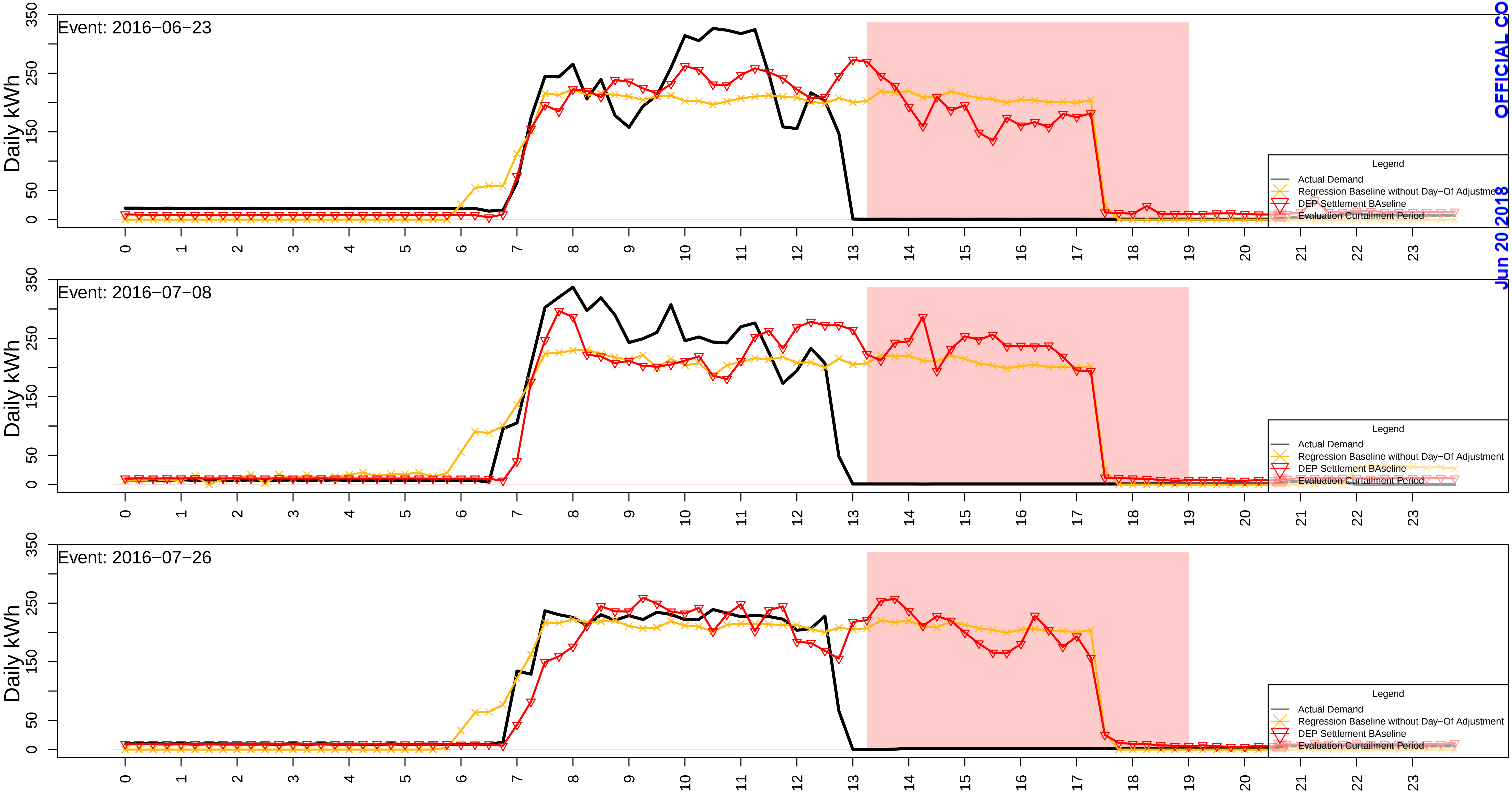

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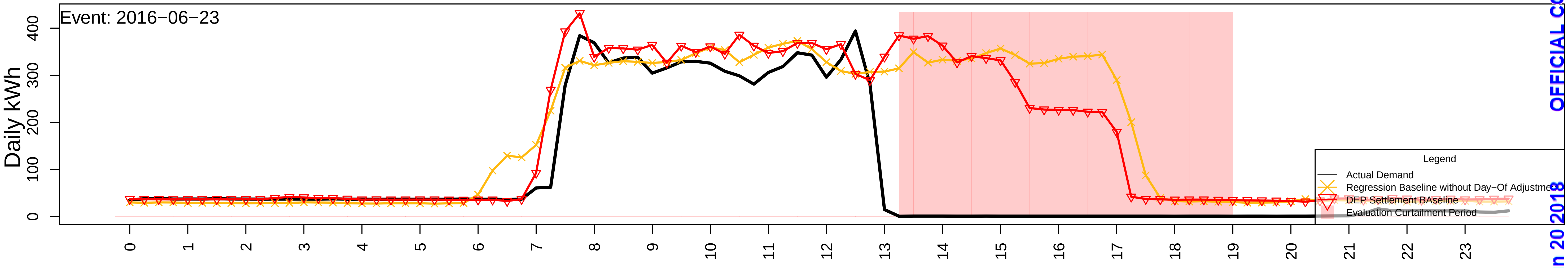

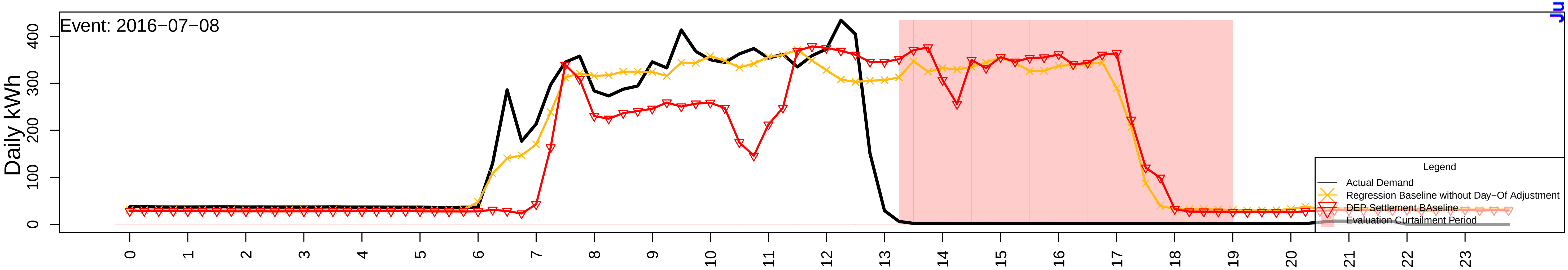

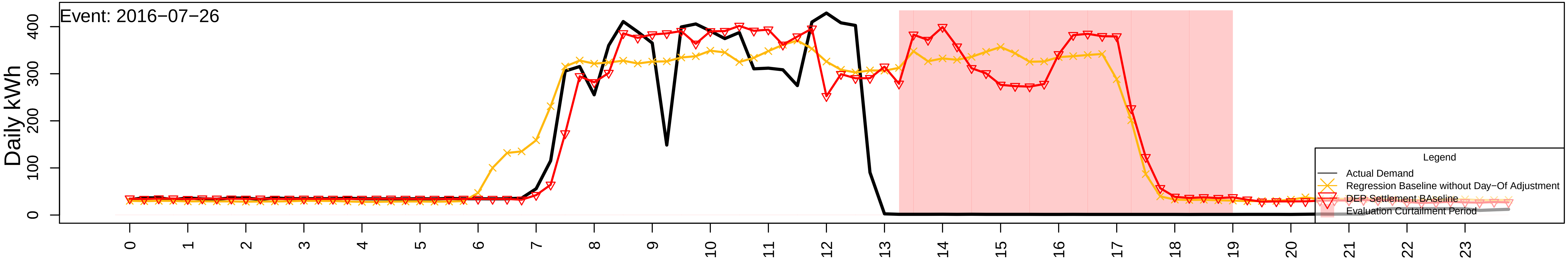

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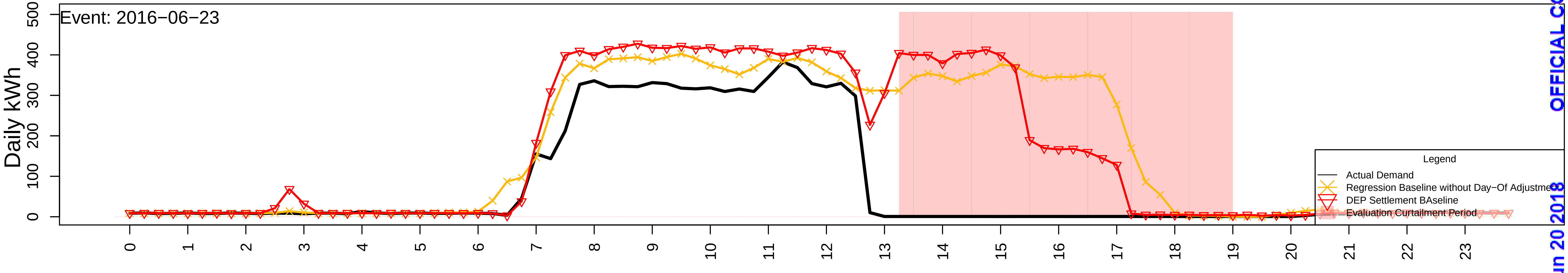

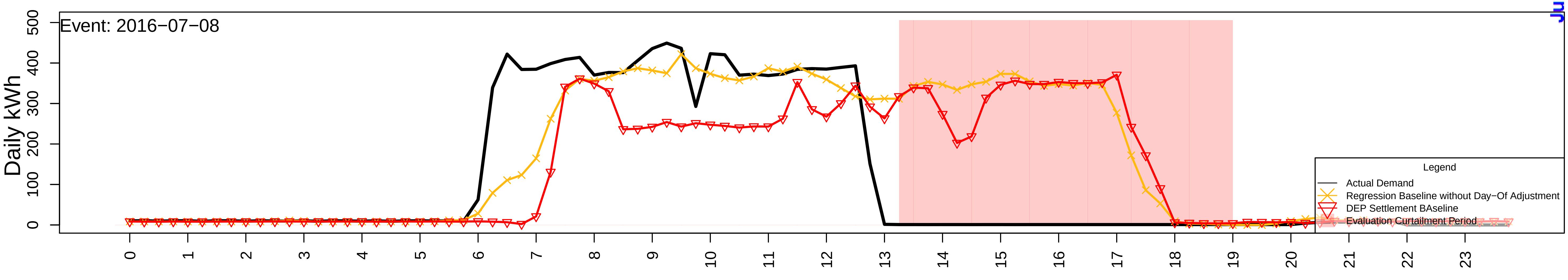

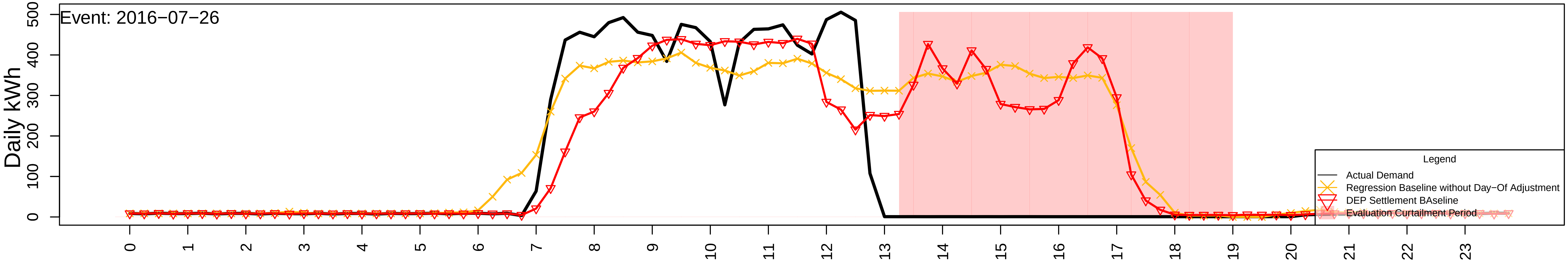

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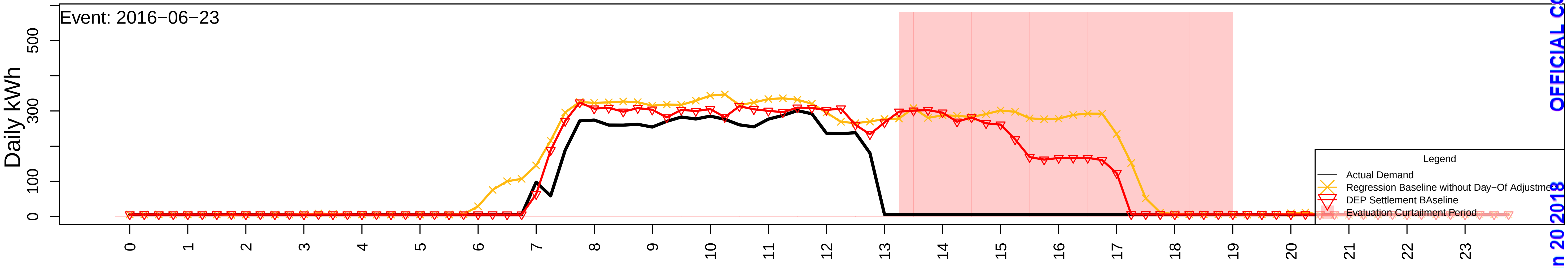

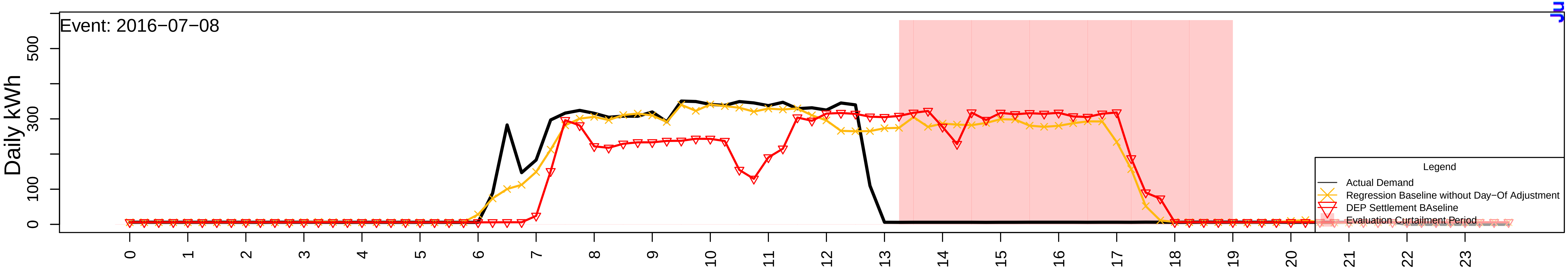

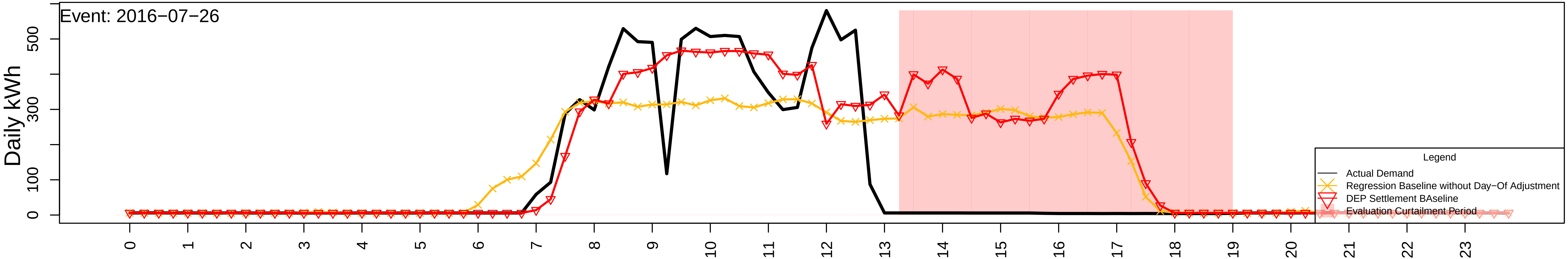

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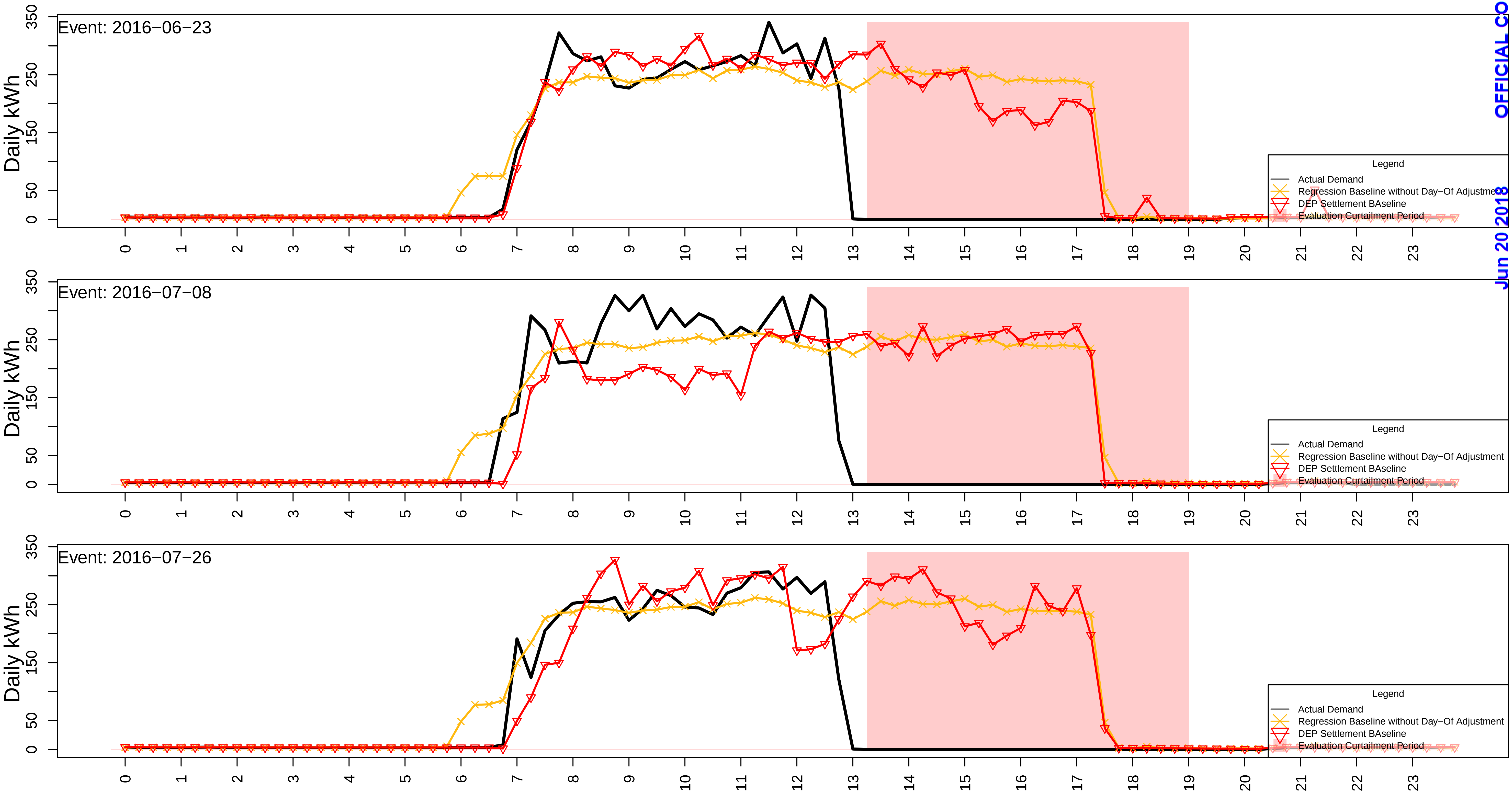

REPORT

research into action inc

Nexant
Reimagine tomorrow.

Energy Efficiency Education in Schools Program Year 2015 - 2016 Evaluation Report

Submitted to Duke Energy Progress
in partnership with Research into Action

July 28th, 2017

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1 Executive Summary

1.1 Program Summary

The Energy Efficiency Education in Schools Program is a Duke Energy Progress (DEP) energy efficiency program implemented by the National Theatre for Children (NTC). The program provides age-appropriate school performances by NTC's professional actors that teach students about energy and energy conservation in a humorous, engaging, and entertaining format. NTC also provides participating schools with classroom curriculum to coincide with the performance, which includes energy efficiency kit request forms that student families can use to receive free energy efficiency measures to install in their home.

1.2 Evaluation Objectives and Results

This report presents the results and findings of evaluation activities for the DEP NTC program conducted by the evaluation team, collectively Nexant Inc. and our subcontracting partner, Research into Action, for the school and program year of August 2015 through May 2016.

1.2.1 Impact Evaluation

The evaluation team conducted the evaluation as detailed in this report to estimate energy and demand savings attributable to the 2015 – 2016 DEP NTC program. The evaluation was divided into two research areas - to determine gross and net savings (or impacts). Gross impacts are energy and demand savings estimated at a participant's home that are the direct result of the homeowner's installation of a measure included in the Duke Energy home kit. Net impacts reflect the degree to which the gross savings are a result of the program efforts and funds. Table 1-1 and Table 1-2 present the summarized findings of the impact evaluation.

Table 1-1: 2015 - 2016 Energy Savings per Kit

Measurement	Reported	Realization Rate	Gross Verified	Net-to-Gross Ratio	Net Verified
Energy (kWh)	216.0	128.0%	276.4	0.89	245.0
Demand (kW)	0.060	195.7%	0.117		0.104

Table 1-2: 2015 - 2016 Program Level Energy Savings

Measurement	Reported	Realization Rate	Gross Verified	Net-to-Gross Ratio	Net Verified
Energy (kWh)	1,388,448	128.0%	1,776,877	0.89	1,604,067
Demand (kW)	385.7	195.7%	754.7		670.5

Figure 1-1 provides the verified energy saving share by measure, and Table 1-3 provides gross verified energy and demand savings by measure and net to gross ratio details.

Figure 1-1: 2015 - 2016 DEP NTC Gross Verified Energy Savings

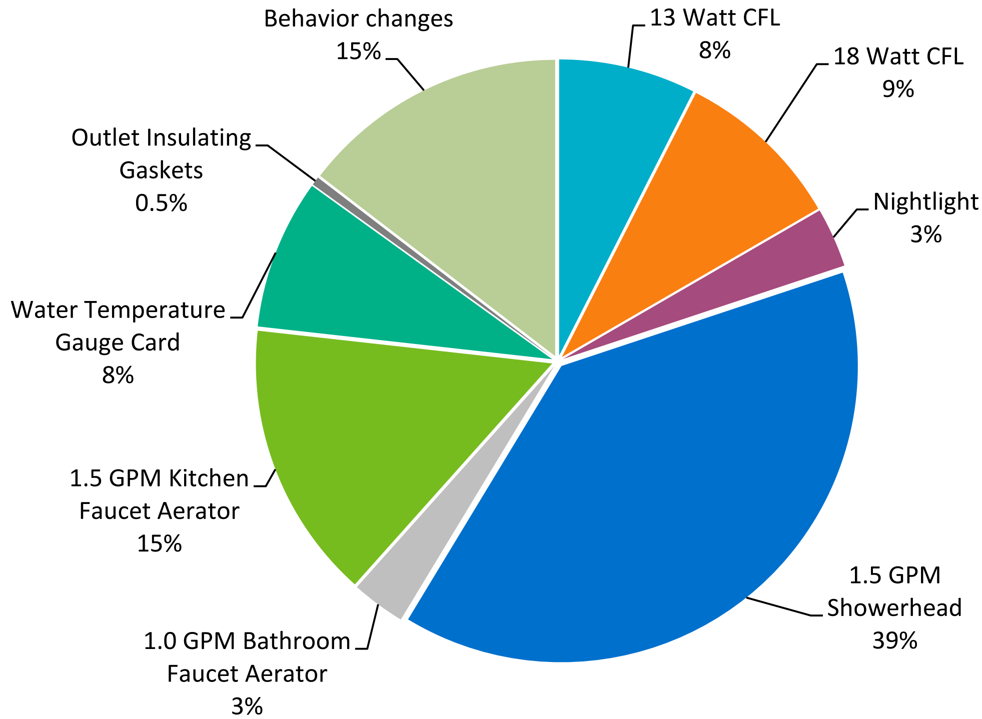


Table 1-3: DEP NTC Program Year 2015 - 2016 Verified Impacts by Measure

Measure	Gross Energy Savings per unit (kWh)	Gross Demand per unit (kW)	Free Ridership	Spillover	Net to Gross Ratio
13 Watt CFL	20.7	0.002	0.36	0.10	0.89
18 Watt CFL	25.3	0.002	0.36		
Nightlight	9.0	0.000	0.21		
1.5 GPM Showerhead	107.2	0.086	0.16		
1.0 GPM Bathroom Faucet Aerator	8.1	0.001	0.08		
1.5 GPM Kitchen Faucet Aerator	41.9	0.006	0.19		
Water Temperature Gauge Card	22.6	0.018	0.21		
Outlet Insulating Gaskets	1.3	0.000	0.21		
Behavioral Changes	40.3	0.002	-	-	-
Total Kit and Behavioral Impacts	**276.4**	**0.117**	**0.21**	**0.10**	**0.89**

1.2.2 Process Evaluation

The process evaluation assessed opportunities for improving the program's design and delivery in DEP service territory. It specifically documented teacher, student, and parent experiences by investigating: 1) teachers' assessments of the NTC performance, quality of curriculum materials, and the kit request form distribution procedure; and 2) student families' responses to the energy efficiency kits and the extent to which the kits effectively motivate families to save energy.

The evaluation team reviewed program documents and conducted telephone and web surveys with student families that received a kit (n=76) and teachers who attended the performance (n=58). The team also conducted in-depth interviews with utility staff, NTC staff, and five teachers who completed the web survey.

Program Successes

The 2015-2016 DEP NTC program evaluation found successes in the following areas:

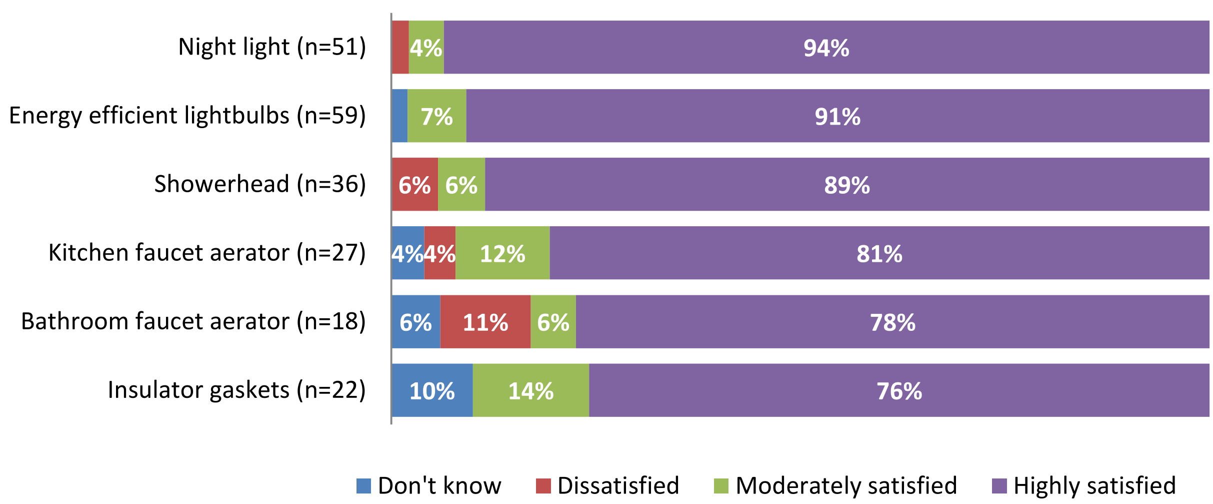
Teachers and students value the NTC performance. Teachers reported overwhelming satisfaction with the NTC performances, explaining that the interactive and humorous performance was an effective and enjoyable medium for teaching primary students of all ages about energy science and conservation. Nearly all stated that there was nothing left out that should have been covered in the performance. Teachers indicated that the performance had reinforced or improved their students' knowledge of the concepts covered in the performance.

Due to high teacher engagement, nearly one-third of student families requested energy saver kits. Nearly all teachers (90%) reported distributing the kit request forms to their students, with some teachers reporting varied methods for encouraging student families for submitting their forms, such as classroom incentives or a board tracking which students submitted their kit forms. In total, approximately one-third of students exposed to the NTC program submitted a kit request form.

The program influenced families to install kit measures and adopt new behaviors. Nearly all student families installed at least one measure from the energy efficiency kit and the vast majority of measures, once installed, remained installed. Student families were highly influenced by the program to install kit measures, as demonstrated by low free ridership rates. Further, about two-thirds of respondents reported that they and/or their children adopted new energy saving behaviors since receiving their kit, and about one-fifth of respondents reported spillover actions.

The great majority of student families are highly satisfied with the items they installed. Respondents were most satisfied with the lighting measures and showerhead (Figure 1-2).

Figure 1-2: Kit Recipient Satisfaction with Installed Measures



The kits are reaching a good mix of consumer segments. Surveyed kit recipients had similar housing ownership rates and incomes to that of the service territory.

Program Challenges

The 2015-2016 DEP NTC program evaluation met some challenges in the following areas:

Aerators are the least popular measures. Only 24% of student families initially installed the bathroom faucet aerator and only 36% installed the kitchen aerator. Further, aerators had some of the lowest satisfaction ratings and had the highest uninstallation rates (about 20% of student families subsequently uninstalled them, whereas the other measures were uninstalled by less than 5% of student families).

The performance and curriculum content may not be age appropriate for older or younger students. Although most surveyed teachers reported the performance (91%) and the NTC classroom curriculum (82%) was reasonably age appropriate for their students, some teachers reported that the concepts were too advanced for younger elementary students or too basic for older students.

The kit request form distribution process requires hand-offs between multiple parties, which presents opportunities for it to get lost or go unnoticed before submission. Even though almost all teachers distributed the form to their students, not all of the students who received the form brought it home. Fewer students' parents saw and understood the kit request form and even fewer submitted the form to request a kit. In a given year, about nearly one-third of student families at participating schools requested energy saver kits.

1.3 Evaluation Conclusions and Recommendations

Based on evaluation findings, the evaluation team concluded the following and provides several recommendations for program improvement:

Conclusion 1: NTC performances effectively engage students on energy conservation issues. Teachers reported overwhelming satisfaction with the NTC performances, noting that their students were entertained and educated by the performances. Teachers also reported their students demonstrated retention of concepts from the performance.

> **Recommendation**: Continue using NTC performances to engage students on energy conservation issues.

Conclusion 2: Concerns about age appropriateness of curriculum materials do not limit kit request form distribution. Most teachers received and used NTC classroom curriculum materials and were largely satisfied with the workbooks. A vocal minority of teachers, though, noted that some workbook activities, formats, and content were not age appropriate for younger or older students. Specifically, some teachers of younger elementary grades found the materials too advanced for their students and some middle school teachers said the comic book format was an ineffective medium for teaching energy and conservation concepts given the age group it was targeting. These concerns did not significantly limit distribution of kit request forms, though they prevented a minority of teachers from using the materials in class.

> **Recommendation**: Investigate whether there is added value in adjusting the classroom materials given that the kit request forms are successfully distributed.

Conclusion 3: The NTC kit form distribution method is a successful model, but minor improvements may be possible. Nearly all teachers distributed the kit request forms to at least some of their students. Teacher-led distribution of the kit request forms was relatively straightforward and without problems. The processes of transferring the kit request forms from students to parents and from parents to R1 are the most likely sources of attrition, which can limit the number of kits distributed each year.[1]

> **Recommendation**: Continue to find ways to increase the visibility of the form to parents in an effort to increase the number of forms submitted, such as: a) encouraging participating schools to use their online portal for parents to advertise the kit opportunity and include a hyperlink to the online kit request form; or b) supplying each school with additional kit request forms so teachers can send reminder forms home with students whose families had yet to submit their kit request form. Additional research with nonparticipating families may uncover prevailing reasons why parents did not send in the kit form.

Conclusion 4: The Energy Efficiency Education Program for Schools program is successfully influencing families to save energy in their homes. Most student families installed at least one measure from the kit and the vast majority of measures, once installed, stayed installed. Student families were highly influenced by the program to install these kit measures, as demonstrated by low free ridership rates. Further, about one-fifth of families reported installing spillover measures and about two-thirds of respondents reported that they and/or their children adopted new energy saving behaviors (such as turning off lights when leaving a room) since receiving their kit.

> **Recommendation:** Leverage the kit to cross-promote other DEP rebate offerings to DEP customers who receive a kit. DEP customers requesting kits are good targets for these promotions, as they:

- Demonstrated willingness to take energy saving actions in their home
- Are reading the energy saving information included in the kit
- Are predominantly single family homeowners

Conclusion 5: Water measures drive savings, but installation rates are low. Nearly one-half of surveyed kit recipients installed a showerhead, about one-third installed a kitchen faucet aerator, about one-quarter installed the bathroom faucet aerator, and about one-fifth adjusted their water heater temperature based on the hot water temperature card in the kit. Further, respondents uninstalled aerators at significantly higher rates than other kit measures: about one-fifth of aerators were subsequently uninstalled, compared to 3% or less of any other measure. Dissatisfied participants reported they did not like the low water flow provided by the units. Despite low installation rates, water measures account for over three-fourths of gross program savings. Improving the installation rates could greatly increase the program savings.

[1] R1, or Relationship1, is the data management vendor for the Energy Efficiency Education in Schools Program. Kit request forms are mailed to R1.

Recommendation: Investigate opportunities to increase installation rates of water measures through focus group research (or comparable qualitative in-depth methods) to learn: 1) what types of aerators and showerheads customers use and like; and 2) whether emphasizing certain features of low-flow showerheads or aerators (for example, multiple spray settings) would entice customers to install low-flow products. Additionally, consider exploring new participant-facing messaging around low flow measures; water measure ISRs may increase if participants have better upfront expectations on the flow rates of the measures and understand how low flow is needed to save energy.

Conclusion 6: Kit measures have varying levels of energy savings success. The lighting measures realized the highest installation rates and contributed 20% of the kit savings. Moreover, 88% of spillover savings were derived from participants purchasing additional Light Emitted Diode (LED) and CFL bulbs to complement the bulbs received in their kit. The low flow measures accounted for 65% of the kit savings (based primarily on installation of the shower head and kitchen aerator); however, installation rates were significantly lower compared to the lighting measures.

Recommendation: A review of the kit measure offerings should be made to assess and weight the benefits and costs of each measure including opportunity for energy savings, cost effectiveness, and education. Opportunities may exist to remove low performing measures and add new measure types or increase the quantity of existing measures that currently perform well such as lighting measures. However, careful review is needed before amending the kit measure mix to ensure it would not hinder the program’s educational and behavioral impacts.

2 Introduction and Program Description

2.1 Program Description

2.1.1 Overview

The Energy Efficiency Education in Schools Program is an energy efficiency program sponsored by Duke Energy Progress (DEP). The program provides free in-school performances by the National Theatre for Children (NTC) that teach elementary and middle school students about energy and conservation concepts in a humorous and engaging format. This report will hereafter refer to the program as the NTC program.

In addition to the NTC performance, NTC provides teachers with: 1) student workbooks that reinforce topics taught in the NTC performance, which include a take-home form that students and parents can complete to receive an energy efficiency starter kit (kit) from DEP; and 2) lesson plans associated with the content in the student workbooks. All workbooks, assignments and activities meet state curriculum requirements. The NTC performers encourage students to have their parents fill out the kit form included in the workbook.

2.1.2 Energy Efficiency Kit Measures

Table 2-1 lists the kit's contents included in the evaluation scope (the kit includes additional educational items described in section 2.2.4 below).

Table 2-1: 2015 - 2016 Kit Measures

Measures	Details
13 Watt CFL	1 lamp
18 Watt CFL	1 lamp
Nightlight	1 LED plug-in nightlight
1.5 GPM Showerhead	1 low-flow showerhead
1.0 GPM Bathroom Faucet Aerator	1 low-flow faucet aerator
1.5 GPM Kitchen Faucet Aerator	1 low-flow kitchen aerator
Water Temperature Gauge Card	1 temperature card indicating water heat temperature
Outlet Insulating Gaskets	8 outlet and 4 light switch gaskets

2.2 Program Implementation

2.2.1 School Recruitment

Duke Energy sends NTC a list of approved schools in DEP territory, which NTC uses to contact schools to schedule NTC performances. NTC ships curriculum materials to participating schools approximately two weeks prior to the performance date.

2.2.2 NTC Performance

NTC has two age-appropriate shows for DEP's NTC program: Space Station Conservation for elementary age students (Kindergarten through sixth grade) and The Conservation Crew for middle school age students (6th through 8th grade). Two actors perform in each show, where they use an entertaining, humorous, and interactive format to educate students on four general areas:

- Sources of energy (renewable and nonrenewable sources)
- How energy is used
- How energy is wasted
- Energy efficiency and conservation

Performers also discuss how DEP offers students and their families free energy efficiency starter kits, and how the items in the kit can save energy in their homes.

2.2.3 DEP Kit Form Promotion and Distribution

In the performance, the actors explain to students that they must fill out the kit request form to receive their kit. Following the performance, teachers give their students the NTC workbooks that – in addition to educational activities that reinforce the concepts from the NTC performance – include a detachable postage-prepaid postcard kit request form. Students take the form home to their parents or guardians, who complete and mail the form. Parents or guardians may also request a kit via a toll-free telephone number or by signing up at MyEnergyKit.org. To encourage participation, those requesting kits are automatically entered in drawings to win cash prizes for their household ($1,000) or their school ($10,000). DEP uses two vendors to fulfill kit requests. The participant's eligibility is confirmed by the firm R1 who sends the fulfillment request to AM Conservation who ships the kit to eligible homes that signed up for the program. The Process Flow Map in Appendix C outlines this process.

2.2.4 DEP Kit Eligibility

Student families can only receive a kit once every 36 months. Additionally, parents/guardians must fill out the survey included on the kit request form in order to receive a kit. The kit contents will differ if a family is a DEP customer versus a non-Duke Energy customer. .DEP customers will receive a kit that includes: 1) a showerhead; 2) kitchen and bathroom faucet aerators; 3) water flow meter bag; 4) hot water temperature card; 5) efficient bulbs; 6) LED night light; 7) eight outlet and four socket gasket insulators; 8) Energy Savers booklet; 9) product information and instruction sheet; and 10) a glow ring toy.

Families who are not DEP customers will receive a smaller kit that includes:

1) a water flow meter bag; 2) hot water temperature card; 3) LED night light; 4) outlet gasket insulators; 5) Energy Savers booklet; and 6) a glow ring toy.

2.2.5 Participation

For the defined evaluation period of August 2015 through May 2016, the program recorded a total of 6,428 kit recipients. During survey recruitment, no participants notified the evaluation team that their kits never arrived.

2.3 Key Research Objectives

Over-arching project goals will follow the definition of impact evaluation established in the "Model Energy-Efficiency Program Impact Evaluation Guide – A Resource of the National Action Plan for Energy Efficiency," November 2007:

> *"Evaluation is the process of determining and documenting the results, benefits, and lessons learned from an energy-efficiency program. Evaluation results can be used in planning future programs and determining the value and potential of a portfolio of energy-efficiency programs in an integrated resource planning process. It can also be used in retrospectively determining the performance (and resulting payments, incentives, or penalties) of contractors and administrators responsible for implementing efficiency programs.*

Evaluation has two key objectives:

1) To document and measure the effects of a program and determine whether it met its goals with respect to being a reliable energy resource.
2) To help understand why those effects occurred and identify ways to improve the program.

2.3.1 Impact

As part of evaluation planning, the evaluation team outlined the following activities to assess the impacts of the DEP NTC program:

- Quantify accurate and supportable energy (kWh) and demand (kW) savings[2] for energy efficient measures implemented in participants' homes;
- Assess the rate of free riders from the participants' perspective and determine spillover effects;
- Benchmark verified measure-level energy impacts to applicable technical reference manual(s) and other Duke similar programs in other jurisdictions.

2.3.2 Process

The process evaluation assessed opportunities for improving the design and delivery of the program in DEP service territory. It specifically documented teacher, student, and parent

[2] The quantification of program impacts was initially attempted through a utility bill regression analysis. However, the program impacts could not be isolated due to the small size of the impact relative to annual consumption. Therefore, the impact analysis relied on engineering algorithms to assess the program's savings impacts. Please see section 3.5 for additional detail.

experiences by investigating: 1) teachers' assessments of the NTC performance, program materials, and curriculum in terms of quality of content, and ability to engage and motivate students to save energy; and 2) student families' responses to the energy efficiency kits and the extent to which the kits effectively motivate families to save energy.

The evaluation team assessed several elements of the program delivery and customer experience, including:

- **Awareness:**
  - How aware are teachers and student families of the DEP sponsorship of the program?
  - Is there a need to increase this awareness?
- **Program experience and satisfaction:**
  - How satisfied are teachers with the overall program, NTC performance, program curriculum, and kit request form distribution?
  - How satisfied are student families with the measures in the kit and to what extent do the kits motivate families to save energy?
- **Challenges and opportunities for improvement:**
  - Are there any inefficiencies or challenges associated with program delivery?
  - How engaged are teachers in implementing the curriculum and motivating student families to request program kits?
  - What are teachers' assessments of the NTC performance, program information, and curriculum?
- **Student family characteristics:**
  - What are the demographic characteristics of kit recipients?

2.4 Evaluation Overview

The evaluation team divided its approach into key tasks to meet the goals outlined:

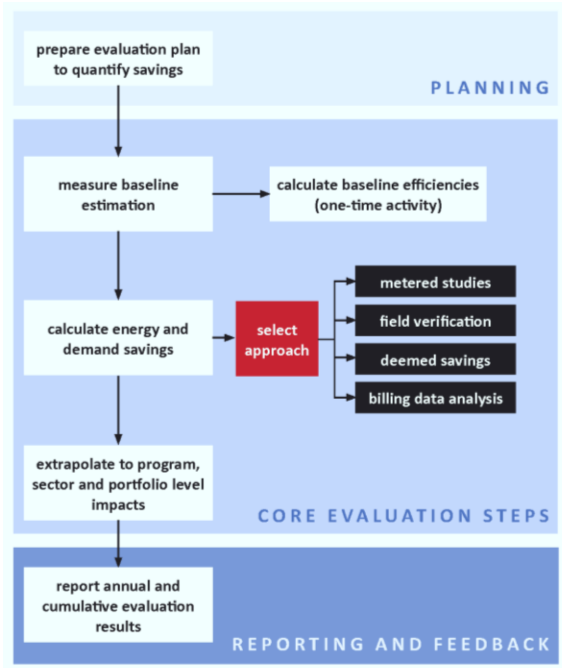
- **Task 1 –** Develop and manage evaluation work plan to describe the processes that will be followed to complete the evaluation tasks outlined in this project;
- **Task 2 –** Conduct a process review to determine how successfully the programs are being delivered to participants and to identify opportunities for improvement;
- **Task 3 –** Verify gross and net energy and peak demand savings resulting from the NTC program through verification activities of a sample of 2015 - 2016 program participants.

2.4.1 Impact Evaluation

The primary determinants of impact evaluation costs are the sample size and the level of rigor employed in collecting the data used in the impact analysis. The accuracy of the study findings is in turn dependent on these parameters. Techniques that we used to conduct our evaluation, measurement, and verification (EM&V) activities, and to meet the goals for this evaluation, included telephone and web-based surveys with program participants, best practice review, and interviews with implementation and program staff.

Figure 2-1 demonstrates the principal evaluation team steps organized through planning, core evaluation activities, and final reporting.

Figure 2-1: Impact Evaluation Process



The evaluation is generally comprised of the following steps, which are described in further detail throughout this report:

- **Participant Surveys:** The file review for all sampled and reviewed program participation concluded with a telephone and web-based survey with the participating families. Table 2-2 below summarizes the number of surveys and on-site inspections completed. The samples were drawn to meet a 90% confidence and 10% precision level based upon the expected and actual significance (or magnitude) of program participation, the level of certainty of savings, and the variety of measures.
- **Calculate Impacts and Analyze Load Shapes:** Data collected via surveys enabled the evaluation team to calculate gross verified energy and demand savings for each measure.
- **Estimate Net Savings**: Net impacts are a reflection of the degree to which the gross savings are a result of the program efforts and incentives. The evaluation team estimated free-ridership and spillover based on self-report methods through surveys with program participants. The ratio of net verified savings to gross verified savings is the net-to-gross ratio as an adjustment factor to the reported savings.

2.4.2 Process Evaluation

Process evaluation examines and documents:

- Program operations
- Stakeholder satisfaction
- Opportunities to improve the efficiency and effectiveness of program delivery

To satisfy the evaluation, measurement, and verification (EM&V) objectives for this research effort, the evaluation team reviewed program documents and conducted telephone and web surveys with participating student families and teachers who attended the performance.

The team also held in-depth interviews (IDI) with utility staff, implementation staff, and teachers. Table 2-2 provides a summary of the activities the evaluation team conducted as part of the DEP NTC program process and impact evaluation.

Table 2-2: DEP NTC Summary of Evaluation Activities

Target Group	2015 - 2016 Survey Population	Sample	Confidence /Precision	Method
Impact Activities				
Participants	6,428	76	90/9.4	Telephone/Web Survey
Process Activities				
Participants – student families who received a kit and are DEP customers	6,428	76	90/9.4	Telephone/Web Survey
Teachers who attended a NTC workshop	Unknown	58	90/10.8[1]	Web Survey
Participating teacher follow-up interviews	Unknown	5	N/A	Telephone In-Depth Interview (IDI)
DEP Program Staff	N/A	1	N/A	Telephone IDI
Implementer Staff: NTC	N/A	1	N/A	Telephone IDI
Implementer Staff: R1	N/A	1	N/A	Telephone IDI

[1] Precision estimated based on assumed infinite population.

3 Impact Evaluation

3.1 Methodology

The evaluation team's impact analysis focused on the energy and demand savings attributable to the NTC program for the period of August 2015 through May 2016. The evaluation was divided into two research areas: to determine gross and net savings (or impacts). Gross impacts are energy and demand savings estimated at a participant's home that are the direct result of the homeowner's installation of a measure included in the program-provided energy saving kit. Net impacts are a reflection of the degree to which the gross savings are a result of the program efforts and funds. The evaluation team verified energy and demand savings attributable to the program by conducting the following impact evaluation activities:

- Review of DEP participant database.
- Completion of telephone and web-based surveys to verify key inputs into savings calculations.
- Estimation of gross verified savings using primary data collected from participants.
- Comparison of the gross-verified savings to program-evaluated results to determine kit-level realization rates.
- Application of attribution survey data to estimate net-to-gross ratios and net-verified savings at the program level.

3.2 Database and Historical Evaluation Review

DEP provided the evaluation team with a program database for the NTC program participation. The program database provided participant contact information including account number, address, phone number, and email address, if available, and whether or not the participant was willing to be contacted. Because DEP was able to provide both phone numbers and email addresses, we were able to design a sampling approach that could take advantage of both phone and web-based surveying.

No previous evaluations existed for the NTC program sponsored by DEP. DEP provided ex-ante, or deemed, savings values at the kit-level; however, it did not have measure-level ex-ante savings available. Because measure-level savings were not provided, realization rates could only be calculated at the kit-level.

Despite the unavailability of measure-level ex-ante savings, the evaluation team conducted a benchmarking review of the uncertainty of ex-ante savings estimates by comparing multiple technical reference manuals (TRMs) and prior Energy Efficiency Education in Schools evaluations conducted in other Duke Energy jurisdictions. The details of the benchmarking review are referenced in Table 3-1. The listed savings values include the impact of in-service rates.

Table 3-1: Comparison of Ex-Ante DEP NTC Energy Savings (kWh) to Peer Group Estimates

Measure	Duke Energy Carolinas 2015 NTC Education evaluation	Duke Energy Kentucky 2015 NTC Education evaluation	Mid-Atlantic 2016 TRM[3]	Indiana 2012 TRM[4]	Texas 2015 TRM[5]	Pennsylvania 2016 TRM[6]
13 Watt CFL	26.0	39.3	22.2	37.6	36.5	25.0
18 Watt CFL	29.8	49.3	25.6	52.1	36.5	29.1
Nightlight	4.1	4.2	4.4	13.6	N/A	29.5
1.5 GPM Showerhead	50.1	24.6	296.6	71.6	186.0	167.7
1.0 GPM Bathroom Faucet Aerator	2.9	2.1	37.6	22.4	48.0	10.4
1.5 GPM Kitchen Faucet Aerator	25.0	20.7	37.6	22.4	48.0	83.9
Water Temperature Gauge Card	1.8	4.1	81.5	N/A	N/A	165.9
Outlet Insulating Gaskets	1.2	1.1	N/A	N/A	N/A	N/A

[1]Duke Energy Carolinas Energy Efficiency in Schools Program evaluation. The Cadmus Group, November 2, 2015.
[2]Energy Efficiency in Schools Program: EM&V for Duke Energy Kentucky. Cadmus. July 30, 2015.
[3]Mid-Atlantic Technical Reference Manual version 6.0. May, 2016.
[4]Indiana Technical Reference Manual, version 1.0. December, 2012.
[5]Texas Technical Reference Manual, version 3.0, Volume 2 Residential Measures. April, 2015.
[6]State of Pennsylvania Technical Reference Manual. June, 2016.

While Table 3-1 does illustrate variation in deemed savings among each source for each given measure, much of this variation reflects different in-service rate assumptions. Also of note is that the Mid-Atlantic, Indiana, and Texas TRMs do not differentiate parameter assumptions between bathroom and kitchen faucet aerators. For this reason, the evaluation team ultimately used assumptions outlined by the Pennsylvania TRM (see section 3.4.4) to capture different usage patterns between each aerator location.

3.3 Sampling Plan and Achievement

To provide representative results and meet program evaluation goals, a sampling plan was created to guide all evaluation activity. A random sample was created to target 90/10 confidence and precision at the program level, assuming a coefficient of variation (C_v) equal to 0.5. After reviewing the program database, the evaluation team identified a population of 6,428 participants within our defined evaluation period.

Based on the population of 6,428 participants, the evaluation team established sub-sample frames for phone and web-based survey administration. As illustrated in Table 3-2 below, we completed a total of 76 surveys. This sample size resulted in an achieved confidence and precision of 90/9.4.

Table 3-2: DEP NTC Impact Sampling

Survey Mode	Population	Sampled Participants	Achieved Confidence/ Precisions
Phone	2,304	27	90/9.4
Web-based	4,124	49	
Total	**6,428**	**76**	

3.4 Description of Analysis

3.4.1 Telephone and web-based surveys

The evaluation team performed telephone and web-based surveys to gain key pieces of information used in the savings calculations. Results of the 76 completed surveys were used to inform our program-wide assumptions as detailed in Table 3-3.

Table 3-3: Participant Data Collected and Used for Analysis

Measure	Data Collected	Assumption
13 Watt CFL 18 Watt CFL Nightlight	Units Installed	In-Service Rate
	Units Later Removed	
	Room Where Installed	Hours of Use
	Original Lamp Removed	Baseline Wattage
1.5 GPM Showerhead 1.0 GPM Bathroom Faucet Aerator 1.5 GPM Kitchen Faucet Aerator	Units Installed	In-Service Rate
	Units Later Removed	
	Hot Water Fuel Type	% Electric DHW
Water Temperature Gauge Card	Gage Cards Used	In-Service Rate
	Thermostats Reverted	
	Hot Water Fuel Type	% Electric DHW
Outlet Insulating Gaskets	Units Installed	In-Service Rate
	Units Later Removed	

3.4.2 In-Service Rate

The in-service rate (ISR) represents the ratio of equipment installed and operable to the total pieces of equipment distributed and eligible for installation. For example, if 15 telephone surveys were completed for customers receiving 1 CFL each, and five customers reported to still have the CFL installed and operable, the ISR for this measure would be five out of 15 or

33%. In some instances equipment was installed but may have been removed later due to homeowner preferences. In these cases the equipment is no longer operable and therefore contributes negatively to the ISR. In-service rates for each measure from all 76 eligible survey respondents are detailed in Table 3-4.

Table 3-4: DEP NTC In-Service Rates

Measure	Distributed	Installed	Removed	ISR
13 Watt CFL	76	50.5	2	64%
18 Watt CFL	76	51.5	2	65%
Nightlight	76	51	1	66%
1.5 GPM Showerhead	76	36	1	46%
1.0 GPM Bathroom Faucet Aerator	76	18	4	18%
1.5 GPM Kitchen Faucet Aerator	76	27	5	29%
Water Temperature Gauge Card	76	17	0	22%
Outlet Insulating Gaskets[1]	912	111	0	12%

[1]Note that 12 outlet insulating gaskets were included in each kit. The evaluation team calculated the ISR based on the total count of equipment distributed and installed.

For brevity and ease of use, the survey tool asked customers about the two CFL measures in one question, which required the evaluation to make predictive assumptions when calculating the ISR. Specifically, the survey asked respondents how many energy efficient bulbs were installed, rather than asking about the 12-watt and 18-watt CFLs separately[3].

3.4.3 Lighting

The three lighting measures in the kit include a 13W CFL, an 18W CFL, and an LED nightlight. Equation 3-1 and Equation 3-2 outline the algorithms utilized to estimate savings accrued by the lighting measures, with key parameters defined in Table 3-5.

Equation 3-1: Lighting Measures Energy Savings

$$\Delta kWh = \frac{Watts_{BASE} - Watts_{EE}}{1000\frac{W}{kW}} \times HOU \times (1 + IE_{kWh}) \times 365.25\frac{days}{year} \times ISR$$

Equation 3-2: Lighting Measures Demand Savings

$$\Delta kW = \frac{Watts_{BASE} - Watts_{EE}}{1000\frac{W}{kW}} \times CF \times (1 + IE_{kW}) \times ISR$$

[3] In the event that the respondent only installed one bulb, they were asked the wattage of the installed bulb as a follow-up question. Out of 76 survey respondents, 46 people installed both lamps. However, ten respondents claimed to have only installed one bulb, with seven of those not being able to identify the wattage of the bulb in question. In calculating the ISR for these seven customers, we assigned a value of 0.5 to the quantity installed for both the 13W and 18W bulbs. This equates to installation of three and one-half 13W bulbs and three and one-half 18W bulbs across these seven customers, which was then added to the 46 customers who definitively installed both bulbs, the two who definitively only installed the 18W bulb, and the one who definitively installed the 13W bulb for a total of 50.5 installed 13W and 51.5 installed 18W lamps.

Table 3-5: Inputs for Lighting Measures Savings Calculations

Input	Units	Value	Source
$Watts_{BASE}$	Watts	CFL: 42.1 or 53 Nightlight: 3.4	CFL: Survey responses and Federal minimum standards Nightlight: Survey responses
$Watts_{EE}$	Watts	CFL: 13 or 18 Nightlight: 0.03	Equipment specifications
HOU	Hours	CFL: 3.3 Nightlight: 12	Duke Energy Progress 2012 Lighting Program Evaluation[1]; Tennessee Valley Authority 2016 TRM; Survey responses; Equipment specifications
CF	N/A	CFL: 0.08 Nightlight: 0.00	Mid-Atlantic 2016 TRM
IE_{kWh}	N/A	-8%	Mid-Atlantic 2016 TRM
IE_{kW}	N/A	+21%	Mid-Atlantic 2016 TRM
ISR	N/A	CFL: 64 – 65% Nightlight: 66%	Survey responses

[1]EM&V Report for the 2012 Energy Efficient Lighting Program; prepared for Duke Energy. July 13, 2013. HOU of 3.3 hours is a weighted average of bulb installation location as reported by participants and room-level HOUs provided in the 2012 Energy Efficient Lighting Program report.

The evaluation team paid careful attention to the effects of the Energy Independence and Security Act (EISA), which mandated higher-efficiency technologies for incandescent bulbs. In the analysis of CFL bulbs, the evaluation team opted to replace the participant-reported baseline wattage with the EISA-compliant bulb that would produce the same lumen output for all instances where CFLs replaced other CFLs. However, two respondents claimed to have replaced LEDs with the provided CFLs. In these instances, a baseline of 9W was used. This resulted in the use of a 53W baseline for 18W CFLs and a 42.1W baseline for 13W CFLs. Nightlights, however, are not affected by EISA, and as such were evaluated using a baseline wattage dependent on what the participant specified as the removed lamp.

Hours of use (HOU) for CFL lighting was based on participant survey responses dictating the location (room) of the new CFLs and primarily estimated HOU values by room based on the DEP 2012 Lighting Program evaluation report.

Using the engineering algorithm and assumptions described above, we determined the gross energy and demand savings value for each lighting measure provided in the kit as summarized in Table 3-6.

Table 3-6: DEP NTC Energy Savings, Lighting Measures

Kit Measure	Gross per unit energy savings (kWh)	Gross per unit demand savings (kW)
13W CFL	20.7	0.002
18W CFL	25.3	0.002
Nightlight	9.0	0.000

3.4.4 Water Heating

The four water heating measures in the kit include a low-flow kitchen faucet aerator, a low-flow bathroom faucet aerator, a low-flow showerhead, and a water temperature gauge card which encouraged participants to set back their hot water heater thermostats. The equations below outline the algorithms utilized to estimate savings accrued by the domestic water heating measures with parameters defined in Table 3-7.

Equation 3-3: Aerator Energy Savings

$$\Delta kWh = ISR \times ELEC \times \left[\frac{\Delta GPM \times T_{person/day} \times N_{persons} \times 365 \frac{days}{year} \times DF \times \Delta T \times 8.3 \frac{BTU}{gal \cdot {}^\circ F}}{\#_{faucets} \times 3{,}412 \frac{BTU}{kWh} \times RE} \right]$$

Equation 3-4: Showerhead Energy Savings

$$\Delta kWh = ISR \times ELEC \times \left[\frac{\Delta GPM \times T_{person/day} \times N_{persons} \times 365 \frac{days}{year} \times N_{showers-day} \times \Delta T \times 8.3 \frac{BTU}{gal \cdot {}^\circ F}}{\#_{showers} \times 3{,}412 \frac{BTU}{kWh} \times RE} \right]$$

Equation 3-5: Water Heater Setback Energy Savings

$$\Delta kWh = ISR \times ELEC \times \left[\frac{A_{tank} \times \Delta T \times 8760 \frac{hrs}{yr}}{R_{tank} \times RE \times 3{,}412 \frac{Btu}{kWh}} + \frac{V_{HW} \times \left(8.3 \frac{lb}{gal}\right) \times \left(365 \frac{days}{yr}\right) \times \left(1 \frac{Btu}{{}^\circ F \cdot lb}\right) \times \Delta T}{\left(3412 \frac{Btu}{kWh}\right) \times EF_{WH}} \right]$$

Equation 3-6: Water Heating Measures Demand Savings

$$\Delta kW = ETDF \times \Delta kWh$$

Table 3-7: Inputs for Water Heating Measures Savings Calculations

Input	Units	Value	Source
ISR	N/A	Bath: 18% Kitchen: 29% Shower: 46% Setback: 22%	Survey responses
ELEC	N/A	Bath: 79% Kitchen: 79% Shower: 64% Setback: 67%	Survey responses
ΔGPM	GPM	Bath: 1.2 Kitchen: 0.7 Shower: 1.0	Product specification sheet compared against federal code minimum
$T_{person/day}$	Minutes	Bath: 1.6 Kitchen: 4.5 Shower: 7.8	Pennsylvania 2016 TRM
$N_{persons}$	Persons	Bath: 4.0 Kitchen: 4.5 Shower: 4.0	Survey responses
$N_{showers\text{-}day}$	Showers per Day	Shower: 0.6	Pennsylvania 2016 TRM
DF	N/A	Bath: 90% Kitchen: 75% Shower: 100%	Pennsylvania 2016 TRM
ΔT	°F	Bath: 19.1 Kitchen: 19.1 Shower: 44.1 Setback: 10.0	Mid-Atlantic 2016 TRM
$\#_{faucets}$	Units	Bath: 2.1 Kitchen: 1.0 Shower: 2.1	Bathroom: 2013 RASS Data[1] Kitchen: Pennsylvania 2016 TRM Showerhead: DeOreo, 2011
ETDF	N/A	Bath: 0.00013 Kitchen: 0.00013 Shower: 0.00080	Pennsylvania 2016 TRM
RE	N/A	98%	Mid-Atlantic 2016 TRM
A_{tank}	Ft^2	24.99	Pennsylvania 2016 TRM
R_{tank}	°F·ft2·hr/BTU	8.3	Pennsylvania 2016 TRM
V_{HW}	GPD	7.3	Pennsylvania 2016 TRM
EF_{WH}	N/A	0.904	Pennsylvania 2016 TRM

[1]Duke Energy 2013 Residential Appliance Saturation Survey. North Carolina and South Carolina respondents.

The evaluation team determined that the 2016 Pennsylvania's TRM provided the most applicable and rigorous algorithm by including factors such as standby losses and water volume savings, differentiating between kitchen and bathroom water use, and more comprehensive algorithms. Where the Mid-Atlantic 2016 TRM made appropriate distinctions, the evaluation team used the Mid-Atlantic parameter assumptions due to its geographic relevance to the DEP territory. However, where the Mid-Atlantic TRM lacked granularity, the evaluation team elected to use the Pennsylvania TRM as the secondary data source for estimating savings.

Using the applicable engineering algorithm and assumptions described above, the gross energy and demand savings value were estimated for each domestic hot water measure provided in the kit as summarized in Table 3-8.

Table 3-8: DEP NTC Gross Energy Savings, Water Heating Measures

Kit Measure	Gross per unit energy savings (kWh)	Gross per unit energy savings (kW)
1.5 GPM Showerhead	107.2	0.086
1.0 GPM Bathroom Faucet Aerator	8.1	0.001
1.5 GPM Kitchen Faucet Aerator	41.9	0.006
Water Temperature Gauge Card	22.6	0.018

3.4.5 Air Infiltration

Equation 3-7 and Equation 3-8 outline the algorithms utilized to estimate savings accrued by the outlet insulating gaskets. The parameters are defined in Table 3-9.

Equation 3-7: Air Infiltration Energy Savings

$$\Delta kWh = ISR \times \frac{\Delta CFM}{home} \times \frac{kWh}{CFM}$$

Equation 3-8: Air Infiltration Demand Savings

$$\Delta kW = \frac{\Delta kWh}{8{,}760}$$

Table 3-9: Inputs for Air Infiltration Measures Savings Calculations

Input	Units	Value	Source
ISR	N/A	13.8%	Survey responses
ΔCFM/home	CFM	0.69	2008 DEK NEED Evaluation Final Report
kWh/CFM	kWh/CFM	15.19	2013 Duke Energy Progress RASS Data, 2008 DEK NEED Evaluation Final Report

In estimating the impacts of the outlet gaskets, the analysis used parameters estimated from a prior evaluation of the Energy Efficiency Education in Schools program conducted in the Duke Energy Kentucky service territory. This previous evaluation estimated reduction in infiltration as a factor of cubic feet per minute (cfm) due to the installation of a gasket. We also considered the previous evaluation's modeled energy savings for reduced infiltration and calibrated the savings value based on the saturation of heating and cooling equipment technologies reported in Duke Energy's 2013 residential appliance saturation study to ensure the savings value represented the NTC program participants. All North Carolina and South Carolina responses recorded in the saturation study were used for model calibration.

Using the engineering algorithm described above, we determined the gross energy and demand savings value for outlet insulating gaskets provided in the kit as summarized in Table 3-10.

Table 3-10: DEP NTC Gross Energy Savings, Air Infiltration Measures

Kit Measure	Gross per unit energy savings (kWh)	Gross per unit energy savings (kW)
Outlet Gaskets	1.3	0.000

3.4.6 Behavioral Analysis

Similarly to how we conducted the impact evaluation of the actual kit measures, the evaluation team estimated the behavioral impacts using the results of the completed surveys in conjunction with engineering algorithms. The survey contained the following questions from which we gauged what sort of behavioral changes were induced by the kit:

- Since your child learned about energy conservation at school and signed up for your energy kit from Duke Energy, what new behaviors has your child adopted to help save energy in your home?
- Since receiving your energy kit from Duke Energy, what new behaviors have you adopted to help save energy in your home?

Survey participants were encouraged to answer as an open-response, rather than choosing behaviors from a list. The typical responses included turning off lights when not in a room, turning off electronics when not in use, taking shorter showers, turning off water when brushing teeth or washing hands, turning off heating and air conditioning when not home, changing thermostat settings, and using fans instead of air conditioning.

The evaluation team estimated the initial impacts of these behavioral changes for the proportion of participants who confirmed taking action (i.e., the in-service rate for the behavioral change) using engineering algorithms similar to those algorithms used to estimate the impacts of the kit measures. We then adjusted these initial savings according to the results of some key survey questions such as:

- On a scale of 0 to 10, where 0 means "not at all influential" and 10 means "extremely influential", how much influence did Duke Energy's kit
- Did you read the information about how to save energy in the booklet that came in the kit?
- During the school year, did you receive any Home Energy Reports from Duke Energy?

The savings calculation methodologies and adjustment factors are detailed in the following subsections.

3.4.6.1 Adjustment factors

Several adjustments were made to the initial calculated savings associated with each behavior to more accurately reflect the extent to which the behaviors were a result of the energy saving kit.

In-Service Rate (ISR)

Similar to kit measure ISRs, the behavioral ISR reflects what percentage of the known population is expected to have adopted this behavior. Separate ISR values were calculated for parent and children adoption rates, which are summarized in Table 3-11.

Table 3-11: Behavioral Savings In-Service Rates

Behavior	Child Adoption Rate	Parent Adoption Rate
Turn off lights	61%	45%
Turn off electronics	33%	29%
Take shorter showers	25%	20%
Turn off heat / AC	N/A	9% / 8%
Change thermostat settings	N/A	37%
Use fans instead of AC	N/A	20%

Kit Influence

We then adjusted the savings by how the level of reported influence the kit had on each respondent's behavioral changes. Participants were asked to rate how heavily the kit influenced their behavioral changes on a scale of 0 to 10. The kit influence adjustment factor was set at the weighted average of participant responses as shown in Table 3-12.

Table 3-12: Behavioral Savings Kit Influence Adjustment Factor

Influence Score	Response Rate
0	0.0%
1	0.0%
2	2.1%
3	0.0%
4	4.3%
5	8.5%
6	2.1%
7	17.0%
8	21.3%
9	4.3%
10	40.4%
Weighted	**81%**

Kit Informational Materials

The energy saving kit included literature on various ways participants could save energy in their homes by altering their behavior. While participants did self-report the level of influence the kit had on their decision, many respondents who claimed to be influenced by the program also responded that they did not read the kit informational materials. The evaluation team used the kit informational materials adjustment factor to correct for apparent bias in the self-reported answers on kit influence. We found that 67 out of 76 respondents read the provided literature and set the adjustment factor at 88%.

MyHER Program Overlap

Duke Energy runs a simultaneous behavioral-based energy saving program in which participants elect to receive regular My Home Energy Reports (MyHER). The report summarizes a customer's consumption and benchmarks it against other energy users of similar home characteristics and demographics. The goal of the program is to influence participants to change their energy consumption habits through increased knowledge.

Participation in the MyHER program does not exclude customers from also receiving the kit from this NTC program. Because of this, the evaluation team used the MyHER program overlap adjustment factor to adjust the behavioral savings to account for the percentage of influence that came from the alternate MyHER program. Based on survey results regarding the MyHER program participation and influence, we determined the possible overlap to be 1%, and set the adjustment factor at 99%[4].

Persistence

While behavioral changes designed to increase energy efficiency or conservation can result in immediate impacts, the initial activity is expected to wane in the absence of consistent intervention. This decay of energy savings resulting from a change in behavior has been carefully documented through random control trials of Home Energy Report programs such as Duke Energy's MyHER program or program's implemented in other jurisdictions by Oracle (formally Opower). The rate at which energy savings persists after a customer receives a report depends on the frequency and longevity that a customer receives follow-up reports.

Because the kit provides information to educate and encourage participants to reduce their energy impacts, the evaluation team felt it was prudent to estimate a persistence rate based on this one-time exposure. We relied on a literature review to estimate how savings may persist based on the NTC program design. Typical persistence rates for Home Energy Report programs ranges from 80% - 90%, i.e., a participant's estimated savings from behavioral changes is expected to decay approximately 10% - 20% per year if no more Home Energy Reports are provided. This persistence rate is based on two consecutive years of receiving monthly reports. However, if a participant receives minimal follow-up after the initial report, the persistence of any initial behavioral impacts is expected to dissipate rapidly. Because participants in the NTC program are treated only once with regard to behavioral changes, the evaluation team estimated a persistence rate of 28%. This estimate is based on research which modeled the persistence of customers who received four quarterly Home Energy Reports after which treatment was ceased[5]. For this evaluation, we calculated the persistence rate as the ratio of the expected average behavioral savings per day (0.397 kWh) to the decay coefficient (1.426 kWh) associated with customers receiving four quarterly reports. Therefore, it is expected the initial impact generated from behavioral changes in the NTC program would fully dissipate approximately three to four months after receiving the kit.

Adjustment Factor Summary

Table 3-13 below provides the adjustment factors which are applied to the behavioral savings described in Section 3.4.6.2.

[4] Based on survey responses, the evaluation team found that approximately 9% of respondents reported receiving a report from the MyHER program. Of those respondents, 72% affirmed reading the report; however, only 17% claimed to have taken a behavioral action to increase their energy conservation.

[5] Allcott, H, Rogers, T., The Short-Run and Long-Run Effects of Behavioral Interventions: Experimental Evidence from Energy Conservation. American Economic Review 2014, 104(10): 3003-3037.

3-13: Adjustment Factors

Adjustment Factor	Percent
In-service rate	Varies by measure
Kit influence	81%
Kit informational materials	88%
MyHER program overlap	99%
Persistence	28%

3.4.6.2 Behavioral Savings Calculations

Turn off lights

The evaluation team calculated the savings associated with the behavior of turning off lights after exiting a room by estimating the likely reduction in lighting operating hours. The reduction in hours was used in lieu of the hours of use term in the standard lighting equations (Equation 3-1 and Equation 3-2) as illustrated in Equation 3-9 and Equation 3-10.

Equation 3-9: Turn Off Lights Energy Savings

$$\Delta kWh = \frac{Watts_{BASE}}{1000\frac{W}{kW}} \times HOU_{reduced} \times (1 + IE_{kWh}) \times 365.25\frac{days}{year} \times Adj.Factors$$

Equation 3-10: Turn Off Lights Demand Savings

$$\Delta kW = ETDF * kWh\ savings \times Adj.Factors$$

The calculations assumed the wattage of the affected lamps to be an EISA standard bulb of 53 watts (1,050 – 1,489 lumens). The hours of use term in the lighting equations used to estimate the impacts of CFLs included in the kit relied on survey responses as to where the light bulbs were installed. Each possible room within the home had an associated daily hours of use as provided by the 2012 ESTAR Evaluation and the TVA 2016 TRM. The likely reduction in operating hours was determined by calculating each possible difference in lighting hours between room types (e.g. the difference in the living room HOU and the dining room HOU) as shown below in Figure 3-1.

Figure 3-1: Calculation of Likely Lighting HOU Reduction

Possible Reduction in Hours		Living Room	Dining Room	Bed-room	Kitchen	Bath-room	Den	Hall-way	Base-ment	Out-doors	Don't Know
		4.39	**5.54**	**3.31**	**6.61**	**3.04**	**2.3**	**0.51**	**1.9**	**3.9**	**2.33**
Living Room	**4.39**	0.00	1.15	0.00	2.22	0.00	0.00	0.00	0.00	0.00	0.00
Dining Room	**5.54**	0.00	0.00	0.00	1.07	0.00	0.00	0.00	0.00	0.00	0.00
Bedroom	**3.31**	1.08	2.23	0.00	3.3	0.00	0.00	0.00	0.00	0.59	0.00
Kitchen	**6.61**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bathroom	**3.04**	1.35	2.5	0.27	3.57	0.00	0.00	0.00	0.00	0.86	0.00
Den	**2.3**	2.09	3.24	1.01	4.31	0.74	0.00	0.00	0.00	1.6	0.03
Hallway	**0.51**	3.88	5.03	2.8	6.1	2.53	1.79	0.00	1.39	3.39	1.82
Basement	**1.9**	2.49	3.64	1.41	4.71	1.14	0.4	0.00	0.00	2.00	0.43
Outdoors	**3.9**	0.49	1.64	0.00	2.71	0.00	0.00	0.00	0.00	0.00	0.00
Don't Know	**2.33**	2.06	3.21	0.98	4.28	0.71	0.00	0.00	0.00	1.57	0.00

The evaluation team calculated the likely reduction in daily runtime to be 0.96 hours, or 351 hours annually. The savings were calculated and adjusted based on this key assumption.

Energy savings were calculated at 17.0 kWh (before applying adjustment factors). Because this behavioral change was completed by both children and parents, we applied adjustment factors and calculated adjusted savings separately for children and parents using their respective ISR. The parameter inputs and final savings are detailed in Table 3-14.

Table 3-14: Behavioral Savings Achieved by Turning off Lights (per home)

Input	Units	Value	Source	
Watts	Watts	53	Federal minimum standards	
$HOU_{Reduced}$	Hours	0.96	Duke Energy Progress 2012 Lighting Program Evaluation; Tennessee Valley Authority 2016 TRM	
IE_{kWh}	N/A	-8%	Mid-Atlantic 2016 TRM	
Energy to Demand Factor (ETDF)	N/A	0.00009	Ratio of calculated lighting measure demand to energy savings	
Energy Savings	**kWh**	**17.0**	**Calculated from algorithm**	
Demand Savings	**kW**	**0.002**	**Calculated from algorithm**	
ISR	**Influence**	**MyHER**	**Kit Info.**	**Persistence**
Child: 61% Parent: 45%	81%	99%	88%	28%
			Savings from child behavior:	2.0 kWh; 0.000 kW
			Savings from parent behavior:	1.5 kWh; 0.000 kW
			Total Energy Savings:	**3.5 kWh**
			Total Demand Savings:	**0.000 kW**

Turn off electronics

The evaluation team used evaluations for “Smart Strips” or “Controlled Power Strips” in order to estimate savings achieved by turning off electronics when not in use. Smart strips are multi-plug power strips with the ability to automatically disconnect specific connected loads depending upon the power draw of a control load which is also plugged into the strip. Power is disconnected from the controlled outlets when the control load power draw is reduced below a certain adjustable threshold, thus turning off all accompanying appliances plugged into the strip.

We researched current studies on smart strip savings (summarized in Table 3-15) and used the average value as the calculated savings amount for this behavioral change.

Table 3-15: Smart Strip Savings

Source	Savings (kWh)
Ameren Missouri Evaluation	52.00
Duke Energy Potential Study	74.46
Illinois 2016 TRM	79.75
Mid-Atlantic 2016 TRM	47.4
Pennsylvania 2016 TRM	61.05
Average	**62.93**

The demand savings were calculated from the energy savings using an assumed hours of use value of 7,300 and an assumed coincidence factor of 90%, both from the Pennsylvania 2016 TRM. Equation 3-11 and Equation 3-12 present the algorithms used to calculate energy and demand savings for the behavior change of turning off electronics.

Equation 3-11: Turn Off Electronics Energy Savings

$$\Delta kWh = Average\ of\ deemed\ savings \times Adj.Factors$$

Equation 3-12: Turn Off Electronics Demand Savings

$$\Delta kW = kWh\ savings / HOU \times CF \times Adj.Factors$$

Energy savings (before applying adjustment factors) were calculated at 62.9 kWh. Because this behavioral change was completed by both children and parents, we applied adjustment factors and calculated adjusted savings separately for children and parents using their respective ISR. The final savings are detailed in Table 3-16.

Table 3-16: Behavioral Savings Achieved by Turning off Electronics

Input	Units	Value	Source	
Coincidence factor (CF)	N/A	0.90	Pennsylvania 2016 TRM	
HOU	hours	7,300	Pennsylvania 2016 TRM	
Energy Savings	**kWh**	**62.9**	**Average of TRMs and prior studies (see Table 3-15)**	
Demand Savings	**kW**	**0.008**	**Calculated from algorithm**	
ISR	**Influence**	**MyHER**	**Kit Info.**	**Persistence**
Child: 33% Parent: 29%	81%	99%	88%	28%
			Savings from child behavior:	4.0 kWh; 0.0005 kW
			Savings from parent behavior:	3.6 kWh; 0.0005 kW
			Total Energy Savings:	**7.6 kWh**
			Total Demand Savings:	**0.001 kW**

Take shorter showers

To determine savings achieved by a reduction in shower time, the evaluation team estimated how much time could be reduced based on actual shower length data. To do this, we utilized data provided by Aquacraft's 2011 Analysis of Water Use in New Single-Family Homes[6] (summarized in left two columns of Table 3-17). We set the target shower length equal to the typical length used in national energy efficiency evaluations (7.8 to 8.4 minutes[7]), and calculated

[6] http://www.aquacraft.com/wp-content/uploads/2015/10/Analysis-of-Water-Use-in-New-Single-Family-Homes.pdf

[7] Based on reported shower times from 2013 Indiana TRM, 2015 Illinois TRM, 2012 TVA Saturation Survey, 2015 Maine TRM, and the 2016 Pennsylvania TRM.

how much opportunity existed in the data for people to reduce their shower times to the national average. Energy and demand savings were calculated based on Equation 3-13 and Equation 3-14, respectively.

Equation 3-13: Take Shorter Shower Energy Savings

$$\Delta kWh = ELEC \times GPM_{retrofit} \times T_{person/day} \times N_{showers-day} \times 365\frac{days}{year} \times \left[\frac{\Delta T \times 8.33\frac{BTU}{gal \cdot {}^{\circ}F}}{3,412\frac{BTU}{kWh} \times RE}\right] \times Adj.Factors$$

Equation 3-14: Take Shorter Shower Demand Savings

$$\Delta kW = ETDF \times Energy\ Savings \times Adj.Factors$$

Table 3-17: Reduction in Shower Time Data and Calculation

Shower Length (minutes)	Responses	Possible Reduction (minutes)
2	0%	-
4	2%	-
6	17%	-
8	35%	GOAL
10	24%	2
12	14%	4
14	4%	6
16	2%	8
18	0%	10
20	1%	12
	Weighted Average	**3.47**

We calculated the likely reduction in shower length to be 3.47 minutes per shower, or 12.7 hours per person annually. The savings were calculated and adjusted based on this key assumption as detailed in Table 3-18.

Table 3-18: Behavioral Savings Achieved by Taking Shorter Showers

Input	Units	Value	Source	
GPM	GPM	1.75	Survey responses, Federal minimum standards	
$T_{person/day}$	Minutes	3.47	Aquacraft 2011 Report	
$N_{persons/day}$	Showers/Person/Day	0.6	Pennsylvania 2016 TRM	
365	Days/Year	365	-	
ΔT	°F	44.1	Mid-Atlantic 2016 TRM	
ELEC	%	64.7%	Survey responses, Duke Energy RASS Data	
RE	N/A	98%	Mid-Atlantic 2016 TRM	
Energy to Demand Factor (ETDF)	N/A	0.00013	Pennsylvania 2016 TRM	
Energy Savings	**kWh**	**94.6**	**Calculated from algorithm**	
Demand Savings	**kW**	**0.013**	**Calculated from algorithm**	
ISR	**Influence**	**MyHER**	**Kit Info.**	**Persistence**
25% (Child) 20% (Parent)	81%	99%	88%	28%
			Savings from child behavior:	4.6 kWh; 0.0006 kW
			Savings from parent behavior:	3.7 kWh; 0.0004 kW
			Total Energy Savings:	**8.3 kWh**
			Total Demand Savings:	**0.001 kW**

Turn off furnace or central air conditioner (CAC) or use fan instead of CAC

To emulate the impacts of the behavior of customers who turned off the heating or cooling mode of their HVAC system, the evaluation team used the effects of a smart thermostat as a proxy. A smart thermostat is a wi-fi enabled programmable thermostat that typically includes multiple functionalities that allow for a reduction in energy use. Most notably the devices are a part of the home's network and regularly check to see what other items are connected to the network as well as utilize motion detectors. In the event that no users are actively connected to the home's network and minimal movement is detected, the thermostat will go into auto away mode. Given this functionality, the evaluation team believes this measure to be an appropriate proxy for the behavior observed by participants of turning off the furnace or air conditioner.

Equation 3-15 and Equation 3-16 present the algorithms used to calculate energy savings for reduced cooling and heating loads. Demand savings were deemed as zero based on assumptions provided in multiple TRMs including the 2016 Mid-Atlantic TRM and 2016 Pennsylvania TRM.

Equation 3-15: Turn off CAC or use fan mode energy savings algorithm

$$\Delta kWh_{cool} = EUI_{cool} \times Area \times Tstat_{cool} \times Adj.Factors$$

Equation 3-16: Turn off furnace energy savings algorithm

$$\boldsymbol{\Delta kWh_{heat} = EUI_{heat} \times Area \times Tstat_{heat} \times ELEC \times Adj.Factors}$$

The evaluation team researched current studies on smart thermostat savings (summarized in Table 3-19). The baseline for all selected studies was a manual mercury thermostat. The median savings observed in the data was then applied to the annual electric heating and cooling consumption for homes in North and South Carolina as provided in the US Energy Information Administration's 2009 Residential Energy Consumption Survey (RECS).

Table 3-19: Smart Thermostat Savings

Study Location	Cooling Savings	Heating Savings
Vectren Indiana[1]	13.9%	12.5%
NIPSCO[2]	16.1%	13.4%
National Grid[3]	10%	N/A
Median	**13.9%**	**13.0%**

[1] Evaluation of 2013–2014 Programmable and Smart Thermostat Program for Vectren Corporation. The Cadmus Group, January 2015.
[2] Evaluation of the 2013–2014 Programmable and Smart Thermostat Program for Northern Indiana Public Service Company. The Cadmus Group, January 2015
[3] Evaluation of 2013- 2014 Smart Thermostat Pilots: Home Energy Monitoring, Automatic Temperature Control, Demand Response. The Cadmus Group, July 2015.

The calculated savings for turning off the air conditioning and for using fans instead of air conditioning are based on the cooling savings only, while the calculated savings for turning off the furnace is based on the heating savings only. We calculated and adjusted savings based on the key assumptions as detailed in Table 3-20 and Table 3-21.

Table 3-20: Behavioral Savings Achieved by Changing AC Use Patterns

Input	Units	Value	Source	
Cooling Energy Use Intensity (EUI_{cool})	kWh/ft^2	1.1305	2009 RECS Data, NC and SC	
Average Cooled Area ($Area_{cool}$)	ft^2	1,481.5	2009 RECS Data, NC and SC	
T-stat $savings_{cool}$	%	13.9%	Multiple Smart Thermostat Studies as noted above	
Energy Savings	**kWh**	**232.8**	**Calculated from algorithm**	
Demand Savings	**kW**	**0.000**	**Deemed**	
Turning off Air Conditioning when Not Home				
ISR	**Influence**	**MyHER**	**Kit Info.**	**Persistence**
8%	81%	99%	88%	28%
			Total Energy Savings:	**3.6 kWh**
			Total Demand Savings:	**0.000 kW**
Using Fans Instead of Air Conditioning				
ISR	**Influence**	**MyHER**	**Kit Info.**	**Persistence**
20%	81%	99%	88%	28%
			Total Energy Savings:	**9.0 kWh**
			Total Demand Savings:	**0.000 kW**

Table 3-21: Behavioral Savings Achieved by Changing Heating Use Patterns

Input	Units	Value	Source	
Heating Energy Use Intensity (EUI_{heat})	kWh/ft^2	0.9044	2009 RECS Data, NC and SC	
Average Heated Area ($Area_{heat}$)	ft^2	1,574.0	2009 RECS Data, NC and SC	
T-stat $savings_{heat}$	%	13.0%	Multiple Smart Thermostat Studies as noted above	
ELEC	**%**	**68.3%**	Duke Energy 2013 RASS Data	
Energy Savings	**kWh**	**126.0**	**Calculated from algorithm**	
Demand Savings	**kW**	**0.000**	**Deemed**	
ISR	**Influence**	**MyHER**	**Kit Info.**	**Persistence**
9%	81%	99%	88%	28%
			Total Energy Savings:	**2.3 kWh**
			Total Demand Savings:	**0.000 kW**

Adjust thermostat set points

The evaluation team again relied on current smart thermostat studies to estimate the savings achieved by adjusting thermostat set points. An additional function of smart thermostats is their ability to learn set points by trending regular changes made by the user in a trial period following installation. The evaluation team believes this increased precision in thermostat set points to be analogous to the behavioral change analyzed here.

Equation 3-17 presents the algorithm used to calculate energy savings for reduced cooling and heating loads. Demand savings were deemed as zero based on assumptions provided in multiple TRMs including the 2016 Mid-Atlantic TRM and the 2016 Pennsylvania TRM.

Equation 3-17: Adjust thermostat set points energy savings algorithm

$$\Delta kWh_{cool} = (EUI_{cool} \times Area \times Tstat_{cool}) + (EUI_{heat} \times Area \times Tstat_{heat} \times ELEC) \times Adj.Factors$$

In our review of smart thermostat data, we also explored studies with mixed baselines (manual and programmable thermostats) in order to better isolate the impact of set point adjustments as opposed to the auto-away function. The sources and their associated savings are detailed in Table 3-22.

Table 3-22: Smart Thermostat Savings

Study Location	Cooling Savings	Heating Savings
Vectren Corporation[1]	N/A	5.0%
NIPSCO[2]	N/A	7.8%
Xcel Energy[3]	4.6%	N/A
Commonwealth Edison[4]	4.8%	6.7%
Florida Power Corporation[5]	9.6%	9.5%
Median	**4.8%**	**7.3%**

[1]Evaluation of 2013–2014 Programmable and Smart Thermostat Program for Vectren Corporation. The Cadmus Group, January 2015.
[2]Evaluation of the 2013–2014 Programmable and Smart Thermostat Program for Northern Indiana Public Service Company. The Cadmus Group, November 2014.
[3]In-Home Smart Device Pilot. Public Service Company of Colorado. EnerNOC, Inc., April, 2014.
[4]Commonwealth Edison Residential Smart Thermostats. Navigant Consulting, February 2016.
[5]Florida Solar Energy Center. Evaluation of the Space Heating and Cooling Energy savings of Smart Thermostats in a Hot-Humid Climate Long-term Data. FSEC-RR-647-16, August 2016.

The savings were calculated and adjusted based on these key assumptions as detailed in Table 3-23.

Table 3-23: Behavioral Savings Achieved by Changing Thermostat Settings

Input	Units	Value	Source	
Heating Energy Use Intensity (EUI_{heat})	kWh/ft^2	0.9044	2009 RECS Data, NC and SC	
Average Heated Area ($Area_{heat}$)	ft^2	1,574.0	2009 RECS Data, NC and SC	
T-stat $savings_{heat}$	%	7.3%	Multiple Smart Thermostat Studies as noted above	
ELEC	%	68.3%	Duke Energy 2013 RASS Data	
Cooling Energy Use Intensity (EUI_{cool})	kWh/ft^2	1.1305	2009 RECS Data, NC and SC	
Average Cooled Area ($Area_{cool}$)	ft^2	1,481.5	2009 RECS Data, NC and SC	
T-stat $savings_{cool}$	%	4.8%	Multiple Smart Thermostat Studies as noted above	
Energy Savings	**kWh**	**150.9**	**Calculated from algorithm**	
Demand Savings	**kW**	**0.000**	**Deemed**	
ISR	**Influence**	**MyHER**	**Kit Info.**	**Persistence**
37%	81%	99%	88%	28%
			Total Energy Savings:	**10.9 kWh**
			Total Demand Savings:	**0.000 kW**

Summary of behavioral impacts

Table 3-24 below presents the total energy savings derived from the behavioral component of the program.

3-24: Energy savings from behavioral impacts

Behavior	kWh savings
Turn off lights	3.5
Turn off electronics	7.6
Take shorter showers	8.3
Turn off furnace	2.3
Turn off AC	3.6
Use fan mode	9.0
Adjust thermostat set points	6.0
Total	**40.3**

3.5 Billing Regression Analysis

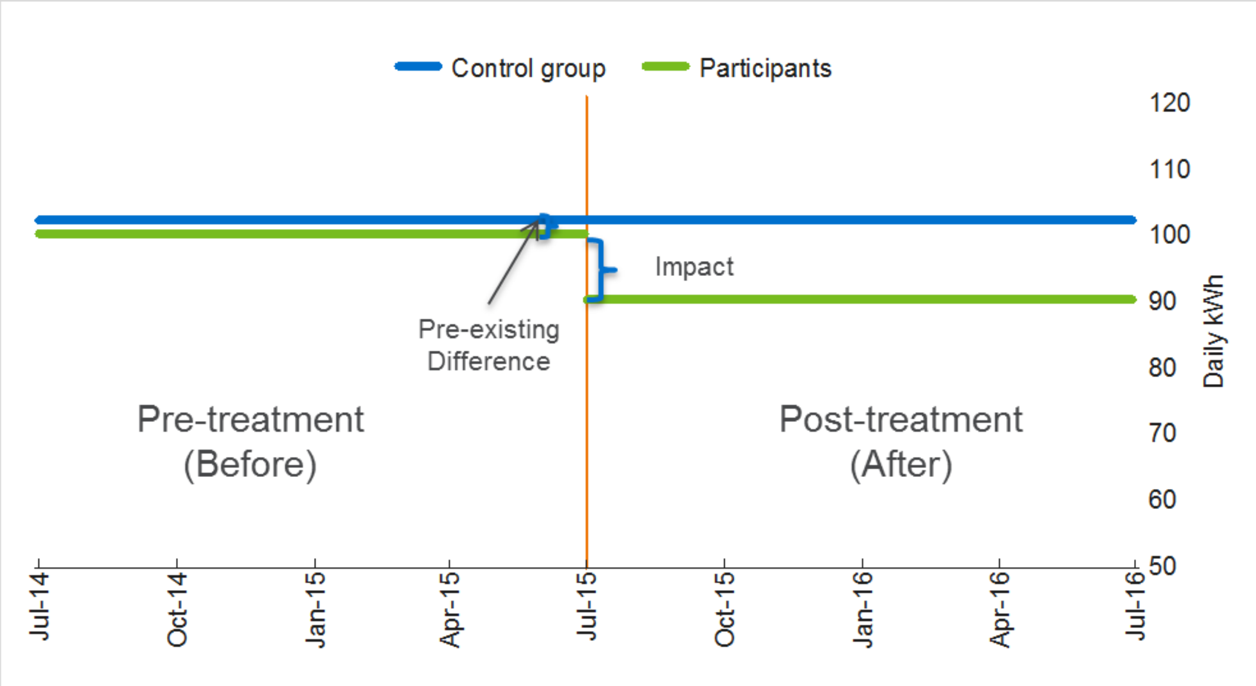
While the NTC program provides participants with kits that include energy efficiency measures, the program also teaches children and families ways to conserve electricity which can lead to behavioral savings. In addition to engineering analysis, the evaluation team attempted to estimate energy savings by analyzing energy use patterns before and after participation in the NTC program – commonly referred to as billing analysis. After a thorough investigation, which is described in more detail below, we concluded that, absent a randomized control trial (RCT), billing analysis was unable to reliably detect energy savings associated with the kit or education effort. When the percent change in household energy use is small, as with the education and kit, the only reliable way to estimate energy savings using billing analysis is through a RCT with large treatment and control groups and pre-and post-data. However, while a RCT would be ideal to isolate impacts via a billing analysis, the design of NTC program is not overly conducive for establishing the required data for conducting such an analysis. First, NTC would need to identify eligible schools and exclude a portion to serve as the basis for the control group. This may result in significantly reduced participation and could strain relations between NTC and the schools. Second, schools that are assigned to the control group would need to provide personal identification information for the parents of their students in order to identify and retrieve the appropriate utility billing records for the analysis. This information is not typically released by schools. Due to the restrictive nature of these prerequisites for conducting an RCT, the evaluation team's recommendation is to rely on the engineering analysis and findings as the source of the verified gross and net savings for the program. Below we discuss how we attempted to complete a billing analysis and how we ultimately determined such an analysis was not feasible.

To estimate energy savings with billing data, it is necessary to estimate what energy consumption would have occurred in the absence of NTC program —the counterfactual or baseline. To infer that the education component of the program led to energy savings, it is necessary to systematically eliminate plausible alternative explanations for differences in electricity use patterns such as random chance.

The basic framework for the analysis the evaluation team used is illustrated in Figure 3-2 and relies on both a control group and pre- and post-data. The analysis is implemented via the difference-in-differences technique which removes any pre-existing differences between the participant and the control group. If the education kit and behavioral changes leads to reductions in consumption, we should observe:

- A change in consumption for households that participated in the NTC program
- No similar change for the control group
- The timing of the change should coincide with the receipt of education kits

Figure 3-2: Framework for Billing Analysis with a Control Group and Pre-Post Data and Expected Results



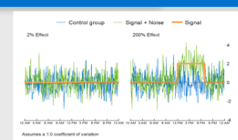
Relying exclusively on pre-post data (without a control group) has significant practical limitations, especially when the percent change in energy, i.e., the signal, is small compared to the underlying variation in the data, i.e., the background noise. Without a control group, billing analysis is entirely dependent on the ability of modeling to explain electricity patterns and thus filter background noise. During the time between the pre- and post-periods, other unrelated changes can occur that influence electricity use patterns. These changes are likely to be unknown to the evaluator (e.g., the number of household members increases or a customer purchases an LED TV) and therefore can be misattributed to participation in the program. That is, a model which relies exclusively on pre-post data and assumes that, on average, the only difference between the pre- and post-period is program participation and variables included in the model (such as weather). This model would assume no other factors influence changes in energy use. A control group that mirrors the participants helps account for factors that may not be observed especially if it is randomly assigned control group.

While the NTC program did not have a randomly assigned control group, the evaluation team did develop a comparison group to use in its analysis. However, there were several key challenges to producing reliable energy savings estimates using billing analysis, which are summarized in Figure 3-3. The two challenges that could not be addressed despite the use of a comparison group were the small effect size and selection bias. On a percentage basis, the expected energy savings from each kit were less than 2% of annual household energy consumption, and therefore it proved difficult to isolate the impacts of the program from other potential explanations, including random chance. Second, households that signed up for the education kit had young children that self-selected from their peers. Households with young children are typically in the growth period of a household life cycle and, thus, may have higher year-to-year energy consumption. Despite using a comparison group, it could only account for observable characteristics – pre-treatment energy use patterns, geographic location, and concurrent participation in DEP's My Home Energy Report (MyHER) program. There was no way to identify households with young children in the comparison group without postponing the evaluation to identify future participating schools from which a comparison group could be developed.. As result, while the participant and comparison group may have had similar energy use patterns in the pre-treatment period, their energy use trajectories were not necessarily the same absent program participation due to differences in the household life cycles.

Figure 3-3: Billing Analysis Evaluation Challenges

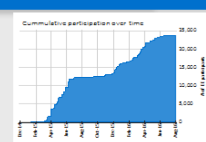
Effect Size

On a percentage basis, expected impacts are small (0.7% to 1.7%) and thus difficult to distinguish from noise



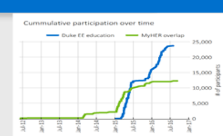
Intervention Does Not Take Place at Once

Changes in mix of participants can be confused with changes in energy use



Concurrent Programs

Because they occur in tandem, MyHER impacts can be mixed up with education kit impacts



Self-selection

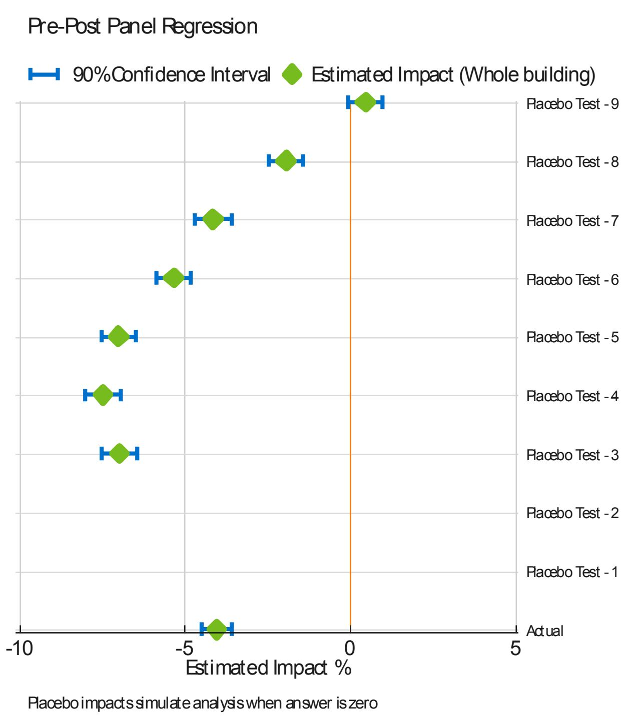
Households that sign up for Education kit are inherently different
- ✓ They are growing households with young kids
- ✓ Students self-select from peers
- ✓ Not all schools participate

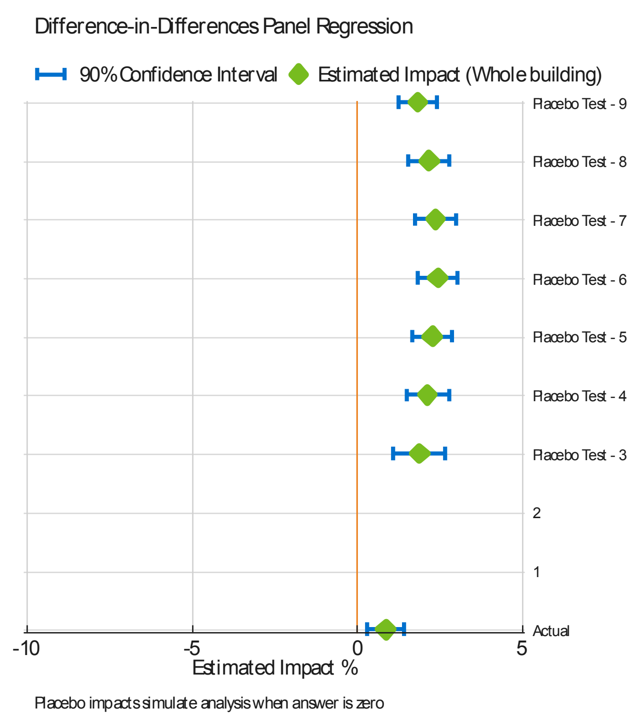
Customers can only be matched on observable characteristics – consumption patterns, location, My HER status – but there is no way to identify households with kids or fully address self-selection

In order to assess if the billing analysis produced reliable results, we implemented a series of placebo pressure tests. The approach consisted of including fake transitions prior to actual participation in the program and assessing if the models detected an effect when using data from the fake "pre" period to estimate the counterfactual for the fake "post" period. Because the transition was fictitious and actual post periods were excluded, we knew impacts were actually zero and any estimated impacts were due to modeling error. The evaluation team used two years of pre-treatment data for the placebo test and each participant's enrollment date was faked to have occurred between three to nine months prior to actual participation, in increments of one month. The placebo tests were implemented using both a pre-post panel regression model with fixed effects and time effects (but not the comparison group) and a difference-in-differences panel regression that made use of the comparison group.

Figure 3-4 shows the results from the placebo pressure tests. Rather than produce zero impacts, the models estimated that the fake transitions led to changes in energy use when in fact no intervention had taken place. Moreover, the models incorrectly concluded that the erroneous impacts were statistically significant in several instances – an example of false precision. The pre-post model without a comparison group consistently estimated large energy savings, when impacts were in fact zero, even after controlling for MyHER impacts. The difference-in-differences model that made use of the comparison group had less variable results, but it estimated energy increases in the range of 1% to 2% when no intervention had taken place. Hence, neither method produced reliable energy savings estimates.

Figure 3-4: Placebo Pressure Test Results





Appendix E provides additional detail including comparison of the program participants and comparison group.

The evaluation team's conclusion is not that there were no energy savings generated by the NTC program, but rather that billing analysis was not the correct tool for estimating the small percent energy savings from the program. Thus, the evaluation team's recommendation is to rely on the engineering analysis and findings as the source of our verified gross and net savings for the programs.

3.6 Targeted and Achieved Confidence and Precision

We developed the NTC program evaluation plan with the goal of achieving a target of 10% relative precision at the 90% confidence interval for the program as a whole. The evaluation team was able to surpass this target through the combination of web-based and phone surveys to ultimately achieve a precision of +/- 9.4% at the 90% confidence level (Table 3-25)

Table 3-25: Targeted and Achieved Confidence and Precision

Program	Targeted Confidence/Precision	Achieved Confidence/Precision
DEP NTC	90/10.0	90/9.4

3.7 Results

Measure-level and kit-level energy savings values are detailed in Figure 3-5 and Table 3-26.

Figure 3-5: 2015 - 2016 DEP NTC Gross Verified Energy Savings

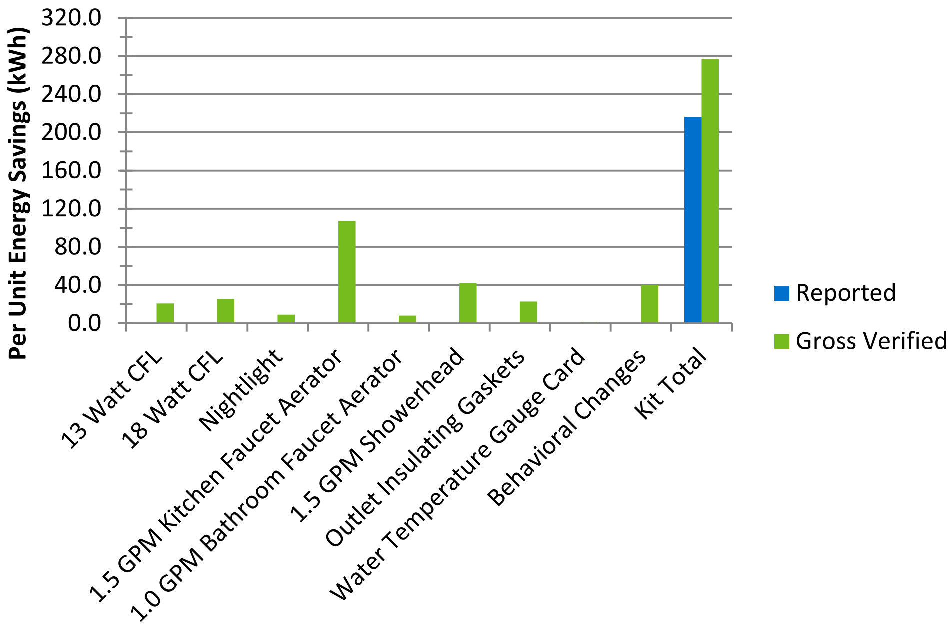


Table 3-26: Measure-Level Reported and Verified Gross Energy Savings

Measure	Reported Energy Savings, per unit (kWh)	Realization Rate	Verified Gross Energy Savings, per unit (kWh)	Total Verified Gross Energy Savings (kWh)
CFL (13W)	N/A	N/A	20.7	132,833
CFL (18W)	N/A	N/A	25.3	162,906
Nightlight	N/A	N/A	9.0	57,780
Low-flow Showerhead	N/A	N/A	107.2	688,818
Low-flow Bathroom Aerator	N/A	N/A	8.1	52,252
Low-flow Kitchen Aerator	N/A	N/A	41.9	269,442
Water Heater Setback	N/A	N/A	22.6	145,477
Outlet Gaskets	N/A	N/A	1.3	8,197
Behavioral Changes	N/A	N/A	40.3	259,173
Total	**216.0**	**128.0%**	**276.4**	**1,776,877**

Measure-level and kit-level demand savings are detailed in Table 3-27.

Table 3-27: Measure-Level Reported and Verified Demand Gross Savings

Measure	Reported Demand Savings, per unit (kW)	Realization Rate	Verified Gross Demand Savings, per unit (kW)	Total Verified Gross Demand Savings (kW)
CFL (13W)	N/A	N/A	0.002	12.1
CFL (18W)	N/A	N/A	0.002	14.9
Nightlight	N/A	N/A	< 0.001	0.0
Low-flow Showerhead	N/A	N/A	0.086	552.0
Low-flow Bathroom Aerator	N/A	N/A	0.001	7.0
Low-flow Kitchen Aerator	N/A	N/A	0.006	36.0
Water Heater Setback	N/A	N/A	0.018	116.6
Outlet Gaskets	N/A	N/A	< 0.001	0.9
Behavioral Changes	N/A	N/A	0.002	15.2
Total	**0.060**	**195.7%**	**0.117**	**754.7**

The impact evaluation for the 2015 - 2016 program resulted in a program energy realization rate of 128% and a demand realization rate of 196% as presented in Table 3-28.

Table 3-28: 2015 - 2016 Energy Savings per Kit

Measurement	Reported	Realization Rate	Gross Verified
Energy (kWh)	216.0	128.0%	276.4
Demand (kW)	0.060	195.7%	0.117

Table 3-29 presents the reported and verified energy and demand savings for the 2015 – 2016 program year.

Table 3-29: 2015 - 2016 Program Level Energy Savings

Measurement	Reported	Realization Rate	Gross Verified
Energy (kWh)	1,375,272	128.0%	1,776,877
Demand (kW)	382.0	195.7%	754.7

4 Net-to-Gross Methodology and Results

The evaluation team used student family survey data to calculate a net-to-gross (NTG) ratio for the NTC program. NTG reflects the effects of free ridership (FR) and spillover (SO) on gross savings. Free ridership refers to the portion of energy savings that participants would have achieved in the absence of the program through their own initiatives and expenditures (U.S. DOE, 2014).[8] Spillover refers to the program-induced adoption of additional energy-saving measures by participants who did not receive financial incentives or technical assistance for the additional measures installed (U.S. DOE, 2014). The evaluation team used the following formula to calculate the NTG ratio:

$$NTG = 1 - FR + SO$$

The evaluation team calculated the mean FR separately for water end-use measures and light bulbs, and aggregated those values to the program level. The team calculated spillover at the program level only.

4.1 Free Ridership

Free ridership estimates how much the program influenced participants to install the energy-saving items included in the energy efficiency kit. Free ridership ranges from 0 to 1, 0 being no free ridership and 1 being total free ridership, with values in between representing varying degrees of partial free ridership.

The evaluation team used participant survey data to estimate free ridership. The survey used several questions to identify items that a given participant installed and did not later uninstall:

- For items that came one to a kit (showerhead, kitchen and bathroom faucet aerators, and night light), the survey asked whether the participant installed the item and, if so, whether the participant later uninstalled the item.
- For insulator gaskets, which came 12 to a kit, the survey asked how many the participant installed and if the participant later uninstalled them.
- For the CFLs (one 13W CFL and one 18W CFL), the survey first asked whether the participant installed one, both, or neither item. If they installed only one CFL, the survey asked respondents to specify whether it was the 13W or 18W. The survey then asked whether the participant uninstalled the bulbs.

The evaluation team's methodology for calculating free ridership consists of two components, free ridership change (FRC) and free ridership influence (FRI), both of which range from 0 to .5 in value.

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[8] The U.S. Department of Energy (DOE) (2014). *The Uniform Methods Project: Methods for Determining Energy Efficiency Savings for Specific Measures. Chapter 23: Estimating Net Savings: Common Practices.* Retrieved August 29, 2016 from http://energy.gov/sites/prod/files/2015/02/f19/UMPChapter23-estimating-net-savings_0.pdf.

$$FR = FRC + FRI$$

4.1.1 Free Ridership Change

FRC reflects what participants reported they would have done if the program had not provided the items in the kit. For each respondent, the survey assessed FRC for each measure that the respondent installed and did not later uninstall.

Specifically, the survey asked respondents which, if any, of the currently installed items they would have purchased and installed on their own within the next year if DEP had not provided them. For each measure, the evaluation team assigned one of the FRC values shown in the Table 4-1, based on the respondents' responses.

Table 4-1: Free Ridership Change Values

What Respondent Would Have Done Absent the Program*	FRC Value
Would ***not*** have purchased and installed the item within the next year	0.00
Would have purchased and installed the item within the next year	0.50
Don't know	0.25

*Survey response to: If you had not received the free efficiency items in the kit, would you have purchased and installed any of these same items within the next year?

4.1.2 Free Ridership Influence

FRI assesses how much influence the program had on a participant's decision to install (and keep installed) the items in the kit. The survey asked respondents to rate how much influence five program-related factors had on their respective decisions to install the measures, using a scale from 0 ("not at all influential") to 10 ("extremely influential"). The program-related factors included:[9]

- The fact that the items were free
- The fact that the items were sent to their home
- Information in the kit about how the items would save energy
- Information that their child brought home from school
- Other information or advertisements from DEP, including its website

Asking respondents to separately rate the influence of each of the five above items had on the decision to install each measure would have been overly burdensome. Therefore, while the survey assessed FRC for each measure, it assessed influence at the end-use level once for all water-saving measures and once for the light bulbs.

[9] To reduce response fatigue, we only asked respondents to rate program influence on their decision to install: a) efficient light bulbs (as a whole), and b) water saving measures (as a whole). Thus, we did not collect separate influence data for each CFL (13W and 18W) nor for each water saving measure (showerhead, bathroom aerator, and kitchen aerator).

For each end-use (water-saving and light bulbs), the highest-rated item for each respondent represents the overall program influence. The evaluation team assigned the following FRI scores, based on that rating (Table 4-2). The evaluation team calculated up to two FRI scores for each respondent: one FRI score for water-saving measures and one FRI score for light bulbs.[10]

Table 4-2: Free Ridership Influence Values

Highest Influence Rating	FRI Value
0	0.50
1	0.45
2	0.40
3	0.35
4	0.30
5	0.25
6	0.20
7	0.15
8	0.10
9	0.05
10	0.00

4.1.3 End-Use-Specific Total Free Ridership

The evaluation team calculated total free ridership by end use, once for water saving measures and once for light bulbs, by:

- Calculating measure-specific FR scores for each respondent by summing each measure-specific FRC score with the corresponding end-use-specific FRI score.
- Calculating the mean FR score for each measure from the individual measure-specific FR scores.
- Calculating a savings-weighted mean of the measure-specific FR means for water-saving measures and a separate savings-weighted mean of the measure-specific FR means for light bulbs. These two savings-weighted means represent the FR estimates for the two end-uses.

[10] Respondents were only asked to rate program influence on end-uses they installed and did not later uninstall. Thus, if a respondent installed both a showerhead and a light bulb, but later uninstalled the light bulb, the evaluation team only asked them to rate program influence on their decision to install the showerhead. Thus in this example, the evaluation team would only calculate a water end-use FRI score for this respondent.

Table 4-3 presents the end-use FR estimates.

Table 4-3: End-Use-Level Free Ridership Scores

End-use	End-Use Free Ridership
Light bulbs	0.36
Water saving measures	0.16

4.1.4 Program-Level Free Ridership

The evaluation team estimated program-level free ridership by calculating a savings-weighted mean of the end-use FR scores presented in Table 4-3. Overall free ridership for the kits is an estimated 21%.

4.2 Spillover

Spillover estimates energy savings from additional energy improvements made by participants who are influenced by the program to do so and is used to adjust gross savings. Since behavioral actions are considered gross impacts, spillover calculations only include additional installations of energy saving technologies. The evaluation team used participant survey data to estimate spillover. The survey asked respondents to indicate what energy-saving measures they had implemented since participating in the program. The evaluation team then asked participants to rate the influence the NTC program had on their decision to purchase these additional energy-saving measures on a scale of 0 to 10, where 0 means “not at all influential” and 10 means “extremely influential.”

The evaluation team converted the ratings to a percentage representing the program-attributable percentage of the measure savings, from 0% to 100%. The team then applied the program-attributable percentage to the savings associated with each reported spillover measure to calculate the participant measure spillover (PMSO) for that measure. We defined the per unit energy savings for the reported spillover measures based on ENERGY STAR® calculators as well as based on algorithms and parameter assumptions listed in the 2016 Pennsylvania and Mid-Atlantic TRMs.

Lighting measures (namely, LEDs and CFLs) were commonly reported spillover measures. Since DEP offers discounted lighting at participating retailers through their Energy Efficient Lighting (EEL) program, it is possible that participants reporting lighting spillover unknowingly purchased their bulbs through EEL. As to not double-count these savings, we discounted the per unit LED and CFL savings values to account for the likelihood that these lighting spillover savings were already captured by the net savings for EEL. We used values from the PY2014 EEL Evaluation Report to estimate the likelihood that reported spillover bulbs were purchased though the program.[11] We then combined this estimate with reported free ridership for EEL to

[11] Opinion Dynamics (2016). *Duke Energy Progress Energy Efficient Lighting Program (PY2014) Evaluation Report.*

discount lighting spillover savings by the likelihood that these lighting spillover savings were already captured by the net savings for EEL.

Participant measure spillover is calculated as follows:

$$PMSO = Deemed\ Measure\ Savings * Program\ Attributable\ Percentage$$

The evaluation team summed all PMSO values and divided them by the sample's gross program savings to calculate an estimated spillover percentage for the NTC program:

$$Program\ SO = \frac{\sum Program\ PMSO}{\sum Sample's\ Gross\ Program\ Savings} t$$

These calculations produced a spillover estimate of 10% for the program.

4.3 Net-to-Gross

Inserting the FR and SO estimates into the NTG formula (NTG = 1 – FR + SO) produces an NTG value for the program of 0.89 (Table 4-4). The evaluation team applied the NTG ratio of 0.89 to program-wide verified gross savings to calculate NTC kit net savings.

Table 4-4: Net-to-Gross Results

Free Ridership	Spillover	NTG
0.21	0.10	0.89

4.4 Comparisons with Other Duke Energy School Kit Programs

Table 4-5 compares DEP NTC NTG metrics (including free ridership and spillover) with NTG metrics of some of Duke Energy's other Energy Efficiency Education in Schools programs. Free ridership and spillover varies across the programs in Table 4-5, with DEP NTC generally exhibiting middling values across the programs compared.

Table 4-5: NTG of Similar Programs

Jurisdiction	Program	Program Year	FR: CFLs	FR: Shower-head	FR: Faucet Aerators	FR: Outlet Insulators	FR: Program	Spillover	NTG
Duke Energy Progress	NTC	2015-2016	36%	16%		Not calculated	21%	10%	89%
Other Duke Energy School Kit Programs									
Duke Energy Kentucky[1]	NEED	2014-2015	33%	6%		Not calculated	17%	26%	109%
Duke Energy Carolinas[2]	NTC	2014-2015	47%	15%	0% (deemed)	16%	24%	15%	91%

[1]Energy Education in Schools Program Year 2014-2015 Evaluation Report. Nexant. November 1, 2016.
[2]Energy Efficiency in Schools Program: EM&V for Duke Energy North Carolina and Duke Energy South Carolina. Cadmus. November 2, 2015.

5 Process Evaluation

5.1 Summary of Data Collection Activities

The process evaluation is based on telephone interviews and either telephone or web surveys with program and implementer staff, teachers, and student families who received a kit during the program evaluation year (Table 5-1).

Table 5-1: Summary of Process Evaluation Data Collection Activities

Target Group	Method	Sample Size	Population	Confidence / Precision
Duke Energy program staff	Phone in-depth interview	1	N/A	N/A
Implementation staff: NTC	Phone in-depth interview	1	N/A	N/A
Implementation staff: R1	Phone in-depth interview	1	N/A	N/A
Teachers who attended NTC performance	Web survey	58	Unknown	90% / 10.8%
Participating teacher follow-up interviews	Phone in-depth interview	5	Unknown	N/A
Student families who received DEP kit and are customers of DEP	Mixed mode (web/phone) survey	76	6,428	90% / 9.4%

5.1.1 Teacher Surveys and Follow-Up Interviews

The evaluation team surveyed and interviewed teachers who attended NTC performances to better understand program success and delivery and to gather an educator perspective on what could be improved.

Between June and September 2016, the evaluation surveyed 58 teachers who attended NTC performances between August 2015 and May 2016. Teacher respondents represented both elementary (n=37) and middle schools (n=21). We analyzed all results to test for significant differences between middle school and elementary school teachers. We found only two instances of a statistically significant difference, which we note. For the remainder of the findings, we report elementary and middle school teachers together, given that there was no meaningful difference between them.

In October of 2016, the evaluation team contacted the teachers who completed the web survey and requested their participation in a follow up in-depth interview (IDI) about their experience with the performance, curriculum materials, and kit request forms. These IDIs served to get a deeper understanding of topics uncovered in the web survey. The evaluation team completed five interviews with these teachers: three elementary school teachers and two middle school teachers. Interviewed teachers taught grade levels ranging from second to eighth grade. Three teachers taught science, including both middle school teachers, and two elementary school teachers taught all core subjects.

5.1.2 Survey of Student Families Who Received the DEP Kit

In June of 2016, the evaluation team surveyed 76 families who received energy efficiency kits from DEP between August 2015 and May 2016 (Table 5-2). During that period, DEP distributed a total of 6,428 kits to families who completed the kit request form that their child brought home from school. The evaluation team attempted contact with a random sample frame of 1,292 households, sending email survey invitations to 900 households for which program records provided an email address and calling 392 other households to complete a telephone version of the survey. Ultimately, the data collection effort achieved an 6% response rate, providing a sample with 90/10 confidence/precision for this population size. Comparisons with census data confirm that the sample is representative of housing characteristics and income for the region. However, respondents demonstrated greater educational attainment than that of the region.[1]

Table 5-2: DEP Student Family Survey Response Rates

Mode	Population Size	Sample Frame Size	Completed Surveys	Response Rate	Confidence/ Precision
Phone	2,304	392	27	7%	90/9.4
Web-based	4,124	900	49	5%	
Total	**6,428**	**1,292**	**76**	**6%**	

5.2 Process Evaluation Findings

5.2.1 Awareness of DEP Sponsorship of the Program

Overall, interviewed teachers and student families were aware of DEP's sponsorship of the program. Of the 58 surveyed teachers, 47 (81%) reported that they were aware of DEP's sponsorship of the program. Teachers learned about DEP's sponsorship most often through another teacher, DEP marketing materials, or through NTC's staff or materials. Elementary teachers were more likely than middle school teachers to learn about DEP's sponsorship from another teacher (Table 5-3).

[1] Region comparisons come from 2014 American Community Survey (Census) 5-year period estimates data for North Carolina and South Carolina.

Table 5-3: How Teachers Learned of DEP's Sponsorship (Multiple Responses Allowed; n=47)

Source	Elementary Teachers (n=29)	Middle School Teachers (n=18)	Total (n=47)
Duke Energy marketing materials	8	7	15 (32%)
The National Theatre for Children materials	9	6	15 (32%)
Another teacher*	12	2	14 (30%)
The National Theatre for Children staff	7	5	12 (26%)
Prior performance at school	2	0	2 (4%)
Principal at school	1	1	2 (4%)
Duke Energy staff	0	1	1 (2%)
Don't know	0	2	2 (4%)
Total	**29**	**18**	**47**

* Difference between elementary and middle school teachers is statistically significant (p<.05).

Most (91%) student family respondents said they knew the kit was sponsored by DEP, with most of those indicating they learned about Duke's sponsorship via the classroom materials that their child brought home (78%) and/or the information material included in the kit (29%).

Student family respondents were less aware of the energy-related classroom activities and the NTC performance sponsored by DEP: about two-fifths of respondents (41%) reported awareness of those activities, most of those saying they found out about them from their child (71%) or from a teacher (29%).

5.2.2 Teacher Experience with the Program

NTC Performance

Overall, teachers were pleased with the NTC performance and its content. Of the 58 surveyed teachers, 53 (91%) said the explanation of energy-related concepts was "about right" for most of their students, while three said the explanation was too advanced and two said it was below their students' levels. Of the three teachers who reported that the performance was too advanced, one was a middle school teacher who taught special needs students, one was a kindergarten teacher who noted that "some of the vocabulary was a little above that of the average five-year-old," and one was a first-grade teacher who, nevertheless, stated that her students were "able to understand." Nearly all (98%) said the performance was *not* missing any important concepts. All surveyed teachers were either highly (98%) or moderately satisfied (2%) with the performance.[2]

Several of the teachers provided more detailed feedback, either during the survey or during the follow-up interviews conducted with a subset of five teachers.

[2] Highly satisfied is indicated by a 4 or 5 rating on a 5-point satisfaction scale. Moderate satisfaction is indicated by a 3 rating on that same 5-point scale.

One teacher elaborated in survey responses that the performance was “age appropriate, funny, engaging, [and] based in relevant, actionable advice about conservation. I would recommend without reservation to any middles school science teacher.” In the follow-up interviews, teachers reiterated that the performance was age-appropriate for their students, with one middle school teacher further praising the performance for providing tips that sixth through eighth graders “can actually do.”

Follow-up interviews also revealed that teachers specifically liked the interactive and humorous approach to teaching children about energy science and conservation in a school play format. All five interviewed teachers said that the performance was engaging and kept their students’ attention, and all praised the interactive nature of the performance. Interviewed teachers said their students enjoyed being selected to go up on stage and that students paid attention to see what their peers would do on stage.

Underscoring the impact of the performance, four of the five interviewed teachers noted that their students discussed ideas from the performance in the classroom in ways that either demonstrated pro-conservation values or retention of the concepts. Three said their students demonstrated increased awareness of energy conservation and were soon incorporating the behavioral tips. Those three teachers said their students reminded the teacher to turn off lights, computers, and the smart board when they left their classrooms. The fourth teacher reported overhearing his students talking about concepts from the performance.

Eight of the teachers offered various performance improvement suggestions, five relating to the performance content and three relating to performance delivery. Of the five who commented on content, two emphasized greater alignment of the performance content with teaching lessons and state standards around energy. A third teacher suggested presenting more information on the pros and cons of different energy sources. On the other hand, one teacher was concerned about the content’s incongruence with the “biblical standards of our Christian school,” noting objection to the use of the phrase “millions of years.” Finally, one teacher simply recommended doing different performances each year.

Of the three teachers that commented on performance delivery, two commented on difficulty hearing the performance, with one specifically saying that it was hard to hear the performers without microphones. For the other teacher, this was particularly a concern for children with disabilities. That teacher indicated that in such cases, the performers should slow down and speak louder. The last teacher suggested that an additional performance be done in the evening so that parents could attend.

To gauge the teachers’ engagement with the performance, the evaluators asked the interviewed teachers to identify the performance’s main theme. All five identified the main theme as “energy conservation,” with one to two teachers each identifying such additional message elements as protecting the environment, how to save money by not wasting energy, and how to save water.

All interviewed teachers mentioned that the performers covered the energy-saver kits and kit request forms toward the end of the presentation.

NTC Staff Interactions

Ten surveyed teachers reported interacting with NTC staff. Nine of those 10 teachers said their discussions related either to the program materials (n=8) or to energy conservation tips like turning off lights and water (n=1). Of the eight teachers who discussed program materials with NTC staff, four said that NTC staff explained how the teachers should use the materials in the classroom to help students learn about energy and two specifically mentioning the energy saver kits. The one teacher who did not talk about the above topics reported chatting with the performers about how many schools they visited in a week. All ten teachers were satisfied with their interactions with NTC staff, NTC staff professionalism and courtesy, and NTC staff knowledge about the topics discussed.

Curriculum and Instructional Materials

Of the 58 surveyed teachers, 48 (83%) reported receiving curriculum or instructional materials through the program, with the other 10 reporting they had not received them or were not sure whether they received them or not. Of those who reported receiving the curriculum or instructional materials, 44 (92%) reported using the materials at least “a little” and 25 (52%) used them at least “moderately” (Table 5-4). Four teachers did not use the materials at all and all four said that it was because the materials were not age-appropriate for the grade they taught.

Table 5-4: Extent to Which Teachers Used Instructional Materials to Teach Students About Energy (n=48)

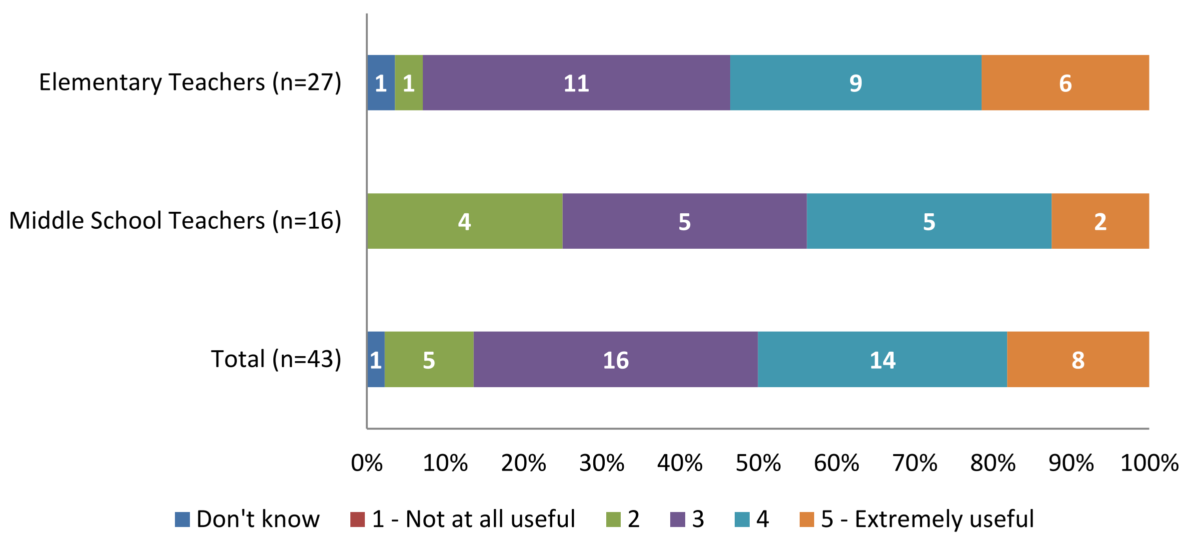
Extent	Elementary Teachers (n=29)	Middle School Teachers (n=19)	Total Sample	Total %
A lot	6	2	8	17%
Moderately	11	6	17	35%
A little	11	8	19	40%
Not at all	1	3	4	8%
Total	**29**	**19**	**48**	**100%**

The follow-up interviews indicated that teachers varied in how they used the materials. An elementary school teacher said she did not teach from the workbooks, but instead let her students work from them independently. Another elementary school teacher had her students work in groups to complete the activities in the workbook for one afternoon. A sixth-grade teacher said that during the week leading up to the performance, she set aside about five to ten minutes a day to review the adventures of a character in the comic book. She discussed with the students why the character was doing what she was doing, which the teacher described as “prepping” her students for the performance. A fifth-grade teacher said she did not distribute the workbooks until several weeks after the performance, which was when she started her unit on conservation, ecology, and ecosystems.

Of the 44 surveyed teachers who reported using the curriculum materials, most (82%) reported being satisfied with them[3] and reported that the manner in which the workbooks explained energy concepts was "about right" for their students. Five teachers (three elementary and two middle school) reported that the workbooks were somewhat too advanced for most of their students, and three middle school teachers said the workbooks were somewhat too basic for most of their students.

Although fairly large majorities of teachers said they were satisfied with the materials and that they explained materials at about the right level, teachers did not consistently rate the materials as highly useful. Exactly half of the 44 teachers who reported using the instructional materials gave a usefulness rating above the midpoint.[4] While no respondent gave the lowest rating, 21 gave usefulness ratings at or below the scale midpoint (Figure 5-1).[5]

Figure 5-1: Usefulness of Instructional Materials to Teachers (n=43)



The rated usefulness of the materials was positively related to the extent to which teachers used the materials: 88% percent of those who gave a usefulness rating above the midpoint used the materials "a lot" compared to just 5% of those who gave a usefulness rating at or below the midpoint.

[3] As indicated by a rating of 4 or 5 on a scale from 1 to 5, where 1 means "not at all satisfied" and 5 means "completely satisfied"; the others gave ratings of 2 or 3.
[4] That is, gave a rating of 4 or 5 on a scale of 1 to 5, where 1 means "not at all useful" and five means "extremely useful."
[5] One teacher who used the instructional materials said she did not know how useful the materials were and is not included in Figure 5-1.

Open-ended comments made during the survey and in the follow-up interviews shed some light on the usefulness ratings. On the positive side, the teachers largely reported in the follow-up interviews that the workbooks were a helpful resource and supplemented concepts from the performance. Two interviewed elementary teachers said that the workbooks reinforced vocabulary for their students. Those two teachers also described how the students recognized key words from the instructional materials, such as “conserve” and “natural resource,” when they got to their natural science units later in the year. Another interviewed teacher said her students learned most of the content from the presentation and described the workbook as a good “backup resource” to the presentation. No teachers reported their students had challenges with any concepts in the instructional materials.

However, about one-quarter of the teachers offered comments in either the survey or the follow-up interview that suggested limitations in either the format or the content of the workbooks.

Even through most teachers thought the level of explanations was “about right,” eight teachers suggested – either in the survey or the follow-up interviews – that there should be additional versions of the workbook. Specific suggestions were separate versions tailored for kindergarten through second grade and one for grades three through five and having more rigorous material for the older students and easier activities for the younger students.

Two teachers commented in either the survey or the follow-up interview that the comic book format of the workbooks was not appropriate for eighth-grade students, specifically using the term “childish” to describe it. One middle school teacher said that the comic book format was “so kiddy and childish that [he] couldn’t get the students to open to the second page.” That teacher further said that the comic book format was not relatable for his eighth graders. A sixth-grade teacher agreed that the comic book format was too juvenile for eighth grade but thought it was appropriate for sixth and seventh graders.

Four teachers offered suggestions for adding to or otherwise revising the instructional materials. One middle school teacher suggested more instruction on lesser-known types of energy, such as tidal energy, and the other suggested explaining turbines in more detail. Another middle school teacher suggested linking the instructional materials more closely with the seventh- and eighth-grade state standards, which reportedly prioritize sources of energy, conversions between types of energy, and clean energy sources over energy conservation.

Finally, two teachers (one fifth-grade and one eighth-grade) suggested that the curriculum materials contain more content-driven text for students to read. The fifth-grade teacher requested additional resources that contained “informational text.” The eighth-grade teacher said that energy was a topic added to the common core curriculum and stated that “energy is this huge empty spot that we don’t have a lot of materials for.” Instead of the comic book he received, he “would have preferred nonfiction, actual content-driven information with more information on the science” that he could use in class to supplement his instruction on energy.

Kit Request Forms

Most teachers distributed the kit request forms to their students and most students took the form home to their parents. Ninety-one percent of surveyed teachers (53 of 58) distributed the kit request forms to students either with the workbooks (n=32) or separately (n=20). Of the 52 surveyed teachers who distributed the kit request form, exactly half reported that 91% to 100% of their students took the kit request form home. On average, teachers reported 81% of their students took the kit request form home.[6]

All interviewed teachers reported giving the kit forms to their students, with the three elementary school teachers noting they put the forms in the students' "homework folders." Only one teacher described a challenge related to the process of distributing the kit request forms: a middle school teacher who had trouble getting his eighth graders to open to the second page of the comic book-style workbook. Further noting that many of the forms got ripped as students were trying to take them out, he suggested that instead of being inside the comic book, the kit request form should be a separate form.

All five interviewed teachers mentioned talking with their students about the kits and kit request forms. One teacher had a reminder on the board about the kit forms and the other provided an incentive in the form of a "homework pass" for those students who provided proof that their family requested the energy-saver kit.[7] One interviewed teacher suggested that the program provide additional copies of the kit request forms in case the teacher wanted to send a reminder form home with the students.

Without being asked by the interviewer, four of the five interviewed teachers expressed concern regarding whether parents noticed the forms once they arrived home. To increase the likelihood that the parents would see the kit request form in the child's backpack or folder, one teacher recommended:

> *"The actual forms themselves – make them very noticeable. Make sure they're bright with bold writing. Have easy-to-see text that says "Free energy conservation materials for your home!" That way, when it goes home in the kids' folder, it jumps out at the parents."*

Only one surveyed teacher reported not distributing the kit request form to the students and said the reason was because "the materials were not interesting looking." An additional five reported that they did not know whether they distributed the kit request form to their students.

Of the 52 surveyed teachers who reported distributing the kit request forms, half reported following up with students to see if their parents had completed the form. On average, these 26

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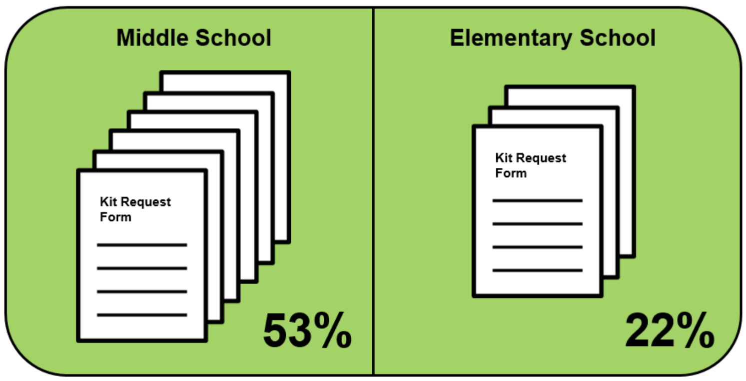
[6] Teachers reported the percentage of students who took the kit request home by selecting one of ten response options, each one representing a 10-percentage-point-range (0%-10%, 11% to 20%, and so forth up to 91%-100%; see Q30 in Appendix E.3 for the full question text). The Evaluation Team calculated the mean of the mid-point values of each teacher's selected range. For example, if one teacher selected 81%-90% and another selected 91%-100%, the mid-points are 85% and 95%, and the mean is 90%.

[7] A "homework pass" allows a student to waive a homework assignment without penalty.

teachers estimated that 38% of their students' parents completed and submitted the kit request form. This is one of the few items that differed for elementary and middle school teachers, with middle school teachers estimating twice as many of their students' families submitted the form (on average) compared to elementary school teachers (53% versus 22%; Figure 5-2). Only one elementary school teacher (of 11) indicated that more than 40% of their students' parents submitted the form to Duke Energy.

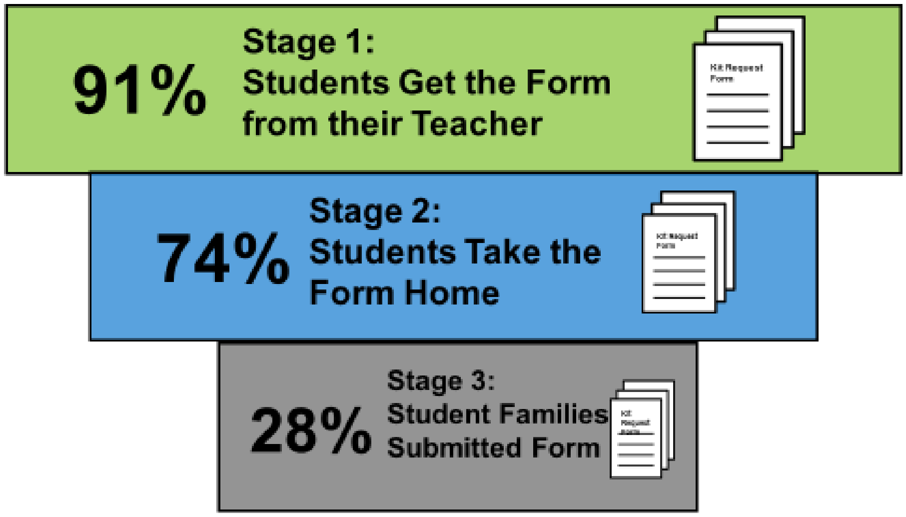
Figure 5-2: Average Percent of Students Submitting Kit Request Form, by School Type



Based on the estimated percentages of students who receive the kit form (91%), who take the form home after receiving it (81%), and who have parents who submit a form that was taken home (38%), the Evaluation Team estimates that, in any given year, about one-quarter (28%) of all student families submit a kit request form.[8] Figure 5-3 illustrates what the Evaluation Team is calling the kit form "attrition rate."

[8] The attrition rate is calculated as follows. Stage 1: 91% is the percentage of teachers that said they distributed the kit forms. Stage 2: 74% is the product of Stage 1 (91%) and the mid-point mean percentage of students that took the form home (81%): 91% * 81% = 74%. Stage 3: 31% is the product of Stage 2 and the mid-point mean percentage of student families that submitted the form (38%): 74% * 38% = 28%.

Figure 5-3: NTC Kit Form Attrition Rate



5.2.3 Student Family Experience with the Program

Installation Rates

The majority (88%) of kit recipients installed at least one measure, installing an average of three measures from the kit. Most kit recipients initially installed at least one of the energy-efficient light bulbs (78%) or the nightlight (67%), with a smaller proportion reporting installing the other measures. The majority of those installing light bulbs (78%) said they installed both bulbs provided in the kit.

Of the 41 respondents that installed any of the water saving measures, none knew the gallon-per-minute flow of their previous aerator or showerhead. The kit also included a hot water temperature gauge card that helps families determine whether their hot water heater temperature is set too high. Nearly one-quarter of the respondents (22%) said they adjusted their water heater's temperature based on the results of this card.

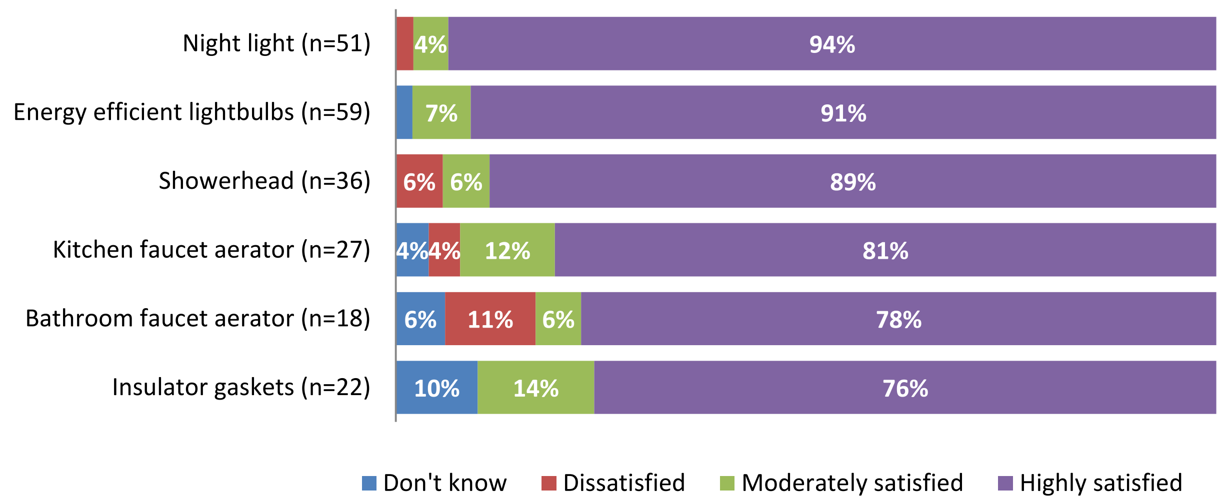
Of the respondents who installed at least one item from the kit, 10% said they later uninstalled at least one of the measures, although no participant uninstalled everything she or he had installed. In total, 6% of all measure types installed were later uninstalled. Kitchen and bathroom faucet aerators had the highest uninstallation rates (about one-fifth of respondents who installed them later uninstalled them). Respondents said they uninstalled these water saving measures because they did not like how they worked, later elaborating that the water pressure provided was insufficient to their preferences.

Nearly 10% of respondent reported installing all measure types. Of the respondents who did not install all items, most (68%) said they plan to install at least one of the items they had not yet installed. Respondents who indicated they don't plan to install one or more of the measures typically said they would not install the remaining items because they already had the item or they had not "gotten around to it."

Measure Satisfaction

Nearly all kit recipients reported moderate to high satisfaction with the items they installed from their kit. To best gauge the experience with the measures, we asked respondents to rate their satisfaction with all measures they installed, including those they later uninstalled. Respondents were most satisfied with the night light, light bulbs, and the showerhead.

Figure 5-4: Kit Recipient Satisfaction with Measures They Had Installed*



* Respondents rated their satisfaction with the measures on a 0 ("very dissatisfied") to 10 ("very satisfied") scale. Dissatisfied indicates 0-3 ratings, moderately satisfied indicates 4-6 ratings, and highly satisfied indicates 7-10 ratings.

Energy Saving Educational Materials in the Kit

In addition to energy-saving measures, the Energy Efficiency Kit includes a DEP-labeled Department of Energy (DOE) Energy Saver Booklet that includes educational information on saving energy at home. Most (88%) respondents said they read the booklet, most of whom (79%) reported they found it highly helpful.[9] Respondents who rated the booklet as not at all to moderately helpful requested clearer or more-detailed instructions or different energy saving tips.

Additional Energy Saving Actions

About two-thirds (68%) of respondents reported their child had adopted new energy-saving behaviors since receiving their kit (Table 5-5). Parents most commonly said that their child now turns off lights when not using a room (61%).

[9] We asked respondents to rate the helpfulness of the DEP-labeled DOE Energy Saver Booklet on a scale from 0 ("not at all helpful") to 10 ("very helpful"). Fifty-three of the 67 (or 79%) respondents who reported reading the booklet gave a rating of 7 or higher.

Table 5-5: New Behaviors Adopted by Child Since Involvement in Program (Multiple Responses Allowed; n=76)

New Behaviors Child Has Adopted	Percent Reporting
Child adopted new behaviors since receiving kit	68%
Turn off lights when not in a room	61%
Turn off electronics when not using them	33%
Take shorter showers	25%
Misc. water saving behaviors	7%
Other	4%

Further, over half (61%) of parent respondents said they had adopted new energy-saving behaviors themselves since receiving the kit, most of whom (45%) said they now turn off lights when they are not using the room (Table 5-6).[10] About one-third said they have changed their thermostat settings (37%) or now turn off electronics when not using them (29%). Over three-quarters (83%) of parent respondents reporting new energy-saving behaviors rated the DEP-sponsored kit and materials on saving energy as 'highly influential' on their reported behavior changes.[11]

Table 5-6: New Behaviors Adopted by Parent Since Involvement in Program (Multiple Responses Allowed; n=76)

New Behaviors Parents Have Adopted	Percent Reporting
Parent adopted new behaviors since receiving kit	61%
Turn off lights when not in a room	45%
Changed thermostat settings to use less energy	37%
Turn off electronics when we are not using them	29%
Used fans instead of air conditioning	20%
Take shorter showers	20%
Turn off furnace when not home	9%
Turn off air conditioning when not home	8%
Misc. water saving behaviors	4%

Over one-quarter (21 of 76, or 28%) of parent respondents reported purchasing and installing additional energy efficiency measures since receiving their kit (Table 5-7). Efficient light bulbs

[10] We asked respondents who had received Home Energy Reports to tell us about new energy saving behaviors that they adopted as a result from receiving the kit, and to exclude any energy saving behaviors that resulted from reading their Home Energy Reports.

[11] We asked respondents to rate the influence of DEP's kit and energy saving educational materials on their reported behavior changes, using a scale from 0 ("not at all influential") to 10 ("extremely influential"). Thirty-nine of the 47 (or, 83%) respondents who reported behavior changes gave a rating of 7 or higher.

were the most commonly reported measure (mentioned by 16 respondents), with nine respondents mentioning CFLs and seven mentioning LEDs. Only one respondent reported getting a DEP rebate for their measure (for air sealing), and most (15 of 21) respondents said the DEP schools program at least partially influenced their decision to purchase and install additional energy-saving measures.

Table 5-7: Additional Energy Saving Measures Purchased (Multiple Responses Allowed; n=76)

	Count of Respondents Reporting Purchases After Receiving the Kit	Count That Received Duke Rebates for the Purchase/Measure	Count Reporting at Least Some DEP Program Influence on Purchase
At least one measure	21	1	15
CFLs	9	0	7
LEDs	7	0	4
Insulation	6	0	3
Air sealing	6	1	5
Duct sealing	3	0	3
Efficient appliances	2	0	1
Efficient windows	2	0	1
Efficient heating or cooling equipment	1	0	0
Sensor night lights	1	0	1

6 Conclusions and Recommendations

The evaluation findings, led to the following conclusions and recommendations for the program.

Conclusion 1: NTC performances effectively engage students on energy conservation issues. Teachers reported overwhelming satisfaction with the NTC performances, noting that their students were entertained and educated by the performances. Teachers also reported their students demonstrated retention of concepts from the performance.

> **Recommendation**: Continue using NTC performances to engage students on energy conservation issues.

Conclusion 2: Concerns about age appropriateness of curriculum materials do not limit kit request form distribution. Most teachers received and used NTC classroom curriculum materials and were largely satisfied with the workbooks. A vocal minority of teachers, though, noted that some workbook activities, formats, and content were not age appropriate for younger or older students. Specifically, some teachers of younger elementary grades found the materials too advanced for their students and some middle school teachers said the comic book format was an ineffective medium for teaching energy and conservation concepts given the age group it was targeting. These concerns did not significantly limit distribution of kit request forms, though they prevented a minority of teachers from using the materials in class.

> **Recommendation**: Duke program staff should consider meeting with NTC to investigate whether there is added value in adjusting the classroom materials given that the kit request forms are successfully distributed.

Conclusion 3: The NTC kit form distribution method is a successful model, but minor improvements may be possible. Nearly all teachers distributed the kit request forms to at least some of their students. Teacher-led distribution of the kit request forms was relatively straightforward and without problems. The processes of transferring the kit request forms from students to parents and from parents to R1 are the most likely sources of attrition, which can limit the number of kits distributed each year.[23]

> **Recommendation**: Continue to find ways to increase the visibility of the form to parents in an effort to increase the number of forms submitted, such as: a) encouraging participating schools to use their online portal for parents to advertise the kit opportunity and include a hyperlink to the online kit request form, or b) supplying each school with additional kit request forms so teachers can send reminder forms home with students whose families had yet to submit their kit request form. Additional research with

[23] R1, or Relationship1, is the data management vendor for the Energy Efficiency Education in Schools Program. Kit request forms are mailed to R1.

nonparticipating families may uncover prevailing reasons why parents did not send in the kit form.

Conclusion 4: The Energy Efficiency Education Program for Schools program is successfully influencing families to save energy in their homes. Most student families installed at least one measure from the kit and the vast majority of measures, once installed, stayed installed. Student families were highly influenced by the program to install these kit measures, as demonstrated by low free ridership rates. Further, about one-fifth of families reported installing spillover measures and about two-thirds of respondents reported that they and/or their children adopted new energy saving behaviors (such as turning off lights when leaving a room) since receiving their kit.

Recommendation: Leverage the kit to cross-promote other DEP rebate offerings to DEP customers who receive a kit. DEP customers requesting kits are good targets for these promotions, as they:

- Demonstrated willingness to take energy saving actions in their home
- Are reading the energy saving information included in the kit
- Are predominantly single family homeowners

Conclusion 5: Water measures drive savings, but installation rates are low. Nearly one-half of surveyed kit recipients installed a showerhead, about one-third installed a kitchen faucet aerator, about one-quarter installed the bathroom faucet aerator, and about one-fifth adjusted their water heater temperature based on the hot water temperature card in the kit. Further, respondents uninstalled aerators at significantly higher rates than other kit measures: about one-fifth of aerators were subsequently uninstalled, compared to 3% or less of any other measure. Dissatisfied participants reported they did not like the low water flow provided by the units. Despite low installation rates, water measures account for over three-fourths of gross program savings. Improving the installation rates could greatly increase the program savings.

Recommendation: Investigate opportunities to increase installation rates of water measures through focus group research (or comparable qualitative in-depth methods) to learn: 1) what types of aerators and showerheads customers use and like; and 2) whether emphasizing certain features of low-flow showerheads or aerators (for example, multiple spray settings) would entice customers to install low-flow products. Additionally, consider exploring new participant-facing messaging around low flow measures; water measure ISRs may increase if participants have better upfront expectations on the flow rates of the measures and understand how low flow is needed to save energy.

Conclusion 6: Kit measures have varying levels of energy savings success. The lighting measures realized the highest installation rates and contributed 20% of the kit savings. Moreover, 88% of spillover savings were derived from participants purchasing additional Light Emitted Diode (LED) and CFL bulbs to complement the bulbs received in their kit. The low flow measures accounted for 65% of the kit savings (based primarily on installation of the shower head and kitchen aerator); however, installation rates were significantly lower compared to the lighting measures.

> **Recommendation:** A review of the kit measure offerings should be made to assess and weight the benefits and costs of each measure including opportunity for energy savings, cost effectiveness, and education. Opportunities may exist to remove low performing measures and add new measure types or increase the quantity of existing measures that currently perform well such as lighting measures. However, careful review is needed before amending the kit measure mix to ensure it would not hinder the program's educational and behavioral impacts.

Appendix A Summary Form

National Theatre for Children Program

Completed EMV Fact Sheet

Description of program

The National Theatre for Children (NTC) Program is an energy efficiency program that attempts to educate children about the science of energy and energy conservation through a live theatrical production. Following the production, students are encouraged to complete a home energy survey with their families to receive a free Energy Efficiency Kit.

Date	March 1, 2015 – May 1, 2017
Region(s)	North Carolina, South Carolina
Evaluation Period	August 1, 2015 – May 31, 2016
Annual Gross kWh Savings	1,766,877
Per Kit kWh Savings	276.4 / kit
Annual Gross kW Savings	755 kW
Net-to-Gross Ratio	0.89
Process Evaluation	Yes
Previous Evaluation(s)	None Available

Evaluation Methodology

Impact Evaluation Activities

- *76 telephone/web surveys and analysis of 8 unique measures.*

Impact Evaluation Findings

- *Realization rate = 128% for energy impacts; 196% for demand impacts*
- *Net-to-gross ratio = 0.89*

Process Evaluation Activities

- *76 telephone/web surveys with student families and analysis of 8 unique measures.*
- *58 web surveys with teachers from participating schools; 5 in-depth follow up interviews*
- *1 in-depth interview with program staff*
- *1 in-depth interview with NTC implementation staff*
- *1 in-depth interview with R1 implementation staff*

Process Evaluation Findings

- *Teachers and students value the NTC performance.*
- *Water heat measures drive savings, but installations are low.*
- *The NTC program is successfully influencing families to save energy in their homes.*
- *The NTC kit form distribution method is a successful model.*
- *The kits are reaching a good mix of consumer segments.*

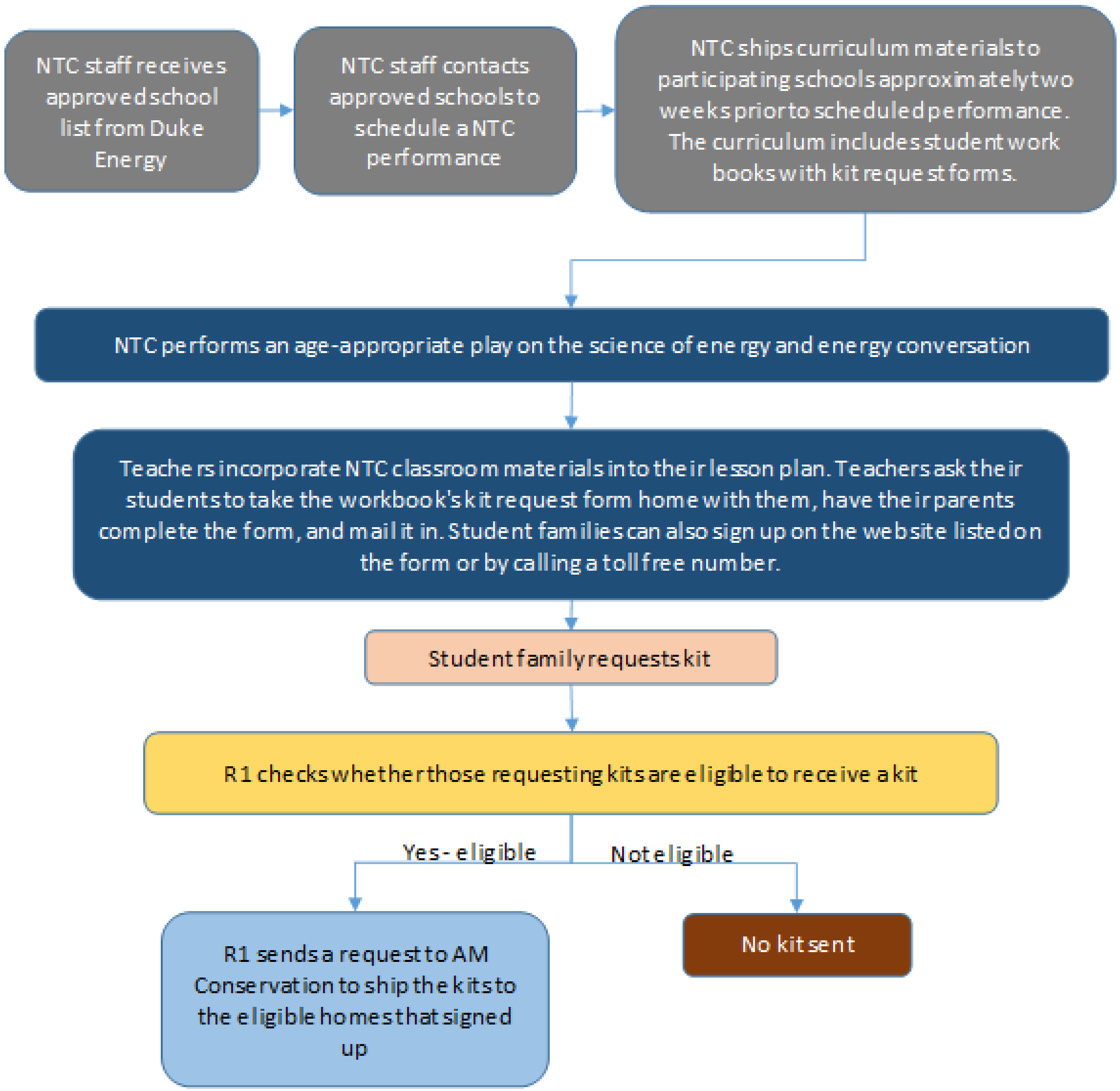
Appendix B Measure Impact Results

Table B-1: Program Year 2015 - 2016 per Unit Verified Impacts by Measure – Key Measure Parameters

Measure Category	Gross Energy Savings (kWh)	Gross Demand (kW)	Realization Rate (Energy)	Free Ridership	Spillover	Net to Gross Ratio	M&V Factor (Energy) (RR x NTG)	Measure Life
13 Watt CFL	20.7	0.002	N/A	0.36	0.10	0.89	N/A	5
18 Watt CFL	25.3	0.002	N/A	0.36			N/A	5
Nightlight	9.0	< 0.001	N/A	0.21			N/A	8
1.5 GPM Showerhead	107.2	0.086	N/A	0.16			N/A	10
1.0 GPM Bathroom Faucet Aerator	8.1	0.001	N/A	0.08			N/A	9
1.5 GPM Kitchen Faucet Aerator	41.9	0.006	N/A	0.19			N/A	9
Water Temperature Gauge Card	22.6	0.018	N/A	0.21			N/A	4
Outlet Insulating Gaskets	1.3	< 0.001	N/A	0.21			N/A	15
Behavioral Changes	40.3	0.002	N/A	-	-	-	N/A	0.3
Total	**276.4**	**0.117**	**128.0%**	**0.21**	**0.10**	**0.89**	**113.4%**	**-**

Appendix C Program Process Flow Chart

Figure C-1: Workshop Recruitment, Material Distribution, and Kit Distribution



Appendix D Program Performance Metrics

This appendix provides key program performance metrics, or PPIs. See Chapter 5 for the underlying results and more detailed findings.

Figure D-1: Program Experience PPIs

	Student Families		Teachers	
Awareness PPIs	**%**	**n**	**%**	**n**
Aware of DEP's sponsorship	91%	76	81%	58
Learned of DEP sponsorship via program collateral*	93%	69	57%	47
Learned of DEP sponsorship via teachers	13%	69	30%	47
Read Energy Saver Booklet	88%	76	-	
Rated Energy Saver Booklet as highly informative	79%	67	-	
Satisfaction PPIs				
NTC performance	-		98%	58
Usefulness of classroom materials	-		50%	44
Overall satisfaction with classroom materials			82%	44
Night light	94%	51	-	
Light bulbs	91%	59	-	
Showerhead	89%	36	-	
Kitchen faucet aerator	81%	27	-	
Bathroom faucet aerator	78%	18	-	
Insulator gaskets	76%	22	-	
Program influence on behavior PPIs				
Installed at least one kit measure	88%	76	-	
Plan to install measure[s] (of those that did not install any measures)	100%	9	-	
Respondents reporting spillover	20%	76	-	
Adopted new energy saving behaviors: parents	61%	76	-	
Adopted new energy saving behaviors: children	68%	76	-	
Challenges and opportunities for improvement PPIs				
Used NTC materials in classroom			76%	58
Suggested improvements to NTC performance	-		14%	58
Distributed kit forms to classroom	-		91%	58
Mentioned challenges/concerns with instructional materials	-		0%	44
Suggested curriculum improvements	-		21%	58

*Program collateral includes NTC materials and DEP marketing materials

Figure D-2: Student Family Demographics Reach PPIs

Housing Type

Detached	63%
Attached	17%
Mobile	20%

Ownership Status

Own	68%
Rent	32%

Number of People in Home

One to two	10%
Three	20%
Four	34%
Five+	36%

Highest Educational Attainment

High school or less	21%
Some college	25%
Bachelors Degree	30%
Graduate Degree	17%
Refused / Don't know	7%

Income

<$30k	28%
$30k to <$60k	18%
$60k to <$75k	4%
$75k to <$100k	13%
$100k+	17%
Refused / Don't know	20%

Appendix E Billing Regression Analysis

This appendix provides additional detail regarding the billing regression analysis. Absent a randomized control trial, billing analysis can be unreliable when the percent energy savings are small. In order to assess if the billing analysis produces reliable results, the evaluation team implemented a series of placebo pressure tests. Rather than produce zero impacts, the billing analysis incorrectly concluded that the fake transitions led to changes in energy use when in fact no intervention had taken place. Moreover, the models incorrectly concluded that the erroneous impacts were statistically significant in several instances – an example of false precision. The evaluation team's conclusion is not that there were no energy savings generated by the NTC program, but rather that billing analysis was not the correct tool for estimating the small percent energy savings from the program. Thus, the evaluation team's recommendation is to rely on the engineering analysis and findings as the source of our verified gross and net savings for the programs.

The appendix includes:

1. A side by comparison of energy use, MyHER program penetration, and share of participants enrolling for the NTC kits over time for participants, and the comparison group. This includes both the pre- and post-intervention data and does not include any energy modeling.

2. Visual comparison of the side-by-side comparisons

3. The placebo tests output for the difference-in-differences panel regression model

4. The placebo tests output for the pre-post panel regression model

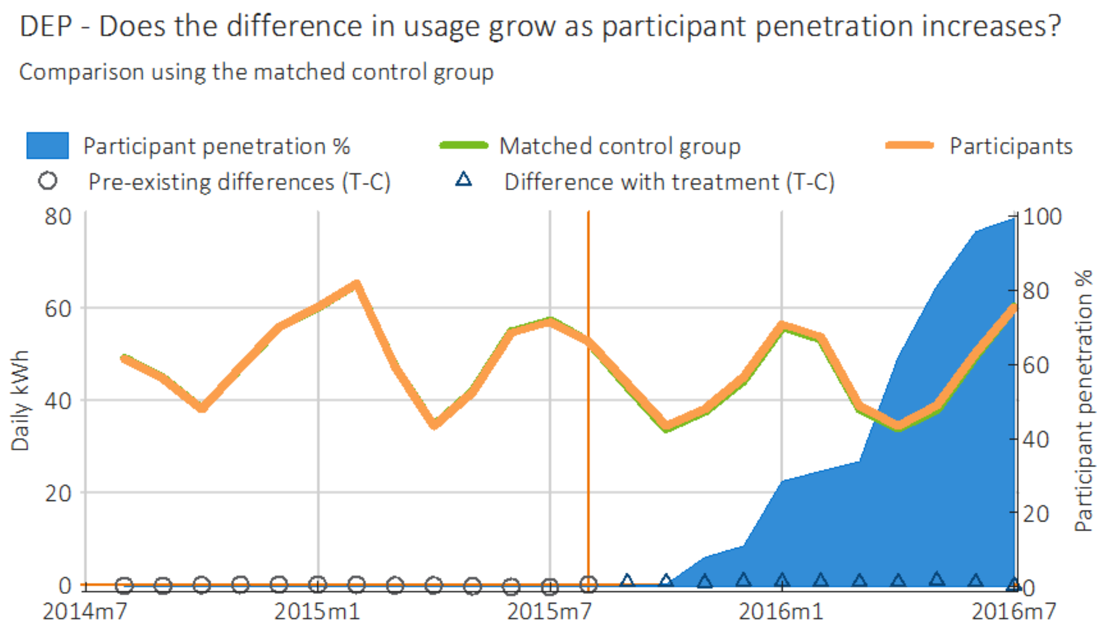
Table E-1: Side-by-side Comparison of Control and Treatment Groups

Year and month	Daily kWh		Diff	% Diff	Kit Penetration %)		My HER (%)	
	Treated	Control			Treated	Control	Treated	Control
Aug-14	49.3	49.1	-0.17	-0.35%	0.0%	0.0%	0.0%	0.0%
Sep-14	44.9	44.7	-0.17	-0.38%	0.0%	0.0%	0.0%	0.0%
Oct-14	38.1	38.1	-0.02	-0.07%	0.0%	0.0%	0.0%	0.0%
Nov-14	47.2	47.2	0.05	0.11%	0.0%	0.0%	0.0%	0.0%
Dec-14	55.9	56.0	0.08	0.14%	0.0%	0.0%	0.0%	0.0%
Jan-15	60.1	60.2	0.08	0.13%	0.0%	0.0%	0.0%	0.0%
Feb-15	65.3	65.3	0.05	0.08%	0.0%	0.0%	15.7%	14.5%
Mar-15	47.3	47.2	-0.06	-0.13%	0.0%	0.0%	30.3%	27.6%
Apr-15	34.5	34.5	-0.07	-0.20%	0.0%	0.0%	47.9%	45.8%
May-15	42.0	41.8	-0.25	-0.60%	0.0%	0.0%	56.6%	53.6%
Jun-15	55.1	54.7	-0.39	-0.71%	0.0%	0.0%	61.1%	59.1%
Jul-15	57.5	57.0	-0.42	-0.73%	0.0%	0.0%	66.2%	63.0%
Aug-15	52.7	52.8	0.10	0.19%	0.0%	0.0%	67.2%	64.4%
Sep-15	43.0	43.7	0.62	1.45%	0.0%	0.4%	67.9%	66.0%
Oct-15	33.8	34.5	0.69	2.05%	0.0%	0.7%	68.1%	66.1%
Nov-15	37.6	38.2	0.53	1.40%	0.0%	8.0%	75.0%	72.1%
Dec-15	44.3	45.1	0.82	1.86%	0.0%	11.0%	76.5%	73.5%
Jan-16	55.8	56.6	0.75	1.34%	0.0%	28.5%	76.8%	74.5%
Feb-16	53.2	53.9	0.70	1.32%	0.0%	31.2%	76.9%	74.5%
Mar-16	38.2	38.8	0.65	1.70%	0.0%	33.9%	76.9%	74.5%
Apr-16	33.9	34.5	0.59	1.75%	0.0%	62.0%	76.9%	74.6%
May-16	37.9	38.9	1.01	2.65%	0.0%	81.1%	76.9%	74.7%
Jun-16	49.7	50.3	0.61	1.24%	0.0%	95.8%	76.9%	75.0%
Jul-16	60.3	60.2	-0.10	-0.17%	0.0%	99.4%	77.0%	75.2%

*Only inlcudes customers with pre-treatment data from Aug 2014 to July 2015

*Billing periods were calendarized (calendar month)

Figure E-1: Visual Comparison of Control and Treatment Groups



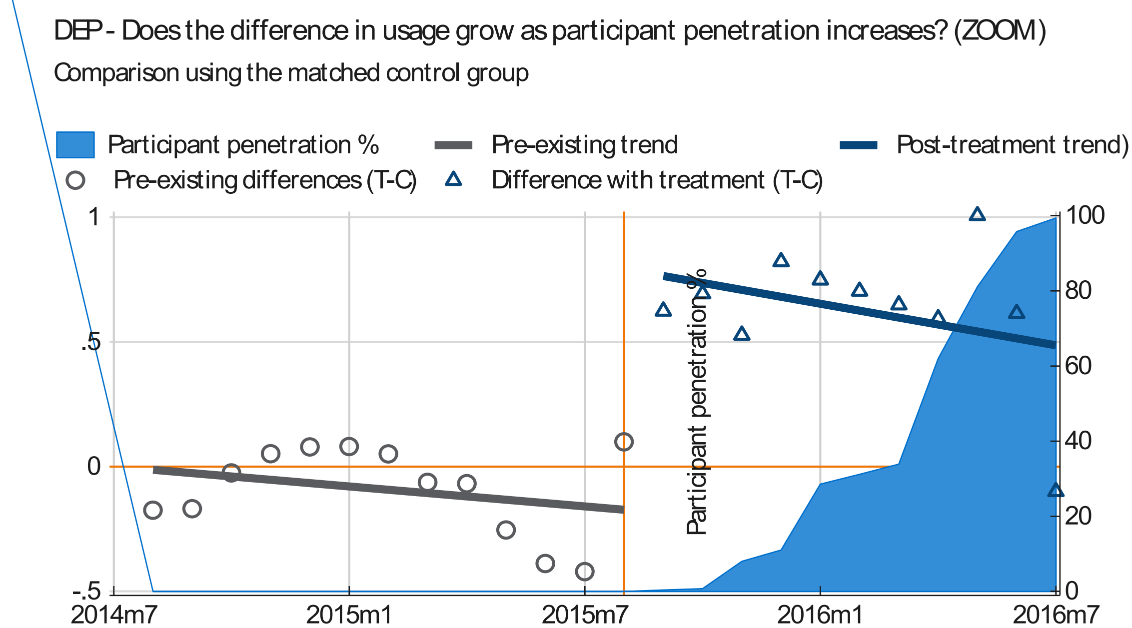


Figure E-2: Difference-in-Differences Panel Regression Model Placebo Test Results – 3 Months Prior

```
Linear regression, absorbing indicators          Number of obs    =     168129
                                                 F(  28, 159861)  =    2534.09
                                                 Prob > F         =     0.0000
                                                 R-squared        =     0.7032
                                                 Adj R-squared    =     0.6878
                                                 Root MSE         =    13.1690
```

daily_kwh	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
pseudo3_post	-.5890594	.2143401	-2.75	0.006	-1.009161	-.1689574
pseudo3_postxpart	.870818	.2192301	3.97	0.000	.4411315	1.300504
myher	-.1459331	.1218091	-1.20	0.231	-.3846764	.0928102
cdd	.6032639	.0624314	9.66	0.000	.4808998	.7256281
hdd	-.9173784	.038549	-23.80	0.000	-.9929336	-.8418231
moyr						
653	7.167445	.4543818	15.77	0.000	6.276866	8.058023
654	7.103373	.4977895	14.27	0.000	6.127716	8.07903
655	5.142777	.4069279	12.64	0.000	4.345207	5.940347
656	2.895617	.2328591	12.44	0.000	2.439218	3.352016
657	2.196966	.4147737	5.30	0.000	1.384018	3.009913
658	24.61843	.9908447	24.85	0.000	22.67639	26.56046
659	35.14695	1.064837	33.01	0.000	33.05989	37.23401
660	43.86423	1.23386	35.55	0.000	41.4459	46.28257
661	52.84804	1.400613	37.73	0.000	50.10286	55.59321
662	20.51885	.8290411	24.75	0.000	18.89394	22.14375
663	-.2398947	.4859595	-0.49	0.622	-1.192365	.7125756
664	.8891043	.2188425	4.06	0.000	.4601776	1.318031
665	8.79512	.5685181	15.47	0.000	7.680836	9.909403
666	10.66994	.631906	16.89	0.000	9.431415	11.90846
667	7.440622	.4859312	15.31	0.000	6.488207	8.393037
668	.0343261	.2979526	0.12	0.908	-.5496548	.618307
669	-.2959529	.5200599	-0.57	0.569	-1.315259	.7233534
670	8.0208	.6914267	11.60	0.000	6.665618	9.375982
671	14.82237	.6761905	21.92	0.000	13.49705	16.14769
672	40.47892	1.279533	31.64	0.000	37.97106	42.98677
673	33.83057	1.11717	30.28	0.000	31.64094	36.0202
674	7.401504	.6545114	11.31	0.000	6.118675	8.684332
675	1.024461	.6289311	1.63	0.103	-.2082303	2.257153
_cons	36.90038	.4793758	76.98	0.000	35.96081	37.83995
account_id	F(8239, 159861) =		36.610	0.000	(8240 categories)	

Figure E-3: Difference-in-Differences Panel Regression Model Placebo Test Results – 4 Months Prior

```
Linear regression, absorbing indicators          Number of obs     =    174753
                                                 F(  28, 166485) =   2624.96
                                                 Prob > F          =    0.0000
                                                 R-squared         =    0.7033
                                                 Adj R-squared     =    0.6886
                                                 Root MSE          =   13.0917
```

daily_kwh	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
pseudo4_post	-.4189488	.1930186	-2.17	0.030	-.7972611	-.0406366
pseudo4_postxpart	1.028842	.1874375	5.49	0.000	.6614688	1.396216
myher	-.0343939	.1197178	-0.29	0.774	-.2690382	.2002504
cdd	.5829819	.0601189	9.70	0.000	.46515	.7008137
hdd	-.9209746	.0376905	-24.44	0.000	-.9948471	-.8471021
moyr						
652	-4.281058	.4775621	-8.96	0.000	-5.21707	-3.345047
653	3.011872	.8431991	3.57	0.000	1.359221	4.664524
654	2.963441	.8878373	3.34	0.001	1.223299	4.703582
655	.9696494	.7933284	1.22	0.222	-.585257	2.524556
656	-1.353203	.5742123	-2.36	0.018	-2.478647	-.2277592
657	-2.169708	.2214946	-9.80	0.000	-2.603833	-1.735583
658	20.24247	.5640282	35.89	0.000	19.13699	21.34795
659	30.77414	.6351075	48.46	0.000	29.52934	32.01894
660	39.50985	.8024389	49.24	0.000	37.93709	41.08262
661	48.48984	.9671138	50.14	0.000	46.59432	50.38536
662	16.09755	.4119054	39.08	0.000	15.29023	16.90488
663	-4.661923	.2134751	-21.84	0.000	-5.08033	-4.243517
664	-3.457323	.4641249	-7.45	0.000	-4.366998	-2.547649
665	4.575089	.9588841	4.77	0.000	2.695698	6.454481
666	6.50924	1.02036	6.38	0.000	4.509358	8.509123
667	3.066954	.874334	3.51	0.000	1.353279	4.78063
668	-4.135733	.6486372	-6.38	0.000	-5.407048	-2.864419
669	-4.779946	.2316258	-20.64	0.000	-5.233928	-4.325964
670	3.846206	.3312362	11.61	0.000	3.196991	4.495422
671	9.601881	.3318397	28.94	0.000	8.951482	10.25228
672	36.01906	.8594649	41.91	0.000	34.33452	37.70359
673	29.18573	.6999929	41.69	0.000	27.81376	30.5577
674	2.578912	.3602053	7.16	0.000	1.872918	3.284907
_cons	41.35578	.1848845	223.68	0.000	40.99341	41.71815
account_id	F(8239, 166485) =		38.176	0.000	(8240 categories)	

Figure E-4: Difference-in-Differences Panel Regression Model Placebo Test Results – 5 Months Prior

```
Linear regression, absorbing indicators          Number of obs     =    179785
                                                 F(  28, 171517)   =   2478.22
                                                 Prob > F          =    0.0000
                                                 R-squared         =    0.7012
                                                 Adj R-squared     =    0.6868
                                                 Root MSE          =   13.1507
```

daily_kwh	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
pseudo5_post	-.1466832	.1868434	-0.79	0.432	-.5128922	.2195258
pseudo5_postxpart	1.119147	.1735309	6.45	0.000	.7790306	1.459264
myher	.120569	.1198525	1.01	0.314	-.1143391	.3554772
cdd	.6271926	.0609665	10.29	0.000	.5076996	.7466855
hdd	-.9295052	.0372799	-24.93	0.000	-1.002573	-.8564374
moyr						
651	-22.06606	.5818113	-37.93	0.000	-23.20639	-20.92572
652	-26.61535	.9866933	-26.97	0.000	-28.54925	-24.68145
653	-19.60403	1.354946	-14.47	0.000	-22.25969	-16.94836
654	-19.68655	1.399244	-14.07	0.000	-22.42904	-16.94406
655	-21.60798	1.305448	-16.55	0.000	-24.16663	-19.04933
656	-23.76231	1.08604	-21.88	0.000	-25.89092	-21.63369
657	-24.27853	.6627757	-36.63	0.000	-25.57756	-22.97951
658	-1.635789	.2058278	-7.95	0.000	-2.039207	-1.232371
659	8.918734	.2124388	41.98	0.000	8.502358	9.335109
660	17.69218	.3085495	57.34	0.000	17.08743	18.29693
661	26.6849	.4487972	59.46	0.000	25.80527	27.56453
662	-5.886041	.2817961	-20.89	0.000	-6.438355	-5.333727
663	-26.80689	.5975369	-44.86	0.000	-27.97804	-25.63573
664	-25.87891	.9764306	-26.50	0.000	-27.79269	-23.96512
665	-18.24741	1.46727	-12.44	0.000	-21.12323	-15.3716
666	-16.48966	1.532844	-10.76	0.000	-19.494	-13.48532
667	-19.61582	1.38347	-14.18	0.000	-22.32739	-16.90425
668	-26.83837	1.159936	-23.14	0.000	-29.11182	-24.56492
669	-26.81609	.5930709	-45.22	0.000	-27.97849	-25.65368
670	-19.01695	.4407024	-43.15	0.000	-19.88071	-18.15318
671	-12.98453	.4897194	-26.51	0.000	-13.94437	-12.02469
672	13.71401	.3957418	34.65	0.000	12.93837	14.48966
673	6.959666	.3157489	22.04	0.000	6.340805	7.578527
_cons	63.38426	.6152982	103.01	0.000	62.17829	64.59023
account_id	F(8239, 171517) =		39.566	0.000	(8240 categories)	

Figure E-5: Difference-in-Differences Panel Regression Model Placebo Test Results – 6 Months Prior

```
Linear regression, absorbing indicators          Number of obs     =    182596
                                                 F(  28, 174328)   =   2621.72
                                                 Prob > F          =    0.0000
                                                 R-squared         =    0.6987
                                                 Adj R-squared     =    0.6844
                                                 Root MSE          =   13.4131
```

daily_kwh	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
pseudo6_post	.2378976	.1880563	1.27	0.206	-.1306884	.6064837
pseudo6_postxpart	1.14769	.1708076	6.72	0.000	.8129114	1.48247
myher	.1778645	.123157	1.44	0.149	-.0635205	.4192494
cdd	.5799077	.0616335	9.41	0.000	.4591073	.700708
hdd	-.930197	.0377191	-24.66	0.000	-1.004126	-.8562684
moyr						
650	-14.66506	.2340525	-62.66	0.000	-15.1238	-14.20632
651	-36.63686	.6872392	-53.31	0.000	-37.98383	-35.28988
652	-40.93589	1.095668	-37.36	0.000	-43.08337	-38.7884
653	-33.62822	1.464081	-22.97	0.000	-36.49778	-30.75865
654	-33.67428	1.508419	-22.32	0.000	-36.63075	-30.71781
655	-35.6731	1.414559	-25.22	0.000	-38.44561	-32.9006
656	-38.00555	1.195096	-31.80	0.000	-40.34791	-35.66319
657	-38.81692	.7698429	-50.42	0.000	-40.3258	-37.30805
658	-16.29466	.2432915	-66.98	0.000	-16.77151	-15.81782
659	-5.746761	.2145589	-26.78	0.000	-6.167292	-5.32623
660	3.022353	.2450659	12.33	0.000	2.542029	3.502677
661	12.01535	.3647207	32.94	0.000	11.30051	12.7302
662	-20.53581	.3651503	-56.24	0.000	-21.25149	-19.82012
663	-41.3436	.706432	-58.52	0.000	-42.72819	-39.95901
664	-40.29536	1.079719	-37.32	0.000	-42.41159	-38.17914
665	-32.43476	1.578493	-20.55	0.000	-35.52857	-29.34095
666	-30.4117	1.642377	-18.52	0.000	-33.63072	-27.19267
667	-33.88337	1.493578	-22.69	0.000	-36.81075	-30.95599
668	-41.45198	1.274657	-32.52	0.000	-43.95028	-38.95368
669	-42.18533	.708718	-59.52	0.000	-43.5744	-40.79626
670	-34.28636	.54499	-62.91	0.000	-35.35453	-33.21819
671	-27.86672	.5832568	-47.78	0.000	-29.00989	-26.72355
672	-1.314526	.3411321	-3.85	0.000	-1.983137	-.6459146
_cons	78.0667	.7255758	107.59	0.000	76.64459	79.48881
account_id	F(8239, 174328) =		39.318	0.000	(8240 categories)	

Figure E-6: Difference-in-Differences Panel Regression Model Placebo Test Results – 7 Months Prior

```
Linear regression, absorbing indicators          Number of obs   =     185148
                                                 F(  28, 176880) =    2876.26
                                                 Prob > F        =     0.0000
                                                 R-squared       =     0.6974
                                                 Adj R-squared   =     0.6833
                                                 Root MSE        =    13.7027
```

daily_kwh	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
pseudo7_post	.5968421	.1907081	3.13	0.002	.2230586	.9706256
pseudo7_postxpart	1.061995	.1697922	6.25	0.000	.729206	1.394784
myher	.1922611	.1273871	1.51	0.131	-.0574148	.441937
cdd	.5173669	.0630814	8.20	0.000	.3937288	.6410051
hdd	-.9367394	.0379103	-24.71	0.000	-1.011043	-.862436
moyr						
649	-9.795476	.3249735	-30.14	0.000	-10.43242	-9.158536
650	-24.48047	.4107704	-59.60	0.000	-25.28557	-23.67537
651	-46.39419	.9286607	-49.96	0.000	-48.21434	-44.57404
652	-50.38322	1.343057	-37.51	0.000	-53.01558	-47.75086
653	-42.68636	1.713441	-24.91	0.000	-46.04467	-39.32806
654	-42.6842	1.758032	-24.28	0.000	-46.1299	-39.2385
655	-44.78538	1.663659	-26.92	0.000	-48.04611	-41.52465
656	-47.35221	1.443083	-32.81	0.000	-50.18063	-44.5238
657	-48.53904	1.013301	-47.90	0.000	-50.52509	-46.553
658	-26.10383	.4274418	-61.07	0.000	-26.94161	-25.26606
659	-15.56529	.3631879	-42.86	0.000	-16.27713	-14.85345
660	-6.744505	.2433544	-27.71	0.000	-7.221474	-6.267536
661	2.256297	.2215508	10.18	0.000	1.822062	2.690531
662	-30.23778	.5867382	-51.54	0.000	-31.38777	-29.08779
663	-51.28899	.9456025	-54.24	0.000	-53.14235	-49.43563
664	-50.04694	1.326411	-37.73	0.000	-52.64667	-47.4472
665	-41.41965	1.829919	-22.63	0.000	-45.00625	-37.83305
666	-39.55525	1.892546	-20.90	0.000	-43.2646	-35.8459
667	-43.19078	1.7524	-24.65	0.000	-46.62545	-39.75612
668	-50.95704	1.529779	-33.31	0.000	-53.95537	-47.9587
669	-52.55384	.9528052	-55.16	0.000	-54.42132	-50.68637
670	-44.26152	.7690898	-57.55	0.000	-45.76892	-42.75412
671	-38.01479	.8080349	-47.05	0.000	-39.59852	-36.43106
_cons	87.99246	.9706892	90.65	0.000	86.08993	89.89499
account_id	F(8239, 176880) =		39.063	0.000	(8240 categories)	

Figure E-7: Difference-in-Differences Panel Regression Model Placebo Test Results – 8 Months Prior

```
Linear regression, absorbing indicators          Number of obs    =     179223
                                                 F(  27, 170956) =    2905.69
                                                 Prob > F         =     0.0000
                                                 R-squared        =     0.6967
                                                 Adj R-squared    =     0.6820
                                                 Root MSE         =    13.7353
```

daily_kwh	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
pseudo8_post	.5269968	.1909071	2.76	0.006	.1528232	.9011704
pseudo8_postxpart	.9749987	.1677693	5.81	0.000	.6461745	1.303823
myher	.0712248	.1311697	0.54	0.587	-.1858649	.3283144
cdd	.5237927	.0635589	8.24	0.000	.3992186	.6483668
hdd	-.9319232	.0379711	-24.54	0.000	-1.006346	-.8575006
moyr						
649	-9.764615	.325602	-29.99	0.000	-10.40279	-9.126443
650	-24.43586	.4115149	-59.38	0.000	-25.24242	-23.6293
651	-46.30651	.9301992	-49.78	0.000	-48.12968	-44.48334
652	-50.31192	1.34593	-37.38	0.000	-52.94992	-47.67393
653	-42.65301	1.718399	-24.82	0.000	-46.02103	-39.28499
654	-42.6558	1.763276	-24.19	0.000	-46.11178	-39.19982
655	-44.74646	1.668302	-26.82	0.000	-48.0163	-41.47663
656	-47.29011	1.446451	-32.69	0.000	-50.12512	-44.4551
657	-48.44935	1.015014	-47.73	0.000	-50.43875	-46.45994
658	-26.06109	.4282084	-60.86	0.000	-26.90037	-25.22181
659	-15.5425	.3640161	-42.70	0.000	-16.25596	-14.82904
660	-6.752676	.2439148	-27.68	0.000	-7.230744	-6.274609
661	2.268293	.2268287	10.00	0.000	1.823713	2.712872
662	-30.35513	.5877824	-51.64	0.000	-31.50717	-29.20309
663	-51.42919	.9498564	-54.14	0.000	-53.29089	-49.56749
664	-49.86019	1.332269	-37.43	0.000	-52.4714	-47.24897
665	-41.41254	1.83525	-22.57	0.000	-45.00959	-37.81549
666	-39.3185	1.905147	-20.64	0.000	-43.05255	-35.58446
667	-43.10635	1.757043	-24.53	0.000	-46.55012	-39.66259
668	-50.908	1.535658	-33.15	0.000	-53.91785	-47.89814
669	-52.21306	.952056	-54.84	0.000	-54.07907	-50.34705
670	-44.06152	.7683139	-57.35	0.000	-45.5674	-42.55564
_cons	87.8733	.9722171	90.38	0.000	85.96778	89.77883
account_id	F(8239, 170956) =		37.650	0.000	(8240 categories)	

Figure E-8: Difference-in-Differences Panel Regression Model Placebo Test Results – 9 Months Prior

```
Linear regression, absorbing indicators          Number of obs    =     171869
                                                 F(  26, 163603) =    2855.79
                                                 Prob > F         =     0.0000
                                                 R-squared        =     0.6962
                                                 Adj R-squared    =     0.6809
                                                 Root MSE         =    13.8452
```

daily_kwh	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
pseudo9_post	.4491905	.1929455	2.33	0.020	.0710216	.8273595
pseudo9_postxpart	.8650776	.1693587	5.11	0.000	.5331381	1.197017
myher	.1376646	.1371407	1.00	0.315	-.1311282	.4064574
cdd	.497722	.0651937	7.63	0.000	.3699438	.6255003
hdd	-.9299552	.0389714	-23.86	0.000	-1.006338	-.853572
moyr						
649	-9.751381	.3316207	-29.41	0.000	-10.40135	-9.101412
650	-24.41769	.4203282	-58.09	0.000	-25.24152	-23.59385
651	-46.20855	.9545486	-48.41	0.000	-48.07944	-44.33765
652	-50.06722	1.382783	-36.21	0.000	-52.77744	-47.35699
653	-42.24375	1.766013	-23.92	0.000	-45.7051	-38.78241
654	-42.22644	1.812151	-23.30	0.000	-45.77822	-38.67467
655	-44.35977	1.7145	-25.87	0.000	-47.72016	-40.99939
656	-47.00214	1.486265	-31.62	0.000	-49.91519	-44.08909
657	-48.32831	1.041886	-46.39	0.000	-50.37038	-46.28623
658	-26.04979	.4376896	-59.52	0.000	-26.90765	-25.19193
659	-15.51797	.3713109	-41.79	0.000	-16.24573	-14.79021
660	-6.745294	.2492084	-27.07	0.000	-7.233737	-6.256851
661	2.188363	.2261954	9.67	0.000	1.745025	2.631701
662	-30.31339	.6072987	-49.92	0.000	-31.50368	-29.1231
663	-51.25503	.973571	-52.65	0.000	-53.16321	-49.34685
664	-49.66153	1.367193	-36.32	0.000	-52.3412	-46.98186
665	-41.14027	1.890115	-21.77	0.000	-44.84485	-37.43568
666	-39.09675	1.955552	-19.99	0.000	-42.92959	-35.26391
667	-42.7108	1.804438	-23.67	0.000	-46.24746	-39.17414
668	-50.61676	1.573534	-32.17	0.000	-53.70086	-47.53267
669	-52.12171	.9715038	-53.65	0.000	-54.02584	-50.21758
_cons	87.84286	.9971642	88.09	0.000	85.88844	89.79728
account_id	F(8239, 163603) =		35.988	0.000	(8240 categories)	

Figure E-9: Pre-Post Panel Regression Model Placebo Test Results – 3 Months Prior

```
Linear regression, absorbing indicators          Number of obs   =      88024
                                                 F(  15,  83889) =    2269.03
                                                 Prob > F        =     0.0000
                                                 R-squared       =     0.7006
                                                 Adj R-squared   =     0.6858
                                                 Root MSE        =    13.0941
```

daily_kwh	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
pseudo3_post	-3.273681	.1555508	-21.05	0.000	-3.57856	-2.968803
myher	-.4995456	.124374	-4.02	0.000	-.7433176	-.2557736
cdd	.430825	.046396	9.29	0.000	.3398891	.5217608
hdd	.3790291	.0190965	19.85	0.000	.3416001	.4164581
month						
2	2.066186	.225508	9.16	0.000	1.624192	2.50818
3	-8.920015	.3400787	-26.23	0.000	-9.586567	-8.253463
4	-17.16391	.4663239	-36.81	0.000	-18.0779	-16.24992
5	-13.0891	.6714731	-19.49	0.000	-14.40519	-11.77302
6	-4.181552	.9644407	-4.34	0.000	-6.071848	-2.291256
7	-2.944002	1.002919	-2.94	0.003	-4.909715	-.9782885
8	-5.69837	.9166603	-6.22	0.000	-7.495018	-3.901723
9	-10.745	.7621438	-14.10	0.000	-12.23879	-9.2512
10	-15.54687	.4763738	-32.64	0.000	-16.48056	-14.61318
11	-12.47954	.308198	-40.49	0.000	-13.08361	-11.87548
12	-4.077889	.2943132	-13.86	0.000	-4.65474	-3.501037
_cons	51.70911	.4855969	106.49	0.000	50.75735	52.66088
account_id	F(4119, 83889) =		38.948	0.000	(4120 categories)	

Figure E-10 Pre-Post Panel Regression Model Placebo Test Results – 4 Months Prior

```
Linear regression, absorbing indicators          Number of obs     =      91305
                                                 F(  15,   87170)  =    2417.82
                                                 Prob > F          =     0.0000
                                                 R-squared         =     0.7021
                                                 Adj R-squared     =     0.6880
                                                 Root MSE          =    12.9638
```

daily_kwh	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
pseudo4_post	-3.571716	.1536847	-23.24	0.000	-3.872936	-3.270495
myher	-.4511291	.1220631	-3.70	0.000	-.6903717	-.2118864
cdd	.5110632	.0459618	11.12	0.000	.4209785	.6011479
hdd	.3144962	.0197515	15.92	0.000	.2757836	.3532089
month						
2	1.887162	.2231038	8.46	0.000	1.449881	2.324444
3	-10.08178	.3503336	-28.78	0.000	-10.76843	-9.395131
4	-17.76074	.4871372	-36.46	0.000	-18.71552	-16.80595
5	-15.5089	.6942387	-22.34	0.000	-16.8696	-14.1482
6	-7.109524	.9809083	-7.25	0.000	-9.032095	-5.186952
7	-6.013572	1.019452	-5.90	0.000	-8.011689	-4.015455
8	-8.328761	.9302962	-8.95	0.000	-10.15213	-6.505389
9	-13.30537	.7807633	-17.04	0.000	-14.83566	-11.77508
10	-17.29759	.4956212	-34.90	0.000	-18.269	-16.32617
11	-13.05801	.3108574	-42.01	0.000	-13.66729	-12.44873
12	-4.661494	.2967635	-15.71	0.000	-5.243148	-4.07984
_cons	53.59299	.5066859	105.77	0.000	52.59989	54.58609
account_id	F(4119, 87170) =		40.668	0.000	(4120 categories)	

Figure E-11: Pre-Post Panel Regression Model Placebo Test Results – 5 Months Prior

```
Linear regression, absorbing indicators          Number of obs    =      93790
                                                 F(  15,   89655) =    2361.45
                                                 Prob > F         =     0.0000
                                                 R-squared        =     0.7007
                                                 Adj R-squared    =     0.6869
                                                 Root MSE         =    12.9839
```

daily_kwh	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
pseudo5_post	-3.343269	.1478178	-22.62	0.000	-3.63299	-3.053547
myher	-.181987	.125637	-1.45	0.147	-.4282344	.0642604
cdd	.4811112	.0456812	10.53	0.000	.3915765	.5706458
hdd	.2773697	.0191963	14.45	0.000	.2397451	.3149944
month						
2	1.841712	.2237337	8.23	0.000	1.403196	2.280228
3	-10.2456	.2942446	-34.82	0.000	-10.82232	-9.668883
4	-18.44949	.474236	-38.90	0.000	-19.37898	-17.51999
5	-15.98197	.6777907	-23.58	0.000	-17.31044	-14.65351
6	-7.429076	.9656452	-7.69	0.000	-9.321732	-5.536421
7	-6.063749	1.00112	-6.06	0.000	-8.025934	-4.101564
8	-8.714935	.9162076	-9.51	0.000	-10.51069	-6.919177
9	-13.80804	.7670303	-18.00	0.000	-15.31142	-12.30467
10	-17.57803	.4760088	-36.93	0.000	-18.511	-16.64505
11	-13.15206	.3022241	-43.52	0.000	-13.74442	-12.55971
12	-4.774765	.2903593	-16.44	0.000	-5.343866	-4.205663
_cons	54.34153	.4917156	110.51	0.000	53.37777	55.30529
account_id	F(4119, 89655) =		41.937	0.000	(4120 categories)	

Figure E-12: Pre-Post Panel Regression Model Placebo Test Results – 6 Months Prior

```
Linear regression, absorbing indicators            Number of obs    =      95170
                                                   F(  15,   91035) =    2472.45
                                                   Prob > F         =     0.0000
                                                   R-squared        =     0.6982
                                                   Adj R-squared    =     0.6845
                                                   Root MSE         =    13.2337
```

daily_kwh	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
pseudo6_post	-2.455967	.1460036	-16.82	0.000	-2.742133	-2.169802
myher	.0635928	.131188	0.48	0.628	-.1935343	.3207199
cdd	.442117	.0457396	9.67	0.000	.3524678	.5317662
hdd	.2684468	.0177696	15.11	0.000	.2336185	.303275
month						
2	2.848163	.2229494	12.77	0.000	2.411184	3.285141
3	-9.900876	.2839329	-34.87	0.000	-10.45738	-9.34437
4	-18.13468	.4423345	-41.00	0.000	-19.00165	-17.26771
5	-15.52445	.6412171	-24.21	0.000	-16.78123	-14.26767
6	-6.501876	.9289132	-7.00	0.000	-8.322537	-4.681215
7	-5.366665	.9681999	-5.54	0.000	-7.264327	-3.469003
8	-8.107076	.882818	-9.18	0.000	-9.837391	-6.376762
9	-13.07175	.7286239	-17.94	0.000	-14.49985	-11.64365
10	-17.35551	.4453735	-38.97	0.000	-18.22844	-16.48259
11	-13.00556	.2923224	-44.49	0.000	-13.57851	-12.43261
12	-4.80431	.2843059	-16.90	0.000	-5.361547	-4.247074
_cons	54.10396	.4538723	119.21	0.000	53.21437	54.99354
account_id	F(4119, 91035) =		41.671	0.000	(4120 categories)	

Figure E-13: Pre-Post Panel Regression Model Placebo Test Results – 7 Months Prior

```
Linear regression, absorbing indicators          Number of obs     =      96418
                                                 F(  15,   92283) =    2632.40
                                                 Prob > F          =     0.0000
                                                 R-squared         =     0.6962
                                                 Adj R-squared     =     0.6826
                                                 Root MSE          =    13.5328
```

daily_kwh	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
pseudo7_post	-1.844993	.1503326	-12.27	0.000	-2.139643	-1.550342
myher	.146169	.1401079	1.04	0.297	-.1284409	.420779
cdd	.3651101	.0469198	7.78	0.000	.2731477	.4570724
hdd	.3020681	.0181538	16.64	0.000	.2664868	.3376493
month						
2	.9182044	.2115952	4.34	0.000	.50348	1.332929
3	-11.47024	.2736431	-41.92	0.000	-12.00658	-10.9339
4	-19.36084	.4396301	-44.04	0.000	-20.22251	-18.49917
5	-16.04729	.6437619	-24.93	0.000	-17.30906	-14.78552
6	-6.617115	.944448	-7.01	0.000	-8.468223	-4.766007
7	-5.416336	.9849523	-5.50	0.000	-7.346832	-3.485839
8	-8.099927	.8931146	-9.07	0.000	-9.850422	-6.349431
9	-13.51909	.7355836	-18.38	0.000	-14.96082	-12.07735
10	-18.62714	.4448981	-41.87	0.000	-19.49914	-17.75514
11	-14.82668	.2915208	-50.86	0.000	-15.39806	-14.2553
12	-6.686369	.2833761	-23.60	0.000	-7.241783	-6.130954
_cons	55.27687	.4511979	122.51	0.000	54.39253	56.16122
account_id	F(4119, 92283) =		41.330	0.000	(4120 categories)	

Figure E-14: Pre-Post Panel Regression Model Placebo Test Results – 8 Months Prior

```
Linear regression, absorbing indicators           Number of obs   =      93426
                                                  F(  15,  89291) =    2620.25
                                                  Prob > F        =     0.0000
                                                  R-squared       =     0.6973
                                                  Adj R-squared   =     0.6832
                                                  Root MSE        =    13.5867
```

daily_kwh	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
pseudo8_post	-.8761222	.1473471	-5.95	0.000	-1.164921	-.5873232
myher	.0404845	.147681	0.27	0.784	-.248969	.3299379
cdd	.4823319	.0480682	10.03	0.000	.3881186	.5765452
hdd	.1328289	.0205433	6.47	0.000	.0925642	.1730936
month						
2	.8320353	.2124495	3.92	0.000	.4156363	1.248434
3	-13.13478	.2902779	-45.25	0.000	-13.70373	-12.56584
4	-22.94058	.4851338	-47.29	0.000	-23.89144	-21.98973
5	-20.91718	.702553	-29.77	0.000	-22.29418	-19.54019
6	-12.4145	1.006681	-12.33	0.000	-14.38759	-10.44142
7	-11.23113	1.045076	-10.75	0.000	-13.27947	-9.182794
8	-13.83847	.9544273	-14.50	0.000	-15.70913	-11.9678
9	-18.91747	.7971318	-23.73	0.000	-20.47984	-17.3551
10	-22.83231	.5012537	-45.55	0.000	-23.81477	-21.84986
11	-17.2551	.3187327	-54.14	0.000	-17.87982	-16.63039
12	-5.585667	.2893699	-19.30	0.000	-6.152829	-5.018505
_cons	59.25962	.5047486	117.40	0.000	58.27032	60.24892
account_id	F(4119, 89291) =		39.887	0.000	(4120 categories)	

Figure E-15 Pre-Post Panel Regression Model Placebo Test Results – 9 Months Prior

Linear regression, absorbing indicators

Number of obs	=	89742
F(15, 85607)	=	2490.33
Prob > F	=	0.0000
R-squared	=	0.6989
Adj R-squared	=	0.6844
Root MSE	=	13.6554

daily_kwh	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
pseudo9_post	.229342	.1483055	1.55	0.122	-.0613355	.5200196
myher	.2048901	.156326	1.31	0.190	-.1015076	.5112878
cdd	.6331696	.0496982	12.74	0.000	.5357615	.7305778
hdd	-.1730511	.023855	-7.25	0.000	-.2198066	-.1262956
month						
2	.5610634	.2138638	2.62	0.009	.1418922	.9802346
3	-16.22423	.3153055	-51.46	0.000	-16.84222	-15.60623
4	-29.67782	.5542216	-53.55	0.000	-30.76409	-28.59155
5	-29.33721	.785233	-37.36	0.000	-30.87626	-27.79816
6	-22.06781	1.091762	-20.21	0.000	-24.20766	-19.92797
7	-21.17659	1.13228	-18.70	0.000	-23.39585	-18.95733
8	-23.5712	1.041064	-22.64	0.000	-25.61167	-21.53072
9	-28.11022	.8830051	-31.83	0.000	-29.8409	-26.37953
10	-30.24228	.5774998	-52.37	0.000	-31.37417	-29.11038
11	-16.55906	.3219787	-51.43	0.000	-17.19014	-15.92798
12	-7.485996	.300399	-24.92	0.000	-8.074775	-6.897216
_cons	66.44991	.5798133	114.61	0.000	65.31348	67.58634
account_id	F(4119, 85607) =		38.606	0.000	(4120 categories)	

Appendix F Instruments

F.1 Program Staff In-Depth Interview Guide

Introduction

Today, we'll be discussing your role in the [*If DEP, DEI say "Energy Efficiency Education Program"; if DEK say "NEED Project in Kentucky"*]. We would like to learn about your experiences in administering this/these program(s) in 2015-2016.

Your comments are confidential. If I ask you about areas you don't know about, please feel free to tell me that and we will move on. Also, if you want to refer me to specific documents to answer any of my questions, that's great – I'm happy to look things up if I know where to get the information.

I would like to record this interview for my note-taking purposes. Do I have your permission? Do you have any questions before we start?

Roles & Responsibilities

Q1. Please describe your position at Duke Energy and your role in the [*IF DEP, DEI SAY "Energy Efficiency Education Program"; IF DEK SAY "Duke sponsored NEED Project in Kentucky"*]:

Q2. How long have you been in this role?

Program Goals

Q3. In 2015-2016 program year or to date, what were Duke Energy targets in terms of:

1. Number of schools recruited
2. Number of teachers and students involved
3. Activities performed
4. Use of curricula by teachers
5. Anything else?

Q4. How were those targets set, and by whom?

Q5. Compared to the previous program years, have these targets been the same or have they changed? [*If changed*:] Why have they changed?

Q6. Are you on track to meet 2015-2016 targets? [*If not on track, probe why not on track and how far behind are they in meeting their targets*.]

1. Number of schools recruited
2. Number of teachers and students involved
3. Activities performed
4. Use of curricula by teachers
5. Anything else?

Q7. Does Duke Energy have any specific targets regarding the number of parents that request energy saving kits? If so, what are they?

Q8. How about savings targets? Are you on track to meet the savings targets? If not, why not?

Q9. Does the program have any process or non-impact goals? (*Probe: low-income or non-English speaking population targeting, increased student knowledge of how to save energy, parental /student interest in energy efficiency, etc.*)

[IF YES:]

1. How are these goals established?
2. How are they measured?

Program Delivery

Next, I'd like to learn more about how this program was delivered in 2015-2016 program year.

Q10. As you know, Duke Energy has partnered with the [*IF DEP, DEP SAY "National Theatre for Children or NTC"; IF DEP SAY "NEED Project"*] to deliver the program. How is Duke or NTC/NEED recruiting schools to participate in this program?

[IF NEEDED:]

1. What types of marketing activities did Duke or NTC/NEED project staff conduct in the 2015-2016 program year?
2. Of all the schools contacted, how many decided to participate? Did you receive any feedback from NTC/NEED why some schools decided not to participate?
3. Have any participating schools dropped out of the program? If so, why?
4. Did you adjust your marketing and outreach strategy in 2015-2016? If so, how?

Q11. Please describe the program curricula and in-school activities.

Q12. Are you involved in any of these activities? Or is it mainly NTC/NEED Project staff who manage these activities?

Q13. Who developed the curricula? Were you involved in developing the curricula?

Q14. [*IF NTC-RUN PROGRAM*:] Please describe the digital workbook of math and science concepts that are provided to teachers and given to students. Do teachers use the workbook and associated collateral? If not, why not?

Q15. What type of feedback have you received from schools and/or teachers about the curricula, workbook, or in-school activities? [*IF ANY ISSUES REPORTED*:] How have you addressed those issues?

Communication

Q16. Can you describe how does NTC/NEED communicate about the program with Duke Energy? Who do you communicate with, how often, and what about?

Q17. Do you communicate with schools directly in any way? If so, how?

Q18. How often do you or NTC/NEED have to resolve an issue with schools? What types of issues come up?

Q19. How do you call or refer to this program when you talk to NTC/NEED? [*If needed: Do you call it "Energy Efficiency in Schools" as it is noted on the website or do you use another name?*]

Data Tracking of Kits

Let's talk about the kits a little bit.

Q20. The kits include [*LIST MEASURES IN THE KIT*]. Were there any changes to the items in the kit during 2015-2016 program year? Any changes for 2016-2017 program year?

Q21. Based on what we read on the program website, student families must complete the Energy Efficiency Survey to receive a kit. Would it be possible to receive/see this survey data?

Q22. What proportion of student families participating in the program fill out the survey? Are you satisfied with this response rate? If not, why not?

Q23. From the moment families request a kit, how long does it take to receive a kit? Is this time frame typical in terms of how long it takes to receive a kit? [*IF NOT TYPICAL, PROBE to get more information on this topic.*]

Q24. Can you tell us how your vendor tracks and reports the number of kits sent out to student families to Duke Energy? Is there information on kit distribution that you need but are not getting? What?

We are almost done. I have a few more questions.

Wrap Up

Q25. What would you say are the greatest strengths of this program?

Q26. What would you say is the biggest challenge in administering this program?

Q27. Is there anything else about the program that we have not discussed that you feel should be mentioned?

Q28. What would you like to learn from the program evaluation?

Those are all of my questions. Thank you very much for your time.

F.2 Implementer Staff In-Depth Interview Guide

Introduction

Hi. My name is _________ and I'm calling from Research Into Action on behalf of Duke Energy [Progress, Indiana, Kentucky]. We are conducting an evaluation of Duke Energy sponsored [*If DEP or DEI say "Energy Efficiency Education Program"; if DEK, say "NEED Project in Kentucky"*]. Because your organization is involved in administering and delivering this program, we would like to get your perspective on how the program works to help guide us in our efforts. Our conversation should take about 40 to 60 minutes. Is now still a good time to talk?

[*Set up appointment or conduct interview*]

I would like to record this interview for my note-taking purposes. Do I have your permission? Do you have any questions before we start?

Roles & Responsibilities

Q1. Please describe your role in the Duke Energy program:

[*If needed:*]

1. What is your role in developing curricula?
2. What are your roles and responsibilities relating to recruiting schools and teachers?
3. What about scheduling in-school activities?

Program Delivery and Goals

Q2. Please describe the curricula and in-school activities. How do the curricula and activities vary among schools, if at all?

[*Probes – if needed*]

1. Do the activities, including in-school presentations, occur in different times of year at different schools? If so…
2. Does the scheduling follow any pattern related to school size, type, location, or other factor? If so, how?
3. Have you gotten any feedback that suggests it's better to start or perform activities at certain times of year than others? If so, what have you heard?

[*Ask for any documentation on curricula and activities as well as on scheduling of presentations or other activities in schools*]

Q3. How were the curricula developed? Who was involved and what information do you have on the effectiveness of the curricula in teaching students the target concepts or promoting the target behaviors?

Q4. What are NTC's/the NEED Project's targets in terms of:

1. Number of schools recruited
2. Number of teachers and students involved
3. Activities performed
4. Use of curricula by teachers
5. The number of parents that request energy saving kits
6. Anything else?

Q5. How were those targets set, and by whom?

Q6. What is NTC's/the NEED Project's progress toward its targets:

1. Number of schools recruited

2. Number of teachers and students involved
3. Activities performed
4. Use of curricula by teachers
5. The number of parents that request energy saving kits
6. Anything else?

Q7. What kinds of challenges, if any, have you encountered in recruiting schools?

[*If needed:*]

1. What characteristics of schools, if any, make them more difficult to recruit? Is it related to location, size, or demographic factors?

Q8. [*If challenges identified:*] What have you done to address those challenges? How has that worked? What support from Duke Energy would be helpful, if any?

Q9. [*IF NTC-RUN PROGRAM:*] Please describe the digital workbook of math and science concepts that are provided to teachers and given to students. Do teachers use the workbook and associated collateral? If not, why not?

Q10. How, if at all, does NTC/The NEED Project work with school faculty and staff in getting the curricula and activities set up?

[*If needed:*]

1. What kind of guidance or assistance does NTC/The NEED Project give to school faculty and staff in the use of curricula?

Q11. What kinds of differences have you noticed among schools, if any, in the level of involvement of school faculty or staff in the program?

[*If needed:*]

1. What characteristics of schools, if any, are related to the level of involvement of school faculty or staff in the program?

Q12. What kinds of feedback have you gotten from school faculty or staff about the curricula and activities?

[*If needed:*]

1. What positive feedback?
2. What negative feedback?
3. Do they use the curricula, collateral, and activities? If not, why not?

Q13. What kinds of challenges, if any, have you encountered in getting students involved in the school activities?

[*If needed:*]

1. What characteristics of students, if any, make it more difficult to get them involved?

Q14. Tell me about your interactions with Duke Energy – who do you communicate with there, how do you communicate, how often, and what about?

Q15. What role does Duke Energy play, if any, in NTC's/the NEED Project's interactions with schools?

[*Probe*]

1. What kinds of direction does Duke Energy give you in how to work with schools?

Q16. Have there been any challenges in your interactions with Duke Energy? If so, what were they? How did you address them? Were they resolved? If not, what do you think might resolve them?

Q17. Is there anything that has happened in your interactions with Duke Energy or the schools that you didn't expect? What?

Q18. What have you learned from your experiences so far with this program that would help others doing a similar program?

Wrap Up

Q19. What would you say are the greatest strengths of this program?

Q20. What would you say is the biggest challenge in delivering this program?

Q21. Is there anything else about the program that we have not discussed that you feel should be mentioned?

Those are all of my questions. Thank you very much for your time.

F.3 Teacher Interview Guide

Teacher Background

Q1. First, can you tell me what grade and subjects you teach?

NTC Performance

The next few questions are about the performance that National Theatre for Children (or NTC) gave at your school.

Q2. What topics were covered in the performance?

Q3. Do you think any of the topics could have been better emphasized or explained? If so, which ones and why?

Q4. Should any topics be removed from the performance? If so, which ones and why?

Q5. [IF ELEMENTARY SCHOOL TEACHER] What about age appropriateness – was the content appropriate for all ages, from kindergarten through grade-5? If not, what was not age appropriate? How could that be improved?

[IF MIDDLE SCHOOL TEACHER] What about age appropriateness – was the content appropriate for all ages from grade 6 through grade 8? If not, what was not age appropriate? How could that be improved?

Q6. Did the performance keep your students' attention? If not, how could the content be improved to keep the students entertained and attentive?

Q7. What did you like the most about the performance?

Q8. What did you dislike the most?

Q9. How did your students respond to the performance?

- Probes: What did students say about the performance? Did they like it? What specifically did they like most about it?

Q10. One of the goals of the NTC program is for performers to get students' families to sign up for energy efficiency kits from Duke Energy that contain energy efficient bulbs, low-flow shower heads, and other items that students' families can install in their home to save energy. Did the performers talk about the kits or the kit forms?

[If yes] What did they say? Did they hand out kit request forms during the performance?

Q11. How many NTC performances have you seen in your school? When did you see that/these performance(s)? [If they saw multiple NTC performances:] How did the latest performance compare to the prior performance(s)?

Materials/classroom [Ask All]

Q12. NTC provides student workbooks that contain educational materials and a form to get an energy saver kit for their home. Have you distributed these workbooks to your students?

- [If no:] Why not?
- [If yes:] How does the workbook distribution work? Do the students get the workbook at the assembly? Or do they get them in a class?
- [If distributed workbooks:] How did you use the workbooks in your classroom?

Q13. Did you get any teacher-facing instructional material from NTC? [If yes] How did you receive it? [Probe: Left in your box, emailed if in digital form, or in some other way?] To what extent did you use that material?

- [If material was not used:] Why haven't you used the material(s)? What would make you more likely to use them?
- [If used:] Using a 1 to 5 scale where 1 means "not at all useful" and 5 means "extremely useful," how useful was the instructional material? Why did you give that rating? What was most/least useful about them?

Q14. Were any other materials handed out by the performers before, during, or after the performance? If so, what was handed out? Did you use these materials in your classroom, or did the students take them home? [probe about value of these materials]

Q15. Thinking about the educational materials NTC provided…

- In what ways, if any, did you incorporate the material into your lesson plans? [IF NOT MENTIONED] That is, did you extensively use it – such as weaving it into your course work over the year – or did you briefly utilize it in the time surrounding the performance? Please explain how extensively you used the material.
- Was the content age appropriate? Or was it too advanced or too basic? What was too basic/advanced? Is it age appropriate for all ages (grades K-5/ 6-8?) How effective is it in teaching kids about energy concepts?
- [IF MIDDLE SCHOOL TEACHER AND NOT MENTIONED] What did you think of the comic book for teaching students about energy and energy conservation behaviors? How effective was it? Was it age appropriate? [IF NOT AGE APPROPRIATE] How was it not age appropriate?

Q16. Did anyone or any of the materials you received emphasize the value of the kits to you? If so, what did they say?

Q17. In the online survey you said you [DID / DID NOT] distribute the kit request form to your students.

[IF DISTRIBUTED] What challenges, if any, did you encounter when trying to distribute the kit forms? Did you have to coordinate with other faculty or staff? If so, can you describe this process and how well the process worked? What can NTC or Duke Energy do to make this process easier for you?

[IF NOT DISTRIBUTED] Why did you not distribute the kit forms? What can NTC or Duke Energy do to make this process easier for you?

Q18. What, if anything, did you say or do to encourage your students to take the kit form and have their parents fill it out?

Q19. Thinking about the performance and curriculum as a whole, in what ways, if any, did your students subsequently demonstrate knowledge on the topics presented? [IF NOT MENTIONED] What were some of their main takeaways? What is the evidence of their increased knowledge? (test scores, etc.?)

Suggestions for Improvement [Ask All]

Q20. What suggestions do you have to improve the National Theatre for Children performance(s)?

Q21. What suggestions do you have to improve the classroom materials received from the National Theatre for Children?

Q22. What suggestions do you have to improve the distribution of the kit forms to students?

F.4 Student Parent Survey

Introduction/ Screening

Q1. Hi, I'm ______, calling on behalf of Duke Energy. We are calling about an energy efficiency educational program that Duke Energy sponsored in your child's school. In addition to sponsoring classroom activities, Duke Energy sent a kit containing energy saving items to your home.

This kit included lightbulbs, a showerhead, and other items that help you save energy in your home. Do you recall receiving this kit?

1. Yes
2. No [If no: Can I speak with someone who may know something about this kit?]
98. Don't know [If DK: Can I speak with someone who may know something about this kit?]
99. Refused [TERMINATE]

[INTERVIEWER INSTRUCTIONS: *If no adults are able to speak about the kit, thank and terminate.*]

Q1a. Do you work at a school that teaches elementary, middle, or high school grades?

1. Yes [-> TERMINATE]
2. No

Program Experience

Q2. Before today, did you know the kit you received was sponsored by Duke Energy?

1. Yes
2. No
98. Don't know
99. Refused

[IF Q2=1]

Q3. How did you learn that the kit was sponsored by Duke Energy? [Select all that apply]

1. Classroom materials brought home by child
2. My child's teacher
3. Information material included in/on the kit
4. Other (specify:___________)
98. Don't know
99. Refused

Q4. Did you read the information about how to save energy in the booklet that came in the kit?

1. Yes
2. No
98. Don't know
99. Refused

[ASK IF Q4 = 1]

Q5. On a scale from 0 to 10 where 0 is not at all helpful and 10 is very helpful, how helpful was the information in the kit in identifying ways your household could save energy at home?

0. Not at all helpful

1.
2.
3.
4.
5.
6.
7.
8.
9.
10. Very helpful
98. Don't know
99. Refused

[ASK IF Q4<7]

Q6. What might have made the information more helpful?

[ASK IF NTC=1]

Q7. In addition to sending the energy saving kits, Duke Energy sponsored a program about energy and energy efficiency at your child's school, which included classroom materials and an in-school performance by the National Theatre for Children. Were you aware of this program before today?

[*Interviewer: Record 'yes' if the respondent reported any awareness of any aspect of the school program*]

1. Yes
2. No
98. Don't know
99. Refused

[ASK IF NEED=1]

Q8. In addition to sending families energy saving kits, Duke Energy sponsored a program about energy and energy efficiency at your child's school, which included classroom activities on energy and conservation. Were you aware of this program before today?

1. Yes
2. No
98. Don't know
99. Refused

[ASK IF Q7=1 or Q8=1]

Q9. Where did you hear about this program?

[MULTIPLE RESPONSE]

1. From my child/children
2. From a teacher
3. On Duke Energy website
4. Other, please specify: [OPEN-ENDED RESPONSE]
98. Don't know
99. Refused

Assessing Energy Saver Kit Installation

We'd like to ask you about the energy saving items included in your kit.

The kit contained an energy-efficient showerhead, faucet aerators for the bathroom and kitchen, energy efficient light bulbs, a night light, and some insulator gaskets for light switches and electricity outlets.
[*IF NEEDED*: The bathroom and kitchen faucet aerators are small metal pieces that you can screw in to a sink faucet to reduce water flow. The insulator gaskets are made of foam and are the size and shape of a light switch or electric outlet.]

Q10. Have you or anyone else installed any of those items in your home, even if they were taken out later?
[*Interviewer: Throughout interview, remind respondent as needed to report whether someone else in the home installed or uninstalled any items*]

[SINGLE RESPONSE]

1. Yes
2. No [-> Q21]
98. Don't know [-> TERMINATE]
99. Refused [-> TERMINATE]

[ASK IF Q10 = 1]

Q11. Your kit contained two energy efficient light bulbs that you can screw into any standard light socket. Do you know if your kit contained CFLs (which have a swirly spiral shape) or LED bulbs (which have a more traditional globe shape)?

1. CFLs
2. LEDs
98. Don't know

[ASK IF Q10 = 1]

Q12. Which of the items did you install, even if they were taken out later?
[*Interviewer: Record each response, then prompt with the list items*.]

Item		Response
a.	Showerhead	1. Yes 2. No 98. DK 99. REF
b.	Kitchen faucet aerator	1. Yes 2. No 98. DK 99. REF
c.	Bathroom faucet aerator	1. Yes 2. No 98. DK 99. REF
d.	Night light	1. Yes 2. No 98. DK 99. REF
e.	Energy efficient light bulb(s)	1. Yes 2. No 98. DK 99. REF
f.	Insulator gaskets for light switches and electricity outlets	1. Yes 2. No 98. DK 99. REF

[ASK IF Q12E (ENERGY EFFICIENT LIGHT BULB(S)) = 1 (YES)]

Q13. In addition to the night light, there were two light bulbs in the kit. Did you install one or both of the light bulbs in the kit?

[SINGLE RESPONSE]

1. Yes – I installed both
2. No – I installed only one light bulb
98. Don't know
99. Refused

[ASK IF Q11=1 (CFL) and Q13 = 2]

Q14. One bulb was a 13 watt CFL, and the other bulb was a 18 watt CFL. Do you recall which one you installed?
[*If needed: The 13 watt CFL is equivalent to a 60 watt incandescent bulb and the 18 watt CFL is equivalent to a 75 watt incandescent bulb*]

[SINGLE RESPONSE]

1. 13 watts
2. 18 watts
98. Don't know
99. Refused

[ASK IF Q12f = 1]

Q15. How many of the light switch gasket insulators from the kit did you [*if needed: or anyone else*] install in your home?

[SINGLE RESPONSE]

1. None
2. One
3. Two
4. Three
5. Four
98. Don't know
99. Refused

[ASK IF Q12f = 1]

Q16. How many electrical outlet gasket insulators from the kit did you [*if needed: or anyone else*] install in your home?

[SINGLE RESPONSE]

1. None
2. One
3. Two
4. Three
5. Four
6. Five
7. Six
8. Seven
9. Eight
98. Don't know
99. Refused

[ASK IF ANY PART OF Q12 = 1]

Q17. Overall, how satisfied are you with the item[s] you installed? Please use 0 to 10 scale, where 0 is very dissatisfied and 10 is very satisfied. How satisfied are you with...

DISPLAY IF	Item		Rating
Q12a = 1	a.	Showerhead	0-10 with DK, REF
Q12b = 1	b.	Kitchen faucet aerator	0-10 with DK, REF
Q12c = 1	c.	Bathroom faucet aerator	0-10 with DK, REF
Q12d = 1	d.	Night light	0-10 with DK, REF
Q12e = 1	e.	Energy efficient lightbulbs	0-10 with DK, REF
Q12f = 1	f.	Insulator gaskets	0-10 with DK, REF

[ASK IF ANY ITEMS IN Q17<7]

Q17a. Can you please explain any dissatisfaction you had with [DISPLAY ALL ITEMS IN Q17 THAT ARE <7]?

[OPEN END: RECORD VERBATIM]

[ASK IF ANY PART OF Q12 = 1]

Q18. Have you since uninstalled any of the items from the kit that you had previously installed?

[SINGLE RESPONSE]

1. Yes
2. No
98. Don't know
99. Refused

[ASK IF Q18 = 1]

Q19. Which of the items did you uninstall?

[*Interviewer: Record the response, then prompt with the list items*.]

[MULTIPLE RESPONSE]

1. [DISPLAY IF Q12a = 1] Showerhead
2. [DISPLAY IF Q12b = 1] Kitchen faucet aerator
3. [DISPLAY IF Q12c = 1] Bathroom faucet aerator
4. [DISPLAY IF Q12d = 1] Night light
5. [DISPLAY IF Q12e = 1] Energy efficient light bulbs
6. [DISPLAY IF Q12f = 1] Insulator gaskets
98. Don't know
99. Refused

[ASK IF Q19 1-6 OPTIONS WERE SELECTED]

Q20. Why were those items uninstalled? Let's start with…

[*Interviewer: Read each item*]

[MULTIPLE RESPONSE]

DISPLAY ONLY THOSE 1-6 ITEMS THAT WERE SELECTED IN Q19	Item		Reason	
	a.	Showerhead	1.	It was broken
			2.	I didn't like how it worked
			3.	I didn't like how it looked
			96.	Other: (specify)
			98.	DK
			99.	REF

	b.	Kitchen faucet aerator	Repeat reason options
	c.	Bathroom faucet aerator	Repeat reason options
	d.	Night light	Repeat reason options
	e.	Energy efficient light bulbs	Repeat reason options
	f.	Insulator gaskets	Repeat reason options

[ASK IF ANY PART OF Q12 = 2 OR Q10 = 2]

Q21. You said you haven't installed [INPUT ONLY THOSE ITEMS IN Q12 IF Q12a-f = 2]. Which of those items do you plan to install in the next three months?
[*Interviewer: Record the response, then prompt with the list items*.]

[MULTIPLE RESPONSE] [DISPLAY ALL IF Q10 = 2]

1. [DISPLAY IF Q12a = 2] Showerhead
2. [DISPLAY IF Q12b = 2] Kitchen faucet aerator
3. [DISPLAY IF Q12c = 2] Bathroom faucet aerator
4. [DISPLAY IF Q12d = 2] Night light
5. [DISPLAY IF Q12e = 2] Energy efficient light bulbs
6. [DISPLAY IF Q12f = 2] Insulator gaskets
98. None
99. Refused

[ASK IF ANY 1-6 OPTIONS WERE NOT SELECTED IN Q21 OR OPTION "NONE" WAS SELECTED]

Q22. What's preventing you from installing those items? Let's start with….
[*Interviewer: Read items*]

[MULTIPLE RESPONSE]

DISPLAY IF	Item		Reason
Q21a was not selected	a.	Showerhead	Use multiple response options below
Q21b was not selected	b.	Kitchen faucet aerator	Use multiple response options below
Q21c was not selected	c.	Bathroom faucet aerator	Use multiple response options below
Q21d was not selected	d.	Night light	Use multiple response options below
Q21e was not selected	e.	Energy efficient light bulbs	Use multiple response options below
Q21f was not selected	f.	Insulator gaskets	Use multiple response options below

[MULTIPLE RESPONSE OPTIONS FOR Q22]

1. Didn't know what that was
2. Tried it, didn't fit
3. Tried it, didn't work as intended (Please specify: ______________________)
4. Haven't gotten around to it
5. Current one is still working

6. Takes too much time to install it/No time/Too busy
7. Too difficult to install it, don't know how to do it
8. Don't have the tools I need
9. Don't have the items any longer (threw away, gave away)
10. [DISPLAY IF Q21e was not selected and BULB=CFL] Already have CFLs
11. [DISPLAY IF Q21e was not selected and BULB=LED] Already have LEDs
12. [DISPLAY IF Q21a was not selected] Already have efficient showerhead
13. [DISPLAY IF Q21b was not selected] Already have efficient kitchen faucet aerator
14. [DISPLAY IF Q21c was not selected] Already have efficient bathroom faucet aerators
96. Other, please specify: [OPEN-ENDED RESPONSE]
98. Don't know
99. Refused

[ASK IF Q12b = 1 AND Q19 KITCHEN FAUCET AERATOR OPTION WAS NOT SELECTED]

Q23. You said you installed the new kitchen faucet aerator. Do you know what your old kitchen faucet aerator's gallon per minute flow was?

[SINGLE RESPONSE]

1. Yes - record flow: ____________
2. No
99. Refused

[ASK IF Q12c = 1 AND Q19 BATHROOM FAUCET AERATOR OPTION WAS NOT SELECTED]

Q24. You said you installed the new bathroom faucet aerator. Do you know what your old bathroom faucet aerator's gallon per minute flow was?

[SINGLE RESPONSE]

1. Yes - record flow: ____________
2. No
99. Refused

[ASK IF Q12a = 1 AND Q19 SHOWERHEAD OPTION WAS NOT SELECTED]

Q25. You said you installed the new energy efficient showerhead. Do you know what your old showerhead's gallon per minute flow was?

[SINGLE RESPONSE]

1. Yes - record flow: ____________
2. No
99. Refused

[ASK IF Q12d = 1 AND Q19 NIGHT LIGHT OPTION WAS NOT SELECTED]

Q26. You said you installed the night light. Did the night light replace an existing night light?

1. Yes
2. No
98. Don't know
99. Refused

[ASK IF Q26 = 1]

Q27. Did the old nightlight have a bulb that you could take out and replace once it burned out?
1. Yes
2. No
98. Don't know
99. Refused

[ASK IF (Q12e = 1 AND Q19 ENERGY EFFICIENT LIGHTS WERE NOT SELECTED)]

Q28. You said you installed at least one of the energy efficient lights. What type of bulb(s) did you replace with the energy efficient lightbulbs?
1. All incandescent [*Interviewer: describe as an old fashioned light bulb - likely purchased more than two years ago*]
2. All halogen [*Interviewer: describe as bulb that looks like an incandescent, but has a glass tube inside of the bulb*]
   All CFL [*Interviewer: describe as spiral, or twisty shape bulb that fit into ordinary light fixtures*]
3. All LED [*Interviewer: describe as a new bulb type that uses little electricity and lasts a long time*]
4. Some combination [OPEN-ENDED RESPONSE]
98. Don't know
99. Refused

[ASK IF (Q12e = 1 AND Q19 ENERGY EFFICIENT LIGHT BULBS NOT SELECTED)]

Q29. In what rooms did you install the energy efficient lightbulbs that were included in the kit? [MULTIPLE RESPONSE] [*Interviewer: If the respondent gives more than two responses, remind them that there were only two bulbs*.]
1. Living room
2. Dining room
3. Bedroom
4. Kitchen
5. Bathroom
6. Den
7. Garage
8. Hallway
9. Basement
10. Outdoors
11. Other area (please specify): _______
98. Don't know
99. Refused

Q30. Have you adjusted the temperature of your water heater based on the Hot Water Gauge Card included in your kit?
1. Yes
2. No
3. Don’t recall seeing the Hot Water Gauge Card
98. Don't know
99. Refused

[ASK IF Q30=1]

Q31. Do you know what the old temperature setting on your hot water heater was?
1. Yes (*please type in previous temperature setting here*)
2. No

[ASK IF Q30=1]

Q32. And what was the new temperature setting you set your hot water heater to?
[Record response]

[ASK IF Q30=1]

Q33. Is the new water heater temperature setting still in place?
1. Yes
2. No
98. Don't know
99. Refused

[IF Q33=2]

Q34. Why did you change the water heater temperature a second time?
[Record response]

Q35. What is the fuel type of your water heater?
1. Electricity
2. Natural Gas
3. Other, please specify: [OPEN-ENDED RESPONSE]
98. Don't know
99. Refused

Q36. How old is your water heater?
1. Less than five years old
2. Five to nine years old
3. Ten to fifteen years old
4. More than fifteen years old
98. Don't know

NTG

[IF ANY PART OF Q12 = 1 AND IT'S NOT THE CASE THAT ALL PARTS OF Q19=SELECTED (THAT IS, THEY INSTALLED ANYTHING AND DID NOT UNINSTALL EVERYTHING THEY INSTALLED)]

Q37. If you had not received the free efficiency items in the kit, would you have purchased and installed any of these same items within the next year?
1. Yes
2. No
98. Don't know
99. Refused

[If Q37 = 1]

Q38. What items would you have purchased and installed within the next year?
[MULTIPLE RESPONSES]

1. [IF Q12a = 1 AND Q19.1 NOT SELECTED] Energy-Efficient Showerhead
2. [IF Q12b = 1 AND Q19.2 NOT SELECTED] Kitchen Faucet Aerator

3. [IF Q12c = 1 AND Q19.3 NOT SELECTED] Bathroom Faucet Aerator
4. [IF Q12d = 1 AND Q19.4 NOT SELECTED] Energy-Efficient Light Bulbs
5. [IF Q12e = 1 AND Q19.5 NOT SELECTED] Energy-Efficient Night Light
6. [IF Q12f = 1 AND Q19.6 NOT SELECTED] Switch/Outlet Gasket Insulators
7. No I would not have purchased any of the items
96. Other, please specify: [OPEN-ENDED RESPONSE]
98. Don't know
99. Refused

[IF Q38.4 IS SELECTED]

Q39. Would you have purchased and installed the 13W CFL, the 18W CFL, both types of CFLs, or something else?

1. Just the 13W CFL
2. Just the 18W CFL
3. Both the 13W and 18W CFL
4.
96. Other, please specify: [OPEN-ENDED RESPONSE]
98. Don't know
99. Refused

[IF (Q12a=1 AND Q19.1 NOT SELECTED) or (Q12b=1 AND Q19.2 NOT SELECTED) or (Q12c=1 AND Q19.3 NOT SELECTED)]

Q40. Now, thinking about the water savings items that were provided in the kit - using a scale from 0 to 10, where 0 means “not at all influential” and 10 means “extremely influential” how influential were the following factors on your decision to install the water saving items from the kit? How influential was…

[*Interviewer: If respondent says “Not applicable - I didn’t get/use that,” then follow up with: “So would you say it was “not at all influential?” and probe to code*]

[MATRIX QUESTION: SCALE]

Elements	**Responses**
The fact that the items were free	0-10 scale with DK and REF options
The fact that the items were mailed to your house	0-10 scale with DK and REF options
Information in the kit about how the items would save energy	0-10 scale with DK and REF options
Information that your child brought home from school	0-10 scale with DK and REF options
Other information or advertisements from Duke Energy, including its website	0-10 scale with DK and REF options

[IF Q12e=11 AND Q19.5 NOT SELECTED]

Q41. Using a scale from 0 to 10, where 0 means “not at all influential” and 10 means “extremely influential” how influential were the following factors on your decision to install the lightbulbs from the kit? How influential was…

[*Interviewer: If respondent says “Not applicable - I didn’t get/use that,” then follow up with: “So would you say it was “not at all influential?” and probe to code*]

[MATRIX QUESTION: SCALE]

Elements	Responses
The fact that the items were free	0-10 scale with DK and REF

	options
The fact that the items were mailed to your house	0-10 scale with DK and REF options
Information in the kit about how the items would save energy	0-10 scale with DK and REF options
Information that your child brought home from school	0-10 scale with DK and REF options
Other information or advertisements from Duke Energy, including its website	0-10 scale with DK and REF options

[ASK IF MYHER=1]

Q42. I've got just a few final questions about other energy saving activities. First, Duke Energy asked us to ask a couple of questions about the Home Energy Reports it sends to some families. These reports provide detailed information on your home's energy usage and compare your home to similar homes of your neighbors.
During the school year, did you receive any Home Energy Reports from Duke Energy? [*If needed: This is extra information on energy use that is mailed separately from your energy bill*.]

1. Yes
2. No
98. Don't know
99. Refused

[ASK IF Q42=1]

Q43. How often do you read those Home Energy Reports?

1. Never
2. Sometimes
3. Always
98. Don't know
99. Refused

[ASK IF Q43=2-3]

Q44. The Home Energy Reports provide specific recommendations for how you can save energy in your home. Have you completed any of the energy saving recommendations from the Home Energy Reports? If so, which ones? [MULTIPLE RESPONSE] [*Don't read, probe if needed*]

1. Nothing
2. Purchased energy saving products for my home and received a Duke Energy rebate
3. Purchased energy saving products for my home but did not receive a Duke Energy rebate
4. Made energy saving modifications to my home [example if necessary: installed insulation or windows]
5. Adjusted how or when I use energy in my home
6. Looked for additional information on how to save energy
7. Other, please specify:

98. Don't know
99. Refused

[IF MYHER=1 AND Q44=2-7, READ] Now we'd like to ask you about any other actions you or your child may have taken to save energy in your home. So please focus on any other things you or your child has done other than what you just told me.

[IF MYHER=1 AND Q44=1, 98, OR 99, READ] Okay, so you said that you have not followed any of the energy savings recommendations from your Home Energy Report. I'd still like to ask you about any actions you or your child may have taken to save energy in your home since your child learned about energy conservation at school and signed up for your energy kit from Duke Energy.

[IF MYHER≠1, READ] I'd like to ask you about any actions you or your child may have taken to save energy in your home since your child learned about energy conservation at school and signed up for your energy kit from Duke Energy.

Q45. Since your child learned about energy conservation at school and signed up for your energy kit from Duke Energy, what **new** behaviors has your child adopted to help save energy in your home? Please only consider new **behaviors** that your child adopted since receiving the kit. [*IF NEEDED: like turning off the lights when room is unoccupied*] [MULTIPLE RESPONSE] [*Interviewer: Do not read list. After each response ask, "Anything else?"*]

1. Not applicable - no new behaviors
2. Turn off lights when not in a room
3. Turn off electronics when not using them
4. Take shorter showers
5. Other (specify:____________)
98. Don't know
99. Refused

Q46. Since receiving your energy kit from Duke Energy, what new behaviors have you adopted to help save energy in your home? Please only consider new behaviors that you have adopted since receiving the kit. [IF NEEDED: like turning off the lights when room is unoccupied]
[MULTIPLE RESPONSE] *[Interviewer: Do not read list. After each response ask, "Anything else?"*]

1. Not applicable - no new behaviors
2. Turn off lights when not in a room
3. Turn off furnace when not home
4. Turn off air conditioning when not home
5. Changed thermostat settings to use less energy
6. Used fans instead of air conditioning
7. Turn off electronics when we are not using them
8. Take shorter showers
9. Turned water heat thermostat down
10. Other (specify:____________)
98. Don't know
99. Refused

Q47. On a scale of 0 to 10, where 0 means “not at all influential” and 10 means “extremely influential,” how much influence did Duke Energy’s kit and materials on saving energy have on your decision to [LIST ALL RESPONSES FROM Q46].

0 – Not at all influential	1	2	3	4	5	6	7	8	9	10 – Extremely influential	98 DK	99 RF

Q48. Since receiving your energy kit from Duke Energy, have you purchased and installed any other **products** or made any improvements to your home to help save energy?

1. Yes
2. No
98. Don't know
99. Refused

[If Q48 = 1]

Q49. What **products** have you purchased and installed to help save energy in your home? [*Do not read list. After each response, ask, “Anything else?”*] [MULTIPLE RESPONSE]

1. Bought energy efficient appliances
2. Moved into an ENERGY STAR home [*VERIFY:“Is Duke Energy still your gas or electricity utility?” Yes/No*]
3. Bought efficient heating or cooling equipment
4. Bought efficient windows
5. Added insulation
6. Sealed air leaks [NOT DUCT SEALING – PROBE TO CODE]
7. Sealed ducts
8. Bought LEDs
9. Bought CFLs
10. Installed an energy efficient water heater
11. None – no other actions taken
96. Other, please specify: ______________________
98. Don't know
99. Refused

[ASK IF Q49<>11, 98, OR 99]

Q50. Did you get a rebate from Duke Energy for any of those products or services? If so, which ones?

[LOGIC] Item	Response
[IF Q49.1 IS SELECTED] 1. Buy energy efficient appliances	Yes No DK REF
[IF Q49.2 IS SELECTED] 2. Move into an ENERGY STAR home	Yes No DK REF
[IF Q49.3 IS SELECTED] 3. Buy efficient heating or cooling equipment	Yes No DK REF
[IF Q49.4 IS SELECTED] 4. Buy efficient windows	Yes No DK REF
[IF Q49.5 IS SELECTED] 5. Buy additional insulation	Yes No DK REF
[IF Q49.6 IS SELECTED] 6. Seal air leaks	Yes No DK REF
[IF Q49.7 IS SELECTED] 7. Seal ducts	Yes No DK REF
[IF Q49.8 IS SELECTED] 8. Buy LEDs	Yes No DK REF
[IF Q49.9 IS SELECTED] 9. Buy CFLs	Yes No DK REF
IF Q49.10 IS SELECTED] 10. Install an energy efficient water heater	Yes No DK REF

[IF Q49.96 IS SELECTED] [Q49 open ended response]	Yes No DK REF

[ASK IF ANY ITEM IN Q49 WAS SELECTED]

Q51. On a scale of 0 to 10, where 0 means "not at all influential" and 10 means "extremely influential", how much influence did the Duke Energy schools program have on your decision to…

[MATRIX QUESTION: SCALE]

[LOGIC] Item	Response
[IF Q49.1 IS SELECTED] 1. Buy energy efficient appliances	0-10 scale with DK and REF
[IF Q49.2 IS SELECTED] 2. Move into an ENERGY STAR home	0-10 scale with DK and REF
[IF Q49.3 IS SELECTED] 3. Buy efficient heating or cooling equipment	0-10 scale with DK and REF
[IF Q49.4 IS SELECTED] 4. Buy efficient windows	0-10 scale with DK and REF
[IF Q49.5 IS SELECTED] 5. Buy additional insulation	0-10 scale with DK and REF
[IF Q49.6 IS SELECTED] 6. Seal air leaks	0-10 scale with DK and REF
[IF Q49.7 IS SELECTED] 7. Seal ducts	0-10 scale with DK and REF
[IF Q49.8 IS SELECTED] 8. Buy LEDs	0-10 scale with DK and REF
[IF Q49.9 IS SELECTED] 9. Buy CFLs	0-10 scale with DK and REF
IF Q49.10 IS SELECTED] 10. Install an energy efficient water heater	0-10 scale with DK and REF
[IF Q49.96 IS SELECTED] [Q49 open ended response]	0-10 scale with DK and REF

[ASK IF Q49.1 IS SELECTED AND Q51.1 <> 0]

Q52. What kinds of appliance(s) did you buy?

[*Do not read list*] [MULTIPLE RESPONSE]

1. Refrigerator
2. Stand-alone Freezer
3. Dishwasher
4. Clothes washer
5. Clothes dryer
6. Oven
7. Microwave
96. Other, please specify: ____________
98. Don't know
99. Refused

[ASK IF Q52 = 1-96]

Q53. Was the [INSERT Q52 RESPONSE] an ENERGY STAR or high-efficiency model?

[SINGLE RESPONSE]

1. Yes
2. No
98. Don't know
99. Refused

[REPEAT THIS QUESTION FOR EACH ITEM MENTIONED IN Q52]

[ASK IF Q52 = 5]

Q54. Does the new clothes dryer use natural gas?

1. Yes - it uses natural gas
2. No – does not use natural gas
98. Don't know
99. Refused

[ASK IF Q49.3 IS SELECTED AND Q51.3 > 0]
Q55. What type of heating or cooling equipment did you buy?
[*Do not read list*] [MULTIPLE RESPONSE]

1. Central air conditioner
2. Window/room air conditioner unit
3. Wall air conditioner unit
4. Air source heat pump
5. Geothermal heat pump
6. Boiler
7. Furnace
8. Wifi-enabled thermostat
96. Other, please specify: _______________
98. Don't know
99. Refused

[ASK IF Q55= 6-7]
Q56. Does the new [INSERT Q55 RESPONSE] use natural gas?

1. Yes - it uses natural gas
2. No – does not use natural gas
98. Don't know
99. Refused

[ASK IF Q55= 1-7, 96]
Q57. Was the [INSERT Q55 RESPONSE] an ENERGY STAR or high-efficiency model?
[SINGLE RESPONSE]

1. Yes
2. No
98. Don't know
99. Refused

[REPEAT THIS QUESTION FOR EACH ITEM MENTIONED IN Q55, EXCLUDING wifi-enabled thermostat]

[ASK IF Q49.4 IS SELECTED AND Q51.4 > 0]
Q58. How many windows did you install?

1. [RECORD VERBATIM _______________]
98. Don't know
99. Refused

[ASK IF Q49.5 IS SELECTED AND Q51.5 > 0]
Q59. Did you add insulation to your attic, walls, or below the floor?

[*Do not read list*] [MULTIPLE RESPONSE]

1. Attic
2. Walls
3. Below the floor
98. Don't know
99. Refused

[ASK IF Q59<>98-99]
[PROGRAMMER: REPEAT Q60 FOR EACH ITEM MENTIONED IN Q59]
Q60. Approximately what proportion of the [ITEM MENTIONED IN Q59] space did you add insulation?

1. [RECORD VERBATIM AS % - INPUT MID-POINT IF RANGE IS OFFERED:] _______________ [IF NEEDED: *Your best estimate is fine*]
2. Don’t know
99. Refused

[ASK IF Q49.8 IS SELECTED AND Q51.8 > 0]
Q61. How many of LEDs did you install in your property?

1. [RECORD VERBATIM:] ___________ [IF NEEDED: *Your best estimate is fine*]
2. Don’t know
99. Refused

[ASK IF Q49.9 IS SELECTED AND Q51.9 > 0]
Q62. How many of CFLs did you install in your property?

1. [RECORD VERBATIM:] ____________ [IF NEEDED: *Your best estimate is fine*]
2. Don’t know
99. Refused

[ASK IF Q49.10 IS SELECTED AND Q51.10 > 0]
Q63. Does the new water heater use natural gas?

1. Yes - it uses natural gas
2. No – does not use natural gas
98. Don’t know
99. Refused

[ASK IF Q49.10 IS SELECTED AND Q51.10 > 0]
Q64. Which of the following water heaters did you purchase?

1. A traditional water heater with a large tank that holds the hot water
2. A tankless water heater that provides hot water on demand
3. A solar water heater
4. Other, please specify: _______________
98. Don’t know
99. Refused

[ASK IF Q49.10 IS SELECTED AND Q51.10 > 0]
Q65. Is the new water heater an ENERGY STAR model?
[SINGLE RESPONSE]

1. Yes
2. No

98. Don't know
99. Refused

Demographics

Lastly, we have some basic demographic questions for you. Please be assured that your responses are confidential and are for statistical purposes only.

Q66. Which of the following types of housing units would you say best describes your home? It is . . .?

1. Single-family detached house
2. Single-family attached home (such as a townhouse or condo)
3. Duplex, triplex or four-plex
4. Apartment or condominium with 5 units or more
5. Manufactured or mobile home
6. Other ______________
98. Don't know
99. Refused

Q67. How many square feet of living space are there in your residence, including bathrooms, foyers and hallways (exclude garages, unfinished basements, and unheated porches)?

1. Less than 500 square feet
2. 500 to under 1,000 square feet
3. 1,000 to under 1,500 square feet
4. 1,500 to under 2,000 square feet
5. 2,000 to under 2,500 square feet
6. 2,500 to under 3,000 square feet
7. Greater than 3,000 square feet
98. Don't know
99. Refused

Q68. Do you or members of your household own your home, or do you rent it?

1. Own / buying
2. Rent / lease
3. Occupy rent-free
98. Don't know
99. Refused

Q69. Including yourself, how many people currently live in your home year-round?

1. I live by myself
2. Two people
3. Three people
4. Four people
5. Five people
6. Six people
7. Seven people
8. Eight or more people
98. Don't know
99. Refused

Q70. What was your total annual household income for 2015, before taxes?

1. Under $20,000
2. 20 to under $30,000
3. 30 to under $40,000
4. 40 to under $50,000
5. 50 to under $60,000
6. 60 to under $75,000
7. 75 to under $100,000
8. 100 to under $150,000
9. 150 to under $200,000
10. $200,000 or more
98. Don't know
99. Prefer not to say

Q71. What is the highest level of education achieved among those living in your household?

1. Less than high school
2. Some high school
3. High school graduate or equivalent (such as GED)
4. Trade or technical school
5. Some college (including Associate degree)
6. College degree (Bachelor’s degree)
7. Some graduate school
8. Graduate degree, professional degree
9. Doctorate
98. Don't know
99. Prefer not to say

NAVIGANT

EM&V Report for the EnergyWise Home Program

Summer 2016

Presented for:
Duke Energy Progress

Prepared by:
Navigant Consulting, Inc.

DUKE ENERGY®

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EXECUTIVE SUMMARY

The EnergyWise Home (EnergyWise) demand response (DR) program offers Duke Energy Progress (DEP) residential customers the opportunity to earn credit on their electricity bill by allowing DEP to remotely control air conditioner (AC) units in the summer months during times of seasonal peak consumption.[1] This report covers evaluation, measurement, and verification (EM&V) activities for this program during the summer of 2016. At the time of the final program-wide summer event of 2016, over 144,000 households were participating in the AC curtailment program.

Navigant estimated impacts using logger data from a sample of 78 participating households.[2] Participating households were split randomly into two separate EM&V samples and curtailed in alternating order throughout the summer.[3] These groupings are referred to as EM&V Group 1 and EM&V Group 2 (or Group 1 and Group 2) throughout this report. In 2016, the total EnergyWise program population was subjected to two DR events. Each EM&V group was subject to five events, for a total of 10 events (including the two to which the entire population was subject).

At the program level, the DR impact for the first event was 128 MW and 149 MW for the second, or approximately 0.93 kW per participant and 1.06 kW per participant with functional switches,[4] respectively. These values, along with some other key event characteristics, are summarized in Table 1. Note that the temperatures listed in this table are the average temperatures across the territory in which the EnergyWise program operates and reflect the geographic distribution of participants.

The evaluation team also estimated energy impacts from the DR events. The first event on June 23 resulted in 236 MWh of energy savings, and the event on September 8 resulted in 271 MWh of energy savings. The total energy savings from the two events was 507 MWh, or about 3.5 kWh per participant with an operating switch.

[1] Some participants in the program also may earn credit by having their electric water heaters or space-heating equipment controlled. This report evaluates only the summer impacts of AC curtailment.

[2] Navigant deployed loggers to 86 homes as an intentional over-sample, and useful data was only recovered from 78 of these homes.

[3] EM&V participants in one group or the other were curtailed on the same days as the larger group of program participants and were further curtailed in a set of M&V events occurring on days where conditions were similar to those that might be observed on true event days.

[4] Altogether 2.7% of switches examined during the data collection phase were non-functional or disconnected. Aggregate estimated impacts account for this operability rate.

Table 1. Estimated Program Impacts

Event Date	Start Time	End Time	No. of Participants	Estimated Impact (MW)	Relative Precision (+/-)*	Participant Temperature (°F)	
						Mean	Max
2016-06-23	2:30 p.m.	5:30 p.m.	141,595	128	13.1%	90°	93°
2016-09-08	3:00 p.m.	6:00 p.m.	144,406	149	14.5%	92°	94°
Average			**143,001**	**138**	**13.8%**	**91°**	**94°**

*At 90% confidence level

Sources: Navigant logger data and analysis, National Oceanic and Atmospheric Administration (NOAA) weather data

Navigant selected the EM&V sample size to target a relative precision of ±10% at the 90% confidence level based on the precision of the PY2011 impacts and the assumption of a similar number of events each; EM&V participants in PY2011 were each exposed to 12 curtailment events.[5] As shown in Table 1, the achieved precision was 13.8% at the 90% confidence interval.

ES 1. Evaluation Methods

The evaluation consists of three distinct but interrelated components:

1. **Impact evaluation.** The estimation of historical summer 2016 curtailment impacts and the forecast of curtailment capability under different conditions going forward. The evaluation team estimated impacts using device-specific logger data and an econometric technique known as a fixed effects regression analysis, which is a common approach for evaluating DR program impacts. A significant change in the estimation approach for 2016, compared to previous years, was the use of two distinct M&V groups curtailed on different days (see below for more details).
2. **Device responsiveness assessment.** The estimation of the percentage of devices that did not respond or only partially responded to DEP's control signal. The evaluation team estimated the responsiveness rate by comparing logged demand immediately prior to the beginning of the curtailment period and logged demand shortly after the start of the curtailment period.
3. **Participant perception evaluation.** An analysis of three surveys of EnergyWise participants put into the field within 24 hours of two summer 2016 events and a placebo event in which responding participants were told an event had been called when in fact one had not. This analysis made use principally of cross-tabulations and summary statistics obtained from the summary data.

As noted in Table 1, the evaluation team introduced an innovation to the EM&V group design for PY2016. In previous years' evaluations, all EM&V participants were subject to the same EM&V events (a within-subject approach), which can make modeling a challenge. EM&V events tend to use up most of the hot summer days, rendering impacts sensitive to model specification and potentially subject to model specification bias.

For PY2016, EM&V participants were randomly selected into two groups (stratified by summer 2015 total energy consumption). When Group 1 was subject to an event, Group 2 was not, and vice versa. Group 1 and Group 2 were never curtailed at the same time. Despite some challenges associated with this

[5] EM&V Participants in PY2016 were each exposed to five events.

approach (detailed in Appendix C) this type of experimental design substantially reduces the possibility of model specification bias, and Navigant would recommend that it be used for all future evaluations of the EnergyWise program.

ES 2. Impacts

The principal EM&V findings regarding 2016 summer event demand impacts are as follows:

- **The average total program impact of the two program-wide events was 138 MW.** The average estimated impact per customer with functional switches[6] was 0.99 kW across both events. The relative precision of these estimates, at the 90% confidence level, is ±13.8%. The average temperature observed by M&V participants during these two program-wide 65% cycling strategy events was 90.6°F; the highest temperature observed by an M&V participant during these events was 93.5°F.
- **The estimated impact of the two 50% cycling events to which EM&V participants were subjected was 0.93 kW per customer.** Each EM&V group was subject to a single 50% cycling event. The 50% cycling event to which EM&V Group 2 was subject was the hottest of any of the curtailment events across both groups. This caused the estimated impacts for that event to be quite high relative to the estimated impacts from the 65% cycling events.
- **The estimated impact of the eight 65% cycling events to which EM&V participants were subjected was 0.96 kW per customer.** Average event impacts varied between 0.71 kW and 1.2 kW per customer, depending on the group curtailed and the temperature at the time of the event.

ES 3. Device Responsiveness

The evaluation team estimated the share of AC units that did not respond or only partially responded to DEP's control signal. This component of the evaluation made use of curtailment event and pre-curtailment event logger data from the 98 controlled devices installed in the 78 EM&V participant homes.

The most significant findings of this analysis are as follows:

- **On average, 12% of AC units that were in use both immediately prior to and immediately following an event appear to have not responded to the DEP control signal.** This response rate fluctuated between 6% and 20% for any given event. Of the non-responsive devices, approximately one-third were part of Group 1 and the remainder a part of Group 2.
- **There were 59 unique combinations of devices and events for which a device was non-responsive. In total, there were 30 unique devices (out of 98 for which logger data was available) that were non-responsive.** About half (17) of these devices were non-responsive for more than one event, with two devices being non-responsive to all five of the events to which they were subjected. Note that each group experienced five events for a total of 10 events throughout the summer across the two groups. The geographic distribution of non-responsive switches matches that of the participant population.

[6] Altogether 2.7% of switches examined during the data collection phase were non-functional or disconnected. Aggregate estimated impacts account for this operability rate.

ES 4. Participant Perceptions

The evaluation team conducted post-event phone surveys with 244 EnergyWise participants during this study. The surveys were conducted after two real DR events and two placebo events.[7] For the placebo events, respondents were told that an event had been called when in fact one had not.

Of the 244 total survey respondents, 210 were from the general program population; the remaining 34 were part of the M&V group that also received data loggers for the field study.

Of the 244 total survey respondents, 137 were surveyed after real DR events; the remaining 107 were surveyed after placebo events. [8]

The surveys achieved a relative precision of ±5% at the 90% confidence level for key quantitative outcomes.

Analysis of these participant perception surveys was intended to determine the degree to which participants were aware of curtailment events, and if aware, what changes participants noticed during the event, including perceptions of comfort.

The principal EM&V findings from the analysis of participant perception were as follows:

- **Participants were generally unaware of curtailment events when they happened.** Most (>90%) survey respondents indicated that they had not been aware that an event had occurred recently.
- **The program has little impact on the comfort of its participants.** Only eight respondents (out of 137 event participants) were both aware that an event had been called and were home during the period in question. For that sub-group, comfort levels reported during the event varied widely, ranging from a rating of a 0 to a 9 on the 0-10 comfort scale. Most survey respondents indicated that they were “very comfortable” during the event.
- **Participants were generally satisfied with the EnergyWise program.** Over half of the respondents indicated that they were “very satisfied,” while only 3% of all survey respondents (8 people) indicated that they were “dissatisfied” with the program. Satisfaction with the program did not differ significantly between respondents who responded to actual events versus those who responded to placebo events.

ES 5. Recommendations

The evaluation team identified the following actions to maintain and improve program performance:

[7] On August 11, 2016, Navigant conducted a survey with both M&V groups. One group had received a real DR event on that day, and the other had not received an event and was considered a placebo. Therefore, Navigant was able to conduct both a real and placebo survey on that day.

[8] Of the 107 participants who received placebo surveys, 90 were from the general program population and 17 were from the EM&V groups.

Recommendation Topic	Recommended Actions
Technical Issues	**Consider (as in PY2011) a thorough investigation into the cause(s) of device non-responsiveness.** The evaluation found that 12% of AC devices did not respond to DEP's control signal for any given event. This is a modest increase from 2013 where, on average, 9% of devices were non-responsive, and only a small change from 2011 when 11% of devices were found to be non-responsive. In PY2011, DEP deployed staff to investigate those devices estimated by the evaluation team to be non-responsive to at least one event, and the investigation determined that inconsistent paging from DEP's commercial provider was reducing the effectiveness of the program.
Evaluation Issues	**Continue to employ the two-group experimental design for future logger analyses.** This approach delivers more accurate and precise results than curtailing all participants at once and is increasingly common for DR program evaluations.
Participant Recruitment and Retention	**Continue to execute curtailment events without notifying participants.** The majority of participants indicated that they were unaware when an event has taken place, and few experienced significant discomfort. Customers did not indicate a desire for notification, and notification would unnecessarily draw attention to the occurrence of events.

1. INTRODUCTION

The EnergyWise Home (EnergyWise) demand response (DR) program offers Duke Energy Progress (DEP) residential customers the opportunity to earn credit on their electricity bill by allowing DEP to remotely control air conditioner (AC) units in the summer months during times of seasonal peak consumption. This report covers evaluation, measurement, and verification (EM&V) activities for this program during the summer of 2016. At the time of the final program-wide summer event of 2016, over 144,000 households were participating in the AC curtailment program.

Navigant estimated impacts using logger data from a sample of 78 participating households. Participating households were split randomly into two separate EM&V samples and curtailed in alternating order throughout the summer. These groupings are referred to as EM&V Group 1 and EM&V Group 2 (or Group 1 and Group 2) throughout this report. In 2016, the total EnergyWise program population was subjected to two DR events. Each EM&V group was subject to five events, for a total of 10 events (including the two to which the entire population was subject).

EM&V is a term adopted by DEP and refers generally to the assessment and quantification of the energy and peak demand impacts of an energy efficiency or DR program. For DR, estimating reductions in peak demand is the primary objective, as energy impacts are generally negligible. EM&V also encompasses an evaluation of program processes and customer feedback, typically conducted through participant surveys.

1.1 Objectives of the Evaluation

This EM&V report is intended to support program improvements and to verify program impacts as per the requirements established by the North Carolina Utilities Commission and the Public Service Commission of South Carolina. Major objectives of the evaluation included the following:

- Estimate the impact of direct load control on residential demand in the summer
- Identify and document participant feedback on their experience with curtailment events and the EnergyWise program as a whole
- Identify areas for improvement to the program and recommend related modifications that can increase participation, load reductions, and cost-effectiveness

Navigant selected the EM&V impact sample size to target a relative precision of ±10% at the 90% confidence level based on the precision of the PY2011 impacts and the assumption of a similar number of events each; EM&V participants in PY2011 were each exposed to 12 curtailment events.[9]

Navigant selected the process survey sample to target a relative precision of ±10% at the 90% confidence level.

[9] EM&V Participants in PY2016 were each exposed to five events.

1.2 Program Overview

The EnergyWise program was developed in response to DEP's determination that a curtailable load program would be a valuable resource for the company and would provide an opportunity to engage directly with customers to help reduce costly seasonal peak demand. The program seeks to attract DR resources by incenting residential customers to allow DEP to remotely control one of the most important drivers of summer peak demand typically found in the home: central AC.

The program offers an annual bill credit of up to $25 to customers that allow DEP to control their central AC unit.

Eligibility. To be eligible to participate in the EnergyWise program, a household must meet the following criteria:

- The participant's AC unit must be a central unit with a ducted system. Wall, window, and ductless units are not eligible for participation.
- All central AC units in the home must be controlled by DEP as part of the EnergyWise program.
- Residential electricity service must be in the name of the participant.

Incentives. Each participant receives as an incentive a one-time bill credit of $25 upon joining the program and then an additional $25 bill credit annually per device controlled to encourage continued participation.

Marketing. DEP is responsible for all marketing of the EnergyWise program. Leads for participation are generated through a mix of direct mailings, bill inserts, outbound calling, and canvassing door to door.

1.3 Reported Program Participation

This subsection reports the overall program participation for the EnergyWise program. The sample sizes for the EM&V analysis may be found in Table 3.

Two DR events were called in the summer of 2016 for all participants in the EnergyWise program, and as of the final event, there were over 144,000 customers with a total of approximately 165,000 central AC units participating. Both program-wide events deployed a 65% cycling strategy.

The date, time, and length of each event and the number of participants and AC units at the time of each event are illustrated in Table 2.

Table 2. Overall Summer 2016 Program Participation by Event

Date	Start Time	End Time	Length of Event (Hours)	No. of Participants	Number of AC Units Controlled[10]	Cycling Strategy
2016-06-23	2:30 p.m.	5:30 p.m.	3	141,595	180,392	65%
2016-09-08	3:00 p.m.	6:00 p.m.	3	144,406	183,973	65%

Source: DEP DR control event tracking report

As noted previously, the EM&V group was divided into two, separately controlled groups: Group 1 and Group 2. Group 1 and Group 2 experienced five events each. Group 1 was subject to the first program-wide event (June 23) as well as four additional EM&V events. Group 2 was subject to the second program-wide event (September 8) as well as four additional EM&V events. Group 1 and Group 2 were never curtailed at the same time.

[10] Based on an average of 1.274 devices per home, per Duke Energy program tracking data.

2. EVALUATION METHODS

This section describes the methods used in estimating load impacts, assessing load control device responsiveness, and evaluating customer perceptions:

1. **Impact evaluation.** The estimation of historical summer 2016 curtailment impacts and the forecast of curtailment capability under different conditions going forward. The evaluation team estimated impacts using device-specific logger data and an econometric technique known as a fixed effects regression analysis, which is a common approach for evaluating DR program impacts. A significant change in the estimation approach for 2016, compared to previous years, was the use of two distinct M&V groups curtailed on different days.
2. **Device responsiveness assessment.** The estimation of the percentage of devices that did not respond or only partially responded to DEP's control signal. The evaluation team estimated the responsiveness rate by comparing logged demand immediately prior to the beginning of the curtailment period and logged demand shortly after the start of the curtailment period.
3. **Participant perception evaluation.** An analysis of three surveys of EnergyWise participants put into the field within 24 hours of two summer 2016 events and a placebo event in which responding participants were told an event had been called when in fact one had not. This analysis made use principally of cross-tabulations and summary statistics obtained from the summary data.

2.1 Impact Evaluation

Navigant estimated demand reduction, snapback, and event-level energy impacts using a fixed effects regression analysis applied to participant interval data, weather data, and data flags indicating the intervals in which events took place. The remainder of this subsection details the data and the econometric method used in the analysis. Appendix C provides further discussion of the regression models used.

2.1.1 EM&V Participants and Events

The estimated impacts presented in this evaluation report are based on a sample of participants from the overall group that agreed to have data loggers installed so that each curtailed device's consumption could be monitored in isolation of the rest of the household's demand. This sample of participants was also subjected to more events than the overall sample to provide the evaluation team with more data points from which impacts could be estimated.

Altogether, Navigant obtained useable logger data from 78 AC participant households[11] equipped with data loggers intended to collect short-interval demand data from the 98 AC units installed in those homes.

For this year's evaluation, Navigant split the EM&V participants into two groups, which differs from prior logger data evaluations of the EnergyWise program in PY2013 and PY2011. When one group is subject to curtailment, the other is not. Participants were assigned randomly by summer usage strata to one

[11] Navigant deployed loggers to 86 homes, but useful data was recovered from only 78 of these homes.

group or the other by the evaluation team. The purpose of this approach (discussed in greater detail below) was to improve estimation accuracy.

A key concern of DR evaluations when all participants are subject to the same events is that there remain some non-event days that sufficiently resemble (in terms of temperature and other factors) event days, which allows for the estimation of a reasonable baseline. Subjecting only half of all EM&V participants to each event ensures the existence in the sample of event-like, non-event days, and provides additional information (from the non-curtailed devices) that helps estimate the counterfactual event demand. These factors improve model accuracy by substantially reducing the likelihood of model specification bias compared to a purely within-subject approach (as used in prior years).

EM&V participants were subjected to a total of 10 events, five for each of the groups. These events include the two to which the balance of the program population was subject; Group 1 was curtailed for the first program-wide event (June 23), and Group 2 was curtailed for the second (and final) program-wide event (September 8). Two of the 10 EM&V events deployed a 50% cycling strategy and eight of the 10 events deployed a 65% cycling strategy. All events lasted for 3 hours.

The date, time, and length of each event the EM&V group controlled as well as the number of EM&V sample participants and AC units for which the evaluation team has reliable interval data at that time of each event is shown in Table 3.

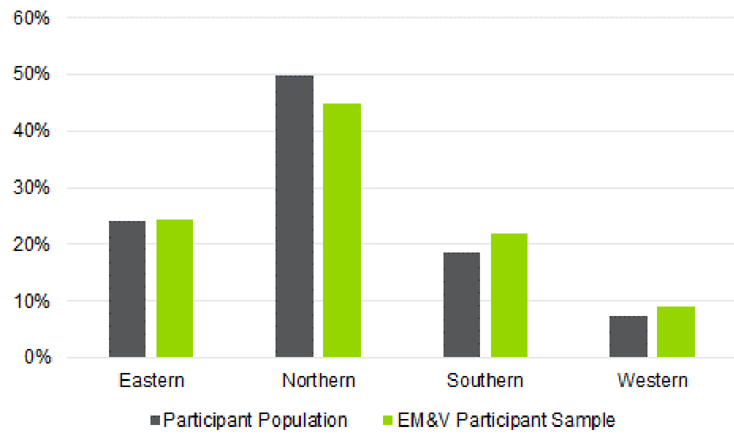
Table 3. AC EM&V Sample Participation

Date	Start Time	End Time	Length of Event (Hours)	No. of Participants	Number of AC Units	Cycling Strategy	Group
2016-06-23	2:30 p.m.	5:30 p.m.	3	40	50	65%	1
2016-07-14	3:00 p.m.	6:00 p.m.	3	38	49	65%	2
2016-07-15	3:00 p.m.	6:00 p.m.	3	40	50	65%	1
2016-07-26	3:00 p.m.	6:00 p.m.	3	38	49	50%	2
2016-07-27	3:00 p.m.	6:00 p.m.	3	40	50	50%	1
2016-08-11	3:00 p.m.	6:00 p.m.	3	38	49	65%	2
2016-08-26	3:00 p.m.	6:00 p.m.	3	40	50	65%	1
2016-08-31	3:00 p.m.	6:00 p.m.	3	38	48	65%	2
2016-09-07	3:00 p.m.	6:00 p.m.	3	40	50	65%	1
2016-09-08	3:00 p.m.	6:00 p.m.	3	38	48	65%	2

Source: Navigant logger data

Navigant designed the EM&V sample to be representative of the population by geography and by the number of devices controlled per residence. Figure 1 shows the relative distribution across the four EnergyWise geographic regions of all program participants (gray bars) and EM&V participants (green bars).

Figure 1. Relative Distribution of Program and EM&V Participants



Source: Duke Energy program tracking data

Within the overall program population, there were 1.27 controlled AC units per residence. Within the EM&V participant sample there were 1.26 controlled AC units per residence.

2.1.2 Data Used for Impact Evaluation

The impact evaluation made use of three sources of data:

- **Logger data.** Five-minute interval logger data from loggers connected to each participating AC unit in the EM&V participants' home. This data was aggregated to quarter-hourly frequency for the analysis.
- **Event scheduling data.** The schedule of events deployed to the program population and the EM&V groups.
- **NOAA weather data.** Outdoor temperature data from seven NOAA weather stations in the DEP service territory are shown in Table 4. Weather stations were assigned to individual participants based on proximity to the participant's ZIP code.

Table 4. Weather Stations (Airports)

Station Name	Air Force Datsav3 Station (USAF No.)	Weather Bureau Air Force Navy (WBAN No.)
Wilmington International	723013	13748
Raleigh-Durham International	723060	13722
Craven County Regional	723095	93719
North Carolina Reserve	998006	99999
Asheville 8 SSW	999999	53877

Source: NOAA

2.1.3 Data Collection

In April 2016, the evaluation team installed loggers onto 110 outdoor AC compressors for 86 pre-recruited homes. When possible, the field technicians enclosed the data loggers inside the AC unit's electronics access panel. If there was no room inside the panel, weatherproof loggers were mounted to the outside of the AC on the most sheltered side of the unit. The data loggers were set to log at 5-minute intervals from May 1 through September 30, a total of 5 months.

Data logger installers visited 96 residences during the deployment of the data loggers. Of these:

- There were seven sites at which data logger installation was not possible due to the customer not being at home, poor access, no accessible disconnecting means, impending AC replacement planned, etc.
- There were three sites (each with a single EnergyWise switch) at which the switch that controls equipment cycling was either non-functional or disconnected. Based on the 110 switches logged and the discovery of the three non-functioning switches (that were not logged), this delivers an operability rate of 97.3%.[12] This value has been applied to aggregate program-level savings values included in this report.

Navigant selected the EM&V sample size to target a relative precision of ±10% at the 90% confidence level based on the precision of the PY2011 impacts and the assumption of a similar number of events each; EM&V participants in PY2011 were each exposed to 12 curtailment events.[13]

2.1.4 Data Quality Control

Upon retrieval, the evaluation team downloaded and batch-processed the data loggers. The quality control (QC) process involved three steps: visual inspection of each logger file, visual inspection of field photographs and notes, and discarding of bad data. First, the team plotted all logger interval data for inspection. If data appeared suspect, the team reviewed the field photographs and notes to determine the cause for the bad data. In all cases where the team identified a problem with the data, it was discarded.

2.1.5 Method for Estimating Impacts

The evaluation team used an econometric technique known as a fixed effects regression to estimate the impacts of the AC devices curtailed. Fixed effects regression is a form of linear regression commonly used to estimate the impact of DR programs. The technique is applied to a set of observations of some variable of interest (in this case electricity demand) from several different individuals (i.e., program participants)—also known as longitudinal or panel data—over time.

Fixed effects regression assigns each individual participant his or her own dummy variable. In this way, the evaluation team may control for each individual's time-invariant characteristics such as the size of a participant's home, its orientation, etc. The fixed effects regressions were applied to quarter-hourly data,

[12] The switches at the seven sites where installation was not possible are not included in this calculation because in these cases it was impossible to observe the functionality of the switch.

[13] EM&V Participants in PY2016 were each exposed to five events.

obtained by taking the average of the three 5-minute interval observations within each 15-minute period for each logged device.

For the analysis, the evaluation team estimated separate regression equations for the 50% cycling strategy and the 65% cycling strategy to obtain the average per-household impacts presented below. The team estimated energy impacts using a third regression model that applied fixed effects and treatment dummies to participant energy use between 2 p.m. and 10 p.m. to capture the net energy impact of both DR and snapback.

Formal model specifications with additional input variable detail may be found in Appendix C of this report.

2.2 Method for Estimating Device Responsiveness to Curtailment Signal

As part of its evaluation of the EnergyWise program, the evaluation team estimated the share of AC units that failed to respond to DEP's control signal. The team estimated the percentage of devices that did not respond to the control signal for each event by comparing each AC unit's average level of demand in the hour immediately prior to each event with its average level of demand in the hour that begins 30 minutes into each event.

The evaluation team determined a device failed to curtail if its average demand in the hour beginning 30 minutes after the start of the event was higher than the same device's average demand in the hour preceding the event, and if the AC unit had been active and operating both before and after the event.

2.3 Participant Perceptions Evaluation Method

To evaluate participants' perceptions of the program, including whether participants noticed if an event took place and the impact on their comfort, the evaluation team conducted three rounds of telephone surveys during the summer season, which resulted in a total of 244 completed surveys:

1. August 11, 2016:
    - Conducted a post-event survey on EM&V Group 2 after a real DR event, resulting in 17 completed responses.
    - Conducted a placebo survey on EM&V Group 1, which did not receive a real event. This effort resulted in 17 completed survey responses.
2. September 8, 2016:
    - Conducted a post-event survey on the general program population after a program-wide DR event. The effort resulted in 120 completed survey responses.
3. September 14, 2016:
    - Conducted a placebo survey on the general program population after no event was called. This effort resulted in 90 completed survey responses.

Table 5 provides a summary of the completed surveys by date.

Table 5. Summary of Telephone Survey Completes

	August 11, 2016[a]	September 8, 2016	September 14, 2016
Post-event survey completes	17	120	
Placebo survey completes	17		90
Participant max temperature during surveys	91°F	94°F	

a. For August 11, the evaluation team conducted a post-event survey with Group 2, which received a real event, and a placebo event with Group 1, which did not receive an event.

A more comprehensive disposition of the survey attempts is shown in Table 6.

Table 6. Complete Disposition Report of Telephone Surveys

Survey Disposition	Group 1 - Event Survey August 11	Group 2 - Placebo Survey August 11	Population Event Survey September 8	Population Placebo Survey September 14	Total
Answering machine	14	7	769	494	**1,284**
Blocked number			5	5	**10**
Business/government			7	8	**15**
Busy			11	11	**22**
Call back	2	2	25	34	**63**
Completed survey	**17**	**17**	**120**	**90**	**244**
Disconnect	1		131	94	**226**
Disqualified		1	31	15	**47**
Language barrier		1	4	1	**6**
No answer	2	5	321	247	**575**
Opted out			8	4	**12**
Refused to talk	5	5	172	113	**295**
Saved – planned callback		3	20	15	**38**
Wrong number			11	13	**24**
Total	**41**	**41**	**1,635**	**1,144**	

2.3.1 Survey Sampling and Demographics

Navigant intended for the telephone survey sampling to be representative of broader program participation in terms of customer geographic location and segmentation as defined by DEP. The evaluation team started with the complete EnergyWise program tracking database. Participants who received data loggers were assigned to the M&V group for survey purposes. The remaining participants were randomly assigned to the Event or Placebo groups for survey purposes.

Table 7 and Table 8 show a comparison of the demographic characteristics between participants from the survey sample and the overall program population. These figures show that the distribution of geographic region and segmentation characteristics of the survey respondents was similar to the program population.

Table 7. Geographic Distribution of Survey Sample and Program Population

Region	Survey Sample			Program Population		
	Manufactured Homes	Multifamily	Single Family	Manufactured Homes	Multifamily	Single Family
Eastern	0%	1%	22%	0%	2%	22%
Northern	0%	3%	45%	0%	4%	46%
Southern	0%	0%	21%	0%	1%	17%
Western	0%	1%	7%	0%	1%	7%

Table 8. Customer Segment Distribution of Survey Sample and Program Population

Customer Sample Segment (from EnergyWise Tracking Database)	Count of Respondents	Representation in Survey Sample	Representation in Program Population
Wealthier Green	100	41%	44%
Plugged-in Green	30	12%	12%
Practical Saver	42	17%	12%
Low Engagement	60	25%	24%
Selfie Generation	12	5%	8%
Grand Total	**244**	**100%**	**100%**

Sample Confidence and Precision

The evaluation team designed the survey sample to target a relative precision of ±10% at the 90% confidence level. Ultimately, the survey achieved a relative precision ±5% at the 90% confidence level for key quantitative outcomes.

2.3.2 Survey Findings

A detailed presentation of survey findings can be found in Appendix B, and the final version of the survey guide can be found in Appendix D.

The principal EM&V findings from the analysis of participant perception were as follows:

- **Participants were generally unaware of curtailment events when they happened.** Most (>90%) survey respondents indicated that they had not been aware that an event had occurred recently.
- **The program has little impact on the comfort of its participants.** Only eight respondents (out of 137 event participants) were both aware that an event had been called and were home during the period in question. For that sub-group, comfort levels reported during the event varied

widely, ranging from a rating of a 0 to a 9 on the 0-10 comfort scale. Most survey respondents indicated that they were "very comfortable" during the event.

- **Participants were generally satisfied with the EnergyWise program.** Over half of the respondents indicated that they were "very satisfied," while only 3% of all survey respondents (8 people) indicated that they were "dissatisfied" with the program. Satisfaction with the program did not differ significantly between respondents who responded to actual events versus those respondents who responded to placebo events.

3. IMPACT FINDINGS

The discussion of program impacts on summer demand is divided into two sub-sections: 1) the first presents the estimated impacts of the actual curtailment events in the summer of 2016, and 2) the second presents the estimated summer capability of DEP's EnergyWise program.[14]

The evaluation team's principal findings regarding summer event demand impacts are as follows:[15]

- **The average total program impact of the two program-wide events was 138 MW.** The average estimated impact per customer with functional switches was 0.99 kW across both events. The relative precision of these estimates, at the 90% confidence level, is ±13.8%. The average temperature observed by M&V participants during these two program-wide 65% cycling strategy events was 90.6°F; the highest temperature observed by an M&V participant during these events was **93.5**°F.
- **The estimated impact of the two 50% cycling events to which EM&V participants were subjected was 0.93 kW per customer.** Each EM&V group was subject to a single 50% cycling event. The 50% cycling event to which EM&V Group 2 was subject was the hottest of any of the curtailment events across both groups. This caused the estimated impacts for that event to be quite high relative to the estimated impacts from the 65% cycling events.
- **The estimated impact of the eight 65% cycling events to which EM&V participants were subjected was 0.96 kW per customer.** Average event impacts varied between 0.71 kW and 1.2 kW per customer, depending on the group curtailed and the temperature at the time of the event.

Evaluations of demand-side management programs typically also estimate a net-to-gross (NTG) ratio based on the evaluated percentage of demand reductions that may be ascribed either to free ridership (which increases the NTG) or to program spillover (which reduces it). Free ridership is typically defined as the percentage of demand reductions that would have occurred anyway, absent the presence of the program. Spillover is typically defined as incremental demand reductions undertaken by a program's participants not directly incented or promoted by the program administrator. In this case, since demand reductions are estimated in contrast to an implied estimated baseline[16] that captures expected participant behavior absent an event, the evaluation team can confidently state that the free ridership is 0: absent the EnergyWise program, none of the observed demand reductions would have taken place. It is possible that there may have been some spillover resulting from the program (from participants becoming more aware of their sites' consumption profiles, for example); however, it is likely impossible to estimate such an effect in a sufficiently robust manner and the assessment of such impacts is beyond the scope of this report.

Since spillover cannot be robustly estimated and because free ridership must, by program design, be considered to be 0, the evaluation team considers the EnergyWise program to have an NTG ratio of 1.

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[14] The estimated or forecast capability refers to the evaluation team's prediction of the impact DEP could expect to observe if an event were called at some set of given temperatures over some set of given hours. In this second sub-section, a small sample of all the possible capability scenarios is discussed. Additionally, the evaluation team has provided all of the parameter estimates required for DEP or other interested parties to generate their own capability scenarios in Appendix C.

[15] Note that these impacts are on average per household across all EM&V households, including those in which the AC unit was estimated not to have responded to the curtailment signal.

16 That is, the average level of behavior implied by the estimated parameter values of the regressions used.

The remainder of this section is divided into two principal sub-sections:

1. **Historical PY2016 estimated load impacts.** The estimated average per-household impacts that the program has generated for actual days on which events were called. This section also discusses snapback and aggregate program-level impacts and provides event day EM&V participant load profiles comparing actual and counterfactual (i.e., baseline) demand.
2. **Forecast DR capability impacts**. The estimated average per household (and aggregate program) impact under a variety of different temperatures. In some EM&V reports these are referred to as ex ante impacts. Capability forecast by temperature is provided at both the individual participant level and in aggregate at the program level.

3.1 Historical Estimated Impacts

Historical demand impacts are the impacts estimated by the evaluation team for the actual events that were called in the summer of 2016. This section is divided into four sub-sections:

- **Program-Level Impacts.** This subsection summarizes the estimated program-level impacts of the two events called for the entire program population.
- **EM&V Sample Impacts.** This subsection summarizes the average event impacts by event, cycling strategy, and EM&V group.
- **Hourly DR and Snapback Impacts.** This subsection provides a summary of the hour-by-hour estimated impacts for the two cycling strategies deployed to the M&V groups, including both DR and snapback impacts.
- **Load Profile Comparisons.** This subsection provides an illustration of M&V participant load profiles during events, showing both actual AC demand and the counterfactual (i.e., the estimated baseline).

3.1.1 Program-Level Impacts

The full population of EnergyWise participants was subject to only two events in the summer of 2016: one in late June and the other in early September. The estimated program-total average event demand impact (in megawatts) for both events[17] is provided in Table 9. Also provided in this table is the average temperature to which EM&V participants (who are geographically representative of the EnergyWise population) were exposed, and the highest temperature to which individual EM&V participants were exposed.

Both program-wide events called in the summer of 2016 were 65% cycling events.

[17] The first event (for which Group 2 was not curtailed) was the only event that began at 2:30 p.m. This means that there are no regression-estimated parameters for Group 2 that can be applied to the moving average of cooling degree hours to deliver an estimated impact. To accommodate this, Navigant assumed that the relationship between impacts and the exponential moving average between 2:30 p.m. and 3:00 p.m. is, for Group 2, the same as the average estimated relationship between 3:00 p.m. and 4:00 p.m. for this group.

Table 9. Program-Level Impacts and Precision

Event Date	Start Time	End Time	No. of Participants	Estimated Impact (MW)	Relative Precision (+/-)*	Participant Temperature (°F)	
						Mean	Max
2016-06-23	2:30 p.m.	5:30 p.m.	141,595	131	13.1%	90°	93°
2016-09-08	3:00 p.m.	6:00 p.m.	144,406	153	14.5%	92°	94°

**At 90% confidence level*

Sources: Navigant logger data and analysis, NOAA weather data

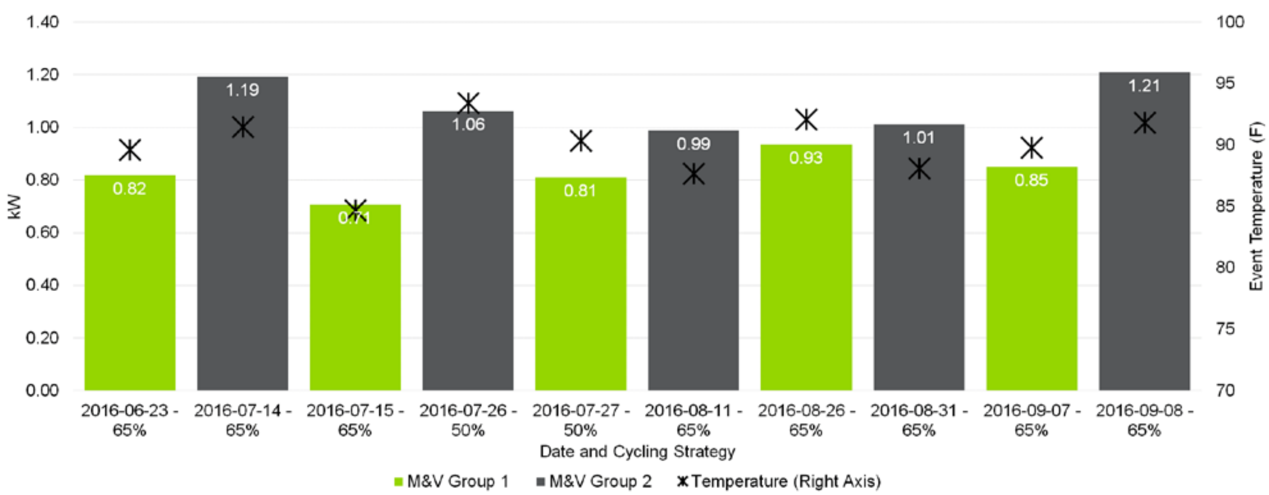
Program-wide impacts were estimated by applying regression-estimated parameters[18] to the average weather observed by EM&V participants during the program-wide events and multiplying these average per-participant impacts by the total program population.

More than 140,000 DEP customers participated in the two program-wide EnergyWise events in the summer of 2016. This represents an increase in the program population of approximately 14,000 households since the summer of 2015, or approximately 50,000 households since the summer of 2013, the last time Navigant deployed data loggers to evaluate the program.

3.1.2 EM&V Sample Impacts

DR impacts by event are illustrated in Figure 2 and Table 10. The average impacts discussed here are the average per-household impacts across all participating EM&V households by group. This average includes all participating devices, including those suspected by the evaluation team of either failing to curtail or of being connected to unused AC units (for analysis of device response rates, see Appendix A).

Figure 2. Average per Household Event DR Impact by Event



Sources: Navigant logger data and analysis, NOAA weather data

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[18] Despite only Group 1 being curtailed for the first program-wide event, estimated coefficients for both Group 1 and Group 2 were used to develop the program-wide savings estimate.

Table 10 provides the average impact estimated for each of the M&V events. In addition to the estimated DR impact, this table provides the relative precision of the estimate (derived from cluster-robust standard errors), the average temperature observed by the relevant group of participants during the event, and the highest temperature observed by some participants in the EM&V group.

Note that these impacts are substantially less precise than those associated with the program-wide impacts (Table 9). This is because the impacts in Table 9 reflect the precision associated with all 78 of the EM&V participants (i.e., both Group 1 and Group 2), whereas the impacts in Table 10 reflect the precision associated only with the specified EM&V group. As noted above, there were 40 participants in EM&V Group 1 and 38 in EM&V Group 2.

Table 10. Average DR Impact per Household by Event

Event	M&V Group	Cyc. Strat.	DR Impact (kW)	Relative Precision (+/-)*	Participant Temperature (°F)	
					Mean	Max
2016-06-23	1	65%	0.82	21%	90°	93°
2016-07-14	2	65%	1.19	19%	91°	96°
2016-07-15	1	65%	0.71	23%	85°	94°
2016-07-26	2	50%	1.06	25%	93°	96°
2016-07-27	1	50%	0.81	35%	90°	98°
2016-08-11	2	65%	0.99	19%	88°	91°
2016-08-26	1	65%	0.93	23%	92°	97°
2016-08-31	2	65%	1.01	19%	88°	94°
2016-09-07	1	65%	0.85	23%	90°	95°
2016-09-08	2	65%	1.21	19%	92°	94°

*90% confidence level

Source: Navigant logger data and analysis

Table 11 shows the average DR impact by EM&V group and cycling strategy, along with the other summary statistics provided for the impact-level results.

Table 11. Average DR Impact per Household by Cycling Strategy and EM&V Group

M&V Group	Cyc. Strat.	DR Impact (kW)	Relative Precision (+/-)*	Participant Temperature (°F)	
				Mean	Max
1	50%	0.81	35%	90°	98°
2	50%	1.06	25%	93°	96°
1	65%	0.83	22%	89°	97°
2	65%	1.10	19%	90°	96°

*90% confidence level

Source: Navigant logger data and analysis

Table 12 shows the average DR impact across both EM&V groups by cycling strategy.

Table 12. Average DR Impact per Household by Cycling Strategy

Cyc. Strat.	DR Impact (kW)	Relative Precision (+/-)*	Participant Temperature (°F)	
			Mean	Max
50%	0.93	21%	92°	98°
65%	0.96	14%	89°	97°

*90% confidence level

Source: Navigant logger data and analysis

Some features of the tables above stand out and merit further discussion. First, the average DR impacts of Group 2 are consistently and materially higher than Group 1 at similar temperatures. The possible reasons for this difference, and the implications are discussed in greater detail in Appendix C, which also presents the technical details of impact estimation.

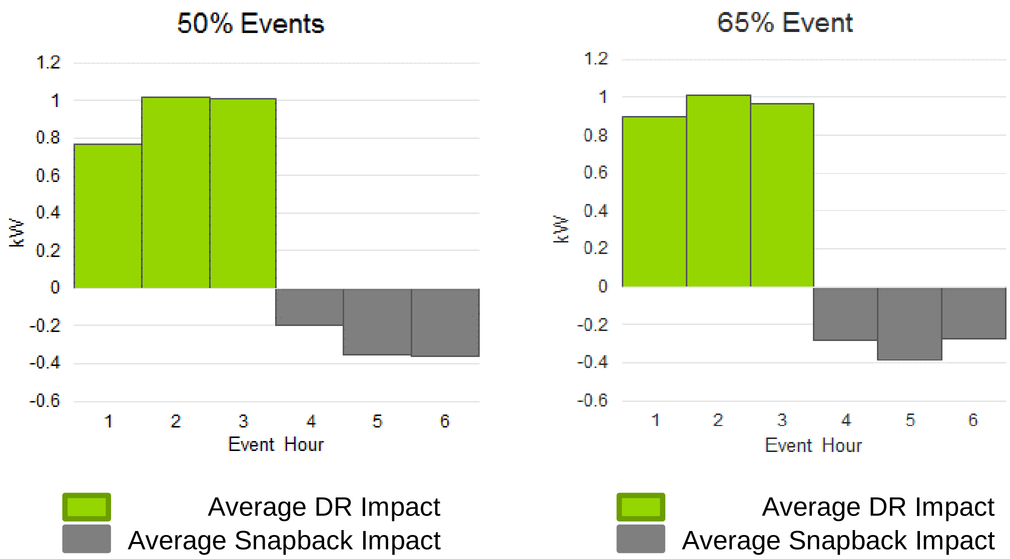
Second, the 50% cycling events have high relative impact as compared to the 65% cycling events. The difference between the average DR impact of 50% and 65% cycling M&V events is only 0.03 kW, on average. This is likely principally due to a higher average temperature of 92°F during the 50% cycling events compared with an average outdoor temperature of 89°F during the 65% cycling events.

3.1.3 Hourly DR and Snapback Impacts

Hourly average program impacts are illustrated graphically for the 50% and 65% cycling strategy events in Figure 3. For both cycling strategies, snapback is higher in the period beginning 1 hour and 15 minutes after the end of the event than it is in the period beginning 15 minutes after the end of the event.

This is may be due to the way groups of participants are ramped down from events by DEP.

Figure 3. Average Demand Reduction and Snapback Impact Across Events



Source: Navigant logger data and analysis

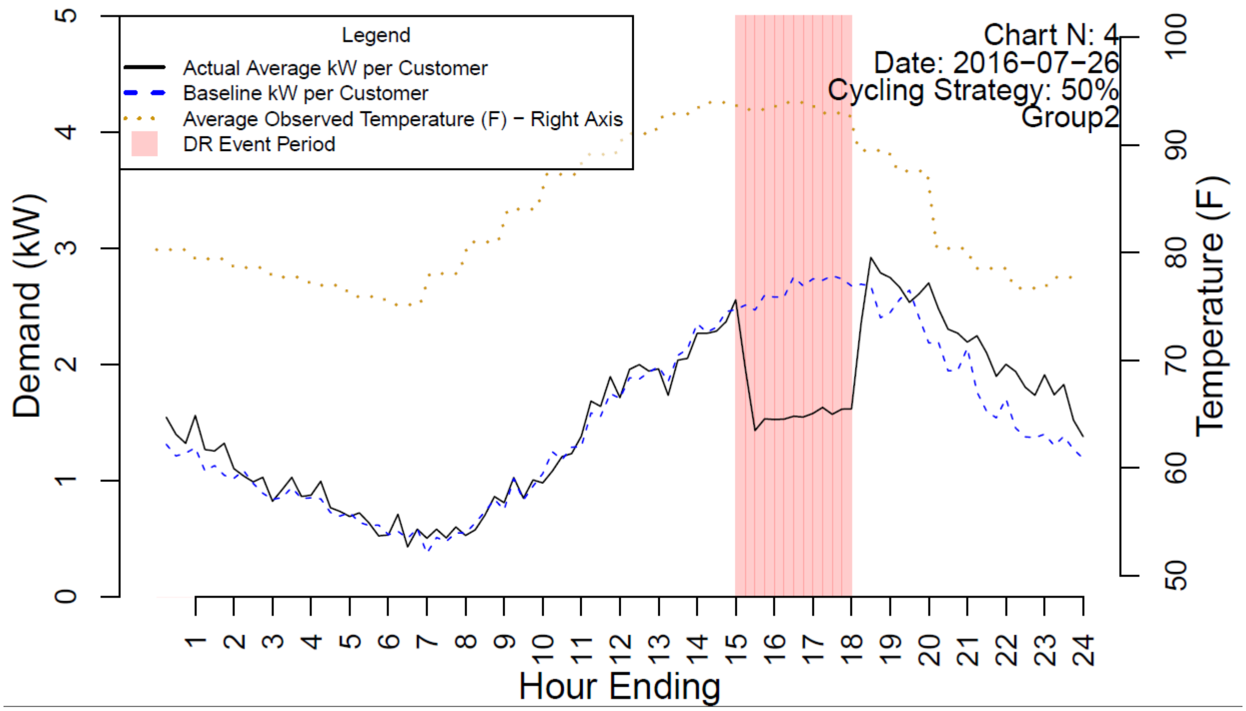
In comparing snapback estimates across the two cycling strategies it should also be noted that each EM&V group was subject to only a single 50% cycling strategy event, but four 65% cycling strategy events.

3.1.4 Load Profile Comparisons

It is Navigant's standard practice in DR evaluations to provide one or more plots of average actual and counterfactual (i.e., model-predicted baseline) participant demand during DR events. These plots are particularly useful in providing a more intuitive understanding of the processes driving the results presented above.

Two examples of such plots are provided below. The first, Figure 4, shows demand during the July 26, 2016 50% cycling event applied only to Group 2. During this event, participants were exposed to the hottest average temperature of all events—93°F. The solid black line indicates what the actual average level of household AC load was on that day. The dashed blue line is what the model has predicted demand would have been had no event been called. Finally, the dotted yellow line shows the average outdoor temperature (right axis).

Figure 4. Reasonableness Check, July 26 (3 Hours), 50% Cycling, Group 2

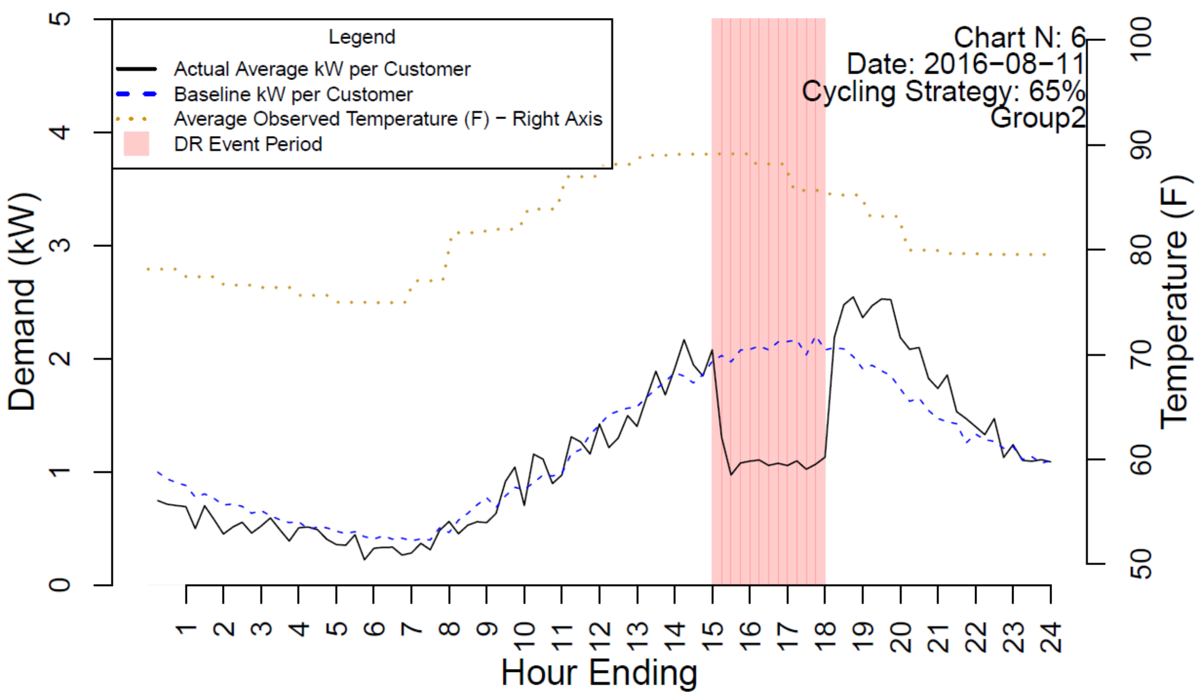


Source: Navigant logger data and analysis

Note how closely the dashed blue line tracks the solid black line prior to the curtailment period. This is a strong indication that the model is doing a good job of estimating the true average impact that the curtailment event is having across the group of EM&V participants during the DR event period.

The second example provided in Figure 5 is that of August 11, 2016, a 65% cycling event. As above, the solid black line represents actual observed average levels of demand on that day, and the dashed blue line represents what the model would predict demand to be if no curtailment event were called. Finally, the dotted yellow line shows the average outdoor temperature (right axis).

Figure 5. Reasonableness Check, July 26 (3 Hours), 65% Cycling, Group 2



Source: Navigant logger data and analysis

The model-predicted demand tracks closely to actual demand prior to the curtailment period. This is again a strong indication that the model is doing a good job of estimating the true average impact that the curtailment event is having across the group of EM&V participants.

3.1.5 Energy Impacts

Direct load control of AC typically yields only trivial energy impacts.

Although demand reductions during the curtailment period are often substantial, curtailment periods tend to be short and infrequent. Additionally, energy savings that are achieved during the curtailment period are partially offset by snapback in the hours immediately following the end of a curtailment period (as the AC compressor works to restore the home to its setpoint temperature).

For completeness, Navigant has estimated the EnergyWise energy impacts at the program level for the two events to which the full program population was subject, as well as for each of the M&V events. Table 13 provides the estimated energy impact at the program level for the two events to which all EnergyWise participants were subject.

The estimated total energy savings contributed by the program population across the two events was approximately 507 MWh, or slightly more than 3.5 kWh per participant with operational switches[19] for the year.

[19] Altogether 2.7% of switches examined during the data collection phase were non-functional or disconnected. Aggregate estimated impacts account for this operability rate.

Table 13. Program-Level Energy Impacts

Event Date	No. of Participants	Estimated Energy Impact (MWh)	Relative Precision (+/-)*
2016-06-23	141,595	236	24%
2016-09-08	144,406	271	24%

*At 90% confidence level

Source: Navigant logger data and analysis

Table 14 provides the estimated energy impact per participant for each of the EM&V groups on each event. Estimated energy savings are generally quite small—in fact, they are not even statistically significant for the Group 1 50% cycling event on July 27.

Table 14. EM&V Event Energy Impacts

Event	M&V Group	Cyc. Strat.	Energy Impact (kWh)	Relative Precision (+/-)*
2016-06-23	1	65%	1.62	38%
2016-07-14	2	65%	2.30	32%
2016-07-15	1	65%	1.03	38%
2016-07-26	2	50%	1.33	76%
2016-07-27	1	50%	0.23	n/s
2016-08-11	2	65%	1.85	32%
2016-08-26	1	65%	1.97	38%
2016-08-31	2	65%	1.80	32%
2016-09-07	1	65%	1.63	38%
2016-09-08	2	65%	2.09	32%

*At 90% confidence level

Source: Navigant logger data and analysis

3.2 Forecast Curtailment Capability

This section of the report provides the estimated EnergyWise DR capability for 65% cycling events.

Estimated DR capability (sometimes referred to as the ex ante impacts) is Navigant's projection—based on the relationships between DR impacts and the outdoor temperature estimated for both EM&V groups—of the average DR that the program would deliver under a set of different temperatures. It is this forecast of capability that provides the truest estimate of a given DR program's value as a system resource because it provides DEP staff with an understanding of how much of a demand reduction the program may be counted on to deliver in future system peak conditions. This is also why it is the forecast DR capability that should be used to calculate the benefits for any cost-benefit ratio test (e.g., total resource cost test, or TRC).

3.2.1 Average DR Capability Per Participant

The estimated average event capability per participant for the 65% cycling strategy is presented in Figure 6.[20] Altogether there are two series of data plotted on the figure:

- The forecast capability of the 65% cycling strategy at a variety of different temperatures, illustrated by the gray line
- The actual 2016 impacts of the events, indicated by the green Xs (Group 1) and stars (Group 2)

The average capability per participant of the program for a 102°F event is approximately 1.51 kW. Given an average of 1.26 switches per customer, this is equivalent to a per-switch capability of 1.2 kW.

This capability is substantially higher than DR impacts estimated for PY2016 because the highest observed average event temperature (appropriately averaged across the program geography) was 93°F.

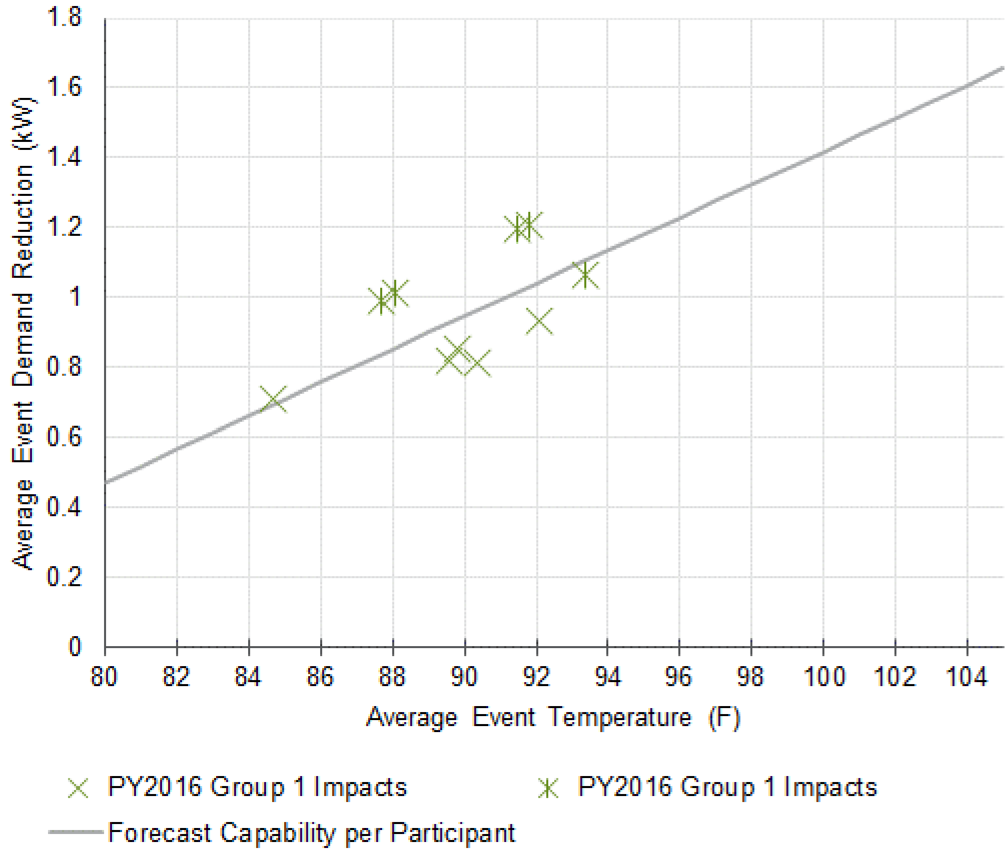
Program capability is estimated by applying a series of temperatures (e.g., between 80°F and 105°F) to the estimated DR impact parameters for each of the EM&V groups delivered by the regression analysis. This delivers an impact for each quarter-hourly interval in which PY2016 events took place given the selected temperature. These impacts are then averaged by interval (across the two M&V groups[21]) and then averaged again across the intervals to deliver an average event capability per participant between 2:30 p.m. and 6:00 p.m.[22]

[20] Navigant has not estimated the DR capability from 50% cycling for PY2016. Each EM&V group was subject to only a single 50% cycling event, meaning that for each group of EM&V participants the relationship between impacts of 50% cycling and outdoor temperature is based only on single event's worth of impact/temperature pairs and may predict impacts unreliably outside the narrow window of temperatures actually observed for the single event each EM&V group was subject to. The best resource for ex ante estimated capability for 50% cycling remains the PY2011 evaluation report, which developed a capability estimate from eight 50% cycling events.

[21] Because there is a separate DR impact parameter for each interval in which events were observed and for each group.

[22] The first event (for which Group 2 was not curtailed) was the only event that began at 2:30 p.m. This means that there are no regression-estimated parameters for Group 2 that came between 2:30 p.m. and 3:00 p.m. To accommodate this, Navigant assumed that the relationship between impacts and weather between 2:30 p.m. and 3:00 p.m. is, for Group 2, the same as the average estimated relationship between 3:00 p.m. and 4:00 p.m. for this group.

Figure 6. EnergyWise DR Capability, 65% Cycling



Source: Navigant logger data and analysis

Average forecast DR capability for the 65% cycling strategy at a variety of different temperatures between 80°F and 105°F is illustrated in Figure 6. The reader should note that these data points represent the average demand reduction that could be expected over a single event if the average temperature for that event (and in the hour immediately preceding it) is that indicated on the x-axis.[23]

The parameter estimates and other values required to reproduce these lines for any given 15-minute interval (in which an event was actually called) are provided in Appendix C. Using the numbers provided in Appendix C, it is possible to reproduce a capability line for those periods.

The slope of the line exists such that at 70°F there would be no DR impact resulting from curtailment. As noted in the description of the regression specification in Appendix C, 70°F was chosen as the threshold for calculating cooling degree quarter hours (CDH).

Although program capability is reported up to 105°F, caution should be used in interpreting projected impacts at the higher temperatures: many of these are outside the sample of observed temperatures during actual 2016 events. The higher forecast temperatures deviate from actual observed 2016

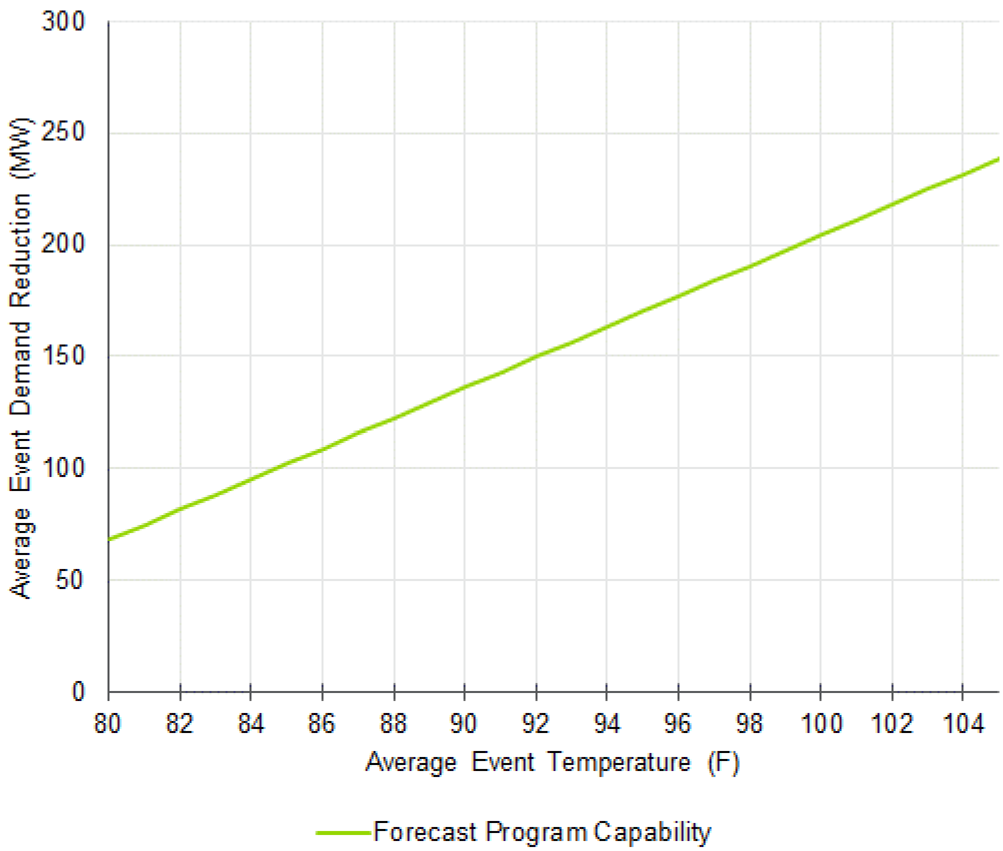
[23] Impacts were estimated as a function of an exponential moving average of CDH to capture the fact that a sudden drop in outdoor temperature does not immediately affect AC load due to heat retention in the building.

temperatures: the farther out of sample the predictions are, the higher the degree of uncertainty in the estimated capability.

3.2.2 Aggregate Forecast DR Capability

To extrapolate aggregate (program-wide) DR capability, the evaluation team has conservatively assumed that the program population (of AC participants) will stabilize at 144,000 participants (there were 144,406 at the time of the final 2016 event) and scaled the per-customer impacts presented above by this number. The program-wide forecast capability at a range of different average event temperatures are shown in Figure 7.

Figure 7. Forecast EnergyWise Program Capability with 144,000 Participants



Sources: Navigant logger data and analysis, DEP program data

As may be seen in Figure 7, the EnergyWise program could have the capability to potentially offer over 200 MW of DR during very hot summer afternoons.

4. SUMMARY FORM

EnergyWise Home
Winter PY2015/2016
Completed EMV Fact Sheet

Description of program

Duke Energy's EnergyWise Home program is a demand response program offered to residential customers in the Duke Energy Progress territory.

EnergyWise is a direct load control program. Participants receive an incentive to allow Duke Energy to control their air-conditioners (in the summer) their heat pump auxiliary heat strips (in the winter) or their electric water heaters (winter or summer). Only participants in the Western region are curtailed in the winter.

This report evaluates the impact of the program in the summer of 2016. Two program-wide events were called in the summer of 2016. Ten events were called for a sample of 78 participants to whom data loggers had been deployed.

Date:	**May 15, 2017**
Region:	Duke Energy Progress
Evaluation Period	Summer PY 2016
DR Event Impact per Participant (kW)[1]	
AC (50% cycling)	0.93
AC (65% cycling)	0.96
DR Event Program Impact (MW)[1]	
AC (50% cycling)	N/A (no program-wide 50% events called)
AC (65% cycling)	0.99
Net-to-Gross Ratio	1

Evaluation Methods

Navigant estimated DR impacts for AC direct load control through the use of two fixed-effects regressions applied to logger data collected from a representative sample of 78 EnergyWise participants. EM&V participants were divided into two sub-samples and curtailed on alternating events. Each group was curtailed five times (ten events in total). This experimental design approach is superior to the previously used "within-subject" design in that it avoids the possibility that all very hot summer days are "used up" for events, leaving no observed hot temperatures with which to properly estimate the implicit baseline against which impacts are measured. This design reduces the possibility of model specification bias.

Impact Evaluation Details

- **The average total program impact of the two program-wide events was 138 MW.** The average estimated impact per customer with functional switches was 0.99 kW across both events. The relative precision of these estimates, at the 90% confidence level, is ±13.8%. The average temperature observed by M&V participants during these two program-wide 65% cycling strategy events was 90.6°F; the highest temperature observed by an M&V participant during these events was 93.5°F.
- **The estimated impact of the two 50% cycling events to which EM&V participants were subjected was 0.93 kW per customer.** Each EM&V group was subject to a single 50% cycling event. The 50% cycling event to which EM&V Group 2 was subject was the hottest of any of the curtailment events across both groups. This caused the estimated impacts for that event to be quite high relative to the estimated impacts from the 65% cycling events.
- **The estimated impact of the eight 65% cycling events to which EM&V participants were subjected was 0.96 kW per customer.** Average event impacts varied between 0.71 kW and 1.2 kW per customer, depending on the group curtailed and the temperature at the time of the event.

5. CONCLUSIONS AND RECOMMENDATIONS

The EnergyWise program experienced steady growth in participation through summer 2016, up by more than 14,000 participants from PY2015. Curtailment events have delivered reliable and meaningful demand reductions. The evaluation found that summer event impacts are consistent with industry norms and similar to those found in the previous program years. The summer AC snapback effect was relatively moderate but still present.

The survey analysis concluded that participants were generally unaware of curtailment events when they happened, and even when they were aware, the majority did not report any decrease in comfort. Participants were generally satisfied with the EnergyWise program, and the evaluation did not identify any reasons why DEP should significantly alter the program going forward.

Modest recommendations to maintain and improve program performance are as follows:

Recommendation Topic	Recommended Actions
Technical Issues	**Consider (as in PY2011) a thorough investigation into the cause(s) of device non-responsiveness.** The evaluation found that 12% of AC devices did not respond to DEP's control signal for any given event. This is a modest increase from 2013 where, on average, 9% of devices were non-responsive, and only a small change from 2011 when 11% of devices were found to be non-responsive. In PY2011, DEP deployed staff to investigate those devices estimated by the evaluation team to be non-responsive to at least one event, and the investigation determined that inconsistent paging from DEP's commercial provider was reducing the effectiveness of the program.
Evaluation Issues	**Continue to employ the two-group experimental design for future logger analyses.** This approach delivers more accurate and precise results than curtailing all participants at once and is increasingly common for DR program evaluations.
Participant Recruitment and Retention	**Continue to execute curtailment events without notifying participants.** The majority of participants indicated that they were unaware when an event has taken place, and few experienced significant discomfort. Customers did not indicate a desire for notification, and notification would unnecessarily draw attention to the occurrence of events.

APPENDIX A. DEVICE RESPONSIVENESS ANALYSIS

As part of its evaluation of the EnergyWise program, the evaluation team estimated the number of AC units within the EM&V sample that either did not respond to DEP's curtailment signal or simply were not running (and thus could not be curtailed) during events. Although there was no two-way communication to track the curtailment signal or device responsiveness, a careful examination of the AC unit logger data and some reasonable assumptions have allowed the evaluation team to estimate the number of non-responsive units.

The most significant findings of this analysis are:

- On average, 12% of AC units that were in use both immediately prior to and immediately following an event appear to have not responded to the DEP control signal. This response rate fluctuated between 6% and 20% for any given event. Of the non-responsive devices, approximately one-third were part of Group 1 and the remainder a part of Group 2.
- There were 59 unique combinations of devices and events for which a device was non-responsive. In total, there were 30 unique devices (out of 98 for which logger data was available) that were non-responsive. About half (17) of these devices were non-responsive for more than one event, with two devices being non-responsive to all five of the events to which they were subjected. Note that each group experienced five events for a total of 10 events throughout the summer across the two groups. The geographic distribution of non-responsive switches matches that of the participant population.

As noted above, these findings are predicated on the methods used and certain assumptions made by the evaluation team. A careful explanation of these assumptions and the method by which the evaluation team calculated the responsiveness rate follows below.

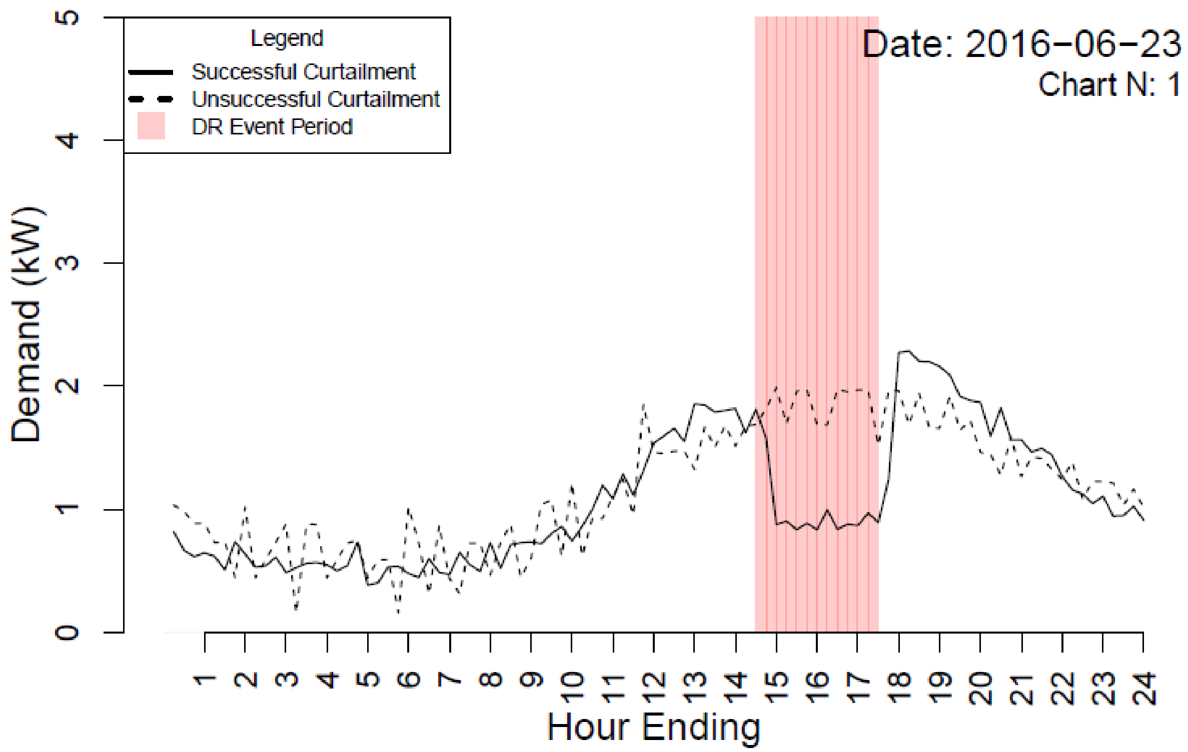
The team believes that its approach and assumptions are reasonable and have provided robust estimates of the device non-response rate. The simplest demonstration of the reasonableness of the evaluation team's approach is a data plot based on the results obtained from this analysis.

The data plot in Figure 8 shows the average demand on June 23 (first event, 65% cycling) of AC units assessed to have responded to the DEP control signal (solid black line) and of AC units assessed to not have responded to the signal (dashed black line).[24] The plot is consistent with expectations that average demand will show a clear drop during a curtailment period if the control signal is received.

Note that the dashed black line (average demand of non-responsive devices) is more jagged than the solid black line simply because fewer devices contribute to the average; altogether data from 32 devices was averaged to create the solid black line, whereas the data from only three devices was averaged to create the dashed black line. A set of similar plots (and tables providing some key summary statistics) for each event may be found in Appendix E, in a separate document.

[24] Note that units deemed to be not in use during the event, in use during the event but not prior to the event, or in use during the event but not following the event are not included in this plot.

Figure 8. Illustration of Reasonableness of Device Responsiveness Analysis Approach (June 23)



Source: Navigant logger data and analysis

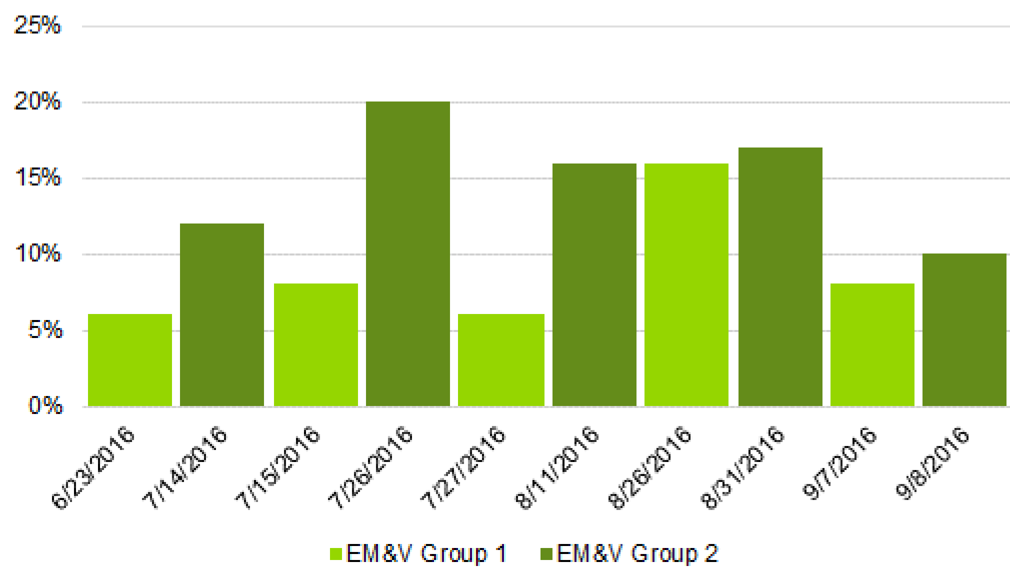
The remainder of this section is divided into two sub-sections:

1. **Distribution of Non-Responsive Devices.** This subsection provides summary statistics regarding non-responsive devices by event.
2. Method for Determining Device Responsiveness**.** This subsection provides a step-by-step guide to the method used by the evaluation team to estimate whether or not a given device had failed to respond to the curtailment signal on a given event day.

A.1 Distribution of Non-Responsive Devices

Group 2 included more non-responsive devices than Group 1. Two devices were found to be non-responsive to all events. Figure 9 illustrates the distribution of non-responsive devices across events.

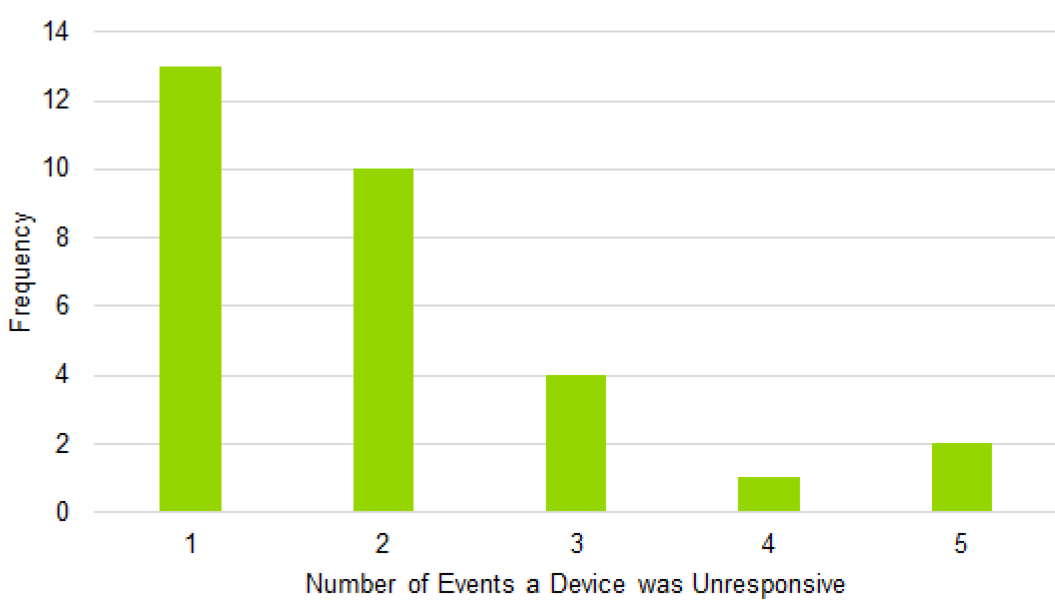
Figure 9. Distribution of Non-Responsive Devices across Events



Source: Navigant logger data and analysis

In total, there were 59 unique combinations of devices and events for which a device was non-responsive. This represented a total of 30 unique devices that were non-responsive, 17 of which were non-responsive for more than one event. Figure 10 shows the frequency of events for which devices were unresponsive. As can be seen, two devices were unresponsive for all five of the events to which they were subject. The majority of devices, however, were only unresponsive to one or two events.

Figure 10. Frequency of Events for Unresponsive Events



Source: Navigant logger data and analysis

Table 15 provides a count of switches that were unresponsive by the number of events to which they failed to respond and the geographic region in which they were located. No clear pattern emerges. The geographic distribution appears similar regardless of how many times a switch failed to respond to the curtailment signal.

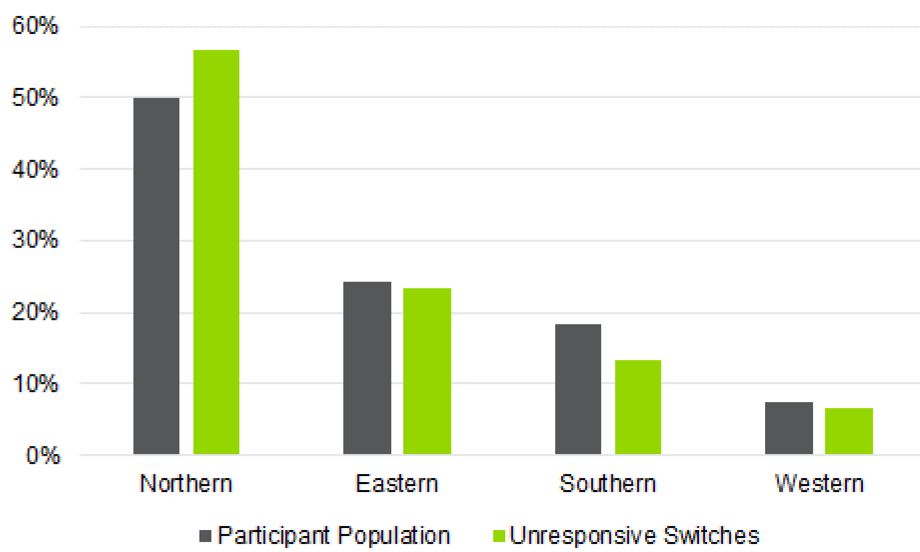
Table 15. Count of Switches by Region and Number of Unresponsive Events

Region	Number of Unresponsive Events				
	1	2	3	4	5
Northern	8	5	2	1	1
Eastern	4	2	1	0	0
Southern	1	2	1	0	0
Western	0	1	0	0	1

Source: Navigant logger data and analysis

Further, there appears to be no meaningful difference between the geographic distribution of non-responsive devices in the EM&V sample and the overall program population (Figure 11).

Figure 11. Geographic Distribution of Unresponsive Switches vs. Population Distribution



Sources: Duke Energy program tracking data, Navigant logger data and analysis

A.2 Method for Determining Device Responsiveness

The following determines device responsiveness:

1. Identifying devices that were not in operation immediately before or after the event (i.e., devices that cannot reasonably be determined to be responsive or not). These devices were removed from the sample.
2. Comparing device demand during the event with device demand immediately prior to the event.
3. Evaluating this comparison against a pre-selected threshold to determine whether a given device was responsive or not.

Unused AC Units

The first step in the process of assessing device responsiveness was determining which AC units were not in operation at all during the event (and thus would provide no curtailment if the signal was successful and the control device fully functioning). The evaluation team assumed that if the average demand logged for an AC unit in the last hour prior to an event and in the first hour following an event was less than 0.25 kW, then it was likely that the unit was not in use during the curtailment period. A device determined not in use during the event can be considered neither a responsive nor a non-responsive device.

Likewise, all units that appeared to have been in operation prior to the event (per the 0.25 kW threshold) but not after it, or units that appeared to have been in operation after the event but not before it were removed at this step. The reason is that without additional information, it is impossible to tell to what degree changes in demand were due to curtailment or some other factor.

Non-Responsive Devices

Once unused units or units in use before but not after the event (and vice versa) were eliminated from the sample, the following steps were used to determine if a device was non-responsive:

Step 1: **Calculate the average demand for each AC unit in the final hour prior to an event starting (the prior hour) and for the hour following the first half hour of the event (the event hour).**
For example:
For the event on August 11 (3 p.m. to 6 p.m.) the difference between average demand from 2 p.m. to 3 p.m. and the average demand from 3:30 p.m. to 4:30 p.m., was calculated.
The reason for using the average demand over the hour immediately following the first half hour of the event (as opposed to simply using the first hour of the event) is to mitigate against the possibility that curtailment is staggered across devices. Put another way, if some devices begin curtailing 15 or 20 minutes into an event instead of at the instant the event begins, then assessing device responsiveness using the average demand in the first hour could result in the evaluation team assessing a device as non-responsive when in fact it may have responded to the control signal.

Step 2: **Calculate the percentage change in average demand from the prior hour to the event hour.**

Step 3: **Compare this percentage change with a pre-determined threshold. If the calculated percentage change is less than the threshold, then curtailment is deemed to have failed.**
The figures presented above were calculated based on a 0% threshold. That is, provided the average demand in the event hour was not greater than the average demand in the prior hour, curtailment was deemed to be successful. This is a quite conservative threshold in the sense that it is intended to minimize the number of devices that are incorrectly deemed to be non-responsive.

APPENDIX B. PARTICIPANT PERCEPTIONS ANALYSIS

This section presents the findings of the evaluation team's analysis of four identical surveys conducted in summer 2016 of EnergyWise participants. Respondents are divided into two groups: EM&V participants and non-M&V participants. EM&V participants are those participants for whom the evaluation team has AC logger data used to estimate demand impacts. Non-M&V participants are those participants in the program for whom the evaluation team has no logger data.

The evaluation team conducted a total of 244 phone surveys with EnergyWise participants during this study. The surveys were conducted after two real DR events and two placebo events.[25] For the placebo events, respondents were told that an event had been called when in fact one had not.

Of the 244 total survey respondents, 210 were from the general program population; the remaining 34 were part of the M&V group that also received data loggers for the field study.

Of the 244 total survey respondents, 137 were surveyed after real DR events; the remaining 107 were surveyed after placebo events. [26]

The evaluation team designed the survey sample to target a relative precision of ±10% at the 90% confidence level. Ultimately, the survey achieved a relative precision ±5% at the 90% confidence level for key quantitative outcomes.

A summary of the survey disposition by group is shown in Table 16. For event surveys, respondents were surveyed 1-2 days following an actual curtailment event and asked questions related to their perception and comfort specifically during the event. The placebo event survey respondents received the same set of questions, although the event in question was a placebo, as no curtailment event was in fact called that day for the group in question.

The principal EM&V findings from the analysis of participant perceptions were as follows:

- **Participants were generally unaware of curtailment events when they happened.** Most (>90%) survey respondents indicated that they had not been aware that an event had occurred recently.
- **The program has little impact on the comfort of its participants.** Only eight respondents (out of 137 event participants) were both aware that an event had been called and were home during the period in question. For that sub-group, comfort levels reported during the event varied widely, ranging from a rating of a 0 to a 9 on the 0-10 comfort scale. Most survey respondents indicated that they were "very comfortable" during the event.
- **Participants were generally satisfied with the EnergyWise program.** Over half of the respondents indicated that they were "very satisfied," while only 3% of all survey respondents (8 people) indicated that they were "dissatisfied" with the program. Satisfaction with the program

[25] On August 11, 2016, Navigant conducted a survey with both M&V groups. One group had received a real DR event on that day, and the other had not received an event and was considered a placebo. Therefore, Navigant was able to conduct both a real and placebo survey on that day.

[26] Of the 107 participants who received placebo surveys, 90 were from the general program population and 17 were from the EM&V groups.

did not differ significantly between respondents who responded to actual events versus those respondents who responded to placebo events.

Table 16 provides a summary of the number of surveys completed in each category.

Table 16. Simplified Survey Disposition Report

	August 11, 2016[a]	September 8, 2016	September 14, 2016
Post-event survey completes	17	120	
Placebo survey completes	17		90
Participant max temperature during surveys	91°F	94°F	

a. For August 11, the evaluation team conducted a post-event survey with Group 2, which received a real event, and a placebo event with Group 1, which did not receive an event.

This section of the report is divided into four sub-sections, the first three of which analyze a distinct aspect of participant perspectives. These are:

1. **Awareness of Event:** To what degree were participants aware that an event had taken place?
2. **Comfort During Event:** How comfortable were participants who were aware an event had taken place?
3. **General Program Satisfaction:** How happy or unhappy are participants with the program?

The fourth section presents participant responses to questions about typical HVAC usage, familiarity with electricity billing, and other topics covered by the survey.

B.1 Awareness of Event

The principal objective of the surveys was to determine the degree to which participants took notice of and were effected by curtailment events. While the surveys included a series of more nuanced questions, one of the most important questions was whether or not the respondents took note of their device activation.

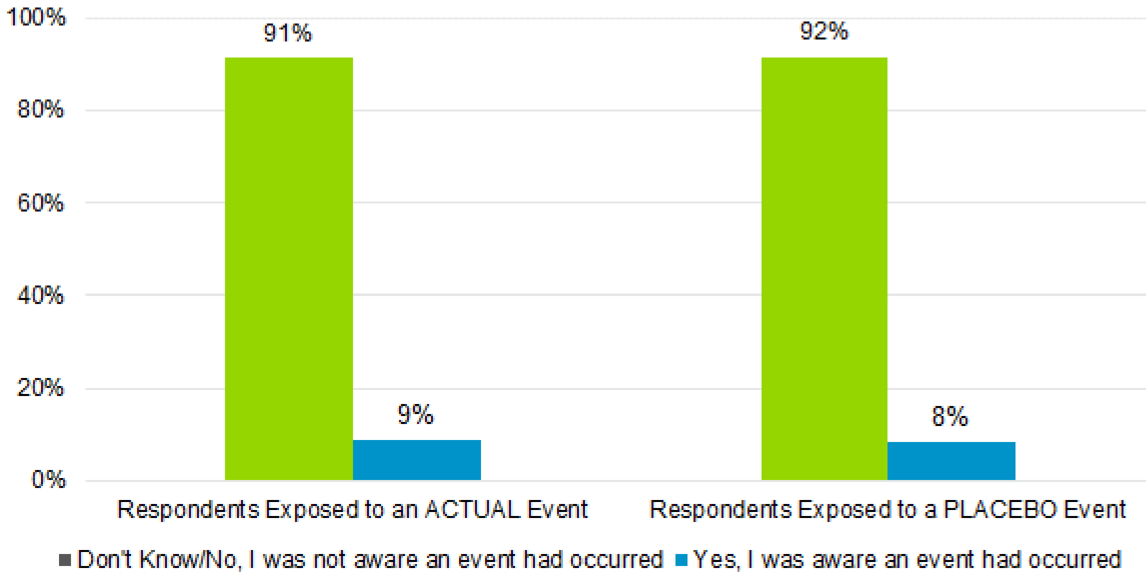
Question 4 in the survey asked: “*Has your device been activated in the last 7 days?”*

The majority of respondents reported being unaware that an event had occurred, as is presented in the distribution of responses between event and non-event respondents in Figure 12. Only 9% of event respondents indicated that they were aware an event had been called within the past 7 days.[27]

[27] Due to constraints on survey scheduling caused by an unanticipated lack of high temperature days, the evaluation team conducted the second placebo survey within 7 days of the most recent population-wide curtailment event. Because of this timing, the majority of placebo respondents would have been correct in answering “yes” to this particular question, making it irrelevant to draw comparisons between survey groups. Regardless, both groups report a strong lack of awareness of an event being called.

Figure 12. Respondent Awareness an Event had Occurred within Past 7 days

(n_{event} = 137, $n_{placebo}$ = 107)[a]



a. Of the 137 completed post-event surveys, 120 were from the general program population and 17 were from M&V Group 1. Of the 107 completed placebo surveys, 90 were from the general program population and 17 were from M&V Group 2.

Source: Post-Event Survey Data, 2016

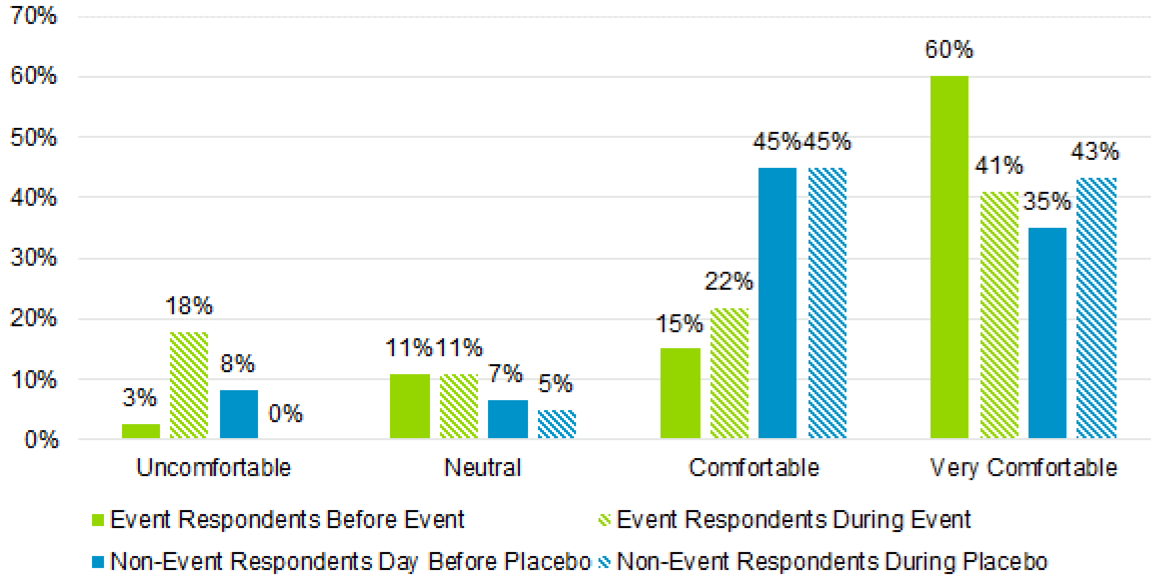
B.2 Comfort During Event

Awareness of a curtailment event is certainly the most important barometer of the impact of the event on customer comfort. If a participant did not notice an event, then its perceived impact on his or her comfort must be trivial. Event awareness is not the only measure of the impact on the participant. Each respondent that was home during an event, regardless of whether he or she was aware of the event, was asked to characterize his or her level of comfort both immediately before and during the event.

Most survey respondents reported high levels of comfort during both the actual and placebo events. Figure 13 shows comfort levels both before and during the events for each group. The percentage of event respondents who rated themselves as “very comfortable” decreased during the event, going from 60% to 41%. Similarly, the percentage of event respondents who rated themselves as “uncomfortable” increased from 3% to 18% during the event. For the non-event respondents, the data revealed no discernible pattern in comfort level change.

Of the survey respondents who were home when an event occurred, approximately 36% of event respondents and 50% of non-event reported using fans to keep cool during the period in question. Eighteen percent reported adjusting the thermostat during the event.

Figure 13. Change in Comfort Level During Curtailment and Placebo Events (n_{event} = 73, $n_{placebo}$ = 60)



Note: Comfort levels assigned based on 0-10 rating scale: 0-4 Uncomfortable, 5 Neutral, 6-8 Comfortable, 9-10 Very Comfortable. Results exclude "Don't know" responses.

Source: Post-Event Survey Data, 2016

In total, only eight respondents were both aware that an event had been called and were home during the period in question. For that sub-group, comfort levels reported during the event varied widely, ranging from a rating of a 0 to a 9 on the 0-10 comfort scale, with 0-4 being "uncomfortable" and 9-10 being "very comfortable."

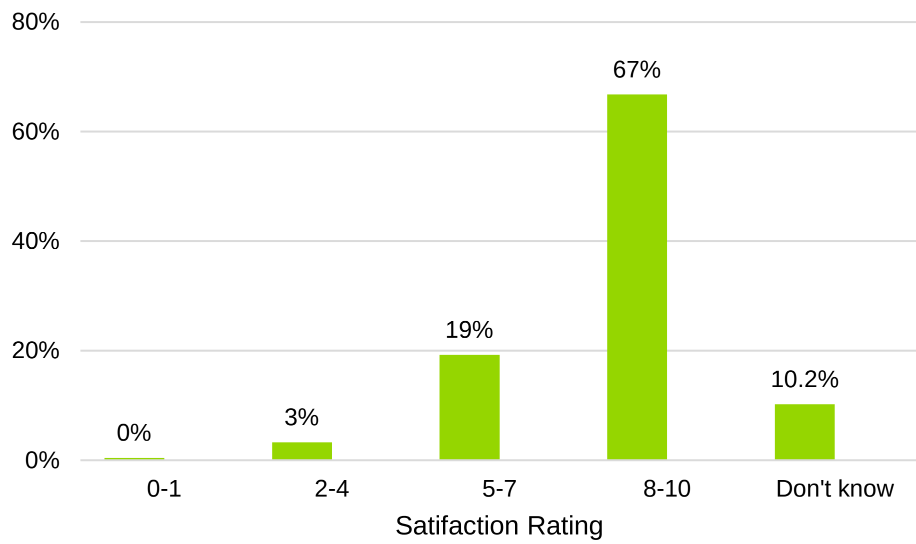
There is limited suggestion that the comfort of program participants decreased during the event, and coupled with low levels of awareness of device activation, it can be safely concluded that the program is having a minimal impact on the comfort of its participants.

B.3 General Program Satisfaction

In addition to testing participant awareness of events and comfort during events, an important component of the post-event survey effort was to determine the general level of satisfaction participants had with the program. The evaluation team asked respondents to rate their satisfaction with the program overall on a scale from 0 to 10, where 10 is "extremely satisfied."

Most survey respondents reported high levels of satisfaction with the program, with 67% of participants rating their satisfaction favorably (8 and above). Only 3% of survey participants rated themselves as dissatisfied with the program (4 or below). Figure 14 shows a breakdown of these findings.

Figure 14. Program Satisfaction of Survey Respondents (n = 244)



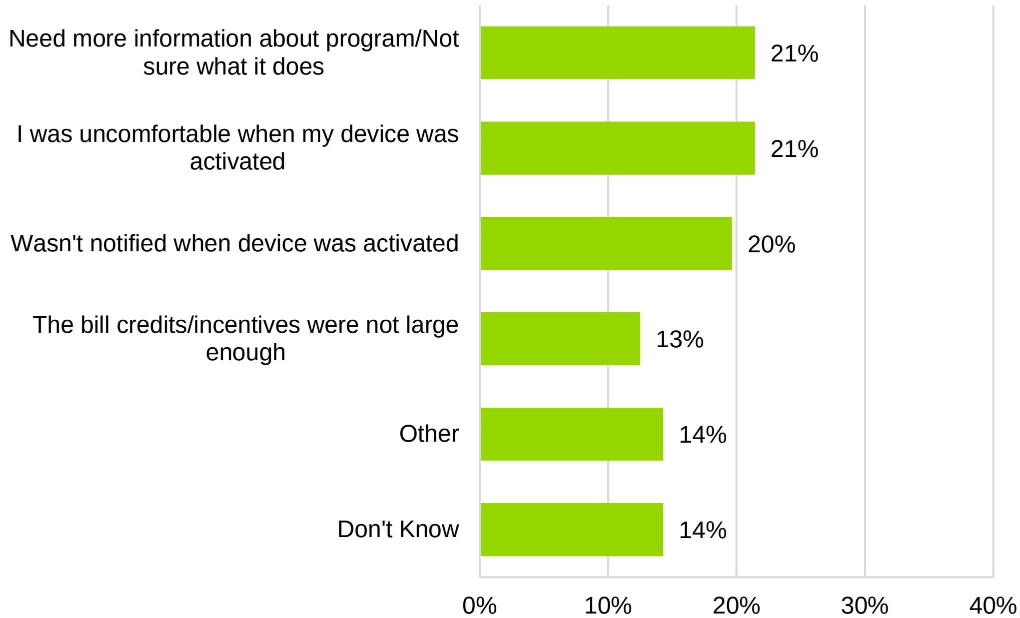
Note: Respondents who answered "Don't Know" to the question of satisfaction are not included in the above graphic

Source: Post-Event Survey Data, 2016

Building on their reported satisfaction, 70% of survey respondents indicated that they would recommend the program to a friend or colleague, characterized by a rating of 8 or higher on a likelihood scale from 0 to 10.

The evaluation team asked respondents who expressed lower satisfaction with the program (a rating of a 7 or below) to expand on their reasoning. Figure 15 shows that respondents had a wide variety of reasons for their dissatisfaction, with the two most popular reasons being a desire for more information on the program itself (21% of respondents) and a perception of discomfort when the device was activated (21% of respondents). Another common reason for dissatisfaction was a lack of notification when DEP activates their device.

Figure 15. Reasons Indicated for Dissatisfaction with the Program (n = 56)



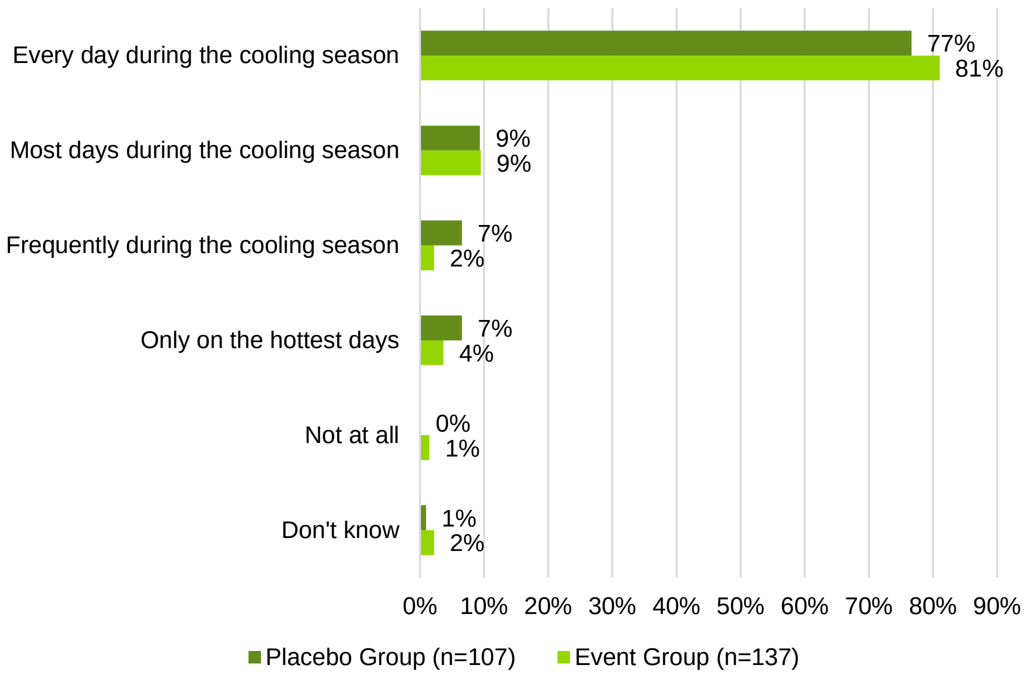
Note: Multiple responses accepted

Source: Post-Event Survey Data, 2016

B.4 Other Survey Findings

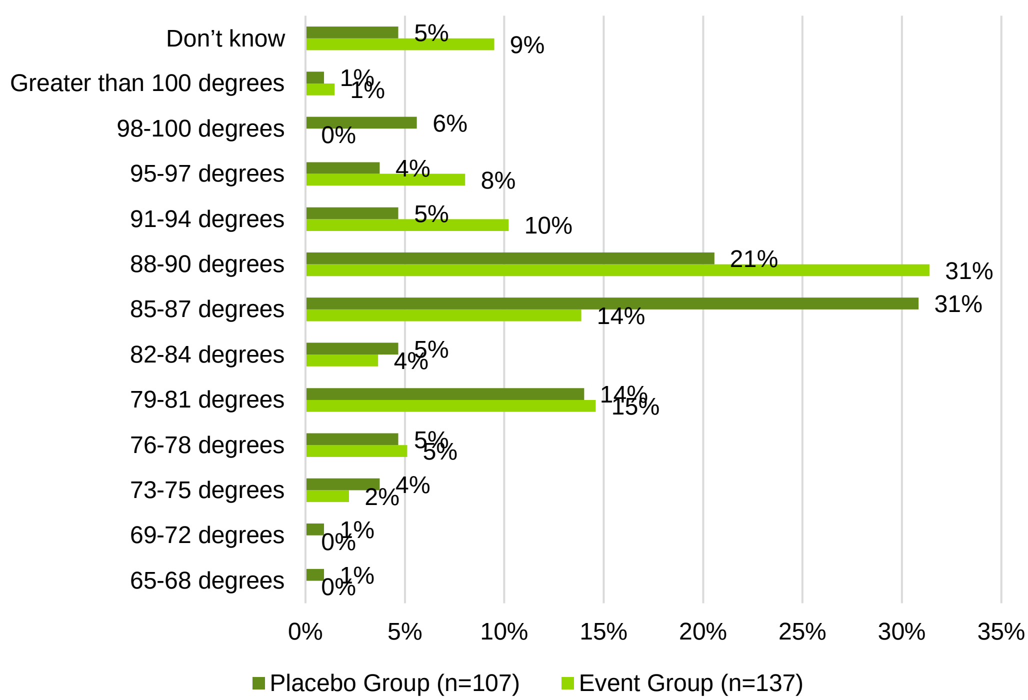
This subsection contains additional results from the participant surveys. As shown in Figure 16. How Often Participants Reported Using Their Central AC Units, the overwhelming majority of respondents indicated using their central AC units during every day of the cooling season. Figure 17 and Figure 18 show the outdoor temperature ranges at which respondents reported being uncomfortably warm and turning on their AC units.

Figure 16. How Often Participants Reported Using Their Central AC Units



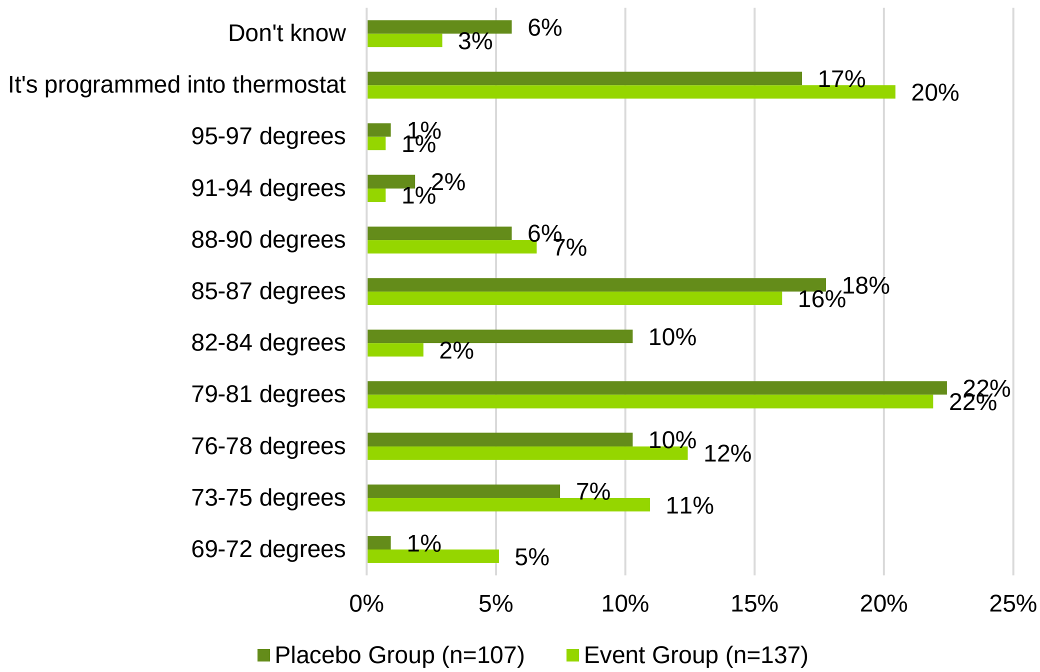
Source: Post-Event Survey Data, 2016

Figure 17. Outdoor Temperature at Which Participants Reported Feeling Uncomfortably Warm



Source: Post-Event Survey Data, 2016

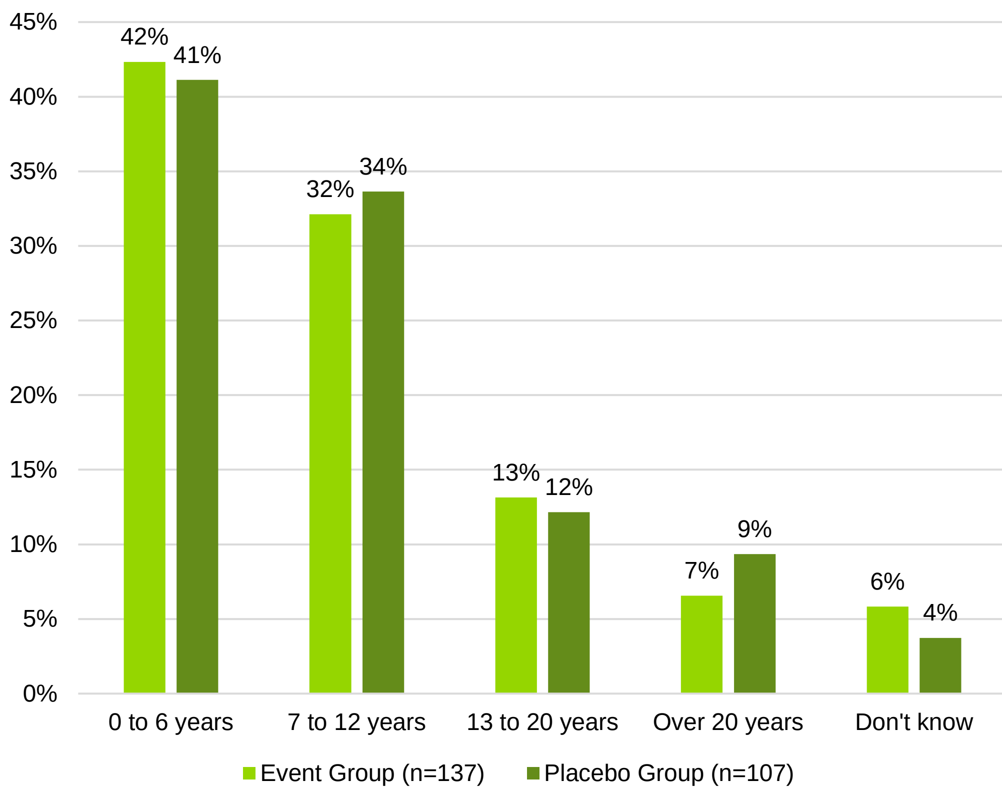
Figure 18. Outdoor Temperature at Which Participants Reported Turning on AC Unit



Source: Post-Event Survey Data, 2016

Figure 19 shows that about three-fourths of respondents indicated their AC units were 12 years old or less. About 40% of respondents indicated their cooling equipment was 6 years old or less. The efficiency characteristics of participant HVAC equipment is a key driver in the kilowatt and kilowatt-hour impacts from DR events.

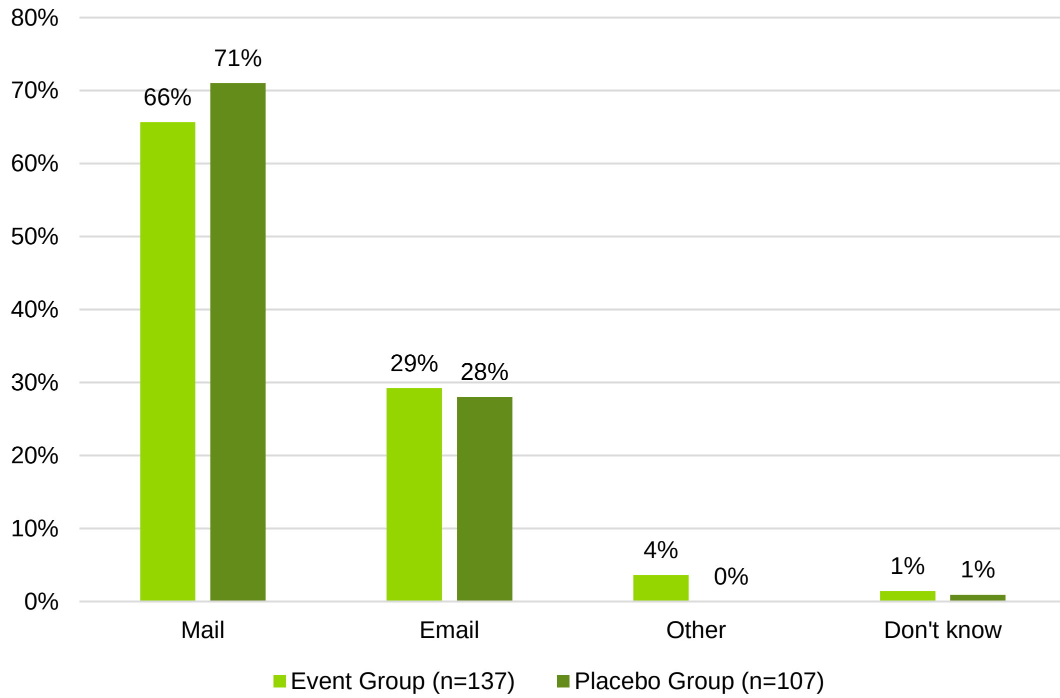
Figure 19. How Old Participants Reported Their AC Units to Be



Source: Post-Event Survey Data, 2016

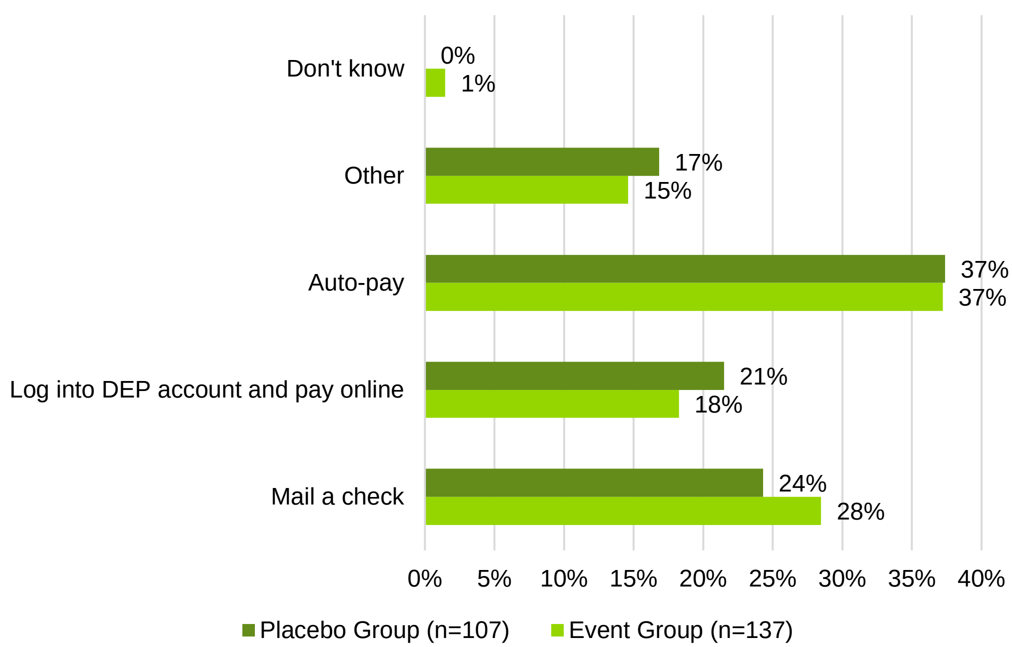
Figure 20 through Figure 23 present information about how respondents reported receiving and reviewing their electric bills from DEP. About 71% of respondents reported that they review their bill every month, whereas only about one-third of respondents reported that they have noticed the EnergyWise Home credit on their bill.

Figure 20. How Participants Reported Receiving Their Energy Bills from DEP



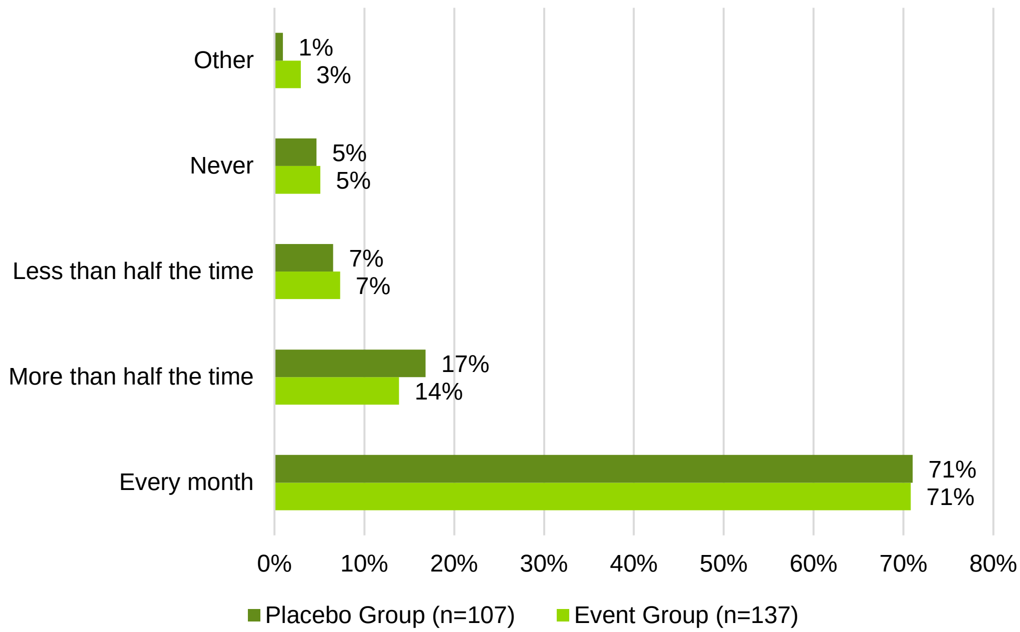
Source: Post-Event Survey Data, 2016

Figure 21. How Participants Reported Paying Their DEP Bill



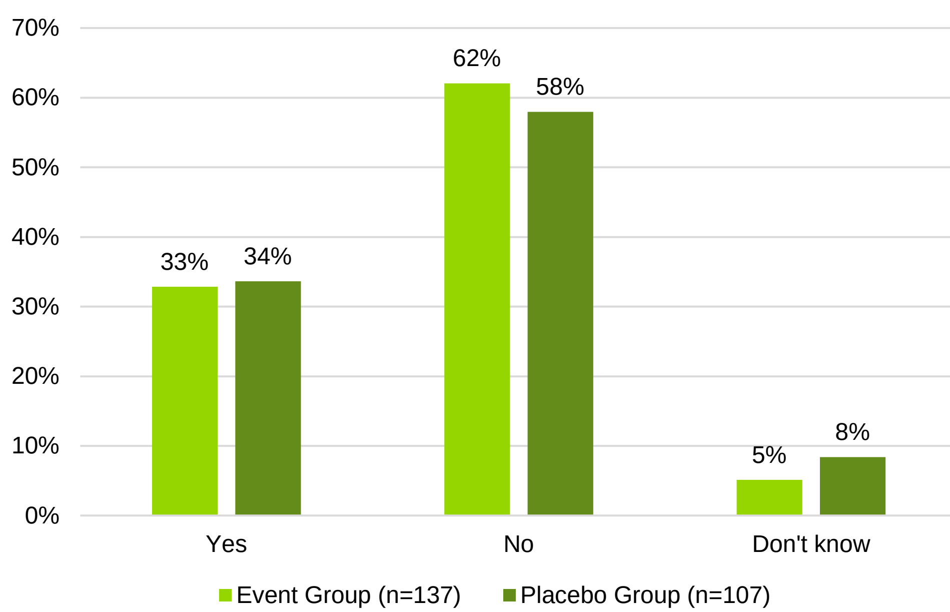
Source: Post-Event Survey Data, 2016

Figure 22. How Often Participants Reported That They Review the Details of Their DEP Bill



Source: Post-Event Survey Data, 2016

Figure 23. Participant Responses to Whether They Have Ever Noticed the EnergyWise Home Credit on Their DEP Bill



Source: Post-Event Survey Data, 2016

APPENDIX C. ESTIMATION DETAILS AND MODEL SPECIFICATION

This appendix provides more detail on the methods employed by the evaluation team to estimate the historical summer 2016 demand impacts and forecast the DR capability of the various types of cycling strategies.

C.1 Model Specification and Details

The evaluation team estimated four regressions for this analysis: one for each cycling strategy for DR impacts and one for each cycling strategy for energy impacts.

Only event days and similar non-event days were included in the data used to estimate the regression. For each event and for each EM&V group the evaluation team used the average weather experienced by the participants on that day to select the most similar non-event weekday. Only data from event days and the matched non-event days were included in the regression.

DR Estimation

The model used to estimate historical 2016 impacts and forecast the DR capability at a variety of temperatures follows. A separate regression was estimated for each cycling strategy.

Equation C-1. Regression Model Equation for Demand

$$
\begin{aligned}
y_{k,t} = \alpha_k &+ \sum_{g=1}^{2}\sum_{i=1}^{96}\left(\beta_{i,g}^{qh}\cdot qh_{i,t}\cdot grp_{g,k}\right) + \sum_{g=1}^{2}\sum_{i=1}^{96}\left(\beta_{i,g}^{EMA\_CDH}\cdot qh_{i,t}\cdot EMA\_CDH_{k,t}\cdot grp_{g,k}\right) + \\
&\sum_{g=1}^{2}\sum_{i=1}^{96}\left(\beta_{i,g}^{MA\_THI}\cdot qh_{i,t}\cdot MA\_THI_{k,t}\cdot grp_{g,k}\right) + \sum_{g=1}^{2}\sum_{i=1}^{96}\left(\beta_{i,g}^{c}\cdot qh_{i,t}\cdot C_{k,t}\cdot EMA\_CDH_{k,t}\cdot grp_{g,k}\right) + \\
&\sum_{g=1}^{2}\left(\beta_{g}^{kW}\cdot grp\_kW_{t,\left(\frac{1}{g}+\frac{1}{g}\right)}\cdot grp_{g,k}\right) + \sum_{g=1}^{2}\sum_{r=1}^{24}\left(\beta_{r,g}^{S}\cdot S_{r,t}\cdot SP_{k,t}\cdot grp_{g,k}\right) + \varepsilon_{k,t}
\end{aligned}
$$

Where:

$y_{k,t}$	=	The average AC demand of household *k* in a quarter hour of sample *t*.
α_k	=	The individual-level fixed effect.
$qh_{i,t}$	=	A dummy variable equal to 1 when the quarter hour of sample *t* falls in the *i*-th hour of the day. For example, if quarter hour *t* fell in the first quarter hour of the day then $qh_{1,t}$ would equal 1 and $qh_{2,t}$ to $qh_{96,t}$ would all be equal to 0.
$grp_{g,k}$	=	Two dummy variables. Each is equal to 1 when participant *k* falls in EM&V Group *g*. For example, if participant *k* is in Group 1, then $grp_{1,k}$ is equal to 1 and $grp_{2,k}$ is equal to 0.

$EMA\_CDH_{k,t}$ = Is the five-period exponential moving average of CDH. This value is an average of the CDH[28] observed in the given 15-minute period *t*, and of the CDH observed in the four 15-minute periods before that (for participant *k*). This average is weighted using an exponential smoothing ration of $2/(n+1)$—i.e., weighting more recent observations exponentially higher than more distant observations.
For this study CDH is defined as the greater of either the temperature in Fahrenheit less 70 degrees, or 0, whichever is greater.

$MA\_THI_{k,t}$ = Is a moving average of the temperature-humidity index over the 48 quarter-hourly periods immediately preceding *t*. The temperature-humidity index used for this moving average is the same as that used in DEP's 2011 and 2013 evaluation and that used by PJM:[29]

$$THI = DB - 0.55 \cdot (1 - RH) \cdot (DB - 55)$$

Where:
DB = Dry bulb temperature (in °F)
RH = Relative humidity (as a percentage)

$C_{k,t}$ = Equal to 1 when participant *k* is subject to curtailment in quarter hour of sample *t*, and 0 otherwise.

$S_{r,t}$ = A group of dummy variables intended to capture the effect of snapback in the quarter hours following the end of the curtailment period. The *r*-th dummy is equal to 1 if quarter hour *t* is the *r*-th hour following the end of a curtailment event and 0 otherwise. For example, if the last quarter hour of a curtailment event occurred in period *t*=500, the *S* in period *t*=501, $S_{r=1,t=501}$ would be equal to 1, whereas $S_{r=2,t=501}$ and all the snapback dummies for periods *r*≠1 would be equal to 0.

$SP_{k,t}$ = The total CDH observed during the DR event that took place on the day in which quarter hour *t* falls, for participant *k*.

$grp\_kW_{t,\left(1/g+1/g\right)}$ = The average kW of the sub-scripted group in the quarter hour of the day (on non-event days) in which quarter hour of sample *t* falls. Per the subscript, when *g* =1 (Group 1) this variable is average demand of Group 2 in the quarter hour of sample *t.* When g = 2 (Group 2) this variable is the average demand of Group 1 in the quarter hour of sample *t.* This variable allows the regression to estimate the relationship between an individual's average demand in a given quarter hour and the average demand of the individuals in the other group in the same

[28] Although referred to throughout this report as "CDH" these values are technically "cooling degree *quarter* hours." Instead of being calculated on an hourly basis, the CDH used in this analysis are calculated on quarter-hourly basis, the same frequency as the demand variable.

[29] PJM, *PJM Manual 19: Load Forecasting and Analysis*, Effective Date: Feb 2012 http://pjm.com/~/media/documents/manuals/m19.ashx

quarter hour. This improves the baseline by leveraging information from the uncurtailed group to help develop the curtailed group's counterfactual.

The parameter estimates obtained from this model (and found later in this appendix) were used to calculate the estimated impact of each of the curtailment events and the forecast capability at a variety of temperatures.

The reader will note that there is no intercept dummy to flag a curtailment period in this model, only a slope (or interactive) curtailment dummy. That is, the level of impact yielded by the 50% or 65% cycling strategy is purely a function of the CDH (temperature)—if CDH are equal to 0, the impact of AC curtailment will also be equal to 0. This is by construction: the CDH threshold (70°F) was chosen during the PY2011 analysis specifically such that when the regression model included an intercept curtailment dummy its estimate was close to 0 or non-significant.

Energy Impact Estimation

The model below was used to estimate PY2016 energy impacts. A separate regression was estimated for each cycling strategy.

Equation C-2. Regression Model Equation for Energy

$$y_{k,t} = \alpha_k + \sum_{g=1}^{2}\left(\beta_g^{cdh} \cdot CDH_{k,t} \cdot grp_{g,k}\right) + \sum_{g=1}^{2}\left(\beta_g^{kW} \cdot grp\_kW_{t,\left(\frac{1}{g}+\frac{1}{g}\right)} \cdot grp_{g,k}\right) + \sum_{g=1}^{2}\left(\beta_g^{c} \cdot C_{k,t} \cdot CDH_{k,t} \cdot grp_{g,k}\right) + \varepsilon_{k,t}$$

Where:

$y_{k,t}$ = The total energy consumed by participant *k* between 2:30 p.m. and 10:00 p.m. on day of sample *t*.

α_k = The individual-level fixed effect.

$CDH_{k,t}$ = The total CDH observed by participant *k* between 2:30 p.m. and 10:00 p.m. on day of sample *t*.

$grp\_kW_{t,\left(\frac{1}{g}+\frac{1}{g}\right)}$ = The average AC energy consumed per household from the sub-scripted group on the non-event days used in the estimation sample (same days as used for the DR analysis) day (on non-event days) in which the quarter hour of sample *t* falls.

$grp_{g,k}$ = Two dummy variables. Each is equal to 1 when participant *k* falls in EM&V Group *g*. For example, if participant *k* is in Group 1, then $grp_{1,k}$ is equal to 1 and $grp_{2,k}$ is equal to 0.

$C_{k,t}$ = Equal to 1 when participant *k* is subject to a curtailment event on day *t*, and 0 otherwise.

C.2 DR Regression Parameters

Readers may use the numbers presented in this subsection either to generate quarter-hourly-specific estimates of historical impacts or quarter-hourly specific forecasts of capability for the various different cycling strategies. To obtain the forecast capability, the reader needs only multiply the estimated slope in Table 17 by the values in Table 18 and Table 19 or by any other CDH value for which he or she is interested in obtaining the impact.

Note that because the regression parameter estimates are capturing a reduction in demand, the slopes presented below appear as negative numbers.

Table 17. Slope Estimates by Group by Cycling Strategy

M&V Group	Quarter Hour Number	Interval Starting Time	50% Cycling	65% Cycling
Group 1	59	14:30	N/A	-0.0202
Group 1	60	14:45	N/A	-0.0505
Group 1	61	15:00	-0.0021	-0.0278
Group 2	61	15:00	-0.0234	-0.0316
Group 1	62	15:15	-0.0372	-0.0441
Group 2	62	15:15	-0.0450	-0.0518
Group 1	63	15:30	-0.0440	-0.0443
Group 2	63	15:30	-0.0452	-0.0530
Group 1	64	15:45	-0.0377	-0.0439
Group 2	64	15:45	-0.0458	-0.0513
Group 1	65	16:00	-0.0454	-0.0436
Group 2	65	16:00	-0.0439	-0.0563
Group 1	66	16:15	-0.0461	-0.0420
Group 2	66	16:15	-0.0510	-0.0537
Group 1	67	16:30	-0.0402	-0.0420
Group 2	67	16:30	-0.0473	-0.0594
Group 1	68	16:45	-0.0455	-0.0438
Group 2	68	16:45	-0.0494	-0.0555
Group 1	69	17:00	-0.0468	-0.0450
Group 2	69	17:00	-0.0463	-0.0623
Group 1	70	17:15	-0.0437	-0.0470
Group 2	70	17:15	-0.0516	-0.0606
Group 1	71	17:30	-0.0465	-0.0389
Group 2	71	17:30	-0.0480	-0.0638
Group 1	72	17:45	-0.0404	-0.0445
Group 2	72	17:45	-0.0457	-0.0577

Note that only Group 1 was subject to curtailment between 2:30 p.m. and 3:00 p.m. (all other events were from 3:00 p.m. to 6:00 p.m.). In calculating overall program impacts, the evaluation team estimated the first two intervals for Group 2 by averaging the coefficients estimated for the first hour (first four intervals) of the events to which this group was subject.

Table 18. Curtailment Event Variable

Date	Start Time	End Time	Cycling Strategy	Group
Jun-23-16	2:30 p.m.	5:30 p.m.	65%	Group 1
Jul-14-16	3:00 p.m.	6:00 p.m.	65%	Group 2
Jul-15-16	3:00 p.m.	6:00 p.m.	65%	Group 1
Jul-26-16	3:00 p.m.	6:00 p.m.	50%	Group 2
Jul-27-16	3:00 p.m.	6:00 p.m.	50%	Group 1
Aug-11-16	3:00 p.m.	6:00 p.m.	65%	Group 2
Aug-26-16	3:00 p.m.	6:00 p.m.	65%	Group 1
Aug-31-16	3:00 p.m.	6:00 p.m.	65%	Group 2
Sept-7-16	3:00 p.m.	6:00 p.m.	65%	Group 1
Sept-8-16	3:00 p.m.	6:00 p.m.	65%	Group 2

Table 19. Curtailment Event Moving Average CDH[30]

Quarter Hour Number	Interval Starting Time	June 23	July 14	July 15	July 26	July 27	Aug. 11	Aug. 26	Aug. 31	Sept. 7	Sept. 8
59	14:30	20.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
60	14:45	20.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
61	15:00	20.4	22.7	21.5	23.4	20.5	19.0	22.5	18.9	21.5	22.6
62	15:15	20.4	22.1	21.0	23.3	20.2	19.0	22.9	19.1	21.5	22.7
63	15:30	20.4	21.6	20.8	23.2	20.0	19.0	23.1	19.3	21.5	22.7
64	15:45	20.3	21.4	20.6	23.2	19.9	19.1	23.3	19.4	21.5	22.7
65	16:00	20.0	21.5	19.7	23.3	20.1	18.7	22.9	19.1	21.2	22.5
66	16:15	19.8	21.7	19.2	23.5	20.2	18.5	22.7	18.8	21.0	22.4
67	16:30	19.7	21.7	18.8	23.5	20.3	18.4	22.5	18.7	20.9	22.3
68	16:45	19.6	21.8	18.6	23.6	20.3	18.3	22.4	18.6	20.8	22.2
69	17:00	18.8	21.5	14.7	23.3	20.3	17.4	22.2	17.3	20.3	21.5
70	17:15	18.4	21.3	12.2	23.1	20.3	16.9	22.0	16.5	19.9	20.9
71	17:30	N/A	21.2	10.5	22.9	20.3	16.5	21.9	15.9	19.7	20.6
72	17:45	N/A	21.1	9.4	22.8	20.3	16.2	21.9	15.5	19.6	20.4

[30] The values in this table represent the moving average CDH only for the participants that are experiencing the event.

C.3 The Two-Group Design

A significant change in the evaluation design for PY2016 was the inclusion of two M&V groups rather than only one. In previous years, all EM&V customers were assigned to a single group and curtailed for the same events.

One significant challenge in these previous years (in particular PY2013) was the conflicting set of incentives for achieving robust results: the more EM&V events there are, the greater the estimated precision will be; on the other hand, if there are no (or very few) event-like (in terms of temperature) non-event days, obtaining an accurate baseline may be a challenge.

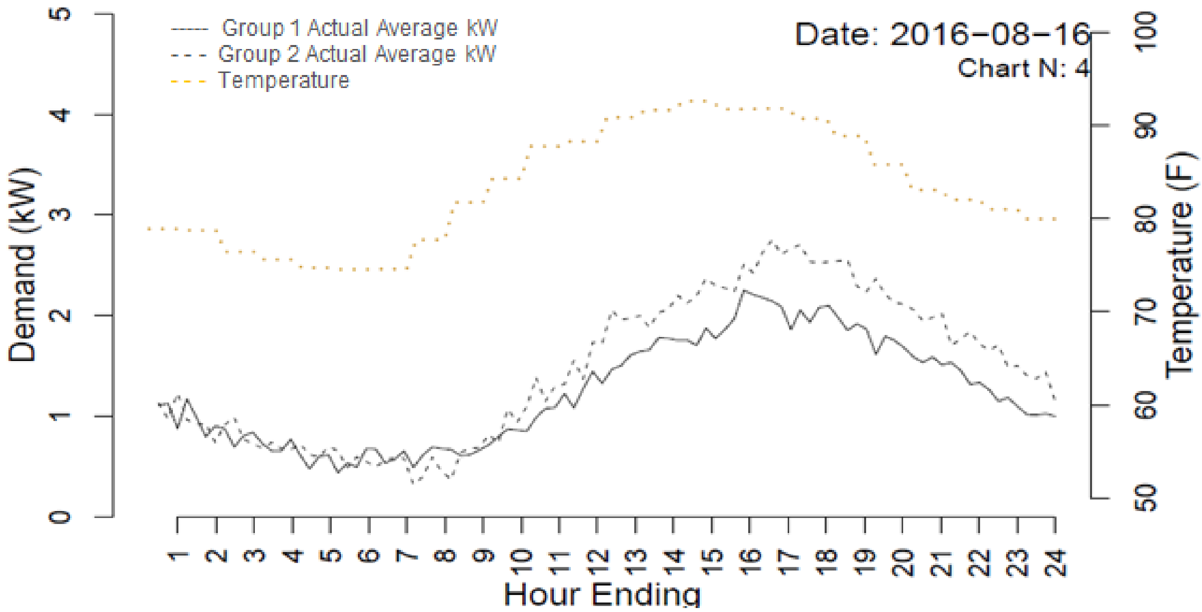
For PY2016, Navigant recommended a new approach to the evaluation design: an experimental design whereby half of the EM&V participants are randomly assigned to one group and the other half are assigned to another. Whenever an event is called, it is called only for one group. This allows for the calling of a relatively high number of events, and under favorable circumstances, vastly reduces the likelihood of model specification bias since one group may be used as a counterfactual for the other.

With random allocation, the event demand of the uncurtailed group would be a consistent estimator of the counterfactual demand of the curtailed group during that event. That is, in sufficiently large samples, average demand from one group would be an unbiased estimator of average demand of the other group.

Participants were allocated randomly by summer monthly consumption strata to the two groups such that the average monthly summer consumption in 2015 for the two groups was nearly the same. This kind of stratified random sampling is intended to produce two groups that share a similar distribution of demands. That is, the intention is that the two groups have a similar load profile. As the number of sample participants added to each group in this way increases, so too does the probability that one group will look like the other.

Unfortunately, when the samples assigned are relatively small, there exists the possibility that one may be materially different than the other (consistency only guarantees unbiasedness in large samples). This possibility (i.e., that the group load profiles differed) appears to have materialized for the EnergyWise EM&V participants in PY2016. Figure 24 shows the average load profile of Group 1 (solid line) and Group 2 (dashed line) on a hot non-event day in the summer of 2016.

Figure 24. Non-Event Day Profile Comparison

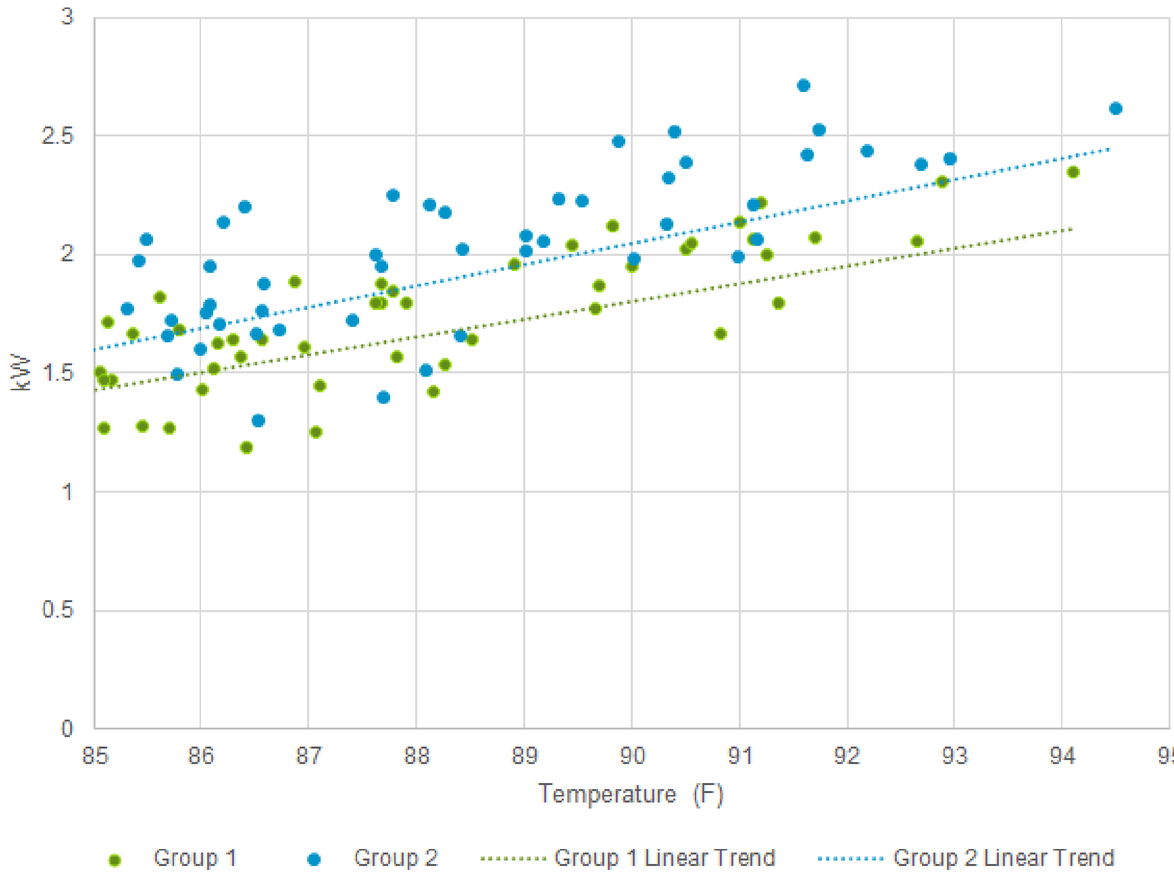


Source: Navigant logger data and analysis

Had the Group 1 and Group 2 samples been larger, then the random group assignment would have resulted in two average load profiles that were directly on top of one another. This would greatly simplify impact estimation. Unfortunately, as is evident from Figure 24, the samples for the two groups are sufficiently small that there is a substantial and meaningful difference between the two groups' consumption profiles.

This becomes even more evident when a comparison is made between the average daily demand and temperature pairs of the two groups for all non-event days in the summer of 2016. These two sets of data are shown in Figure 25. In this plot, each point represents the average demand and temperature between 3 p.m. and 6 p.m. for a single day for either Group 1 (green) or Group 2 (blue).

Figure 25. Average Daily Demand and Temperature Pairs, 3 p.m.-6 p.m., Group 1 and Group 2



Source: Navigant logger data and analysis

This systematic difference in demands is what led to Navigant to apply a group-specific set of dummy variables to all regression variables (functionally equivalent to estimating two separate regressions). Although it would have been preferable to not have to include this additional set of dummies had the two groups' load profiles been more closely aligned, the two-group design still provides a more accurate estimate of impacts than a single group design, such as that used in previous years.

Despite the results of the experimental design not perfectly meeting expectations, the new evaluation design did offer a material improvement over the approach used in previous years. This improvement comes in the form of the inclusion on the right-hand side of the regression equation of a new variable: the contemporaneous average demand of the other EM&V group. The motivation behind this inclusion is that although there is a substantial difference between the two groups' demands, it is a reasonably consistent difference. Thus, the demand of non-curtailed group can provide useful information regarding the shape of curtailed participant demand during the event period.

For this reason, despite not wholly achieving the original aims of the design, Navigant would recommend that this style of experimental evaluation design be maintained for EnergyWise logger data evaluations going forward.

APPENDIX D. FINAL SURVEY GUIDE USED FOR PARTICIPANT PERCEPTION PHONE SURVEYS

D.1 DEP EnergyWise Home Program Evaluation

Residential Post-Event Survey

Purpose: The EnergyWise program provides residential customers the opportunity to earn credit on their electricity bill by allowing Duke Energy Progress to remotely control air conditioners (AC) in the summer months during times of seasonal peak demand, known as DR events. Telephone surveys will be conducted with program participants following DR events and "placebo" events, where no event is actually called, but features similar conditions to DR event days. The key process research objectives addressed through this survey will include assessing overall participant program satisfaction and evaluating participant awareness and comfort levels during actual DR events as compared to "awareness" of placebo DR events.

FOR EVENT SAMPLE: Use two attempts at different times of the day within 27 hours of event notification before dropping contact from the contact list. Call times are from 10:00 a.m. to 8:00 p.m. EDT or 9-7 CST Monday through Saturday. No calls on Sunday. For example, if a control event occurs on a Monday, calling hours for that particular event would be:

Monday 6:30pm-8pm Eastern (5:30-7 Central)
Tuesday 10am-8pm Eastern (9-7 Central)

FOR NON-EVENT SAMPLE: Use two attempts at different times of the day within 27 hours of weather similar to when a real event would be called but no EnergyWise Home event being called. Call times are from 10:00 a.m. to 8:00 p.m. EDT or 9-7 CST Monday through Saturday. No calls on Sunday. For example, if a high temperature/no event day occurs on a Monday, calling hours for that particular non-event would be:

Monday 6:30pm-8pm Eastern (5:30-7 Central)
Tuesday 10am-8pm Eastern (9-7 Central)

For a Friday Event calls can be made on the Monday following if needed.

State:
( ) North Carolina
( ) South Carolina

Info
Survey ID: ________________________
Event ID: __DATE_____________________
Surveyor Name: ________________________

Basic Customer Data: (To be provided from Sample)

- Name (Adult Customer of Record and/or Spouse)
- Date Survey Completed
- Property Address
- Phone number
- Utility Account Number

Sample Variables:

1. CONTACT_NAME
2. SAMPLE_TYPE (1 = EVENT; 2 = NON-EVENT)

3. HIGHTEMP_DATE
4. EVENT_STARTTIME
5. EVENT_ENDTIME
6. BEFORE_HIGHTEMP_DATE

INSERT LABEL	Round 1/ Event 1	Round 2/ Event 2	Round 3/ Event 3 (Placebo)
HIGHTEMP_DATE	August 11, 2016	September 8, 2016	September 14, 2016
EVENT_STARTTIME	3:00 p.m.	3:00 p.m.	3:00 p.m.
EVENT_ENDTIME	6:00 p.m.	6:00 p.m.	6:00 p.m.
BEFORE_HIGHTEMP_DATE	August 10, 2016	September 7, 2016	September 13, 2016

INTRO. Hello, my name is (YOUR NAME), and I'm calling from Bellomy Research on behalf of Duke Energy Progress. May I please speak to [INSERT CONTACT NAME]? (IF NOT AVAILABLE, SAY:) May I please speak to the person who would be most familiar with your household's participation in the EnergyWise Home Program? (IF NO ONE AVAILABLE TO SPEAK WITH, TRY TO SCHEDULE A CALLBACK WITHIN THE NEXT 24 HOURS ONLY.)

According to our information, you presently participate in Duke Energy Progress's EnergyWise Home Program. This program allows Duke Energy Progress to cycle your air conditioner when there is a critical need for electricity in the region. This is a short survey that will take about 5 minutes to complete and the information you provide will be confidential and will help to improve the program.

1. Are you aware of your participation in the EnergyWise Home Program?
   1. Yes
   2. No
   98. Don't know/Not sure

[IF Q1 = 2 OR 98 CONTINUE. OTHERWISE, SKIP TO Q2.]
1a. May I please speak to the person who would be most familiar with your household's participation in the EnergyWise Home Program? (IF NOT AVAILABLE, TRY TO SCHEDULE A CALLBACK WITHIN THE NEXT 24 HOURS ONLY.)
   1. Yes, available
   99. Refused

[IF Q1A = 1, CONTINUE. OTHERWISE, THANK AND TERMINATE.]
1b. Hello, my name is (YOUR NAME), and I'm calling from Bellomy Research on behalf of Duke Energy Progress. According to our information, you presently participate in Duke Energy Progress's EnergyWise Home Program. This program allows Duke Energy Progress to cycle your air conditioner when there is a critical need for electricity in the region. This is a short survey that will take about 5 minutes to complete and the information you provide will be confidential and will help to improve the program.
   1. Yes, continue
   99. Refused

[IF 1B = 1, CONTINUE. OTHERWISE, THANK AND TERMINATE.]
2. Has Duke Energy Progress activated the EnergyWise Home device since you joined the program?
(IF THEY ASK WHAT THIS MEANS, RESPOND WITH:) "Duke Energy Progress has the ability to send a signal to activate the device to cycle your central air conditioner on and off during an event." (THEN REPEAT THE QUESTION.)
   1. Yes
   2. No
   98. Don't know/Not sure

3. How do you know when the device has been activated? (DO NOT READ LIST. RECORD ALL MENTIONS.)
   1. AC shuts down
   2. Home temperature rises
   3. The light on the meter is on
   4. Light on AC unit flashes
   5. Bill credits
   6. Lower bill
   97. Other (Please Specify)
   98. Don't know/Not sure

Has your device been activated within the last 7 days?
   1. Yes
   2. No
   98. Don't know/Not sure

5. [IF SAMPLE_TYPE = 1 "Event", DISPLAY: According to our records, your device was activated on [INSERT HIGHTEMP_DATE] starting at [INSERT EVENT_STARTTIME] and ending at [INSERT EVENT_ENDTIME]].
[IF SAMPLE_TYPE = 1 "EVENT", Q5_INSERT = "during the time of the event?"]
[IF SAMPLE_TYPE = 2 "NON-EVENT", Q5_INSERT = "at 3pm on [INSERT HIGHTEMP_DATE]?"]
At what temperature was your thermostat set to [INSERT Q5_INSERT]
   1. Less than 65 degrees
   2. 65-68 degrees
   3. 69-72 degrees
   4. 73-75 degrees
   5. 76-78 degrees
   6. 79-81 degrees
   7. 82-84 degrees
   8. 85-87 degrees
   9. 88-90 degrees
   10. 91-94 degrees
   11. 95-97 degrees
   12. 98-100 degrees
   13. Greater than 100 degrees
   14. It's programmed into the thermostat
   15. Thermostat was turned off
   16. Air conditioner was turned off
   98. Don't know/Not sure

[IF SAMPLE_TYPE = 1 "EVENT", Q6_INSERT = "when Duke Energy Progress activated your EnergyWise Home device at that time?"]
[IF SAMPLE_TYPE = 2 "NON-EVENT", Q6_INSERT = "at that time?"]
6. Were you or any members of your household home [INSERT Q6_INSERT]

   1. Yes

   2. No

   98. Don't know/Not sure

[IF Q6 = 1, CONTINUE. OTHERWISE, SKIP TO Q14.]
[IF SAMPLE_TYPE = 1 “EVENT”, Q71_INSERT = “During this recent activation,”]
[IF SAMPLE_TYPE = 1 “EVENT”, Q72_INSERT = “before the recent activation?”]
[IF SAMPLE_TYPE = 2 “NON-EVENT”, Q71_INSERT = “During this time,”]
[IF SAMPLE_TYPE = 2 “NON-EVENT”, Q72_INSERT = “on [INSERT BEFORE_HIGHTEMP_DATE]?”]

7. [INSERT Q71_INSERT] using a scale of 0 to 10, where 0 means “Very Uncomfortable” and 10 means “Very Comfortable”, how would you describe your level of comfort [INSERT Q72_INSERT]

Very Uncomfortable										Very Comfortable	Don’t know/Not sure
0	1	2	3	4	5	6	7	8	9	10	98

[IF SAMPLE_TYPE = 1 “EVENT”, Q8_INSERT = “during the recent activation?”]
[IF SAMPLE_TYPE = 2 “NON-EVENT”, Q8_INSERT = “on [INSERT HIGHTEMP_DATE]?”]

8. Using the same scale of 0 to 10, where 0 means “Very Uncomfortable” and 10 means “Very Comfortable”, how would you describe your level of comfort [INSERT Q8_INSERT]

Very Uncomfortable										Very Comfortable	Don’t know/Not sure
0	1	2	3	4	5	6	7	8	9	10	98

[IF Q7 OR Q8 = 98 “DK/NS”, SKIP TO Q10.]
[IF Q8 ANSWER < Q7 ANSWER, CONTINUE. OTHERWISE SKIP TO Q10.]
[IF SAMPLE_TYPE = 1 “EVENT”, Q9_INSERT = “EnergyWise Home Program/Control”]
[IF SAMPLE_TYPE = 2 “NON-EVENT”, Q9_INSERT = “EnergyWise”]

9. What do you feel caused your decrease in comfort? (DO NOT READ LIST. RECORD ALL MENTIONS.)
   1. [INSERT Q9_INSERT]
   2. Rising temperature
   3. Rising humidity
   4. Power outage
   97. Other (Please Specify)
   98. Don’t know/Not sure

[IF SAMPLE_TYPE = 1 “EVENT”, Q10_INSERT = “When Duke Energy Progress activated your EnergyWise Home device on [INSERT HIGHTEMP_DATE],”]
[IF SAMPLE_TYPE = 2 “NON-EVENT”, Q10_INSERT = “On [INSERT HIGHTEMP_DATE],”]

10. [INSERT Q10_INSERT] did you or any other members of your household adjust the settings on your thermostat?
   1. Yes
   2. No
   98. Don’t know/Not sure

[IF Q10 = 1, CONTINUE. OTHERWISE SKIP TO Q12.]
[IF SAMPLE_TYPE = 1 “EVENT”, Q11_INSERT = “during the control event?”]
[IF SAMPLE_TYPE = 2 “NON-EVENT”, Q11_INSERT = “on [INSERT HIGHTEMP_DATE]?”]

11. At what temperature was it originally set, and what temperature did you set it to [INSERT Q11_INSERT] (USE 998 FOR DON’T KNOW/NOT SURE.)

______ Original temperature setting (degrees F) [ENTER NUMBER FROM 0-100.]
______ Adjusted temperature setting (degrees F) [ENTER NUMBER FROM 0-100.]

[IF SAMPLE_TYPE = 1 "EVENT", Q12_INSERT = "When Duke Energy Progress activated your EnergyWise Home device on [INSERT HIGHTEMP_DATE],"]
[IF SAMPLE_TYPE = 2 "NON-EVENT", Q12_INSERT = "On [INSERT HIGHTEMP_DATE],"]

12. [INSERT Q12_INSERT] did you or any other members of your household turn on any fans to keep cool?
   1. Yes
   2. No
   98. Don't know/Not sure

13. What else did you or other members of your household do to keep cool? (DO NOT READ LIST. RECORD ALL MENTIONS.)
   1. Continued normal activities/Didn't do anything different [EXCLUSIVE]
   2. Turned on room/window air conditioners
   3. Closed blinds/shades
   4. Moved to a cooler part of the house
   5. Left the house and went somewhere cool
   6. Wore less clothing
   7. Drank more water/cool drinks
   9. Opened windows
   97. Other (Please Specify)
   98. Don't know/Not sure

14. Now I'm going to ask you some questions about your usual air conditioning use. How often do you use your central air conditioner? Would you say you use it...(READ LIST)? (STOP WHEN RESPONDENT ANSWERS.)
   1. Not at all
   2. Only on the hottest days
   3. Frequently during the cooling season
   4. Most days during the cooling season
   5. Every day during the cooling season
   8. (DO NOT READ) Don't know/Not sure

15. When you think of a typical hot and humid summer day, at what outside temperature do you tend to feel uncomfortably warm? (DO NOT READ LIST.)
   1. Less than 65 degrees
   2. 65-68 degrees
   3. 69-72 degrees
   4. 73-75 degrees
   5. 76-78 degrees
   6. 79-81 degrees
   7. 82-84 degrees
   8. 85-87 degrees
   9. 88-90 degrees
   10. 91-94 degrees
   11. 95-97 degrees
   12. 98-100 degrees
   13. Greater than 100 degrees
   98. Don't know/Not sure

16. At what <u>outside temperature</u> do you tend to turn on the air conditioner? (DO NOT READ LIST.)
   1. Less than 65 degrees
   2. 65-68 degrees
   3. 69-72 degrees

4. 73-75 degrees
5. 76-78 degrees
6. 79-81 degrees
7. 82-84 degrees
8. 85-87 degrees
9. 88-90 degrees
10. 91-94 degrees
11. 95-97 degrees
12. 98-100 degrees
13. Greater than 100 degrees
14. It's programmed into the thermostat
98. Don't know/Not sure

17. How old is your air conditioner? (DO NOT READ LIST.)
    1. 0 to 6 years old
    2. 7 to 12 years old
    3. 13 to 20 years old
    4. Over 20 years old
    98. Don't know/Not sure

18. Using a scale of 0 to 10, where 0 means "Very Dissatisfied" and 10 means "Very Satisfied", what is your overall satisfaction with the EnergyWise Home Program?

Very Dissatisfied										Very Satisfied	Don't know/Not sure
0	1	2	3	4	5	6	7	8	9	10	98

[IF Q18 = 0-7, CONTINUE. OTHERWISE SKIP TO Q20.]

19. Why are you less than satisfied with EnergyWise Home? (RECORD ALL MENTIONS.)
    1. They activated my EnergyWise Home device more often than I would like
    2. The bill credit/incentives were not large enough
    3. I was uncomfortable when my EnergyWise device was activated
    97. Other (Please Specify)
    98. Don't know/Not sure

20. Using a scale of 0 to 10, where 0 means "Very Dissatisfied" and 10 means "Very Satisfied", what is your overall satisfaction with Duke Energy Progress?

Very Dissatisfied										Very Satisfied	Don't know/Not sure
0	1	2	3	4	5	6	7	8	9	10	98

[IF Q20 = 0-7, CONTINUE. OTHERWISE SKIP TO Q22.]

21. Why are you less than satisfied with Duke Energy Progress? (RECORD VERBATIM.)
    ____ CODING USE ONLY

22. Using a scale of 0 to 10, where 0 means "Extremely Unlikely" and 10 means "Extremely Likely", how likely is it that you would recommend this program to a friend or colleague?

Extremely Unlikely										Extremely Likely	Don't know/Not sure
0	1	2	3	4	5	6	7	8	9	10	98

[IF Q22 = 0-7, CONTINUE. OTHERWISE SKIP TO Q24.]
23. Why would you not recommend the program? (RECORD VERBATIM.)
_______________________________________ CODING USE ONLY

24. Do you get your Duke Energy Progress bill in the mail or by email?
1. Mail
2. Email
97. Other (Please Specify)
98. Don't know/Not sure

25. How do you pay your bill? Do you…(READ LIST)? (STOP WHEN RESPONDENT ANSWERS.)
1. Mail a check
2. Log into your Duke Energy Progress account and pay online
3. Or, do you have an auto-pay set up for your account
97. (DO NOT READ) Other (Please Specify)
98. (DO NOT READ) Don't know/Not sure

26. On average, how often do you review the details of your Duke Energy Progress bill? (READ LIST.) (STOP WHEN RESPONDENT ANSWERS.)
1. Every month
2. More than half the time
3. Less than half the time
4. Never
97. (DO NOT READ) Other (Please Specify)
98. (DO NOT READ) Don't know/Not sure

27. Have you noticed EnergyWise Home credit on your bill?
1. Yes
2. No
98. Don't know/Not sure

[IF Q27 = 1, CONTINUE. OTHERWISE SKIP TO Q30.]
28. Using a scale of 0 to 10, where 0 means "Very Dissatisfied" and 10 means "Very Satisfied", what is your overall satisfaction with the credit amount?

Very Dissatisfied										Very Satisfied	Don't know/Not sure
0	1	2	3	4	5	6	7	8	9	10	98

[IF Q28 = 0-7, CONTINUE. OTHERWISE SKIP TO Q30.]
29. Why do you say you're not satisfied? (RECORD VERBATIM.)
_______________________________________ CODING USE ONLY
[PROGRAMMER: ALLOW A DON'T KNOW/NOT SURE CHECK BOX.]

[IF SAMPLE_TYPE = 1 "EVENT", Q30_INSERT = "Duke Energy Progress about the EnergyWise Home Program?"]
[IF SAMPLE_TYPE = 2 "NON-EVENT", Q11_INSERT = "Duke Energy Progress?"]
30. We have reached the end of the survey. Do you have any comments that you would like for me to pass on to [INSERT Q30_INSERT] (RECORD VERBATIM.)
_______________________________________ CODING USE ONLY

[PROGRAMMER: ALLOW A NO COMMENTS CHECK BOX.]

CLOSE 2. Thank you for your time and feedback today!

NAVIGANT

EM&V Report for the EnergyWise Home Program

Appendix D. Device Responsiveness Plots and Tables

Summer 2016

Presented for:
Duke Energy Progress

Prepared by:
Navigant Consulting, Inc.

DUKE ENERGY®

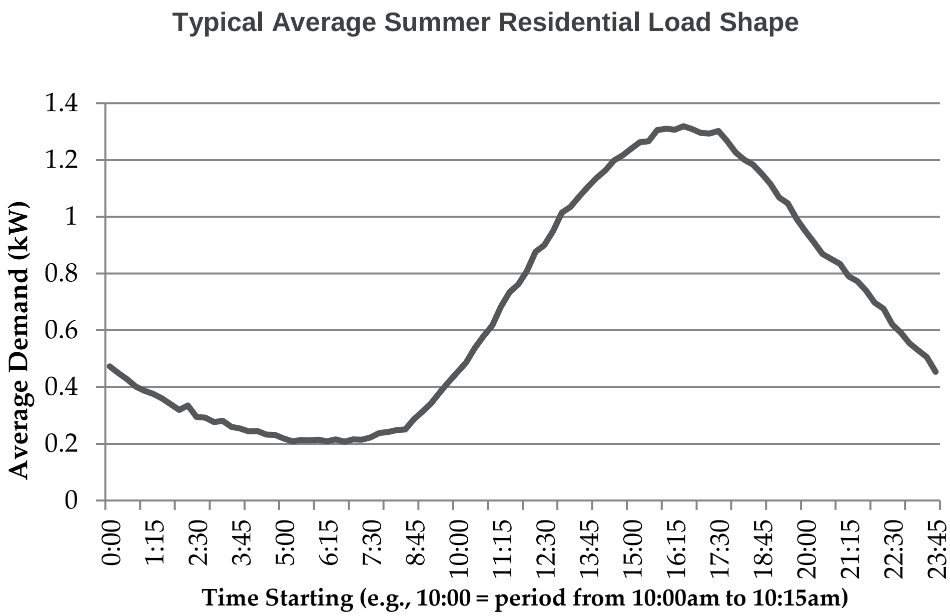
June 5, 2017

This appendix includes plots of average demand of all A/C units, for each event, split according to whether that unit was deemed to have successfully curtailed or not. The threshold criterion used to make the determination of a successful curtailment is 0%. This is the same threshold that was used in the DEP program years 2011 and 2013 evaluation. For a more comprehensive description of the analysis performed to determine the 0% threshold, please see the DEP 2011 evaluation.[1] A 0% threshold means simply that a device is considered to have successfully curtailed if the average level of demand during the event hour is not higher than it was in the prior hour.

The plots below present a graph per event of the devices that experienced successful curtailment and those devices that were unsuccessful at curtailment. The tables that precede these graphs include statistics relevant to each event.

Caution must be exercised in examining these plots, particularly those of demand. Electricity demand data are notoriously "noisy" –particularly as the granularity of the data increases. Likewise, in most cases there will be considerably fewer units considered to have failed to curtail than to have successfully curtailed. What this means is that plots of demand of devices that were non-responsive will tend to be more jagged than the plots of demand for devices that *were* responsive and may not always conform to the typically expected summer day load profile. Most readers will be familiar with the shape of the typical residential summer load shape, such as the one shown in the Figure below.

This is the average demand of all units included in the PY2011 analysis for which data exist in each fifteen-minute interval of all non-event weekdays.



Source: Navigant logger data and analysis

The reader must bear in mind, however, when comparing the load profile of the non-responsive devices to the standard load profile, that the standard load profile is an average of a large number of contributing units.

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The load shapes of non-responsive devices are the average demand of much fewer units, and are averaged only across a single hour (rather than across multiple days at the same hour). Thus, significant deviations from the typical load shape should be expected.

The remainder of this Appendix is divided into two components. The first, immediately below, consists of a series of tables capturing summary statistics for each event. For consistency with previous logger data analyses, these include all the same fields as those included in the PY2011 and PY2013 evaluation reports. Each table corresponds to a load profile plot. These plots are presented immediately following the operability tables. Each plot may be linked to its corresponding table based on the chart number provided in the first row of each operability table, and in the chart number provided in the top right-hand corner of each plot.

Operability Tables

Chart N 1			
Event Date	23-June-2016	Curtailment Strategy	65%
Threshold	0%	**Comparator Period**	Prior Hour
# Successful Curtail	32	**# Failed Curtail**	3
# On during but not before event *or* on during but not after event	7	**# Not on During Event***	17

Chart N 2			
Event Date	14-July-2016	Curtailment Strategy	65%
Threshold	0%	**Comparator Period**	Prior Hour
# Successful Curtail	37	**# Failed Curtail**	6
# On during but not before event or on during but not after event	3	**# Not on During Event***	6

Chart N 3			
Event Date	15-July-2016	Curtailment Strategy	65%
Threshold	0%	**Comparator Period**	Prior Hour
# Successful Curtail	32	**# Failed Curtail**	4
# On during but not before event *or* on during but not after event	6	**# Not on During Event***	15

Chart N 4			
Event Date	26-July-2016	Curtailment Strategy	65%
Threshold	0%	**Comparator Period**	Prior Hour

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# Successful Curtail	32	**# Failed Curtail**	10
# On during but not before event *or* on during but not after event	1	**# Not on During Event***	7

Chart N 5			
Event Date	27-July-2016	Curtailment Strategy	65%
Threshold	0%	**Comparator Period**	Prior Hour
# Successful Curtail	34	**# Failed Curtail**	3
# On during but not before event *or* on during but not after event	4	**# Not on During Event***	10

Chart N 6			
Event Date	11-Aug-2016	Curtailment Strategy	65%
Threshold	0%	**Comparator Period**	Prior Hour
# Successful Curtail	34	**# Failed Curtail**	8
# On during but not before event *or* on during but not after event	2	**# Not on During Event***	8

Chart N 7			
Event Date	26-Aug-2016	Curtailment Strategy	65%
Threshold	0%	**Comparator Period**	Prior Hour
# Successful Curtail	27	**# Failed Curtail**	8
# On during but not before event *or* on during but not after event	6	**# Not on During Event***	9

Chart N 8			
Event Date	31-Aug-2016	Curtailment Strategy	65%
Threshold	0%	**Comparator Period**	Prior Hour
# Successful Curtail	28	**# Failed Curtail**	8
# On during but not before event *or* on during but not after event	7	**# Not on During Event***	12

Chart N 9			
Event Date	07-Sept-2016	Curtailment Strategy	65%

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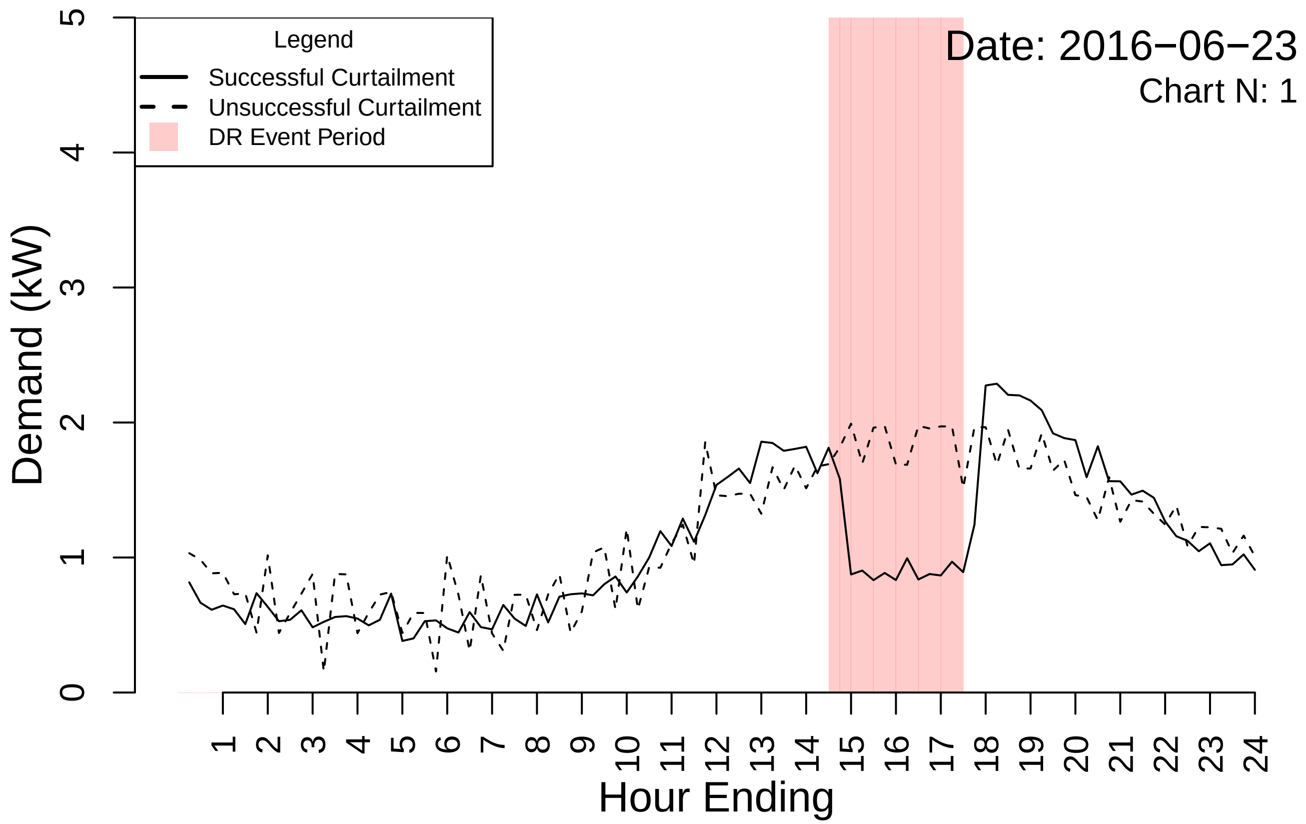
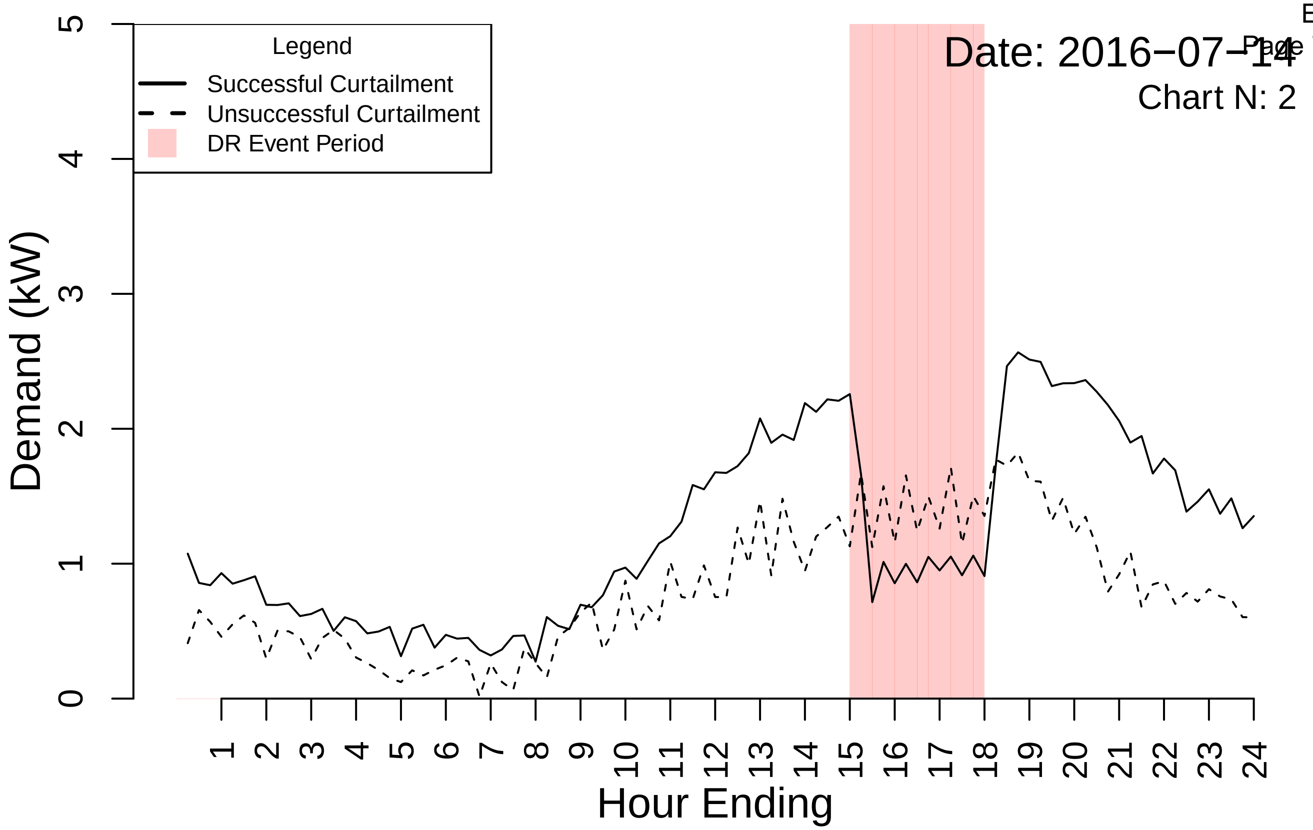
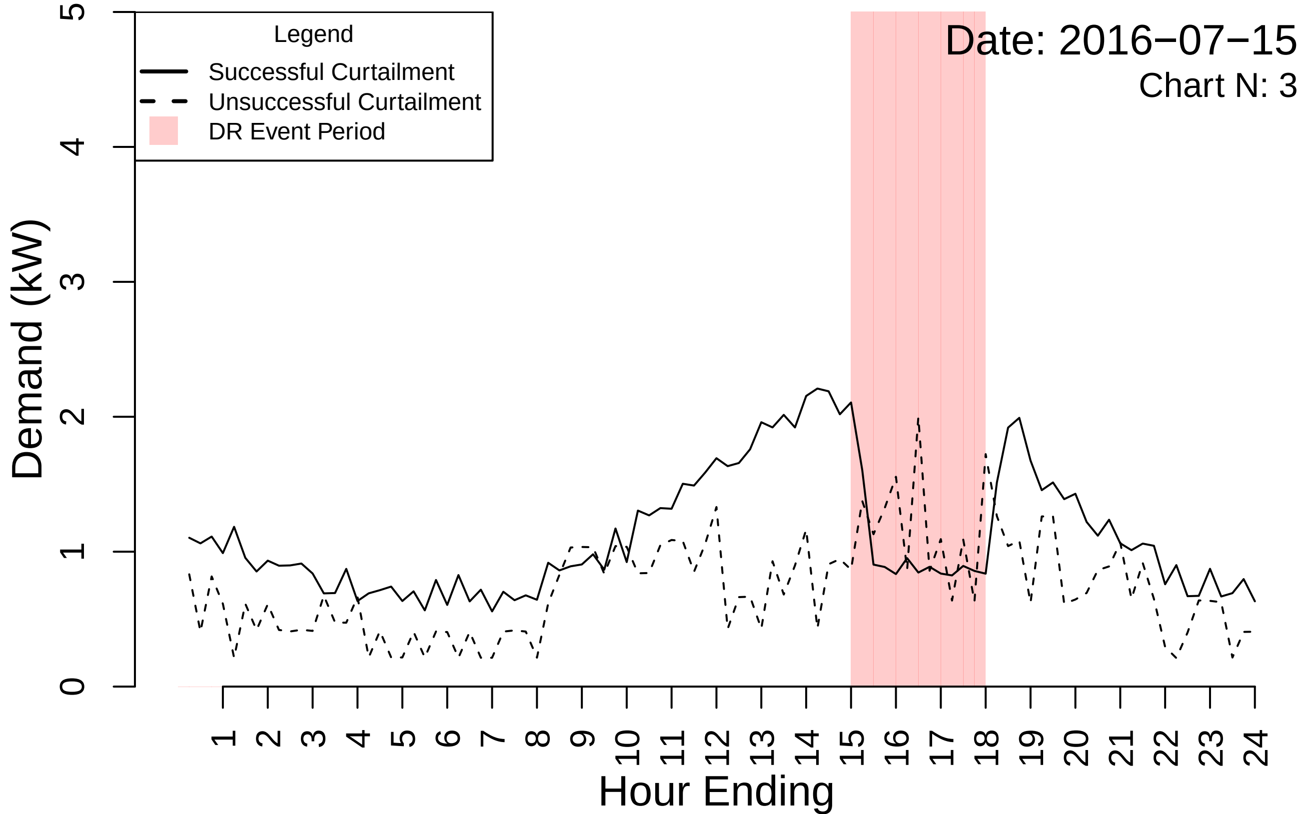
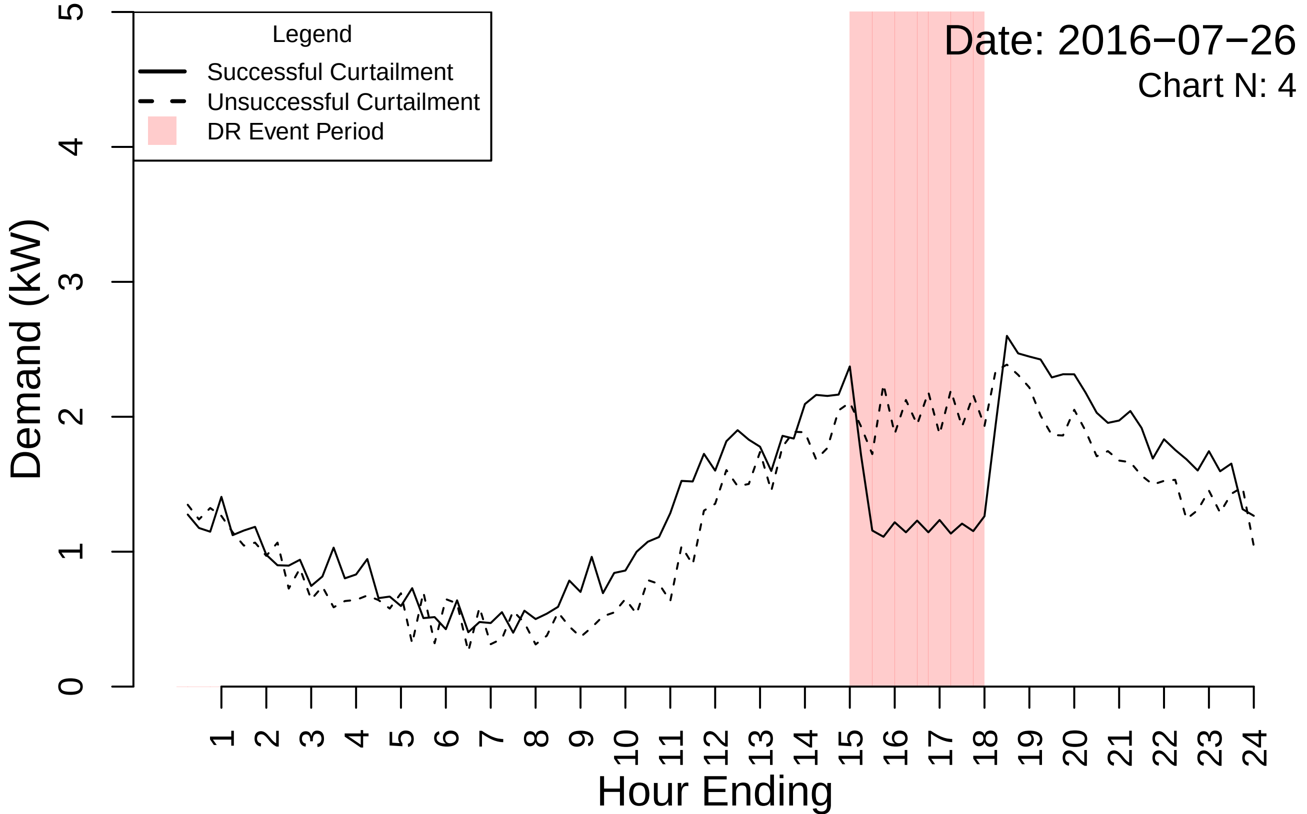
Threshold	0%	**Comparator Period**	Prior Hour
# Successful Curtail	31	**# Failed Curtail**	4
# On during but not before event *or* on during but not after event	5	**# Not on During Event***	16

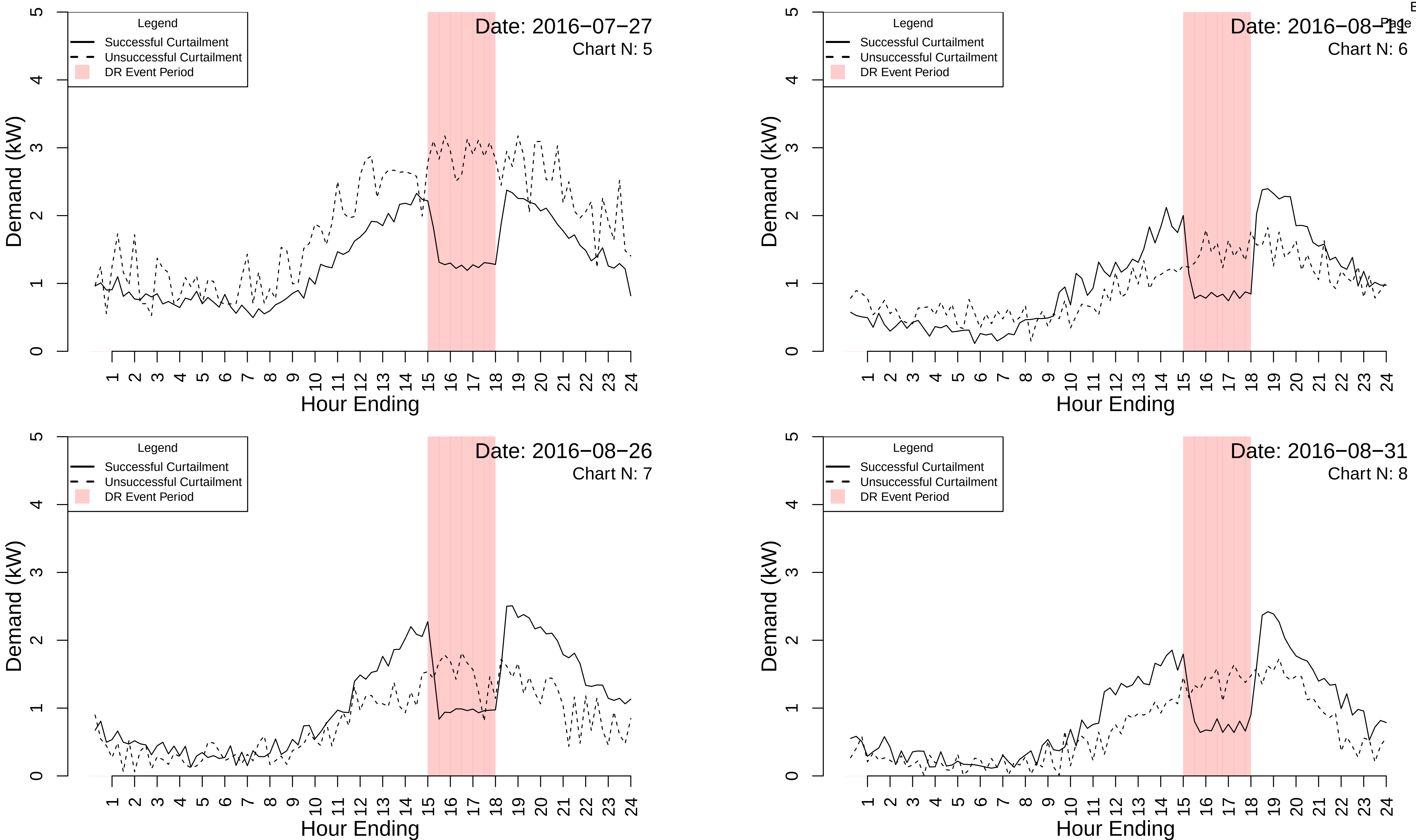
Chart N 10			
Event Date	08-Sept-2016	Curtailment Strategy	65%
Threshold	0%	**Comparator Period**	Prior Hour
# Successful Curtail	35	**# Failed Curtail**	5
# On during but not before event *or* on during but not after event	5	**# Not on During Event***	10

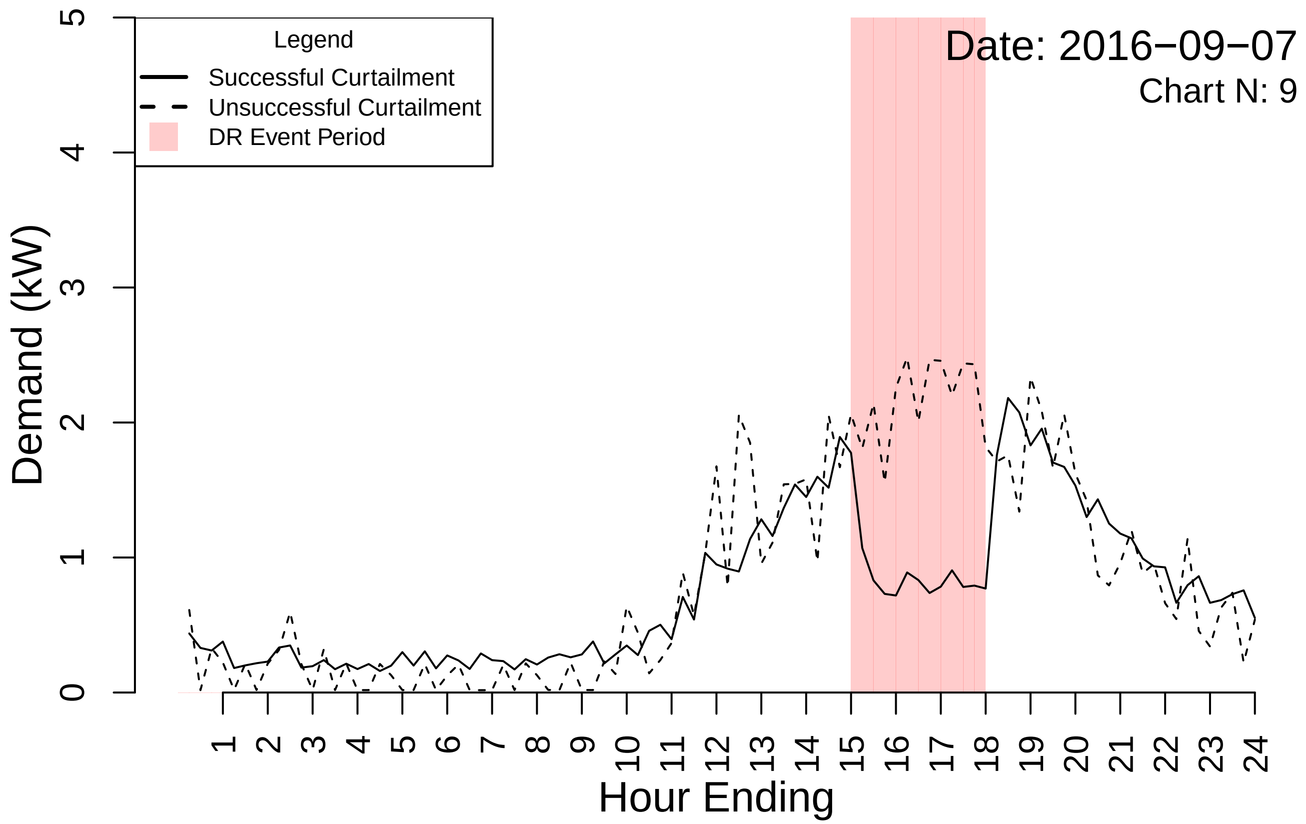

Legend
Successful Curtailment
Unsuccessful Curtailment
DR Event Period
Date: 2016−06−23
Chart N: 1
Demand (kW)
Hour Ending

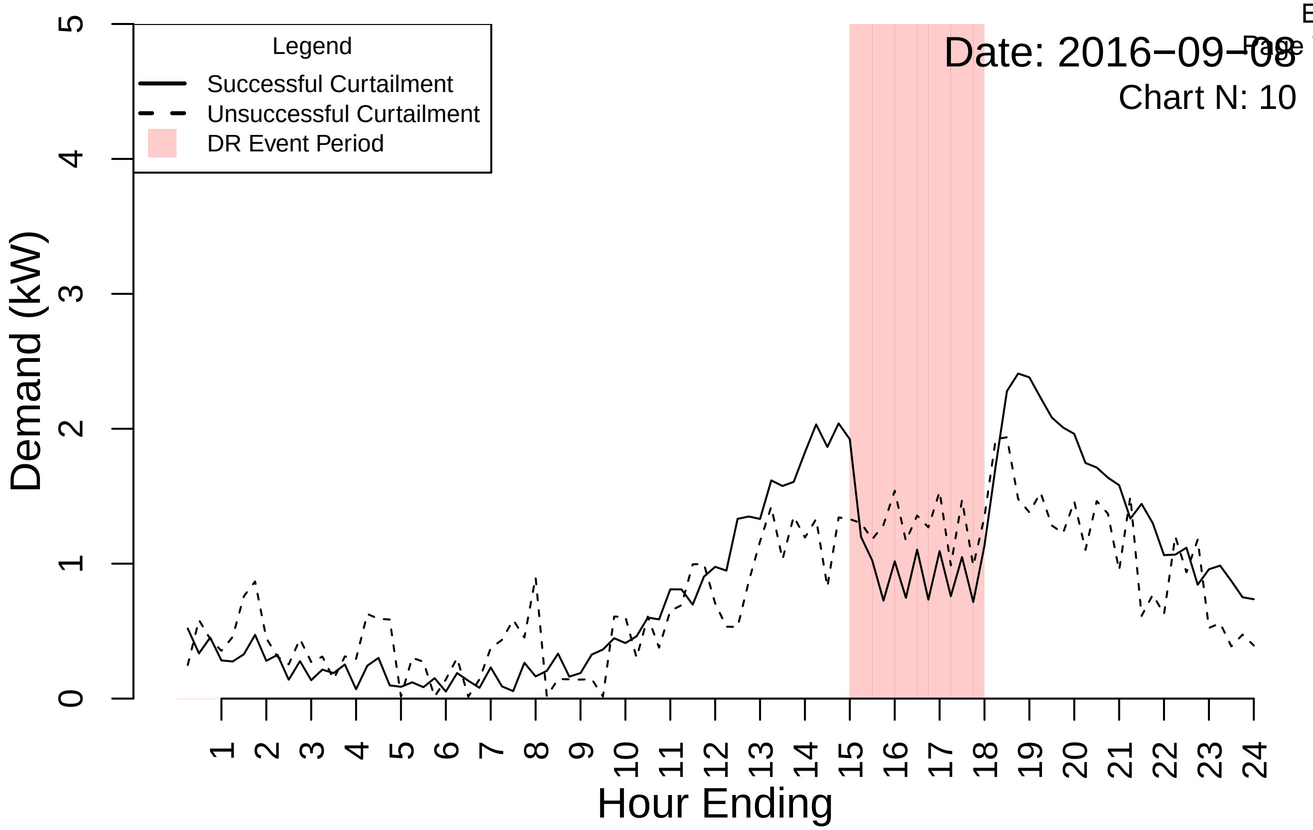

Legend
Successful Curtailment
Unsuccessful Curtailment
DR Event Period
Date: 2016−07−14
Chart N: 2
Demand (kW)
Hour Ending


Legend
Successful Curtailment
Unsuccessful Curtailment
DR Event Period
Date: 2016−07−15
Chart N: 3
Demand (kW)
Hour Ending


Legend
Successful Curtailment
Unsuccessful Curtailment
DR Event Period
Date: 2016−07−26
Chart N: 4
Demand (kW)
Hour Ending


Legend
Successful Curtailment
Unsuccessful Curtailment
DR Event Period
Date: 2016−07−27
Chart N: 5
Demand (kW)
Hour Ending
Legend
Successful Curtailment
Unsuccessful Curtailment
DR Event Period
Date: 2016−08−11
Chart N: 6
Demand (kW)
Hour Ending
Legend
Successful Curtailment
Unsuccessful Curtailment
DR Event Period
Date: 2016−08−26
Chart N: 7
Demand (kW)
Hour Ending
Legend
Successful Curtailment
Unsuccessful Curtailment
DR Event Period
Date: 2016−08−31
Chart N: 8
Demand (kW)
Hour Ending


Legend
Successful Curtailment
Unsuccessful Curtailment
DR Event Period
Date: 2016−09−07
Chart N: 9
Demand (kW)
Hour Ending


Legend
Successful Curtailment
Unsuccessful Curtailment
DR Event Period
Date: 2016−09−08
Chart N: 10
Demand (kW)
Hour Ending

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EM&V Report for the EnergyWise Home Demand Response Program

Winter PY2016/2017

Prepared for:

Duke Energy Progress

DUKE ENERGY®

July 6, 2017

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EM&V Report for the EnergyWise Home Demand Response Program

EVALUATION SUMMARY

The EnergyWise Home (EnergyWise) demand response (DR) program offers Duke Energy Progress (DEP) residential customers the opportunity to earn credits on their electricity bill by allowing DEP to remotely control air conditioners in the summer months (available system wide) and space- and water-heating equipment in winter (Western region customers only) during times of seasonal peak consumption. This report covers the evaluation, measurement, and verification (EM&V) activities for the winter of 2016-2017.

At the time of the single event called by Duke Energy during the winter of 2016-2017, there were over 8,390 participants with water heaters and over 4,060 participants with sets of heat pump auxiliary heat strips enrolled in the program.

As shown in Table 1, the estimated program-level impact for the EnergyWise winter Program Year (PY) 2016/2017 DR program was 7.13 MW. The system impact and per customer impact by device type are also presented in Table 1.

Table 1. Average Demand Reduction Impact by Technology: PY2016/2017

Device Curtailed	Average Per Participant Impact (kW)	Participants Controlled	System Impact (MW)	Relative Precision (+/-)*
Auxiliary Heat Strips	0.90	4,060	3.65	32%
Electric Water Heater	0.42	8,390	3.49	24%
Total System Impact:			**7.13**	

*At 90% confidence level

Source: Navigant Analysis, PY2016/2017 weather, and PY2014/2015 modeling results

Evaluation Methods

Navigant estimated DR impacts for auxiliary heat strips by applying the regression coefficients estimated as part of the PY2014/2015 evaluation[1], and the proportion of auxiliary heat strips that were fully responsive or partially responsive to DEP's curtailment signal as observed in the PY2014/2015 evaluation,[2] and the hourly observed heating degree hours in the appropriate quarter-hour of the PY2016/2017 DR event.

Navigant estimated DR impacts for water heaters by applying the regression coefficients estimated as part of the PY2014/2015 evaluation to the appropriate quarter-hour of the PY2016/2017 DR event.

[1] Navigant Consulting, Inc., on behalf of Duke Energy Progress, *EM&V Report for the EnergyWise Home Program: Winter 2014/2015,* June 2015.

[2] In that evaluation (as in the PY2011/2012 winter evaluation), Navigant divided auxiliary heat strips based on a visual examination of logger data into "fully responsive," "partially responsive," "unused," and "unresponsive" categories—referred to as dispositions. Separate equations were used to estimate impacts for fully and partially responsive devices.

Evaluated Impacts

The principal EM&V findings regarding the PY2016/2017 winter event demand impacts are as follows:

- **Auxiliary heat strips delivered an average DR impact of 0.90 kW per household.** The total estimated program impact of the 4,060 participating households was 3.65 MW.
- **Auxiliary heat strip impacts were lower on average for PY2016/2017 than PY2014/2015 due to the single PY2016/2017 event occurring on a relatively mild weather day.** In PY2014/2015, there were three events where the average event temperature was at or below approximately 5°F. In contrast, for the PY2016/2017 event, the average event temperature was approximately 19°F.
- **Water heaters delivered an average DR impact of 0.42 kW per household.** The total program impact of the 8,390 participating households was 3.49 MW.

1. INTRODUCTION

The EnergyWise program provides residential customers the opportunity to earn credits on their electricity bill by allowing DEP to remotely control air conditioning (in the summer) and water heater and heat pump auxiliary heating strips (in the winter – Western region customers only) during times of seasonal peak consumption. This report covers the EM&V activities for the winter of PY2016/2017.

EM&V is a term adopted by DEP and refers generally to the assessment and quantification of the energy and peak demand impacts of an energy efficiency or DR program. For DR, estimating reductions in peak demand is the primary objective, as energy impacts are generally negligible. EM&V also can encompass an evaluation of program processes and customer feedback typically conducted through participant surveys. The winter PY2016/2017 EM&V cycle did not include a process evaluation.

1.1 Objectives of the Evaluation

This report is intended to verify program impacts per the requirements established by the North Carolina Utilities Commission and the Public Service Commission of South Carolina. Since no data loggers were deployed to participating homes in the winter of PY2016/2017, the principal objective of the PY2016/2017 evaluation is to apply the results of the PY2014/2015 EM&V report to PY2016/2017 weather and participation data to estimate the impact of direct load control on residential demand in the winter.

1.2 Program Overview

The EnergyWise program was developed in response to DEP's determination that a curtailable load program would be a valuable resource for the company, and that it would provide an opportunity to engage directly with customers to help reduce costly seasonal peak demand. The program seeks to attract DR resources by providing incentives to residential customers to allow DEP to remotely control two of the most important drivers of winter peak demand typically found in the home—auxiliary heat strips and water heaters.

The program offers an annual bill credit of $25 (per appliance type controlled) to customers that choose to allow DEP to control their electric auxiliary heat strips and/or water heaters.

Eligibility. To be eligible for participation in the winter component of the EnergyWise program, a household must meet the following criteria:

- Participants must occupy the residence where the controls are installed. Renters must complete a Tenant Authorization Form and the landlord/property owner must approve.
- Residential electricity service must be in the name of the participant.
- Must reside in DEP's Western region (Asheville area).
- Participants must be in an area that can receive the EnergyWise Home paging signal.
- Participation also requires that participants have an electric water heater and/or a centrally ducted heat pump (for auxiliary heat strip control).

Incentives. Each participant receives a $25 bill credit per appliance or load type upon joining the program, and then an additional $25 bill credit every 12 months per appliance or load type to encourage continued participation.

Marketing. DEP is responsible for all marketing of the EnergyWise program. Participant enrollments are generated through a mix of direct mail, bill inserts, email, outbound calling, and door-to-door canvassing.

1.3 Reported Program Participation

This section reports the overall program participation for the winter EnergyWise program in the winter of PY2016/2017.

DEP called one DR event in winter PY2016/2017 on January 9, 2017. There were a total of 4,060 auxiliary heat strip participants and 8,390 water heater participants during the winter PY2016/2017 event.

The number of participants and number of appliances controlled by appliance type are shown in Table 2. Both devices were curtailed from 6:30 a.m. to 9:30 a.m., using a 100% cycling strategy. All winter EnergyWise participants are located in DEP's Western region.

Table 2. Overall Winter PY2015/2016 Program Participation by Appliance

Appliance	Number of Participants	Number of Appliances Controlled
Auxiliary Heat Strips	4,060	4,399
Electric Water Heater	8,390	8,548

Source: DEP EW Control Event Tracking Report

2. EVALUATION METHODS

This section of the EM&V report describes the approach used to estimate the DR and snapback impacts of the EnergyWise program for PY2016/2017.

Navigant estimated DR impacts from auxiliary heat strip by applying the regression coefficients estimated as part of the PY2014/2015 evaluation[3] and the device responsiveness shares as observed in the PY2014/2015 evaluation[4] to the hourly observed heating degree hours in the appropriate quarter-hour of the PY2016/2017 DR event.

Navigant estimated DR impacts from water heaters by applying the regression coefficients estimated as part of the PY2014/2015 evaluation to the appropriate quarter-hour of the PY2016/2017 DR event.

This section is divided into three subsections:

- **Demand Reduction Impacts:** How the demand reduction impacts were estimated based on regression-estimated parameters obtained from the PY2014/2015 evaluation report other technology-specific variables.
- **Snapback Impacts:** How the snapback impacts were estimated, using the coefficients estimated in the PY2014/2015 analysis.
- **Energy Impacts:** How energy impacts were estimated, using the DR and snapback estimated impacts.

2.1 Demand Reduction Impacts

This section details methodology for demand reduction impacts for both the auxiliary heat strip and water heater programs.

2.1.1 Auxiliary Heat Strip Demand Reduction Impacts

Navigant estimated DR impacts from auxiliary heat strips by applying the regression coefficients estimated as part of the PY2014/2015 evaluation[5] and the device responsiveness shares as observed in the PY2014/2015 evaluation[6] to the hourly observed heating degree hours in the appropriate quarter-hour of the PY2016/2017 DR event.

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[3] Navigant Consulting, Inc., on behalf of Duke Energy Progress, *EM&V Report for the EnergyWise Home Program: Winter 2014/2015,* June 2015.

[4] In this evaluation, as in the PY2011/2012 winter evaluation, Navigant divided auxiliary heat strips based on a visual examination of logger data into "fully responsive," "partially responsive," "unused," and "unresponsive" categories—referred to as dispositions. Separate equations were used to estimate impacts for fully and partially responsive devices.

[5] Navigant Consulting, Inc., on behalf of Duke Energy Progress, *EM&V Report for the EnergyWise Home Program: Winter 2014/2015,* June 2015.

[6] In this evaluation, as in the PY2011/2012 winter evaluation, Navigant divided auxiliary heat strips based on a visual examination of logger data into "fully responsive," "partially responsive," "unused," and "unresponsive" categories—referred to as dispositions. Separate equations were used to estimate impacts for fully and partially responsive devices.

The DR parameters estimated for auxiliary heat strips in the PY2014/2015 evaluation provide an estimate of the relationship between the observed outdoor heating degree hours (HDH) during a given quarter-hour of the day, and the demand reduction impact in that same quarter-hour when a DR event is called. Navigant estimated PY2016/2017 impacts of each auxiliary heat strip disposition type (see below for more details) by applying this relationship to the HDH observed in the appropriate quarter-hour of the day for the PY2016/2017 event.

The average impacts per device were estimated based on a weighted average of disposition-specific estimated impacts. The weights were derived from the average distribution of device dispositions observed during the PY2014/2015 evaluation.

Customers can have more than one set of auxiliary heat strips or more than one water heater controlled. As a result, the Navigant team multiplied auxiliary heat strip impact by the average number of devices controlled per participant (1.08 devices per participant) and multiplied the water heater impact by the average number of water heaters controlled per participant (1.02 per participant) to obtain an estimate of the average impact per participant.

2.1.2 Water Heater Demand Reduction Impact

Navigant estimated DR impacts from water heaters by applying the regression coefficients estimated as part of the PY2014/2015 evaluation to the appropriate quarter-hour of the PY2016/2017 DR event.

2.2 Snapback Impact

Snapback refers to the increase in demand observed in the hours immediately following a DR event. During a winter DR event, space heating or water heating is curtailed. When curtailed, the home or water tank cools beyond the customer’s preferred settings, reducing electricity demand during the event. Snapback refers to the incremental electricity required to restore the water tank or home to the setpoint temperature in the period immediately following the event.

2.2.1 Auxiliary Heat Strip Snapback Impact

In PY2014/2015, Navigant estimated auxiliary heat strip snapback impacts as a function of the total HDH observed during the DR event, and the number of periods that had elapsed since the end of the event (i.e., the relative quarter-hour of snapback). In PY2016/2017, Navigant estimated snapback impacts by aligning the relative quarter-hour estimated parameters with the appropriate quarter-hours following the PY2016/2017 event and then applying event period weather data.

As with DR impacts, snapback impacts were weighted by disposition for impacts per device and scaled by number of devices per participant to get impacts per participant.

2.2.2 Water Heater Snapback Impact

In PY2014/2015, Navigant estimated water heater snapback impacts as a function of the number of periods that had elapsed since the end of the event (i.e., the relative quarter-hour of snapback). In

PY2016/2017, snapback impacts were estimated by aligning the relative estimated quarter-hour parameters with the appropriate quarter-hours following the PY2016/2017 event.

Snapback impacts were constrained such that the total energy recovered during the snapback (as a proportion of energy saved during the event period) was equal to that estimated in PY2014/2015. More specifically, snapback impacts are constrained such that total energy taken back during the snapback period is equal to approximately 94% of total energy saved during the curtailment period.

This constraint meant that some of the regression-estimated snapback parameters had to be adjusted slightly. The curtailment period observed in PY2016/PY2017 was longer than any of the curtailment periods observed in PY2014/2015; consequently, without adjustment, the regression-estimated snapback parameters would not deliver the appropriate level of net energy savings. The additional energy required to be taken back by the snapback (that was not accounted for by the existing parameters) was allocated across the snapback periods in proportion to the snapback demand impact in each quarter-hour of that period.

The logic used to calculate snapback may be observed directly in the Excel spreadsheet that accompanies this report (Appendix A).

2.3 Energy Impacts

Total energy impacts were estimated by subtracting the energy use increase estimated to have occurred in the snapback period from the energy reduction estimated to have been delivered during the event period.

3. IMPACT FINDINGS

This section provides the estimated demand reduction and snapback impacts for the EnergyWise program for the winter of PY2016/2017. Section 2.1 details how these impacts were estimated. Impacts are based on the results of the PY2014/2015 evaluation report, and PY2016/2017 weather and participation as applicable.

The estimated average DR impact by equipment type is shown in Table 3.

Table 3. Average Demand Reduction Impact by Technology: PY2016/2017

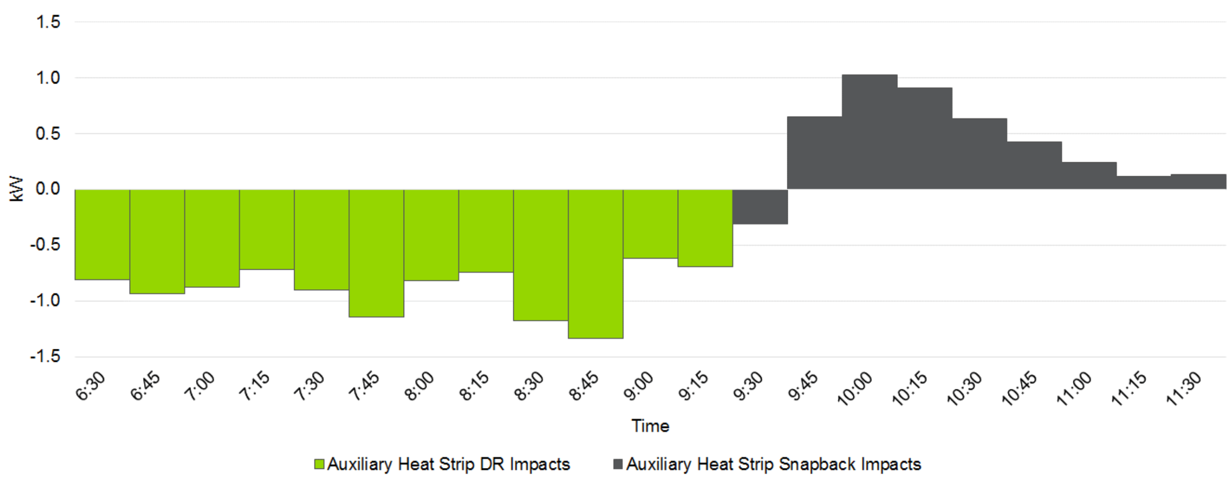
Device Curtailed	Average Per Participant Impact (kW)	Participants Controlled	System Impact (MW)	Relative Precision (+/-)*
Auxiliary Heat Strips	0.90	4,060	3.65	32%
Electric Water Heater	0.42	8,390	3.49	24%
Total System Impact:			**7.13**	

*At 90% confidence level

Source: Navigant Analysis, PY2016/2017 weather, and PY2014/2015 modeling results

Hour-by-hour results are shown graphically in Figure 1 and Figure 2. In Figure 1, DR impacts are represented as a negative number (i.e., demand reduction) and snapback as a positive (i.e., an increase in demand). Note that due to ramping, there is still a lingering DR impact in the first quarter-hour of the snap-back period (i.e., the negative value of the first gray column in the figure below).

Figure 1. Auxiliary Heat Strip Demand Response Impact



Source: Navigant Analysis, PY2015/2016 weather, and PY2014/2015 modeling results

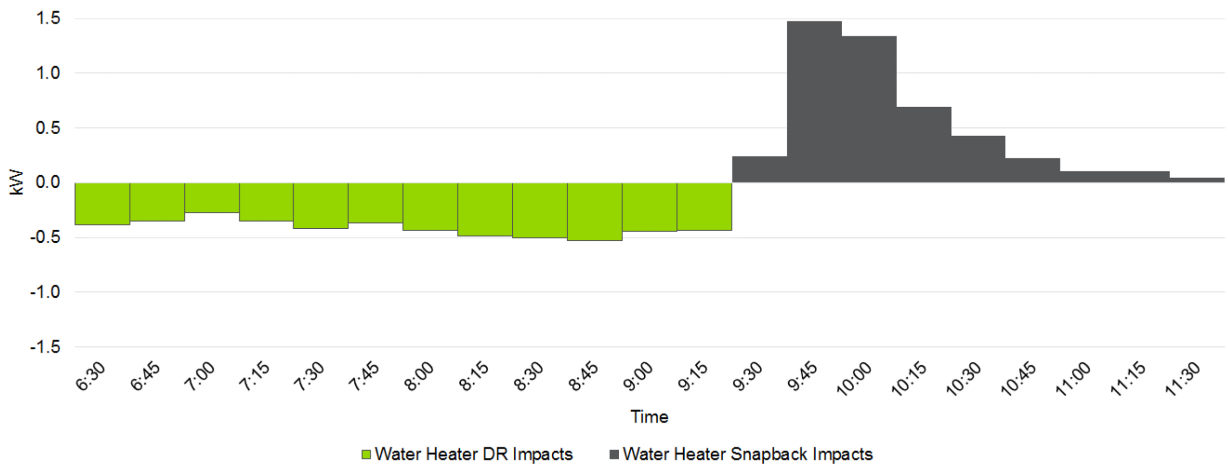
The PY2016/2017 auxiliary heat strip DR impact (0.90 kW) is approximately two-thirds the average DR impact reported for auxiliary heat strips in PY2014/2015 (1.37 kW). This is due to the lower temperatures observed during the PY2014/2015 DR events. In that program year, the average outdoor event temperature was less than 16°F, and for three of the ten events was less than 6°F. In contrast, during

PY2016/2017 the average outdoor temperature observed during the single event was approximately 19°F.

The most suitable event from PY2014/2015 with which to compare the impacts of the single PY2015/2016 event occurred on February 13, 2015. For this event, the average outdoor temperature was 19°F. The event lasted from 6:30 a.m. to 9:00 a.m..; the estimated DR impact of heat strips for that event was 0.9 kW.

The estimated quarter-hour impacts of water heater curtailment are shown in Figure 2. In this graphic, as in the above, the convention is to represent DR impacts as a negative number (i.e., demand reduction) and snapback as a positive (i.e., an increase in demand).

Figure 2. Water Heater Demand Response Impact

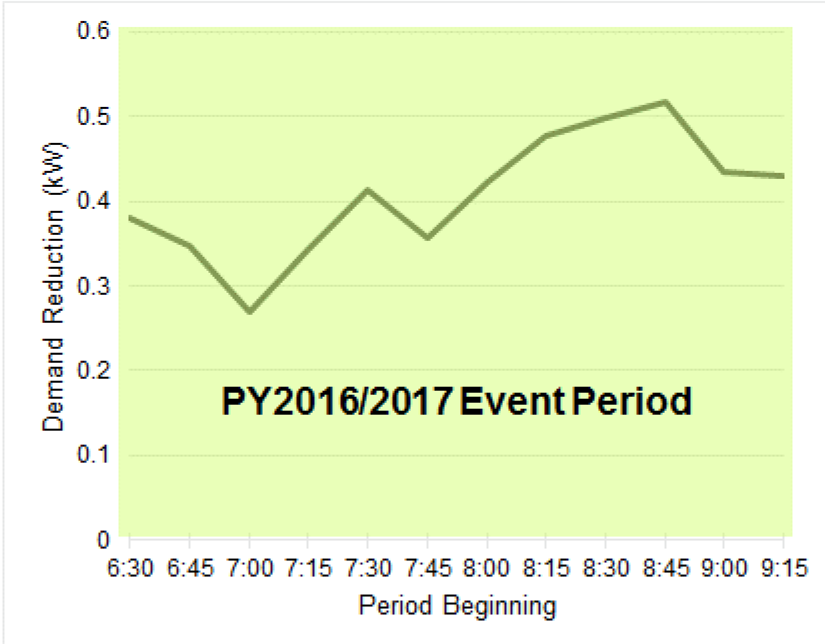


Source: Navigant Analysis, PY2016/2017 weather, and PY2014/2015 modeling results

The PY2016/2017 water heater DR impact (0.42 kW) is slightly higher than the average DR impact reported for water heaters in PY2014/2015 (0.4 kW). This is because the PY2016/2017 event extended until 9:30 a.m., whereas eight out of the ten events in PY2014/2015 ended at 9:00 a.m. or earlier.

As seen in Figure 3, the estimated DR impacts climb steadily through the morning, peaking in the period between 8 a.m. and 9 a.m. Since the magnitude of water heater DR impacts reflects the underlying hot water usage patterns, this suggests that a high proportion of the EM&V participants in the PY2014/2015 logger data study shower at or slightly after 8 a.m.

Figure 3. Water Heater DR Impacts by Quarter-Hour



Source: Navigant Analysis, PY2014/2015 modeling results

As noted previously, energy impacts were estimated by taking the difference between the average energy savings realized during the curtailment period and the average energy increases that occurred in the snapback period. Estimated energy impacts are presented in Table 4. The estimated energy impacts are small, and reflect the patterns estimated as part of the PY2014/2015 study.

Table 4. Estimated Energy Impacts

Device Curtailed	DR Energy Savings (kWh)	System Energy Savings (MWh)
Auxiliary Heat Strips	1.74	7.06
Electric Water Heater	0.08	0.67
Total System Impact:		**7.73**

Source: Navigant Analysis, PY2016/2017 weather, and PY2014/2015 modeling results

Water heater energy savings are small and reflect the closed nature of the system being curtailed; effectively, participants' water heaters are being used as an electric/thermal battery. The small savings that are realized may be due to reduced standby losses during curtailment.

Auxiliary heat strip energy savings are, relatively speaking, much larger, although still trivial in absolute terms. The much lower energy take-back in the snapback period could be due to a number of factors: participants adjusting their thermostats (or having their thermostats programmed to adjust) to reduce setpoint during the working hours when they may not be home, and rising temperatures as the sun rises reducing the proportion of heat pumps that need to rely on their auxiliary heat strips.

4. SUMMARY FORM

EnergyWise Home
Winter PY2016/2017
Completed EMV Fact Sheet

Description of Program

Duke Energy's EnergyWise program is a DR program offered to residential customers in the DEP territory.

EnergyWise is a direct load control program. Participants receive an incentive to allow Duke Energy to control their air conditioners (in the summer), their heat pump auxiliary heat strips (in the winter), or their electric water heaters (winter or summer). Only participants in the Western region are curtailed in the winter.

This report evaluates the impact of the program in the winter of 2016-2017. Only a single event was called, on January 9, 2017.

Date:	July 6, 2017
Region:	DEP
Evaluation Period	Winter PY2016/2017
DR Event Impact per Participant (kW)	
Water Heaters	0.42
Auxiliary Heat Strips	0.90
DR Event Program Impact (MW)	
Water Heaters	3.49
Auxiliary Heat Strips	3.65
Net-to-Gross Ratio	1

Evaluation Methods

Navigant estimated DR impacts for auxiliary heat strips by applying the regression coefficients estimated as part of the PY2014/2015 evaluation, and the proportion of auxiliary heat strips that were fully responsive or partially responsive to DEP's curtailment signal, as observed in the PY2014/2015 evaluation, to the hourly observed heating degree hours in the appropriate quarter-hour of the PY2016/2017 DR event.

Navigant estimated DR impacts for water heaters by applying the regression coefficients estimated as part of the PY2014/2015 evaluation to the appropriate quarter-hour of the PY2016/2017 DR event.

Impact Evaluation Details

- **Auxiliary heat strips delivered an average DR impact of 0.90 kW per household.** The total estimated program impact of the 4,060 participating households was 3.65 MW.
- **Auxiliary heat strip impacts were lower on average for PY2016/2017 than PY2014/2015 due to the single PY2016/2017 event occurring on a relatively mild weather day.** In PY2014/2015, there were three events where the average event temperature was at or below approximately 5°F. In contrast, for the PY2016/2017 event the average event temperature was approximately 19°F.
- **Water heaters delivered an average DR impact of 0.42 kW per household.** The total program impact of the 8,390 participating households was 3.49 MW.

5. CONCLUSION

The principal EM&V findings regarding the winter event demand impacts for PY2015/2016 are as follows:

- **Auxiliary heat strips delivered an average DR impact of 0.90 kW per household.** The total estimated program impact of the 4,060 participating households was 3.65 MW.
- **Auxiliary heat strip impacts were lower on average for PY2016/2017 than PY2014/2015 due to the single PY2016/2017 event occurring on a relatively mild weather day.** In PY2014/2015, there were three events in which the average event temperature was at or below approximately 5°F. In contrast, for the PY2016/2017 event the average event temperature was approximately 19°F.
- **Water heaters delivered an average DR impact of 0.42 kW per household.** The total program impact of the 8,390 participating households was 3.49 MW.

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EM&V Report for the Duke Energy Multifamily Energy Efficiency Program

Prepared for:

Duke Energy Progress, Duke Energy Carolinas

DUKE ENERGY®

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EM&V Report for the Duke Energy
Multifamily Energy Efficiency Program

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1. EVALUATION SUMMARY

1.1 Program Summary

Duke Energy's Multifamily Energy Efficiency Program provides energy efficient equipment to multifamily housing properties at no cost to the property managers or tenant end-users. The program is delivered through coordination with property managers and owners. Tenants are provided with notice and informational materials to inform them of the program and potential for reduction in their energy bills. The program consists of lighting and water measures.

- **Lighting measures:** Compact fluorescent light (CFL) bulbs installed in permanent fixtures
- **Water measures:** Bathroom and kitchen faucet aerators, water-saving showerheads, hot water pipe wrap

For this evaluation cycle, Navigant assessed the following:

Duke Energy Progress: lighting and water measures installed between 1/1/15 and 2/29/16
Duke Energy Carolinas: lighting measures installed between 1/1/14 and 2/29/16[1]

Franklin Energy is the implementation contractor for the program. Customers (i.e., property managers) have the option to choose self-installation or direct installation through Franklin Energy. Duke Energy informed Navigant that most customers choose the direct install route by Franklin Energy. Duke Energy also informed Navigant that third-party quality control inspections are completed on 20 percent of properties in any given month. Within a selected property, the quantity of units to inspect is based on property size as defined by the number of housing units.

1.2 Evaluation Objectives and Program-Level Findings

Duke Energy selected Navigant to provide independent Evaluation, Measurement, and Verification (EM&V) for the Multifamily Energy Efficiency Program in the Duke Energy Progress (DEP) and Duke Energy Carolinas (DEC) jurisdictions. EM&V is a term used to describe the process of evaluating a program to assess the impacts as well as the program structure and delivery. For this EM&V effort, the evaluation approach and objectives can be described as follows:

- **Impact evaluation:** To quantify the net and gross energy and coincident demand savings associated with program activity at both the measure level and program level
- **Process evaluation:** To assess program delivery and customer satisfaction

By performing both components of the EM&V effort, Navigant is able to provide Duke Energy with verified energy and demand impacts, as well as a set of recommendations that are intended to aid Duke Energy with improving or maintaining the satisfaction with program delivery while meeting energy and demand reduction targets in a cost-effective manner.

[1] Navigant completed an evaluation report in November of 2015 for water measures in DEC.

Overall, Navigant found that the Multifamily Energy Efficiency Program is being delivered effectively, customer satisfaction is generally favorable, and the reported measure installations are accurate.

For the evaluation period covered by this report, there were a total of 26,492 housing units at 262 participating properties managed by 85 different property management companies in the DEP jurisdiction. There were 21,937 housing units at 210 properties managed by 99 different property management companies in the DEC jurisdiction. The program-level evaluation findings are presented in Table 1 though Table 4. For the DEP jurisdiction, Navigant found the realization rate for gross energy savings to be 94 percent, meaning that total verified gross energy savings were found to be lower than claimed in the tracking database provided by Duke Energy. For DEC, the realization rate for gross energy savings was 66 percent. Navigant found the net-to-gross (NTG) ratio to be 0.94, meaning that for every 100 kWh of reported energy savings, 94 kWh can be attributed directly to the program. These findings will be discussed in greater detail throughout this report.

Table 1. Program Claimed and Evaluated Gross Energy Impacts

	Claimed	Evaluated	Realization Rate
DEP Gross Energy Impacts (MWh)	21,133	19,939	94%
DEC Gross Energy Impacts (MWh)	7,299	4,807	66%

Source: Navigant analysis, totals subject to rounding.

Table 2. Program Claimed and Evaluated Gross Peak Demand Impacts

	Claimed	Evaluated	Realization Rate
DEP Gross Summer Peak Demand Impacts (MW)	1.99	2.35	118%
DEP Gross Winter Peak Demand Impacts (MW)	3.32	3.97	120%
DEC Gross Summer Peak Demand Impacts (MW)	0.68	0.71	104%
DEC Gross Winter Peak Demand Impacts (MW)	0.68	0.90	132%

Source: Navigant analysis, totals subject to rounding.

Table 3. Program Net Energy Impacts

	MWh
DEP Net Energy Impacts	18,836
DEC Net Energy Impacts	4,541

Source: Navigant analysis, totals subject to rounding.

Table 4. Program Net Peak Demand Impacts

	MW
DEP Net Summer Peak Demand Impacts	2.22
DEP Net Winter Peak Demand Impacts	3.75
DEC Net Summer Peak Demand Impacts	0.67

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DEC Net Winter Peak Demand Impacts	0.85

Source: Navigant analysis, totals subject to rounding.

1.3 Evaluation Parameters and Sample Period

To accomplish the evaluation objectives, Navigant performed an engineering review of measure savings algorithms, field verification to assess installed quantities and characteristics, as well as surveys with tenants and property managers to assess satisfaction and decision-making processes. The evaluated parameters are summarized in Table 5. For field verification, the expected sampling confidence and precision was 90 percent ± 10 percent, and the achieved was 90 percent ± 9 percent.

Table 5. Evaluated Parameters

Evaluated Parameter	Description	Details
Efficiency Characteristics	Inputs and assumptions used to estimate energy and demand savings	1. CFL wattage 2. CFL operating hours 3. Aerator flow rates (gpm) 4. Showerhead flow rates (gpm) 5. Water temperature (F) 6. Pipe wrap length (ft) 7. Baseline characteristics
In-Service Rates	The percentage of program measures in use as compared to reported	1. CFL, aerator, and showerhead quantities 2. Pipe wrap length
Satisfaction	Customer satisfaction	1. Satisfaction with program 2. Satisfaction with contractor 3. Satisfaction with program measures
Free Ridership	Fraction of reported savings that would have occurred anyway, even in the absence of the program	
Spillover	Additional, non-reported savings that occurred as a result of participation in the program	

This evaluation covers program participation from January 1, 2015 through February 29, 2016 in DEP, and from January 1, 2014 through February 29, 2016 in DEC. Table 6 shows the start and end dates of Navigant's sample period for evaluation activities.

Table 6. Sample Period Start and End Dates

Activity	Start Date	End Date
Field Verification	April 4, 2016	April 15, 2016
Tenant Phone Surveys	April 21, 2016	April 30, 2016
Property Manager Interviews	April 30, 2016	May 18, 2016

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1.4 Evaluation Recommendations

Navigant developed a series of recommendations during the EM&V effort. These recommendations are intended to assist Duke Energy with enhancing the program delivery and customer experience, as well as to support future EM&V activities and possibly increase program impacts. Further explanation for each recommendation can be found later in this report.

1. Navigant recommends that Duke Energy should adopt the ex post, per-unit energy and demand impacts from this evaluation and use them going forward (with the possible exception of making an appropriate adjustment for the lighting measure baseline as discussed in Section 4 of this report).
2. Navigant recommends that no more than the first three feet of cold water inlet pipes be insulated for the water heater pipe wrap measure.
3. Duke Energy should consider adding LEDs to the program.

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2. PROGRAM DESCRIPTION

2.1 Design

The Multifamily Energy Efficiency Program is designed to provide energy efficiency to a sector that is often underserved or difficult to reach via traditional, incentive-based energy efficiency programs. This market can be difficult to penetrate because multifamily housing units are often tenant-occupied rather than owner-occupied, meaning that the benefits of participation may be realized by the tenant whereas the incremental costs of participating in the program are absorbed by the owner.

Duke Energy's Multifamily Energy Efficiency Program provides energy efficient equipment to multifamily housing properties at no cost to the property managers or tenant end-users. The program is delivered through coordination with property managers and owners. Tenants are provided with notice and informational materials to inform them of the program and potential for reduction in their energy bills. The program consists of lighting and water measures.

- **Lighting measures:** Compact fluorescent light (CFL) bulbs installed in permanent fixtures
- **Water measures:** Bathroom and kitchen faucet aerators, water-saving showerheads, hot water pipe wrap

2.2 Implementation

Franklin Energy is the implementation contractor for the program. To recruit participants, Franklin Energy conducts onsite visits, in combination with internet searches, and SalesGenie[2] lists, to identify properties, property managers, or property management companies that it believes are likely to participate. Franklin Energy then sends an outreach team of energy advisors to coordinate with property managers and explain the program delivery and benefits. This is considered an Energy Assessment. This is also an opportunity for energy advisors to determine the type of measures along with associated quantities that can be installed. One potential delay in committing to the program is the need for the property manager to get approval to participate from their corporate office.

Once a property has been fully assessed and a service agreement has been signed, the project is handed over to a different group at Franklin Energy to schedule the installations. The installation crew performs the work as scheduled, while displaying Duke Energy branded clothing, badges, and vehicle decals as directed. The installation crews record the quantities and locations of installed measures for each housing unit via a tablet device, which are eventually entered into a tracking database.

When energy efficient program measures are installed, Franklin Energy removes the existing or baseline equipment and generally disposes of it onsite. If the property management previously requested to keep the existing equipment, Franklin Energy will package it up and leave it behind with property management or maintenance personnel. In general, Franklin Energy does not record specific information about the

[2] SalesGenie is a business and consumer lead generation tool that sales and marketing professionals can use to search for targeted leads, get contact names and phone numbers, and view detailed information. The tool also provides marketing and data solutions designed to help businesses reach their intended audiences more effectively.

efficiency characteristics of the equipment being removed, although Franklin Energy indicated they are experimenting with the idea of doing so.[3]

There can be logistical complications associated with performing these types of retrofits at multifamily housing properties. Franklin Energy indicated that some units may be skipped at a property due to safety issues, lack of access to equipment, pet barriers, or refusal from tenants.

Franklin Energy indicated that they have internal and external forms of quality control (QC) to ensure consistent measure installation. On the internal side, a Franklin Energy supervisor may accompany installation crews to ensure quality work. On the external side, a third-party inspector, High Performance Building Solutions, conducts inspections on a least five percent of participating housing units each year. The QC inspections are required to happen within 22 business days of installation. If a property is selected for a QC inspection, at least 20 percent of the units at the property are targeted for inspection.

During each month of QC inspections, Franklin Energy is provided with a discrepancy report that indicates when measures were missing, installed incorrectly, or if there were missed opportunities. Franklin Energy attempts to address the discrepancies, and subsequently updates the tracking data to reflect the QC findings. The tracking data is ultimately provided to Duke Energy, and subsequently to Navigant for EM&V.

[3] During the property assessment phase, Franklin Energy determines that housing units selected for participation contain lower efficiency light bulbs (incandescents) and standard aerators and showerheads.

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3. KEY RESEARCH OBJECTIVES

As outlined in the Statement of Work, the key research objectives were to conduct impact and process evaluations, as well as a net-to-gross (NTG) analysis. The evaluation covers both lighting and water measures in DEP, and lighting measures only in DEC.

The primary purpose of the evaluation, measurement, and verification (EM&V) assessment is to estimate net annual energy and demand impacts associated with participation from January 1, 2015 through February 29, 2016 in DEP, and January 1, 2014 through February 29, 2016 for DEC. Secondary objectives include the following:

- Estimate net and gross impacts by measure
- Perform detailed review of deemed savings estimates for each measure, and provide updates if necessary
- Assess the installed quantities and efficiency characteristics of program measures
- Evaluate the strengths and weaknesses of current program processes and customer perceptions of the program offering and delivery
- Recommend improvements to program rules and processes that support greater savings, enhanced cost-effectiveness, and improved customer satisfaction
- Update measure life assumptions, if applicable

Key impact and process research questions to be explored include:

- Is the program achieving targeted energy and demand savings at the measure level?
- How do customers learn about the program, and can participation be increased?
- How is the persistence of savings impacted by participant removal of measures installed through the program?
- Are there opportunities for additional measure offerings through the program?
- Provide the effect on baseline lamp wattage from EISA, including some discussion on the projected degradation of baseline lamp wattage in future years.

4. IMPACT EVALUATION

4.1 Impact Results

Figure 1 shows the program-level results for gross energy savings. Table 7 shows a more complete list of program-level findings. The evaluation team calculated the results in Table 7 by multiplying the measure quantities found in the tracking database by the verified energy and demand savings estimated during the EM&V process for each measure. The net impacts were found by multiplying the gross impacts by the NTG ratio of 0.94. The NTG methodology and results are discussed in detail in Section 5 of this report.

Figure 1. Reported and Verified Program-Level Impacts

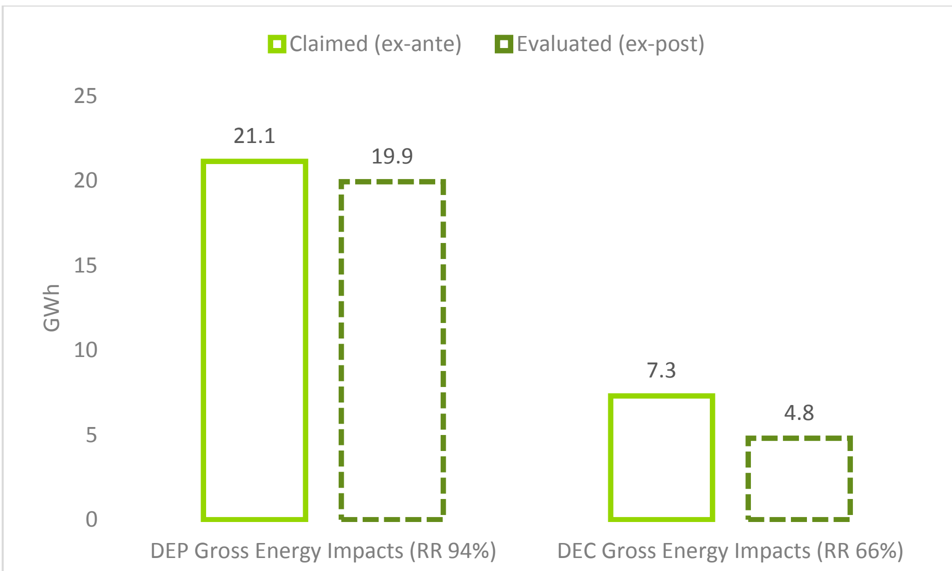

Table 7. Summary of Program Impacts

	Energy (MWh)	Summer Coincident Demand (MW)	Winter Coincident Demand (MW)
DEP Verified Gross Impacts	19,939	2.35	3.97
DEP Verified Net Impacts	18,836	2.22	3.75
DEC Verified Gross Impacts	4,807	0.71	0.90
DEC Verified Net Impacts	4,541	0.67	0.85

Source: Navigant analysis

A summary of each measure's contribution to program savings and realization rate between reported savings and verified savings is shown in Table 8 for DEP, and Table 9 for DEC. Compact Fluorescent Light (CFL) bulbs account for just under half of the energy savings for DEP. By dividing the total verified savings by the total reported savings in the tracking data in Table 8, Navigant calculates a gross realization rate of 94 percent for energy savings at the program level for DEP. The corresponding realization rate for DEC is 66 percent, as shown in Table 9.

Table 8. Distribution of Program Energy Savings by Measure (DEP)

Measure	Measure Count from Tracking Data	Total Ex Ante Savings from Tracking Data (MWh)	Share of Total Savings from Tracking Data	Total Verified Ex Post Gross Savings (MWh)	Realization Rate
CFLs	238,783	9,718	46%	6,400	66%
Bathroom Faucet Aerators	28,710	1,239	6%	1,135	92%
Kitchen Faucet Aerators	18,862	1,715	8%	1,630	95%
Showerheads	24,743	5,741	27%	5,859	102%
Pipe Wrap (ft)	73,338	2,720	13%	4,916	181%
Total	384,436	21,133	100%	19,939	94%

Source: Navigant analysis

Table 9. Distribution of Program Energy Savings by Measure (DEC)

Measure	Measure Count from Tracking Data	Total Ex Ante Savings from Tracking Data (MWh)	Share of Total Savings from Tracking Data	Total Verified Ex Post Gross Savings (MWh)	Realization Rate
CFLs	179,338	7,299	100%	4,807	66%

Source: Navigant analysis

The realization rate for summer coincident demand is 118 percent at the program level for DEP, as shown in Table 10. The realization rate for summer coincident demand is 104 percent at the program level for DEC, as shown in Table 11. The realization rate for winter coincident demand is 120 percent for DEP and 132 percent for DEC, as shown in Table 12 and Table 13, respectively. These realization rates include adjustments to the estimated savings for each measure which will be discussed during the remainder of this report. On a measure level, the largest adjustments were made to the energy savings for bathroom faucet aerators due to the in-service rates found during field verification.

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Table 10. Distribution of Summer Coincident Demand Savings by Measure (DEP)

Measure	Total Savings from Tracking Data (MW)	Share of Total Savings from Tracking Data	Total Verified Ex Post Gross Savings (MW)	Realization Rate
CFLs	0.907	46%	0.941	104%
Bathroom Faucet Aerators	0.163	8%	0.149	92%
Kitchen Faucet Aerators	0.226	11%	0.214	95%
Showerheads	0.472	24%	0.481	102%
Pipe Wrap (ft)	0.217	11%	0.561	258%
Total	1.99	100%	2.35	118%

Source: Navigant analysis

Table 11. Distribution of Summer Coincident Demand Savings by Measure (DEC)

Measure	Total Savings from Tracking Data (MW)	Share of Total Savings from Tracking Data	Total Verified Ex Post Gross Savings (MW)	Realization Rate
CFLs	0.681	100%	0.707	104%

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Table 12. Distribution of Winter Coincident Demand Savings by Measure (DEP)

Measure	Total Savings from Tracking Data (MW)	Share of Total Savings from Tracking Data	Total Verified Ex Post Gross Savings (MW)	Realization Rate
CFLs	0.907	27%	1.199	132%
Bathroom Faucet Aerators	0.143	4%	0.131	92%
Kitchen Faucet Aerators	0.197	6%	0.187	95%
Showerheads	1.856	56%	1.893	102%
Pipe Wrap (ft)	0.217	7%	0.561	258%
Total	3.32	100%	3.97	120%

Source: Navigant analysis

Table 13. Distribution of Winter Coincident Demand Savings by Measure (DEC)

Measure	Total Savings from Tracking Data (MW)	Share of Total Savings from Tracking Data	Total Verified Ex Post Gross Savings (MW)	Realization Rate
CFLs	0.681	100%	0.901	132%

Source: Navigant analysis

4.2 Impact Evaluation Methodology

Navigant's methodology for evaluating the gross and net energy and demand impacts of the program included the following components:

1. Detailed review of deemed savings estimates including: engineering algorithms, key input parameters, and supporting assumptions.
2. Onsite field verification to assess measure characteristics and in-service rates (ISRs)
3. Net-to-gross (NTG) analysis
4. Incorporating supplemental impact findings from tenant surveys

4.2.1 Detailed Review of Ex Ante Deemed Savings

Navigant reviewed the ex-ante savings and supporting documentation used to estimate ex ante program impacts. For the compact fluorescent lighting measure in both DEP and DEC, Navigant believes the

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deemed savings are well-documented in the previous EM&V report and that the algorithms and assumptions used to estimate savings are reasonable.[4]

The deemed savings for the 13 watt CFLs are shown in Table 14 below. The baseline lamp is assumed to be a 60 watt incandescent.

Table 14. Ex Ante Savings and Parameters for CFLs

Program measure	kWh savings	Non-coincident kW savings	Coincident kW savings	Coincidence factor	Average baseline wattage	EE wattage	Average daily hours of use
13 watt CFL	40.7	0.0469	0.0038	0.081	55.33	13	2.89

Navigant was able to trace all of these findings to the previous EM&V report provided by Duke Energy. The impacts were calculated using the following algorithms:

Equation 1. Energy Savings Algorithm for CFLs

$$kWh\ savings = ISR\ x \left[\frac{(Watts_{base}\ x\ HOU_{base}) - (Watts_{EE}\ x\ HOU_{EE})}{1000}\right] x\ 365\ x\ HVAC_C$$

Equation 2. Coincident Demand Savings Algorithm for CFLs

$$kW\ savings^{5} = ISR\ x \left[\frac{Watts_{base} - Watts_{EE}}{1000}\right] x\ CF\ x\ (1 + HVAC_d)$$

Where the parameters are defined as:

ISR = in-service rate
$Watts_{base}$ = wattage of baseline lamp removed
$Watts_{EE}$ = wattage of CFL lamp installed
HOU_{base} = daily operating hours of baseline lamp removed
$HOUs_{EE}$ = daily operating hours of CFL lamp installed
$HVAC_C$ = HVAC interaction factor for energy
$HVAC_D$ = HVAC interaction factor for demand
CF = coincidence factor

[4] *Process and Impact Evaluation of Duke Energy's Residential Smart $aver: Property Manager CFLs in the Carolinas*, TecMarket Works, 2013.

[5] To calculate winter coincident demand savings, the HVAC interaction factor, $HVAC_d$, is subtracted instead of added. This conservative assumption accounts for a mix participants who will have electric heat pumps for heating, as well as those who may use auxiliary electric heating to supplement gas during winter coincident peak periods.

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For water measures, the deemed savings for DEP were based on Navigant's recent EM&V of water measures in the DEC, so little review was needed.[6]

4.2.2 Onsite Field Verification

Navigant performed onsite field verification at 123 housing units across 16 properties. Field verification efforts were designed to assess the measure characteristics as reported in the tracking data and to assess measure parameters that can be used to verify inputs and assumptions used to estimate energy and demand savings for individual measures. Table 15 shows a summary of the parameters assessed by Navigant during field verification, and Table 16 shows the field verification sample.

Table 15. Parameters Evaluated During Field Verification

	CFLs	Faucet Aerators	Water-saving Showerheads	Hot Water Pipe Wrap
Installed quantity	x	x	x	x
Installed wattage	x			
Flow rates (gpm)		x	x	
Water heating system characteristics		x	x	x
Water Temperatures		x	x	x
Pipe length				x
Measure location	x	x	x	x
Baseline information (where available)	x	x	x	x

Table 16. Field Verification Sample

Program Measure	Number of Housing Units in Sample[a]	Number of Measures Reported in Sample
CFLs	123	1,181
Bathroom Faucet Aerators	73	97
Kitchen Faucet Aerators	76	76
Showerheads	76	91
Pipe Wrap	31	162 ft

a. Totals exceed 123 because many sites had multiple measures

Source: Navigant analysis

A summary of findings from field verification is included in Section 4.3.

[6] Please refer to Navigant's report, titled "Multifamily Energy Efficiency Program, Evaluation, Measurement, and Verification for Duke Energy Carolinas", dated 11-3-15 for more information.

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4.2.3 Tenant Surveys

Navigant incorporated supplemental findings from 150 tenant phone surveys to inform the impact analysis where applicable. The findings from the tenant surveys will be addressed later in this report.

4.3 Impact Evaluation Findings

The impact evaluation findings for lighting measures and water measures are discussed separately.

4.3.1 Compact Fluorescent Light Bulbs

Table 17 shows a summary of Navigant's ex-post, verified findings for CFLs. The energy savings per bulb decreased from the 40.7 kWh provided in the deemed savings to 26.8 kWh. To calculate verified energy and demand impacts, Navigant assessed the parameters that were used in the algorithms to estimate ex-ante savings. Table 18 lists all parameters used to calculate ex-post savings.

Table 17. Summary of CFL findings

	Ex-Post	Ex-Ante
In-Service Rate[1]	84.6%	94.7%
Daily Operating Hours	1.93	2.89
Gross Energy Savings Per Bulb (kWh)	26.8	40.7
Gross Summer Coincident Demand Savings Per Bulb (kW)	0.0039	0.0038
Gross Winter Coincident Demand Savings Per Bulb (kW)	0.0050	N/A

1. *Navigant did not account for vacant housing units, so the actual number of CFLs in use may be lower.*
Source: Navigant analysis

Table 18. Calculation parameters for ex post CFL impacts

Program measure	ISR	Average baseline wattage	EE wattage	Average daily hours of use for baseline lamps[a]	Average daily hours of use for CFLs[a]	Summer coincidence factor	Winter coincidence factor	Energy HVAC interaction factor[b]	Demand HVAC interaction factor[b,c]
13 watt CFL	84.6%	60	13	1.93	1.93	0.082	0.32[d]	0.96	0.21

a. Includes self-report bias correction factor from TecMarket Works and Building Metrics. "Duke Energy Residential Smart $aver® CFL Program in North Carolina and South Carolina". February 15, 2011. Pg. 35.
b. Sourced from 2016 Mid-Atlantic TRM
c. The demand HVAC interaction factor is added for summer coincident demand impacts, and subtracted for winter. Navigant also adjusted the interaction factor for winter demand to account for 50% of participants having gas heating per the 2013 Duke Energy Residential Appliance Saturation Survey.
d. Source: *Coincidence Factor Study, Residential and Commercial & Industrial Lighting Measures*, prepared for: New England State Program Working Group

4.3.1.1 In-Service Rate

At the 123 housing units inspected by Navigant that had CFLs, there were a total of 1,181 reported program CFLs in the tracking database. During the inspections, Navigant found 844 CFLs. Additionally, during phone surveys with tenants, Navigant interviewed customers representing an additional 1,186 CFLs. Thirteen of the phone survey respondents indicated they had removed a total of 41 CFLs. The predominant reason for removing CFLs was burnout. Navigant used a weighted average to combine the ISR from field verification with the ISR from phone surveys to calculate a final ISR.[7]

4.3.1.2 Wattage

Navigant assessed the wattage of CFLs inspected during the onsite verification and found them to be 13 watts as reported. However, there is potential uncertainty in the wattages of lamps removed during the retrofit process, or at least whether that wattage should be the baseline going forward. The time period covered by this evaluation is January of 2014 through February of 2016. The Energy Independence and Security Act (EISA) of 2007 established that as of January 1st, 2014, 60 watt incandescent bulbs could no longer be manufactured or imported. The new, EISA compliant wattage was 43. However, Navigant's experience has shown that there was considerable lag between the EISA compliance schedule and actual market activity, and potential back stocking of incandescents by multifamily maintenance staff. Because Duke Energy's Multifamily Energy Efficiency Program is a retrofit program (rather than replace on burnout), it is important to consider the actual characteristics of the lamps removed because they likely had remaining useful life. Franklin Energy has indicated that they only remove incandescent lamps during the retrofit process.

Figure 2 shows the results of customer self-reporting from tenant phone surveys with regards to the wattage of lamps removed during participation in the program. It can be seen that a large number of respondents were not sure, but more than half (51 percent) of respondents indicated that the lamps were 60 watts or higher. Additionally, during Navigant's field verification efforts, seven tenants were able to recall the lamps removed, and all seven indicated they were 60 watt incandescents. High rates of tenant turnover at multifamily housing units could explain why so many customers did not know what type of lamps were removed.

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[7] The weighted results reflect a total of 1,989 verified CFLs out of a sample of 2,367. Navigant used the same approach to calculate ISRs during our 2015 evaluation of this program in DEC. We believe that combining the results from field and phone verification effectively increases the sample size, and helps to control for the extended time period covered by this evaluation by incorporating participant input and field observations.

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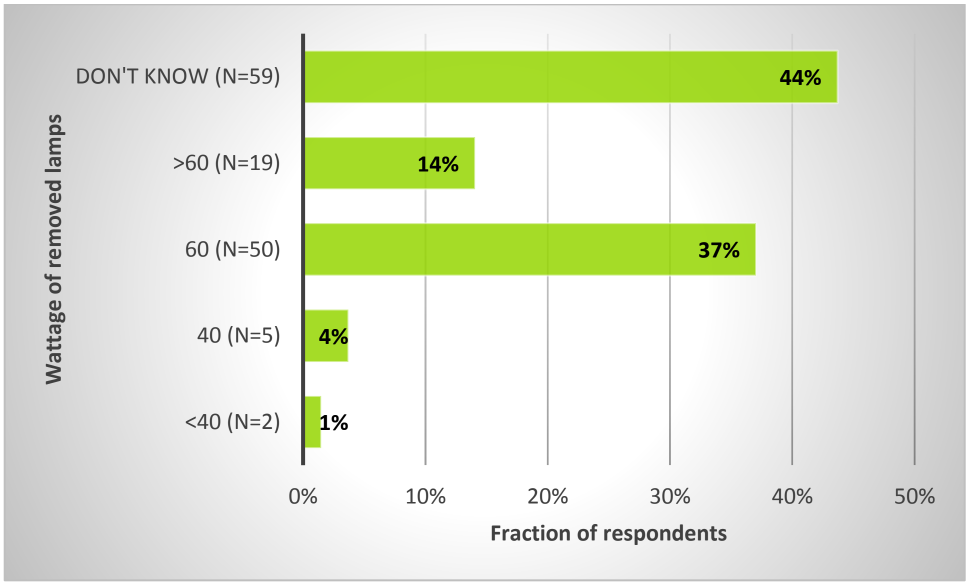
Figure 2. Customer self-reporting of wattage of lamps removed



Given that the period of time covered by this evaluation coincides with important EISA compliance dates that may have experienced a lag in market uptake, along with the results shown in Figure 2, Navigant believes that a baseline wattage assumption of 60 watts was appropriate for this evaluation cycle. However, as will be discussed later in this report, Navigant suggests further research be conducted to understand the lighting baseline for future evaluation cycles.

4.3.1.3 HVAC Interaction and Coincidence Factors

Navigant reviewed the ex-ante assumptions for HVAC interaction factors and summer coincidence factors and chose to replace them with updated values from the 2016 Mid-Atlantic TRM. For a winter coincidence factor, Navigant used a secondary literature source.[8]

4.3.1.4 Lighting Hours of Use

The hours of use for CFLs are an important parameter input to the energy savings algorithm, however the scope and budget of this evaluation did not support a full metering study to quantify operation hours. Navigant assessed the lighting operation hours via the following methods:

1. Collected self-report data from program participants during tenant phone surveys
2. Performed extensive review of the previous estimates for deemed savings
3. Performed a literature review to assess estimates from secondary sources

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[8] RLW Coincidence Factor Study for New England State Program Working Group, https://www.puc.nh.gov/Electric/Monitoring%20and%20Evaluation%20Reports/National%20Grid/116_RLW_CF%20Res%20C&I%20ltg.pdf

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4. Applied self-report bias correction factor from previous study completed for Duke Energy

Navigant collected self-reported hours of use estimates from participants during the tenant phone surveys with 150 participants. The average self-reported estimate was 2.64 hours per day. Navigant recognizes that significant uncertainty exists in customer ability to estimate hours of use. For that reason, the evaluation team compared the self-report estimate of 2.64 with other sources.

Table 19 shows a comparison of estimated CFL operating hours from several sources. Navigant applied a self-reporting bias correction factor of 0.73 (a 27 percent reduction) to the self-reported operating hours, for a final value of 1.93 hours per day. The bias correction factor was sourced from a previous study completed for Duke Energy.[9]

Table 19. Comparison of CFL Operating Hours

Estimated Daily CFL Usage Hours	Method	Source
2.89	Metering Study	TecMarket Works, previous EM&V study for Property Manager CFL Program for Duke Energy[10]
2.21	Metering study	Navigant metering study for similar multifamily program in Southwestern U.S.
1.5-1.6	Meta data analysis	U.S. Department of Energy *Residential Lighting End-Use Consumption Study: Estimation Framework and Initial Estimates* (2012)[11]

Source: Navigant analysis

4.3.1.5 Effect of Baseline Wattage Requirements for EISA

It is important to address the topic of CFL baseline in more detail. The Energy Independence and Security Act (EISA) was enacted to increase the availability of reduced wattage lighting options, and hence shift the lighting market toward higher efficiency. In theory, this would eventually cause the program CFL baseline to eventually shift to a lower wattage as 60 watt incandescents become less-prominent. There is still uncertainty around what the exact baseline is in Duke Energy's service territories.

Navigant believes that EISA standards should be applied to new construction applications or replace-on-burnout scenarios. However, the Multifamily Energy Efficiency Program is primarily a direct install retrofit program targeting existing homes where the existing lamps likely have remaining useful life. The program implementer requires that all lamps being removed are incandescents. Furthermore, some program participants have reported that the lamps removed were higher than 60 watts. Due to the

[9] TecMarket Works and Building Metrics. "Duke Energy Residential Smart $aver® CFL Program in North Carolina and South Carolina". February 15, 2011. Pg. 35.

[10] *Process and Impact Evaluation of Duke Energy's Residential Smart $aver: Property Manager CFLs in the Carolinas*, TecMarket Works, 2013.

[11] http://apps1.eere.energy.gov/buildings/publications/pdfs/ssl/2012_residential-lighting-study.pdf

changing market for residential lighting, Navigant suggests that further research be conducted in future evaluation years to assess the baseline.

4.3.2 Water Flow Regulation Measures

For field verification of program water measures, Navigant collected information to validate the efficiency characteristics of the equipment. This included verifying the reported number of measures and measuring actual flow rates of the retrofit equipment.

4.3.2.1 In-Service Rate

The ISRs for water measures are shown in Table 20. These were calculated using a weighted average of results from the onsite field verification inspections and the tenant phone surveys.

Table 20. In-Service Rates for Water Measures

Measure	ISR
Kitchen aerators	94%
Bathroom aerators	92%
Showerheads	95%
Pipe wrap	93%

Source: Navigant analysis

4.3.2.2 Energy Savings

The deemed savings for water measures in DEP are based on a recent EM&V report by Navigant for DEC, which was completed in November of 2015. The evaluation team used a similar approach for DEP, but supplemented or replaced inputs with data gathered during field verification. To calculate verified savings for aerators and showerheads, Navigant used a standard engineering equation taken shown in Equation 3, Equation 4, and Equation 5. Navigant subsequently applied inputs collected during field verification or assumptions as listed below in Table 21. The resulting estimates for impacts of aerators and showerheads are presented in Table 22.

Equation 3. Algorithm for Estimating Energy Savings for Faucet Aerators

$$kWh\ savings\ for\ faucet\ aerators = ISR \times \left[\frac{(GPM_{base} - GPM_{low}) \times T_{home/day} \times 365 \frac{days}{yr} \times DF \times (T_{out} - T_{in}) \times 8.3 \frac{Btu}{gal \cdot °F}}{\#_{faucets} \times 3412 \frac{Btu}{kWh} \times RE} \right]$$

Equation 4. Algorithm for Estimating Energy Savings for Low Flow Showerheads

$$kWh\ savings\ for\ low\ flow\ showerheads = ISR \times \left[\frac{(GPM_{base} - GPM_{low}) \times T_{home/day} \times N_{showers/day} \times 365 \frac{days}{yr} \times (T_{out} - T_{in}) \times 8.3 \frac{Btu}{gal \cdot °F}}{\#_{showers} \times 3412 \frac{Btu}{kWh} \times RE} \right]$$

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Equation 5. Algorithm for Estimating Coincident Demand Savings for Aerators and Showerheads

$$\Delta kW_{peak} = \Delta kWh/yr \times CF/365$$

Table 21. Input Parameters and Assumptions for Aerator Savings Calculations

Input	Definition	Value	Source
ISR	In-service rate	Refer to Table 20	Navigant field verification and phone surveys
GPM_{base}	Baseline flow rate	Aerators 2.2 Shower 2.5	Deemed savings assumptions from Duke Energy
GPM_{low}	Retrofit flow rate	Aerators 1 Shower 1.5	Deemed savings assumptions from Duke Energy[a]
$T_{home/day}$	Avg hot water use per day per home (minutes)	Kitchen 4.7 Bath 2.4 Shower 8.4	Building America Benchmark
$N_{showers/day}$	Number of showers per person per day	1	Navigant assumption
DF	Percent of water going down drain	Kitchen 75% Bath 90%	Navigant assumption
T_{out}	Temp of water flowing from faucets (F) Temp of water flowing from showerheads (F)	90[b] 105	Navigant field verification 2016 Mid-Atlantic TRM
T_{in}	Temp of water entering water heater (F)	66	Navigant field verification
#faucets/showers	Number of faucets in home (used to distribute minutes of use between different faucets)	Kitchen 1 Bathroom 1.33 Shower 1.2	Navigant field verification
RE	Recovery efficiency of water heater	0.98	Ohio TRM
CF (aerators)	Coincidence Factor	Summer 0.048 Winter 0.042	Building America Benchmark
CF (showerheads)	Coincidence Factor	Summer 0.03 Winter 0.118	Building America Benchmark

a. *Navigant measured flow rates during onsite field verification and they were lower than the reported flow rates for the measures installed. However, this was likely due to calcification or water pressure characteristics and suggests that baseline flow rates may also have been lower. Because we did not measure flow rates for baseline units, we chose to use the reported flow rates in both cases.*

b. *The actual measured hot water temperature was 109F. For analysis purposes, Navigant assumed that customers use water at a temperature of 90 degrees, or the average of 109F and 70F.*

Table 22. Verified Estimates of per Unit Impacts for Aerators and Showerheads[12]

Measure	Annual Energy Savings per Unit (kWh)		Annual Summer Coincident Demand Savings per Unit (kW)		Annual Winter Coincident Demand Savings per Unit (kW)	
	Ex Post	Ex Ante	Ex Post	Ex Ante	Ex Post	Ex Ante
Kitchen aerator (1.0 GPM)	86	91	0.0114	0.0120	0.0099	0.010
Bathroom aerator (1.0 GPM)	40	43	0.0052	0.006	0.0045	0.005
Low flow showerhead (1.5 GPM)	237	232	0.0195	0.0190	0.0765	0.0750

Source: Navigant analysis

4.3.3 Water Heater Pipe Wrap

During field verification, Navigant found that some of the water heater pipe wrap was installed on the cold water inlet pipe to the water heater. Industry standards are to install pipe wrap on all hot water pipes, and only the first three feet of the cold water pipe because savings are minimal from insulating cold water pipes.[13] Therefore, when calculating the ISR, Navigant did not count savings from pipe wrap of greater than three feet installed on cold water pipes.

To estimate impacts from the pipe wrap measure, Navigant used algorithms from the 2016 Mid-Atlantic TRM shown in Equation 6 and Equation 7 below.[14] The ex-post impacts are shown in Table 23.

Equation 6. Energy savings for water heater pipe wrap

$$\Delta kWh = \left(\frac{1}{R_e} - \frac{1}{R_n}\right) \times (L \times C) \times \Delta T \times 8760 \div nDHW \div 3413$$

Equation 7. Demand savings from water heater pipe wrap

$$\Delta kW = \Delta kWh \div 8760$$

The following list defines the parameters used in the equations above:

R_e = R-value of existing, uninsulated pipe (R = 1)
R_n = insulation R-value of pipe after retrofit (R = 2.5)
L = length of pipe (per foot)
C = circumference of pipe (Navigant assumed average of 0.5” and 0.75” diameter pipe)
ΔT = temperature difference between water in pipe and ambient air (65F)
nDHW = heat recovery efficiency (0.98)
3413 = conversion from Btu to kWh

[12] The program offers aerators and showerheads at other flow rates. However, the tracking data indicated that 100 percent of the water measures installed during the period covered by this evaluation cycle were the flow rates shown in Table 22, so a verified savings are shown here for only those measures. A full list of savings is shown in Section 9

[13] http://www.energy.gov/energysaver/projects/savings-project-insulate-hot-water-pipes-energy-savings

[14] http://www.neep.org/mid-atlantic-technical-reference-manual-v6

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Table 23. Verified Impacts for Water Heater Pipe Wrap

Measure	Annual Energy Savings per Unit (kWh)	Annual Summer Coincident Demand Savings per Linear Foot (kW)	Annual Winter Coincident Demand Savings per Linear Foot (kW)
Ex Post	67	0.0077	0.0077
Ex Ante	37	0.0030	0.0030

Source: Navigant analysis

4.3.4 Measure Life

Navigant reviewed the measure life assumptions for all program measures and compared them to other sources from secondary literature research. The evaluation team believes all program measure lives are appropriate and not in need of an update.

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5. NET-TO-GROSS ANALYSIS

Navigant conducted an NTG analysis to estimate the share of program savings that can be attributed to participation in or influence from the program. Table 24 shows the results of Navigant's NTG analysis. Navigant anticipated low free ridership and spillover given that the program is structured to offer energy efficient equipment at no cost to multifamily housing units, which are typically not owner-occupied. The results shown here are in line with expectations. Navigant chose to present a program-level NTG ratio rather than measure level due to the limited sample size of property managers and the fact that it is difficult to estimate spillover by measure. Navigant believes it is more appropriate to present the NTG ratio in aggregate.

Table 24. NTG Results

Estimated Free Ridership	7.5%
Estimated Spillover	2.0%
Estimated NTG	0.94

Source: Navigant analysis

5.1 Overview of Net-to-Gross Methodology

As indicated in the evaluation plan, Navigant used a survey-based, self-report methodology to estimate free ridership and spillover for the Multifamily Energy Efficiency Program. A self-report approach is outlined in the Universal Methods Protocol (UMP), and Navigant has previously used this method to estimate a NTG ratio for several other Duke Energy programs in the Carolinas. Navigant primarily targeted property managers for the NTG surveys, because they are the decision makers for participation in the program.[15] Navigant also incorporated supplemental data gathered during tenant phone surveys into the analysis.

5.1.1 Definitions of Free Ridership, Spillover, and NTG Ratio

The methodology for assessing the energy savings attributable to a program is based on a NTG ratio. The NTG ratio has two main components: free ridership and spillover.

Free ridership is the share of the gross savings that is due to actions participants would have taken anyway (i.e., actions that were not induced by the program). This is meant to account for naturally occurring adoption of energy efficiency measures. The Multifamily Energy Efficiency Program and most other Duke Energy programs cover a wide range of energy efficiency measures and are designed to advance the overall energy efficiency market. However, it is likely that, for various reasons, some participants would have wanted to install some high-efficiency measures even if they had not participated in the program or been influenced by the program in any way.

[15] Navigant recognizes that some property managers may have been instructed to participate by higher-level decision makers at the corporate level. Although we do not think this was the case very often, we do think that the local property managers were still privy to the decision making process.

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Spillover captures program savings that go beyond the measures installed through the program. Also called market effects, the term spillover is often used because it reflects savings that extend beyond the bounds of the program records. Spillover adds to a program's measured savings by incorporating indirect (i.e., non-incentivized) savings and effects that the program has had on the market above and beyond the directly incentivized or directly induced program measures.

The overall NTG ratio accounts for both the net savings at participating projects and spillover savings that result from the program but are not included in the program's accounting of energy savings. When the NTG ratio is multiplied by the estimated gross program savings, the result is an estimate of energy savings that are attributable to the program (i.e., savings that would not have occurred without the program). The NTG formula is shown in Equation 8:

Equation 8. Net-to-Gross Formula

$$NTG = 1 - \textit{free ridership} + \textit{spillover}$$

The underlying concept inherent in the application of the NTG formula is that only savings caused by the program should be included in the final net program savings estimate but that this estimate should include all savings caused by the program.

5.1.2 Estimating Free Ridership

Data to assess free ridership was gathered through the self-report method using a series of survey questions asked to the property managers at participating properties. The survey assessed free ridership using both direct questions, which aimed to obtain respondent estimates of the appropriate free ridership rate that should be applied to them, and supporting or influencing questions, which could be used to verify whether the direct responses were consistent with participants' views of the program's influence.

Each respondent to the survey provided perspectives on the measures that they had installed through the program. The core set of questions addressed the following three categories:

- **Likelihood:** To estimate the likelihood that they would have incorporated measures "of the same high level of efficiency," if not for the assistance of the program. In cases where respondents indicated that they might have incorporated some but not all of the measures, they were asked to estimate the share of measures that would have been incorporated anyway at high efficiency. This flexibility in how respondents could conceptualize and convey their views on free ridership allowed respondents to give their most informed response, thus improving the accuracy of the free ridership estimates.
- **Prior planning:** To further estimate the probability that a participant would have implemented the measures without the program. Participants were asked the extent to which they had considered installing the energy efficient measure prior to participating in the program. The general approach holds that if customers were not definitively planning to install all of the efficiency measures prior to participation then the program can reasonably be credited with at least a portion of the energy savings resulting from the high-efficiency measures. Strong free ridership is reflected by those participants who indicated they had already allocated funds for the purchase and selected the equipment and an installer.
- **Program importance:** To clarify the role that program components (e.g., information, incentives) played in decision-making and to provide supporting information on free ridership.

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Responses to these questions were analyzed for each respondent, not just in aggregate, and were used to identify whether the direct responses on free ridership were consistent with how each respondent rated the influence of the program.

Free ridership scores were calculated for each of the three categories.[16] Navigant then calculated a weighted average from each respondent based on their share of sample energy savings, and divided by 10 to convert the scores into a free ridership percentage. Next, a timing multiplier was applied to the average of the three scores to reflect the fact that respondents indicating that their energy efficiency actions would not have occurred until far into the future may be overestimating their level of free ridership. Participants were asked when they would have installed the equipment without the program. Respondents who indicated that they would not have installed the equipment for at least two years were not considered free riders and received a timing multiplier of 0. If they would have installed at the same time as they did, they received a timing multiplier of 1; within one year, a multiplier of 0.67; and between one and two years, a multiplier of 0.33. Participants were also asked when they learned about the financial incentive; if they learned about it after the equipment was installed then they received a timing multiplier of 1.

5.1.3 Estimating Spillover

The basic method for assessing participant spillover was an approach that asked a set of questions to determine the following:

- **Whether spillover exists at all.** These were yes-or-no questions that asked, for example, whether the respondent incorporated energy efficiency measures or designs that were not recorded in program records and did not receive any rebates from Duke Energy.
- **The savings that could be attributed to the influence of the program.** Participants were asked to list the extra measures they installed, and the evaluation team assigned a savings value. See below for the method of assigning savings.
- **Program attribution***.* Estimates were derived from a question asking the program importance on a 0 to 10 scale. Participants were also asked how the program influenced their decisions to incorporate additional energy efficiency measures.

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[16] Scores were calculated by the following formulas:

- Likelihood: The likelihood score is 0 for those that “definitely would NOT have installed the same energy efficient measure” and 1 for those that “definitely WOULD have installed the same energy efficient measure.” For those that “MAY HAVE installed the same energy efficient measure,” the likelihood score is their answer to the following question: “On a scale of 0 to 10, where 0 is DEFINITELY WOULD NOT have installed and 10 is DEFINITELY WOULD have installed the same energy efficient measure, can you tell me the likelihood that you would have installed the same energy efficient measure?” If more than one measure was installed in the project, then this score was also multiplied by the respondent’s answer to what share they would have done.
- Prior Planning: If participants stated they had considered installing the measure prior to program participation, then the prior planning score is the average of their answers to the following two questions: “On a scale of 0 to 10, where 0 means you ‘Had not yet planned for equipment and installation’ and 10 means you ‘Had identified and selected specific equipment and the contractor to install it,’ please tell me how far along your plans were” and “On a scale of 0 to 10, where 0 means ‘Had not yet budgeted or considered payment’ and 10 means ‘Already had sufficient funds budgeted and approved for purchase,’ please tell me how far along your budget had been planned and approved.”
- Program Importance: This score was calculated by taking the maximum importance on a 0 to 10 scale of the four program importance questions and subtracting from 10 (i.e., the higher the program importance, the lower the influence on free ridership).

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If respondents said no, they did not install additional measures, they were assigned a 0 score for spillover. If they said yes, then Navigant estimated the energy spillover savings on a case-by-case basis. It is important to note that although free ridership questions were only asked of property managers, Navigant surveyed both property managers and tenants for spillover.[17]

5.1.4 Combining Results Across Respondents

The evaluation team determined free ridership estimates for each of the following:

- Individual respondents, by evaluating the responses to the relevant questions and applying the rules-based approach discussed above.
- The program as a whole, by taking a weighted average of the individual results based on each respondent's share of reported energy savings.

5.2 Results for Free Ridership, Spillover, and Net-to-Gross

5.2.1 Review of Data Collection Efforts for Attribution Analysis

Surveys were conducted with decision makers to provide the information to estimate free ridership, and thus, NTG ratios. A total of 21 property managers were surveyed. These 21 property managers managed 39 total properties in the program. This sample represents about 10 percent of the total reported energy savings, as shown in Table 25.

Table 25. Property Manager Sample Representation

	Program Total	Sample Total	% of Program
Properties	449	39	9%
CFLs	418,121	39,942	10%
Bathroom faucet aerators	28,710	2,737	10%
Kitchen faucet aerators	18,862	1,948	10%
Showerheads	24,743	1,964	8%
Pipe wrap (ft)	73,338	10,189	14%
Total Energy Savings			**10%**

Source: Navigant analysis

5.2.2 Free Ridership Results

[17] The reason for not assessing free ridership at the tenant level is because tenants generally participated in the program via their property managers rather than personal choice. It is possible that tenants would have installed the same measures themselves, but Navigant does not believe they should be considered free riders to the program because the timing of those installations would have been difficult to evaluate and tenants would still have the ability to install CFLs in non-retrofitted fixtures. If a tenant already had equivalent measures in place, it is unlikely that the implementer would have replaced them with program measures.

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As described above, surveyed participants responded to a series of questions intended to elicit explicit estimates of free ridership, as well as ratings of program influence. Estimates are based on questions regarding the likelihood, scope, and timing of the investments in energy efficiency if the respondent had not participated in the program. For the Multifamily Energy Efficiency Program, free ridership was estimated at 7.5 percent, which is a relatively low value as anticipated by Navigant.

Navigant developed the free ridership estimate presented above based on responses to a variety of questions that related to survey respondents' intentions prior to participating in the program and to the influence of the program itself. Below are summaries by scoring component.

Prior Planning: Fourteen of the respondents did not have any prior plans for installing any of the energy efficient measures. The other seven respondents indicated that they did have plans, but for the most part, their plans were not very far along. These results indicate low free ridership.

Program Importance: Respondents stated that the program was very important in having the measures installed. Several property managers noted that their decision to participate was influenced by helping their tenants save energy and money.

Likelihood: Respondents were asked in the absence of the program, if they would have had at least some of the work done. Twelve respondents stated they "definitely would not have" installed the measures in the absence of the program, and six said they "may have".

Timing: 11 of 21 respondents stated they would have done the installation within two years or less in the absence of the program. The other 10 stated they would have done the installation after two years or never if not for the program. These findings are suggestive of low free ridership.

In summary, respondents indicated that the program was very important in their decisions to have the energy efficient measures installed. Some indicated that they did have some prior plans to install the measures, but their plans were not very far along.

5.2.3 Spillover Results

Three of the 21 surveyed property managers indicated that the program influenced him/her to install additional, non-incentivized energy efficiency measures at the property. The additional measures included LEDs in outdoor or common spaces, attic insulation, and water heater insulation wraps. In addition to the three property managers reporting spillover, eight tenants reported installing a small number of LEDs and other efficient lights after participating in the program.

Navigant estimated spillover from the equipment reported by property managers and tenants by applying simple engineering equations along with the self-reported measure quantities and characteristics. Navigant calculated the total spillover to be 2.0 percent.

5.2.4 NTG Results

The NTG ratio was calculated as written in Equation 9:

Equation 9. Net-to-Gross Ratio

$$NTG = 1 - free\ ridership + spillover = 1 - 0.075 + 0.0197 = 0.9447$$

This suggests that for every one kWh reduced from program measures, about 0.94 kWh of savings can be directly attributed to the program.

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6. PROCESS EVALUATION

Navigant conducted a process evaluation of the Multifamily Energy Efficiency Program to assess program delivery and customer satisfaction. The process findings summarized in this section are based on the results of customer surveys with 150 program participants, detailed surveys with 21 property managers representing 39 properties, an interview with the Duke Energy Program Manager, and a high level review of the program documents and functionality. The property manager interviews and tenant surveys were also used to inform the NTG analysis.

6.1 Key Findings

- The program appears to be effectively addressing many key challenges that are inherent to delivering energy efficiency programs to non-owner-occupied multifamily housing facilities.
- Over half of the property managers learned about this program through outreach by a program representative. This onsite marketing approach seems to be a successful way of gaining participants. Most tenants learned of this program through their property managers.
- Property managers indicated they chose to participate in the program to provide a service and save money for their tenants and owners as well as to capitalize on the free installation to save on internal labor costs
- 75 percent of DEP tenants and 83 percent of DEC tenants noticed savings on their energy bills since the installation of the measures.
- 55 percent of tenants stated that the program CFLs were installed in the light fixtures used most in the home. Incandescent bulbs were listed as the most commonly removed type of bulb.
- A majority of program participants were satisfied with the program. On a scale of 0 to 10, where 0 indicates “not satisfied at all” and 10 indicates “extremely satisfied”:
    - Over 65 percent of participants indicated 8-10 for satisfaction with the overall program
    - Over 80 percent of participants indicated 8-10 for satisfaction with the installer’s quality of work
    - Over 70 percent of participants indicated 8-10 for satisfaction with Duke Energy
- High satisfaction ratings by tenants were often associated with money savings as the primary benefit. Low satisfaction ratings were often associated with complaints about the equipment.
- Satisfaction was higher for CFLs than for showerheads and aerators.
- During the tenant phone surveys, several participants expressed dissatisfaction with the low water pressure in their showers and sinks. Additionally, some property managers indicated that they had received tenant complaints about low water pressure.

6.2 Documentation Review

Navigant requested program documentation and tracking data to conduct a complete review of current processes. The program tracking data was sufficient to identify the measure characteristics and quantities of installed measures for each tenant at the participating properties.

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6.3 Property Manager Interviews

The evaluation team conducted interviews with property managers from the participating properties to assess decision-making (which will ultimately feed into the NTG analysis) and overall satisfaction with the program. The evaluation team interviewed twenty-one property managers who were responsible for 39 properties representing over 56,000 measures or 10% of the program measures.

Overall, property managers indicated that their experience with the program was very favorable. Some key findings from the property manager interviews are listed below:

- Property managers expressed high satisfaction with the free program measures and free installation by an external contractor. Property manager's noted the contractor's quality of work as "well done and professional" and "impressive."
- Over 60% of property managers responsible for their energy bills noticed a decrease in the property energy bills since participating in the program.
- Over 95% of property managers are very likely to recommend this program to other property managers. Provided are a subset of property manager responses on how the program influenced their decision to install the energy efficient measures:
    - "The program made it happen, otherwise it never would have."
    - "The program made it easy, so why not do it."
    - "[Duke Energy] did all the work and we just made the appointments available to get the efficient measures installed. Overall the cost and the work was done quickly."
    - "I didn't have to do anything. We just scheduled the appointment and they just came and did the installs."
    - "[I] saw that it would save move – just the electricity costs and everything it just made sense."
- One property's maintenance staff communicated that after 90 days, over 40% of the installed showerheads started leaking due to dirt buildup. The maintenance staff was able to clean the showerheads after discovering the root problem.
- One property's maintenance staff indicated that some tenants are confiscating program lightbulbs, showerheads, and aerators upon apartment turnover.
- A small number of property managers stated that they were not satisfied with the responsiveness of program staff if any rescheduling or additional follow-up work was needed.
- General suggestions for program improvement from property managers and maintenance staff include adding the following measures/material to the program: window weather stripping, outside or porch lights, and a reminder sticker below the thermostat to display a suggested air conditioner temperature.

6.4 Overall Marketing and Outreach

Customer outreach is a key driver to program participation. Navigant recognizes the importance of marketing and outreach with regards to continued participation and satisfaction, so several questions in the tenant survey and property manager interviews were included to address this.

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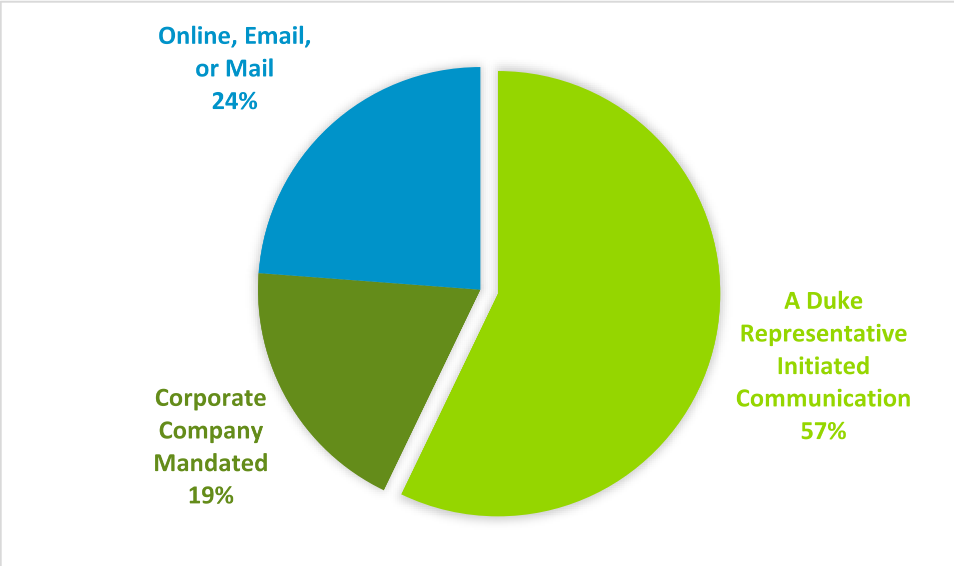
Table 26 and Figure 3 show how tenants and property managers learned about the program, respectively. Tenant participants were asked to indicate all of the sources through which they learned about the program, and about 70 percent indicated they had learned about the program through property managers as would be expected given the program model. Tenants also indicated having received notice via a Duke Energy mailing or bill stuffer. Property managers indicated that they were approached in-person by a program representative, or received a mail or email with program details.

Table 26. How Tenants Learned About the Program

How Tenants Learned About the Program (n=150)	
Through property manager	70%
Duke Energy mailing or bill stuffer	13%
Duke Energy website	5%
Through family, friend or neighbor	4%
Marketing by trade ally, vendor or contractor	1%
Duke Energy email	1%
Don't Know	6%

Source: Navigant analysis

Figure 3. How Property Managers Learned About the Program (n=21)



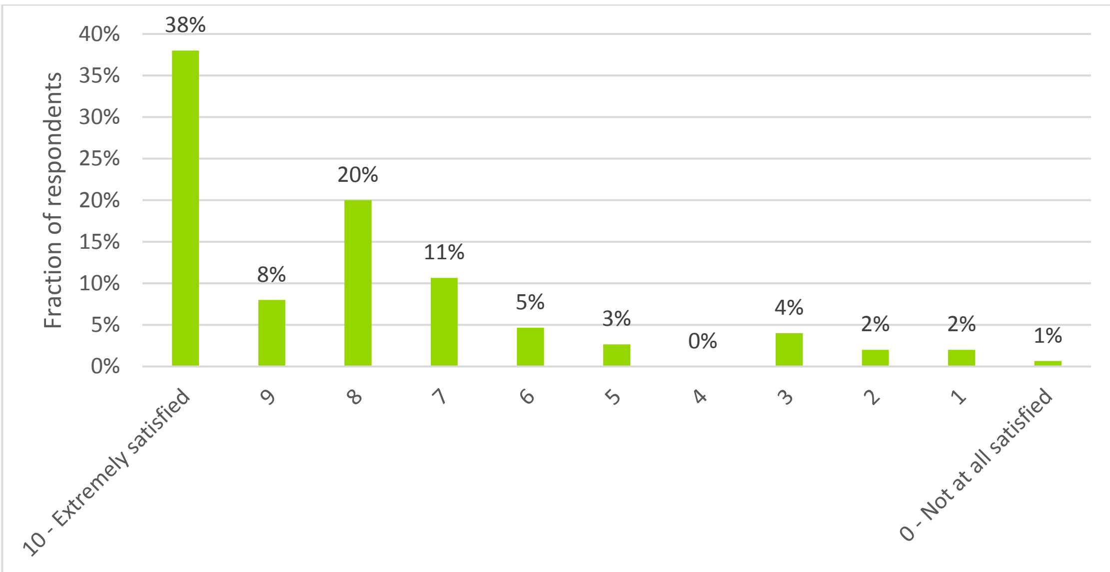
Source: Navigant analysis

6.5 Tenant Surveys

Navigant conducted phone surveys with 150 residential tenants to assess program satisfaction. The surveys contained a number of questions to assess satisfaction with program participation, satisfaction with new equipment, as well as questions to assess measure baseline and any measures removed by the tenant after participation.

Customer satisfaction with the program is high. On a scale of 0 to 10, where 0 indicates "not satisfied at all" and 10 indicates "extremely satisfied," two-thirds of customers rated satisfaction with the program as an 8-10 as shown in Figure 4. Participants who ranked their overall satisfaction low did so because they disliked the products or did not experience any energy savings. This chart includes data from both DEP and DEC territories as there were no significant satisfaction differences.

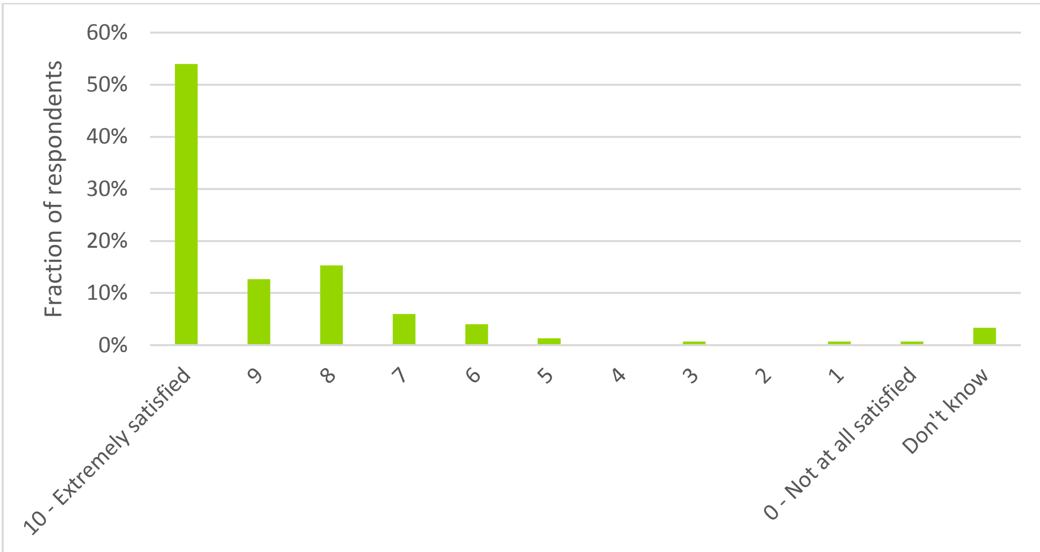
Figure 4. Tenant Satisfaction with Overall Program Experience (n=150)



Source: Navigant analysis

Customer satisfaction with the contractor quality of work was also high, as shown by Figure 5.

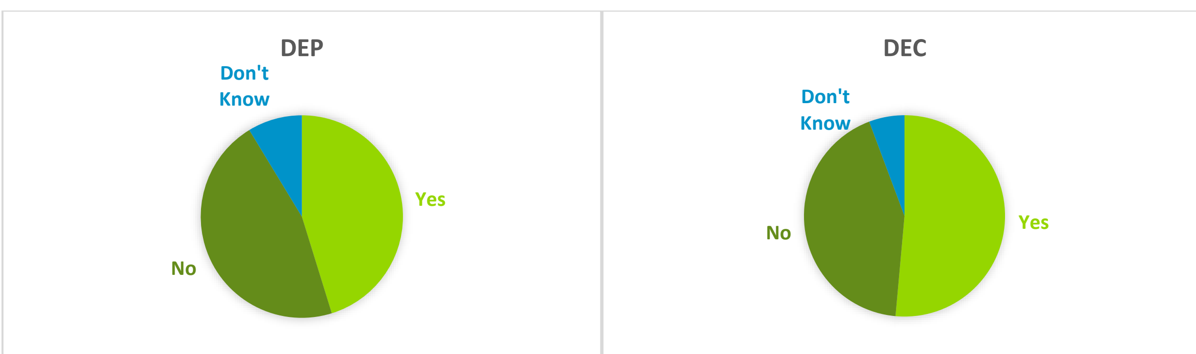
Figure 5. Tenant Satisfaction with Contractor's Quality of Work (n=150)



Source: Navigant analysis

As shown in Figure 6, about half of participants noticed a decrease in their energy bills after the new measures were installed.

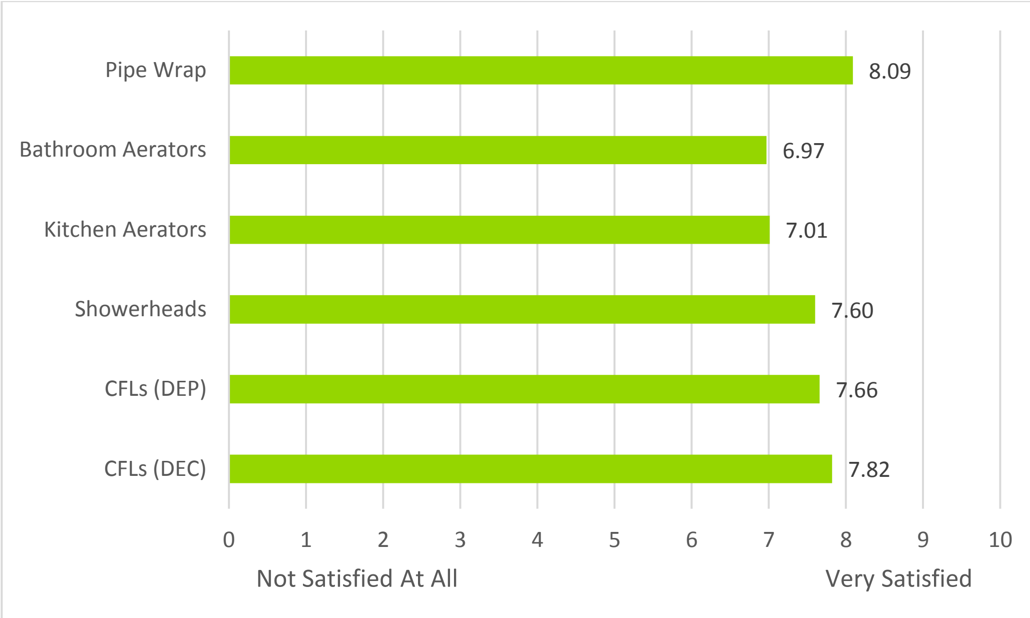
Figure 6. Participants Who Noticed a Decrease in Their Energy Bill After Installing Program Measures (n=150)



Source: Navigant analysis

While a majority of participants were satisfied with the new measures, some were not. Navigant asked the participants to rate their satisfaction for each measure installed at their home. Average satisfaction ratings ranged from as high as 8.09 out of 10 for Pipe Wrap, to as low as 6.97 out of 10 for bathroom faucet aerators as shown in Figure 7.

Figure 7. Tenant Satisfaction Rating for Each Measure (n=150)



Source: Navigant analysis

A small percentage of tenants removed the installed measure as shown in Figure 8. In the DEC territory, 100 percent of the CFLs removed by tenants were bulbs that had burned out. In the DEP territory, 57 percent of the CFLs removed by tenants were due to burnout, and the remainder were removed due to poor product quality. Participants indicated they removed bathroom faucet areators because of poor water pressure. Showerheads and kitchen faucet areators were removed because of leakage or excess water spray.

Figure 8. Participants Who Removed Any Installed Measures

Source: Navigant analysis

6.5.1.1 Participant Suggestions

Navigant also included a question in the tenant satisfaction survey that allowed respondents to offer suggestions for improving the program. One-fourth of the respondents offered suggestions, which were as follows:

- Several respondents asked for a better quality of equipment, including the quality of CFLs, showerheads, and aerators
- Several participants asked for better notification of installation date and time
- Two participants requested LEDs instead of CFLs
- One respondent requested offering motion sensors

7. SUMMARY FORM

Multifamily Energy Efficiency Program

Completed EMV Fact Sheet

Description of program

Duke Energy's Multifamily Energy Efficiency Program provides energy efficient equipment to multifamily housing properties at no cost to the property managers or tenant end-users. The program is delivered through coordination with property managers and owners. Tenants are provided with notice and informational materials to inform them of the program and potential for reduction in their energy bills. Typically, measures are installed directly by the implementation contractor rather than tenants or onsite maintenance staff.

The program consists of lighting and water measures.

- **Lighting measures:** Compact fluorescent light (CFL) bulbs installed in permanent fixtures
- **Water measures:** Bathroom and kitchen faucet aerators, water-saving showerheads, hot water pipe wrap

Date:	June 27, 2017
Region:	Duke Energy Progress Duke Energy Carolinas
Evaluation Period	DEP 1/1/15 – 2/29/16 DEC 1/1/14 – 2/29/16
Annual kWh Savings	DEP 19,938,742 DEC 4,806,786
Per Participant kWh Savings	DEP 753 DEC 219
Net-to-Gross Ratio	0.94

Evaluation Methods

The evaluation team used engineering analysis and onsite field inspections as the primary basis for estimating program impacts. Additionally, telephone surveys were conducted with tenants and multifamily housing units to assess customer satisfaction and spillover. Detailed interviews were conducted with property managers to assess their decision-making process, and ultimately to estimate a net-to-gross ratio.

Impact Evaluation Details

- **Field inspections were conducted at 123 housing units.** The evaluation team inspected program equipment at 123 housing units to assess measure quantities and characteristics to be compared with the program tracking database.
- **In-Service rates (ISRs) varied by equipment type.** The evaluation team found ISRs ranging from 85% for CFLs to 95% for low flow showerheads.
- **Participants achieved an average of 753 kWh of energy savings per year in DEP, and 219 kWh in DEC.** The evaluation for DEC only included lighting measures, whereas the evaluation for DEP included lighting and water measures. Therefore, the two should not be compared directly.
- **The type of lamp removed during retrofit that was most commonly reported by participants was 60W incandescents.** Of the tenants who could recall what type of lamps were removed during lighting retrofits, the majority reported 60W incandescents. The evaluation team believes that evaluation periods covering dates beyond the end of this cycle will include a lower baseline wattage for retrofitted lamps.

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8. CONCLUSIONS AND RECOMMENDATIONS

Navigant's findings in this report suggest that Duke Energy's Multifamily Energy Efficiency Program is being delivered and tracked effectively in the DEC and DEP jurisdiction. Customer satisfaction is generally high, and the program measure installations appear to be tracked appropriately. Navigant presents the following list of recommendations that may help improve program delivery and impacts:

1. **Navigant recommends that Duke Energy should adopt the per-unit energy and demand impacts from this evaluation and use them going forward.** The engineering analysis and data collection described in this report provide support for updating the estimated impacts for each program measure. Duke Energy should consider additional research to investigate the baseline for CFLs for future evaluation cycles.
2. **Navigant recommends that no more than the first three feet of cold water inlet pipes be insulated for the water heater pipe wrap measure.** The U.S. Department of Energy recommends only insulating the first three feet of cold water inlet pipes. Beyond that, savings are likely negligible. During field verification, Navigant found that over half of the reported water heater pipe wrap was installed on cold water pipes (with just under 10 percent of those installations greater than three feet on the cold water heater pipes).
3. **Duke Energy should consider adding LEDs to the program.** Because of EISA, the baseline for the 13 watt CFL measure will eventually reach 40 watts instead of 60 watts. This will diminish the cost-effectiveness of program CFLs. LED options may provide increased savings and improved customer satisfaction.

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9. MEASURE-LEVEL INPUTS FOR DUKE ENERGY ANALYTICS

Navigant used the findings from field verification, surveys, and review of Duke Energy's deemed savings to estimate an updated set of deemed savings for Duke Energy to use for tracking program activity. Table 27 provides the measure-level inputs that can be used by Duke Energy Analytics for estimates of future program savings. Impacts for water measures apply to the DEP jurisdiction only, whereas impacts from CFLs apply to both DEP and DEC.

Table 27. Gross Measure-Level Impacts

Measure	Annual Energy Savings Per Unit (kWh)	Annual Summer Coincident Demand Savings Per Unit (kW)[1]	Annual Winter Coincident Demand Savings Per Unit (kW)[2]
Faucet Aerators MF Direct 0.5 GPM - bath	55.99	0.007	0.006
Faucet Aerators MF Direct 1.0 GPM - bath	39.52	0.005	0.005
Faucet Aerators MF Direct 1.0 GPM - kitchen	86.40	0.011	0.010
Faucet Aerators MF DIY 0.5 GPM - bath	45.46	0.006	0.005
Faucet Aerators MF DIY 1.0 GPM - bath	32.09	0.004	0.004
Faucet Aerators MF DIY 1.0 GPM - kitchen	68.98	0.009	0.008
LF Showerhead MF Direct 0.5 GPM	473.56	0.039	0.153
LF Showerhead MF Direct 1.0 GPM	355.17	0.029	0.115
LF Showerhead MF Direct 1.5 GPM	236.78	0.019	0.077
LF Showerhead MF DIY 0.5 GPM	374.70	0.031	0.121
LF Showerhead MF DIY 1.0 GPM	281.03	0.023	0.091
LF Showerhead MF DIY 1.5 GPM	187.35	0.015	0.061
Pipe Wrap MF Direct	67.03	0.008	0.008
Pipe Wrap MF DIY	54.08	0.006	0.006
13W CFLs	26.80	0.004	0.005

1. *The summer coincident period for DEP and DEC is defined as weekdays in July, hour ending 17.*
2. *The winter coincident period for DEP and DEC is defined as weekdays in January, hour ending 8.*

APPENDIX A. DETAILED SURVEY RESULTS

This appendix contains additional results from the property manager interviews and tenant surveys. It is meant as a supplement to other sections of the report.

A.1 Property Manager Interviews

Navigant conducted in-depth interviews with 21 property managers. As shown in Table 25, the sample of 21 property managers represented 39 properties. This section presents details of the interviews. The responses to each question shown are paraphrased to maintain confidentiality and summarize the key points.

Table 28. How did you learn about the Duke Energy Multifamily Energy Efficiency Program?

Respondent(s)	Response
1,2,5,7,10-12,14,16-18,21	Duke Energy online, mail or email
3,4,6,9	Corporate company mandated
8,13,15,19,20	Approached by a program representative

Source: Navigant analysis

Table 29. What were the primary reasons to participate in the program?

Respondent(s)	Response
1,7,10,	Energy Efficiency
3,4,14	Corporate mandated
5,8,9,12,13,15,18,21	To save money
2,6,11,16,17,19,20	To savings water cost for tenants

Source: Navigant analysis

Table 30. On a scale of 0 to 10, with 0 being "not satisfied at all" and 10 being "extremely satisfied", how satisfied are you with your overall program experience?

Respondent(s)	Response
1-4,7,9-12,14,18,20	10
5,20	9
13,16,17,19	8
8	7
6	5

Source: Navigant analysis

Table 31. On a scale of 0 to 10, with 0 being "not satisfied at all" and 10 being "extremely satisfied", how satisfied are you with the tenant notification and program materials?

Respondent(s)	Response
3,4,6,10-12,14,16,18,21	10
1,2,5,7,15,20	9
8,9,13	8
19	7
17	5

Source: Navigant analysis

Table 32. On a scale of 0 to 10, with 0 being "not satisfied at all" and 10 being "extremely satisfied", how satisfied would you say your tenants are with the new energy efficient equipment?

Respondent(s)	Response
1,3,12	10
2,10,14	9
5-7,9,11,16,17,21	8 – because some of the tenants prefer the incandescent light bulbs because of look and color, but most really like the CFLs
8,15,19	7 – the kitchen aerators and showerheads are leaking and breaking, requiring equipment repairs
4,13,20	6
18	5 – water measures cut down water pressure noticeably

Source: Navigant analysis

Table 33. On a scale of 0 to 10, with 0 being "not likely at all" and 10 being "very likely", how likely are you to recommend the Multifamily Energy Efficiency Program to other property managers?

Respondent(s)	Response
1,7,9-12,14, 16,18,20,21	10
2,15,19	9
4,5	8
3,6,8,13,17,	7

Source: Navigant analysis

Table 34. Prior to participating in the program, had you considered installing the same energy efficient equipment at your facility?

Respondent(s)	Response
1-6,8,10-15,19	No
7, 16-18,20	Yes

9	Yes – for lighting measures, not the water measures
21	Yes, they considered installing CFLs and the water measures to save on energy bills

Source: Navigant analysis

Table 35. Did your experience with the program influence you to incorporate any additional energy efficiency equipment for which you did not receive a Duke Energy program rebate?

Respondent(s)	Response
1-4,6,9,11-20	No
5	Yes, installing LED
7	Yes, remodeling apartments
8	Yes, installed more energy efficiency exterior lighting
21	Yes, insulation blankets on water heaters, insulation on attic, and caulked windows at multiple properties

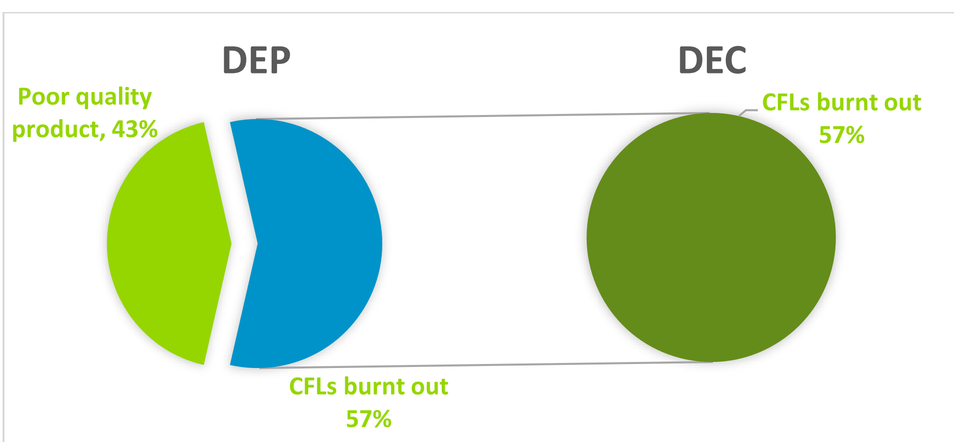
Source: Navigant analysis

A.2 Tenant Satisfaction Surveys

Satisfaction surveys were conducted with 150 program participants. Many of the results are presented in Section 6.5 of the main report, and this section serves as a supplement.

Figure 9 shows the reasons why tenants removed CFLs, the most common being burnout. For water measures, the most common reason for removal was low water pressure and leakage, although fewer measures had been removed.

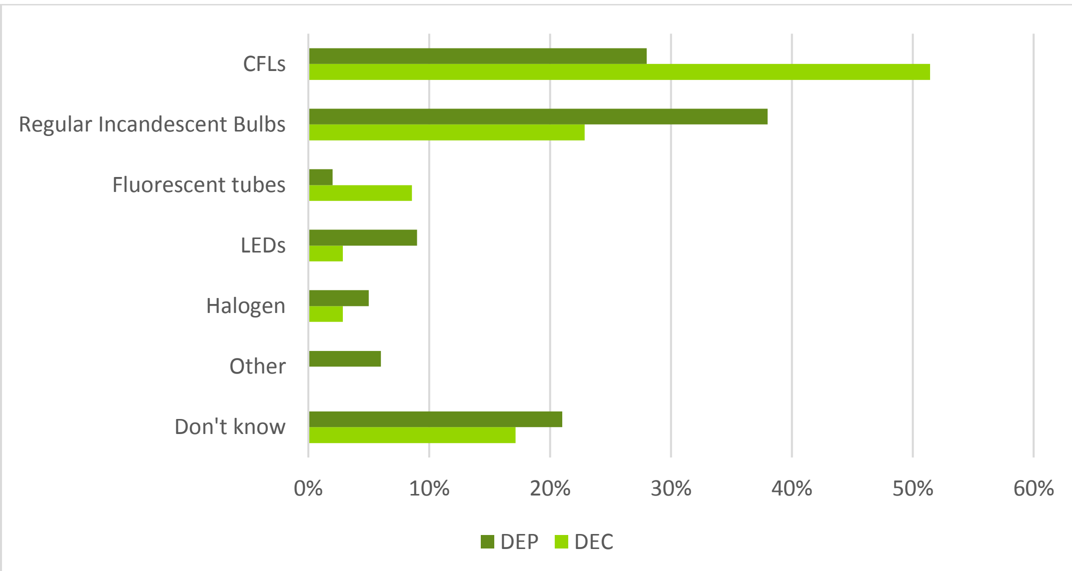
Figure 9. Reasons Why Tenants Removed CFLs (DEP = 7; DEC=3)



Source: Navigant analysis

Figure 10 shows the types of light bulbs that tenants reported as being installed in the non-retrofitted fixtures in their homes. For the DEC territory, an important supplement to this figure is that just under 90 percent of tenants reported that program CFLs were installed in the fixtures used most in their homes, which demonstrates that the program is effective in reaching the fixtures with greatest savings potential. For the DEP territory, just under 50% of tenants reported that CFLs were installed in fixtures that are used most in the home. Additionally, for the DEP jurisdiction 60 percent of tenants reported that they were very likely to install CFLs in their home in the future; for the DEC jurisdiction 77 percent of tenants indicated they were very likely to purchase CFLs in the future.

Figure 10. Type of Bulbs Found in Non-Retrofitted Fixtures



Source: Navigant analysis

As noted earlier, overall tenant satisfaction with the program was very high for DEP and DEC jurisdictions, with an average rating of 8.05 on a scale of 0 to 10 with 10 as very satisfied. However, ten of the 150 tenants reported a satisfaction of five or less with the program for the following reasons:

- No money savings (n=7)
- Dislike products (n=1)
- Mandated program participation by property management (n=1)

Tenants also reported a few suggestions for improving the program:

- Improve the kitchen faucet aerator (n=4)
- Improve the quality of products (n=3)
- Improve the quality of CFLs (n=3)
- Provide LEDs instead of CFLs (n=2)
- Provide participants a discount (n=1)
- Offer motion sensors (n=1)

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Non-Residential Prescriptive Program Evaluation Report – Final

March 25, 2018

Opinion Dynamics

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1. Evaluation Summary

1.1 Program Summary

The Duke Energy Carolina (DEC) Smart $aver Prescriptive Program and the Duke Energy Progress (DEP) Energy Efficiency for Business (EEB) Program (hereafter referred to as the DEC/DEP Non-Residential Prescriptive Program) provide incentives for electric commercial and industrial customers to purchase and install a variety of high-efficiency equipment, including lighting, HVAC systems, pumps and drives, and qualifying process, food service, and information technology equipment. The programs also use incentives to encourage maintenance of existing equipment to reduce energy usage. Incentives are available for new construction and retrofits and replacements. Prescriptive incentives under the programs are limited to 75% or less of the customer cost.

The main delivery channel for the DEC/DEP Non-Residential Prescriptive Program is application-based and driven by trade allies. The program has two additional delivery channels:

1. The Business Savings Store on the Duke Energy website (hereafter referred to as the "online store") offers customers a limited number of qualified products for which they can receive an instant discount. The discounts offered in the store are consistent with incentive levels in the main delivery channel.

2. The midstream channel allows distributors to provide instant discounts on eligible lighting equipment to prequalified customers. The discounts offered through this channel are also consistent with incentive levels in the main delivery channel. The midstream channel is offered through distributors only and is not available through trade allies.

The Non-Residential Prescriptive Program period under evaluation in this report is:

- DEC: August 1, 2015 to February 28, 2017
- DEP: March 1, 2016 to February 28, 2017

For the DEP service territory, the evaluation period begins later because the program completed its transition to the Smart $aver incentive structure in February 2016. This evaluation includes only projects that were incented under the new incentive structure, i.e., after February 2016.

Given the relatively small contribution of the online store and the midstream channel to total program savings, the focus of this evaluation is on the main program delivery channel, i.e., projects that receive incentives provided via traditional applications. However, we develop program-level gross impacts by applying gross impact results from the main channel to measures incented through the online store and the midstream channel, where applicable.

1.2 Evaluation Objectives

Our evaluation addresses the following key objectives.

Gross Impact Evaluation

- Verify deemed savings estimates through review of measure assumptions and calculations.

  - Document causes of differences between ex post (evaluated) and ex ante savings estimates.
  - Develop a realization rate for each reviewed measure.
- Estimate the amount of observed gross energy and peak demand savings (both summer and winter) by measure group via engineering analysis.

Net-to-Gross Analysis

- Develop a net-to-gross ratio (NTGR) and determine net impacts by estimating free-ridership (FR) and spillover (SO).

Process Evaluation

- Identify barriers to program participation and how these barriers can be addressed.
- Identify program strengths and opportunities for improvements.
- Assess customer and trade ally satisfaction with program processes.
- Assess the effects of the Non-Residential Prescriptive Program on trade ally practices.

1.3 High-Level Findings

During the evaluation period, non-residential customers completed 12,855 projects through the DEC Smart $aver Program and 3,186 projects through the DEP Energy Efficiency for Business Program. These projects generated approximately 287 GWh (DEC) and 73 GWh (DEP) of net energy savings, 49 MW (DEC) and 11 MW (DEP) of net summer peak demand savings, and 47 MW (DEC) and 10 MW (DEP) of net winter peak demand savings. Seventy-four percent of DEC net energy savings and 91% of DEP net energy savings were generated through the program's main delivery channel, with the remainder coming from purchases through the program's midstream channel and online store. Lighting accounted for the majority of program projects and savings.

Our gross impact analysis found realization rates for energy savings of over 100% for the DEC and DEP programs overall. Realization rates for summer demand savings were also over 100% for both DEC and DEP, generally due to deemed savings adjustments to lighting. Winter demand savings saw the largest change to realization rates, with DEC at 251% and DEP at 173%. These realization rates were driven by the program not claiming winter demand savings for several lighting measures. Our desk reviews and site visits found relatively few data tracking issues with respect to the quantities of installed measures. We adjusted the quantities for 6 of the 145 sampled projects. Of the six discrepancies, five were relatively minor, while one adjustment for a food service project had a significant impact on the food service realization rate.[1]

Based on our net impact analysis, the program-level NTGR for the Non-Residential Prescriptive Program is 78.7% for DEC and 85.8% for DEP. For both jurisdictions, the lighting NTGR is higher (81.0% DEC; 86.4% DEP) compared to the non-lighting NTGR (59.3% DEC; 67.9% DEP). We estimate overall program-level FR for DEC to be 28.5% and 21.4% for DEP. PSO and TA SO are 0.06% and 7.2% respectively.

Table 1-1 summarizes the net-to-gross results of our evaluation.

---

[1] The adjustment for the food service project was due to a data entry error. The program has since implemented additional quality assurance processes to avoid similar errors in the future.

Table 1-1. Summary of DEC and DEP NTG Results

Technology	FR	PSO	TA SO	NTGR*
DEC				
Lighting	26.3%	0.06%	7.2%	81.0%
Non-Lighting	48.0%			59.3%
DEC Total	**28.5%**	**0.06%**	**7.2%**	**78.7%**
DEP				
Lighting	20.8%	0.06%	7.2%	86.4%
Non-Lighting	39.4%			67.9%
DEP Total	**21.4%**	**0.06%**	**7.2%**	**85.8%**

*NTGR = 1 – FR + PSO + TA SO

Table 1-2 and Table 1-3 summarize ex post gross and net savings for the evaluation period for DEC and DEP, respectively.

Table 1-2. Summary of DEC Ex Post Gross and Net Savings

Technology	Ex Post Gross			NTGR	Ex Post Net		
	Energy Savings (kWh)	Summer Peak Demand (kW)	Winter Peak Demand (kW)		Energy Savings (kWh)	Summer Peak Demand (kW)	Winter Peak Demand (kW)
Main Channel	268,914,950	44,373	42,064		211,751,454	35,026	33,382
Lighting	*240,987,942*	*40,161*	*38,891*	*0.81*	*195,187,673*	*32,528*	*31,500*
Pumps and Drives	*10,267,207*	*1,481*	*1,598*	*0.59*	*6,089,581*	*878*	*948*
HVAC	*7,869,879*	*1,840*	*656*	*0.59*	*4,667,702*	*1,091*	*389*
Food Service Products	*4,889,807*	*439*	*418*	*0.59*	*2,900,193*	*260*	*248*
Information Technology	*3,322,377*	*146*	*195*	*0.59*	*1,970,534*	*87*	*116*
Process Equipment	*1,577,738*	*306*	*306*	*0.59*	*935,772*	*181*	*181*
Midstream Channel	*65,238,691*	11,731	11,376	1.00	*65,238,691*	11,731	11,376
Online Store	*9,591,131*	1,893	1,864	1.00	*9,591,131*	1,893	1,864
DEC TOTAL	343,744,772	57,997	55,304		286,581,276	48,651	46,622

Table 1-3. Summary of DEP Ex Post Gross and Net Savings

Technology	Ex Post Gross			NTGR	Ex Post Net		
	Energy Savings (kWh)	Summer Peak Demand (kW)	Winter Peak Demand (kW)		Energy Savings (kWh)	Summer Peak Demand (kW)	Winter Peak Demand (kW)
Main Channel	77,664,493	11,581	10,936		66,708,433	9,933	9,399
Lighting	*65,966,238*	*10,398*	*10,053*	*0.86*	*57,025,896*	*8,989*	*8,691*
HVAC	*1,485,524*	*366*	*239*	*0.68*	*1,008,938*	*248*	*162*
Food Service Products	*807,334*	*54*	*53*	*0.68*	*548,325*	*36*	*36*
EEB - Lighting	*9,376,146*	*760*	*589*	*0.86*	*8,105,406*	*657*	*509*
EEB - HVAC	*29,252*	*4*	*1*	*0.68*	*19,867*	*3*	*1*
Midstream Channel	6,227,819	1,026	987	1.00	6,227,819	1,026	987
Online Store	43,549	6	7	1.00	43,549	6	7
DEP TOTAL	83,935,861	12,614	11,930		72,979,800	10,966	10,393

Our process evaluation found a program that is operating effectively, with satisfied participants that are generating significant numbers of projects and energy savings. The program has gone through a number of transitions shortly before and during the evaluation period. Key program design and implementation changes include:

- The EEB and Smart $aver programs, which operated separately in DEP and DEC territory, were brought into closer alignment. This included changing the DEP incentive structure from a watts-reduced approach to a per-unit incentive.
- Application and incentive processing—previously carried out by external contractors—was brought in-house. Applications are now processed through a Salesforce-integrated system.
- In the fall of 2014, the Non-Residential Prescriptive Program added Business Energy Advisors (BEAs) to its roster of program staff. The primary responsibility of BEAs is to work with small and medium-sized customers to generate interest and participation in the Non-Residential Prescriptive Program and to assist customers with the participation process.
- In March 2016, the program rolled out an online application portal for DEC customers and trade allies. The online portal was introduced to DEP customers in January 2017. This online portal was designed to streamline and ease the participation process.
- The program opened the online store to DEC customers in early 2016 and to DEP customers in December 2016.

Our process evaluation sought to explore customer and trade ally awareness and use of some of these new program features and to assess how effective they were in streamlining program processes and reducing barriers to participation. However, the timing of these changes, relative to our evaluation period, means that some participating customers and trade allies may not have been exposed to the new features or may have experienced them during the time of transition, when the new processes may not have been fully functional. As such, some of the findings presented in this report, while reflective of participants during the evaluation period, may not be fully representative of current participants. We note in the detailed discussion in this report where this might be the case.

Overall, our process evaluation found the following:

Sources of Information

- Contractors and trade allies continue to be an important source of information for customers.
  - 41% of DEC and 37% of DEP participants first learned about the program from a trade ally or contractor.
  - 87% of DEC participants and 85% of DEP participants worked with a contractor or vendor to select equipment.
  - Word of mouth (35% DEC; 38% DEP) was another common source of awareness, suggesting that participants are generally satisfied with their experience and are recommending the program to others.

Barriers to Energy Efficiency and Participation

- Higher cost of energy efficient equipment and access to financing/capital are key barriers to installing energy-efficient equipment.
- Trade allies and participants consider financial considerations; paperwork, application processes, and time required to participate; and incentive levels to be the barriers to program participation. However, a large number of trade allies and participants do not see any barriers to program participation.

Satisfaction

- Participants are highly satisfied with the program overall and all program components, rating no component less than an average score of 8.4 on a scale of 0 to 10. The program overall was rated an average of 8.8 by DEP participants and 9.2 by DEC participants, the highest and second highest rating for the respective territories.
  - 75% of DEC participants and 84% of DEP participants are very or somewhat likely to participate again.
  - 93% of DEC participants and 78% DEP participants are very likely to recommend the program to other businesses.
- Trade allies are somewhat less satisfied with program processes than participants, but still rated their satisfaction with all program factors an average of 6.5 or higher. Trade allies in both territories gave their highest average ratings to program staff interactions and the program overall.

Business Energy Advisor Interactions

- Twenty-five percent of DEC and 27% of DEP participants have had energy efficiency-related interactions with a BEA.
  - The most common reason for interaction with the BEA was for program scoping (54% DEC) and application support (37% DEP).

  - 85% of DEC and 68% of DEP participants who worked with a BEA said the BEA was very or somewhat influential in their decision to participate in the program.

Online Portal

- Relatively few participants (37% DEC; 28% DEP) are aware of the customer online portal. Fewer still have used the portal (16% DEC; 12% DEP). The most common use was to submit applications (63% DEC; 70% DEP).
- Trade ally awareness of the portal is high (76% DEC; 72% DEP). More than half of DEC trade allies (54%) have used the portal, while slightly fewer DEP trade allies (44%) have.

Online Store

- Moderate numbers of main channel participants (46% DEC; 22% DEP) are aware of the online store. Fewer—13% of DEC participants and 1% of DEP participants—have made a purchase from the store. The later rollout of the online store to DEP customers may explain their lower awareness and use of this program channel.
  - 75% of DEC participants and 62% of DEP participants said that they were very or somewhat likely to make a purchase within the next year.
  - Barriers to making a purchase from the online store include existing vendor relationships, specific company purchasing requirements, or having no need for additional equipment.

Trade Ally Business Practices

- Nearly all trade allies reported an increase in one or more high-efficiency aspects of their business, and most of those trade allies said that the program was at least somewhat influential in those increases.
  - The aspect for which the highest share of trade allies reported significant increases was percent of sales recommending high-efficiency equipment (DEC 51%; DEP 41%).
- Trade allies generally credited the program with the highest influence on the increases in sales recommendations and energy-efficient installations (total volume and percentage of jobs).
- Less than half of trade allies have participated in program-sponsored training.
  - Of those who attended any training, the largest share (54% DEC; 79% DEP) attended program training, and about half attended online portal training.
  - The main reasons for not participating in any training were a lack of awareness that the program offered training, a lack of time to participate, and a lack of need for training.

1.4 Evaluation Recommendations

Through our research, we identified several opportunities for program improvement.

Increase Promotion of Lesser-Known Program Components

While the program is performing well and generating savings, there are program components that can be further promoted and improved to create even higher levels of participation. The BEAs represent a strong opportunity for the program to reach small- and medium-sized businesses and increase program knowledge and participation among this group. Increased operational support could be provided to the BEAs to facilitate more targeted communications and knowledge transfer to customers at the key moment when they are selecting equipment for their projects.

The program should also make attempts to increase promotion of the online store and the online portal, particularly among DEP customers for whom these components are still relatively new. The online store represents an opportunity for customers with relatively simple projects (primarily lighting) to purchase equipment in a streamlined fashion and could drive increased participation. BEAs in particular should promote this option to their customers, as it might be well suited for the needs of smaller businesses. At the same time, the program should emphasize the online portal in communications with customers and trade allies as a mechanism to streamline the application process and as a way for these key stakeholders to receive vital information about the program.

Finally, the program periodically provides training to trade allies in the form of in-person meetings and webinars. However, knowledge of and participation in these trainings was relatively low among surveyed trade allies. Since the trainings address some of the areas of lower trade ally satisfaction (e.g., application processing, the online portal), there is an opportunity for the program to better educate trade allies, remove some of the obstacles to participation, and increase satisfaction. The program might also consider making an introductory training mandatory, to ensure that all trade allies are aware of key program processes and requirements. Some similar programs that have lists of registered trade allies do require this.[2] In some cases, they also require attendance in annual meetings, to inform trade allies of important changes to the program.

Consider More Frequent Updates of Eligible Measure List, Especially for Lighting Measures

Many trade allies install non-incented high-efficiency equipment, and many of these installations are not completed through the program because the measures are not on the program's list of eligible equipment. Trade allies listed multiple types of energy-efficient equipment—mostly lighting measures—that they think should be eligible for a program incentive: tubular LED bulbs; high-output lighting, such as high-bay LEDs and "corn cob LEDs"; LED floodlights; low-wattage TLEDs; and generally, a wider range of LED bulbs and fixtures.

While relying on third-party lists of qualifying equipment, such as those from the DLC and ENERGY STAR®, allows the program to reduce its administrative burden, the program may be missing opportunities for increasing participation and realizing more savings. Lighting still represents an excellent source of program

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[2] Examples of similar business programs that have trade ally training requirements include NIPSCO's Business Energy Efficiency Program, which requires new TAs to complete an orientation session; ComEd's Smart Ideas® Energy Efficiency Program, which requires new TAs to attend a Trade Ally Basic Training class and one launch event per program year; SDG&E's C&I programs, which require new TAs to participate in the Trade Professional Program Essentials training; and PG&E's C&I programs, which require new TAs to attend the Trade Professional Alliance 101 Seminar before participating in the programs.

savings, and levels of FR are low compared to non-lighting measures. As such, staying current with newer and better lighting technologies represents an opportunity for the program to continue capturing lighting-related savings.

Continue to Improve and Streamline the Application Process

The program has taken steps to improve the application process, including bringing the application processing system in-house and offering an online application system for participants and trade allies. Nevertheless, the online portal is the lowest-rated program components for trade allies. While the evaluation team did not have direct access to the online portal, we recommend that the program collect specific feedback from portal users and explore implementing solutions to the most commonly cited challenges. Among suggestions provided by trade allies surveyed in support of this evaluation were a function to auto-populate data for customers with multiple sites, allowing a multi-location application, and including an archive or filter function.

Improve Data Collection and Tracking Processes

Our review and processing of program tracking data revealed a number of issues that, if addressed, would allow program staff to better track program activity and would also facilitate evaluation efforts. In particular, areas that can be improved include the following:

- **Create unique identifiers for participants and trade allies.** During interviews and conversations, program staff noted two difficulties related to data tracking: (1) an inability to identify and enumerate unique customers in the participation data and (2) difficulty identifying inactive trade allies for potential removal from the program's trade ally list. Creating a unique identifier for each participating customer and each participating trade ally would solve both of these problems and would allow program staff to easily tabulate program activity, identify top- and low-performing trade allies, identify repeat customers, and better target specific types of customer or trade ally. Assigning unique identifiers could also help with auto-populating certain information in the online portal, as suggested by one trade ally to streamline the application process.

- **Perform additional quality assurance steps on the data entered into the program tracking database.** While our impact analysis generally found few data tracking issues, one major error in quantity significantly affected the realization rate of food service equipment. Additional checks on entered data, e.g., for outlier values, could help prevent such issues in the future.

- **Ensure that information collected on the application is complete and consistently entered into the program tracking database.** Missing data encountered during our evaluation included operational information, such as hours of use, as well as customer contact information. Collecting and entering more complete technical and operational data will enable more accurate estimates of program impacts while more complete customer contact information will support program outreach efforts.

2. Program Description

2.1 Program Design

The Duke Energy Carolina (DEC) Smart $aver Prescriptive Program and the Duke Energy Progress (DEP) Energy Efficiency for Business (EEB) Program (hereafter referred to as the DEC/DEP Non-Residential Prescriptive Program) provide incentives for electric commercial and industrial customers to purchase and install a variety of high-efficiency equipment, including lighting, HVAC systems, pumps and drives, and qualifying process, food service, and information technology equipment. The programs also use incentives to encourage maintenance of existing equipment to reduce energy usage. Incentives are available for new construction and retrofits and replacements. Prescriptive incentives under the programs are limited to 75% or less of the customer cost.

The main delivery channel for the DEC/DEP Non-Residential Prescriptive Program is application-based and driven by trade allies. The program has two additional delivery channels:

1. The Business Savings Store on the Duke Energy website (hereafter referred to as the "online store") offers customers a limited number of qualified products for which they can receive an instant discount. The discounts offered in the store are consistent with incentive levels in the main delivery channel.

2. The midstream channel allows distributors to provide instant discounts on eligible lighting equipment to prequalified customers. The discounts offered through this channel are also consistent with incentive levels in the main delivery channel. The midstream channel is offered through distributors only and is not available through trade allies.

The Non-Residential Prescriptive Program was first implemented in the DEC/DEP territory in 2009. Prior to March 2016, the DEP Energy Efficiency for Business Program provided incentives on a performance basis, e.g., watts reduced, rather than on a per-unit basis. In an effort to more closely integrate the DEC and DEP programs, the Energy Efficiency for Business Program incentive structure was transitioned to the per-unit basis offered by the Smart $aver Prescriptive Programs in Duke Energy's other jurisdictions (including DEC). This evaluation covers projects incented through the DEP Energy Efficiency for Business Program after the transition to the per-unit incentive structure.

2.2 Program Implementation

Duke Energy staff implement the Non-Residential Prescriptive Program, along with contractor support for some program components. The program is also offered in other Duke Energy territories, and most program staff share responsibilities across the territories. In the DEC and DEP territories, the program is managed by two program staff, with support from Duke Energy marketing staff, a trade ally outreach team, a team of BEAs and operational support for processing applications and incentives.

The program is marketed to commercial and industrial customers through targeted outreach and communications by the program. Marketing approaches during the evaluation period included email and direct mail; online marketing; print marketing using tailored marketing collateral, such as a do-it-yourself (DIY) brochure; and monthly marketing materials that focused on a different topic each month to generate interest in specific technologies and areas of the program. Additional outreach is conducted by Large Business Account Managers, BEAs, and Local Government and Community Relations staff. BEAs are a new addition to the program as of the fall of 2014. The role of BEAs is to conduct targeted outreach to small and medium-sized businesses that fall below the threshold for large account management.

The program also has a trade ally outreach team that is specifically tasked with marketing the program to trade allies, who in turn are encouraged to promote the program to their customers. The trade ally outreach team manages existing trade ally relationships, recruits new trade allies, and educates trade allies about the program offerings and changes in the program as they occur. The program also offers a co-marketing campaign for trade allies that provides reimbursement for up to 50% of their marketing costs (up to $2,000).

During the evaluation period, the program changed several of its implementation strategies:

- Application and incentive processing—previously carried out by external contractors—was brought in-house. Applications are now processed through a Salesforce-integrated system.
- In March 2016, the program rolled out an online application portal for DEC customers and trade allies. The online portal was introduced to DEP customers in January 2017. This online portal aligns with the new application processing system.
- The program opened the online store to DEC customers in early 2016 and to DEP customers in December 2016.

2.3 Program Participation and Performance

During the evaluation period (August 1, 2015 to February 28, 2017 for DEC; March 1, 2016 to February 28, 2017 for DEP), the program completed 12,855 projects in DEC territory and 3,186 projects in DEP territory.[3] These projects were completed by close to 7,000 unique DEC customers and 1,700 unique DEP customers, and they accounted for 332 GWh of ex ante gross savings for DEC and almost 75 GWh of ex ante gross savings for DEP.

More than 7 of 10 (72.3%) DEC projects and 92.6% of DEP projects were completed through the main channel. In DEC territory, 16.7% of projects were completed through the midstream channel and 11.0% were completed through the online store. In DEP territory, only 7.0% of projects went through the midstream channel and fewer than 1% went through the online store.

Project counts and ex ante savings are summarized, by territory, in Table 2-1.

[3] The program tracking database tracks measures but not projects. For evaluation purposes, we defined unique projects as one or more measures of the same technology installed by the same customer (based on account number and name), at the same location, at the same time. Project counts in this report exclude 35 projects with zero savings.

Table 2-1. Non-Residential Prescriptive Projects and Ex Ante Gross Savings during the Evaluation Period

Delivery Channel	Projects		Number of Unique Customers[A]	Ex Ante Savings	
	Number	Percent		kWh	Percent
DEC					
Main Channel	9,288	72.3%	5,124	262,599,683	79.2%
Midstream Channel	2,152	16.7%	1,190	59,834,601	18.0%
Online Store	1,415	11.0%	1,027	9,280,200	2.8%
DEC Total	**12,855**		**6,916**	**331,714,484**	
DEP					
Main Channel	2,949	92.6%	1,570	69,375,093	92.9%
Midstream Channel	224	7.0%	160	5,301,118	7.1%
Online Store	13	0.4%	11	39,783	<0.1%
DEP Total	**3,186**		**1,696**	**74,715,994**	

[A] Note that some customers participated in more than one delivery channel. As a result, the sum of unique customers across delivery channels does not add to the DEC and DEP totals.

Table 2-2 shows the distribution of main channel projects by technology type. Lighting accounted for the majority of projects for both DEC and DEP. During the evaluation period, lighting represented 89% of projects and 86% of savings for DEC and 81% of projects and 82% of savings for DEP. HVAC projects (5% DEC; 6% DEP) and food service projects (5% DEC; 7% DEP) were the next most common project type in the program. Some DEP projects were categorized as “EEB lighting” and “EEB HVAC,” without any additional measure detail. Based on our desk reviews, at least some of these projects included more than one technology. Therefore, we categorize these projects and their savings separately.

Table 2-2. Distribution of Main Channel Projects and Savings by Technology Type

Technology	% Projects		% Ex Ante Savings	
	DEC	DEP	DEC	DEP
Lighting	89%	81%	86%	82%
HVAC	5%	6%	3%	2%
Food Service Products	5%	7%	5%	2%
Pumps and Drives	1%	–	4%	–
Process Equipment	<1%	–	1%	–
Information Technology	<1%	–	1%	–
EEB Lighting	–	6%	–	14%
EEB HVAC	–	<1%	–	<1%

3. Overview of Evaluation Activities

To address the research objectives outlined in the previous section, the evaluation team performed a range of data collection and analytic activities, including:

- Program staff interviews (n=3)
- Program materials review
- BEA interviews (n=3)
- A participant survey (n=127 DEC; n=94 DEP)
- A trade ally survey (n=111 DEC; n=31 DEP)
- Database review
- Engineering desk reviews (n=145)
- Site visits (n=32 DEC; n=6 DEP)
- Deemed savings review

3.1 Program Staff Interviews

We conducted three in-depth interviews with program staff: one with the two Duke Energy Non-Residential Prescriptive Program managers, one with the leader of the trade ally outreach team, and one with the leader of the BEA team.

- The interview with the program managers took place in March 2016. The purpose of this interview was to understand the program's current design and implementation, including the online store and the midstream channel. We also explored recent program changes, strengths, and challenges, as well as program staff's priorities for the process evaluation.
- The trade ally outreach team leader interview took place in April 2016. The goals of this interview were to understand the role of trade allies in the Non-Residential Prescriptive Program, to identify key program outreach activities targeted at trade allies, and to discuss areas for further research.
- The BEA team leader interview took place in April 2016. The goals of the interview were to understand the role of BEAs in the Non-Residential Prescriptive Program and to identify key activities that BEAs undertake to reach small and medium-sized customers and to encourage them to participate in the program. We attempted, but did not complete, a follow-up interview with the BEA team leader in June/July 2017 to explore any changes in the BEAs' role in the program.

3.2 Program Materials Review

The evaluation team reviewed the following prior evaluation reports for the DEC and DEP Non-Residential Prescriptive Program:[4]

[4] Prior evaluations were conducted for the DEC and DEP programs separately.

- DEC Evaluations:
  - Duke Energy Carolinas Smart $aver® Prescriptive Incentive Program (July 2016, revised August 2017; The Cadmus Group)
  - Process Evaluation of the 2013-2014 Smart $aver® Nonresidential Prescriptive Incentive Program in the Carolinas System (December 2015; The Cadmus Group)
  - Process and Impact Evaluation of the Non-Residential Smart $aver Prescriptive Program in the Carolina System: Lighting and Occupancy Sensors (April 2013; TecMarket Works)
- DEP Evaluations:
  - 2014 EM&V Report for the Energy Efficiency for Business Program (March 2016; Navigant Consulting)
  - 2013 EM&V Report for the Energy Efficiency for Business Program (December 2014; Navigant Consulting)
  - 2012 EM&V Report for the Energy Efficiency for Business Program (September 2013; Navigant Consulting)

We also reviewed summary documents describing the program design and implementation approach, marketing materials and collateral developed for the program, and documentation of the incentives and technologies available through the program. In support of the gross impact evaluation, we also reviewed a number of technical reference manuals (TRMs), including the Arkansas TRM, the Illinois TRM, the Indiana TRM, the Mid-Atlantic TRM, the Wisconsin TRM, the Tennessee Valley Authority TRM, and the Texas TRM, as well as a variety of secondary materials documenting Duke Energy's ex ante deemed savings assumptions. The full list of these materials is included in the Deemed Savings Review Memorandum in (see Appendix).

3.3 Business Energy Advisor Interviews

We interviewed three of the five BEAs assigned to the Non-Residential Prescriptive Program in the DEC and DEP territories. The BEAs are primarily responsible for working with small and medium-sized customers to generate interest and participation in the program and for assisting customers with the participation process. The goals of these interviews were to explore the BEAs' perspective on program processes, including program strengths and weaknesses and areas for improvement; to hear their perspective on customer awareness of and interest in the program; and to better understand customer barriers to energy efficiency and program participation.

3.4 Participant Survey

We conducted a computer-assisted telephone interview (CATI) survey with a stratified random sample of participants in the main channel. The survey was designed to collect information on FR and PSO in support of the net impact analysis, and on program processes, such as interactions with BEAs, awareness and prior use of the online store and the online application portal, barriers to participation, and satisfaction.

Sample Design

The survey sample was designed to allow for the development of statistically significant FR estimates for four analysis groups: DEC lighting projects, DEC non-lighting projects, DEP lighting projects, and DEP non-lighting projects. We further stratified the sample in each group based on project savings. While the sampling unit for this survey was the unique customer contact, the FR questions had to be asked about a specific project completed by that customer. Because many customers had completed more than one project during the evaluation period, our sampling approach prioritized projects in strata with fewer available sample points, i.e., projects with larger savings and non-lighting projects.

We completed 221 total interviews with customers who participated in the program's main delivery channel, 127 with DEC participants and 94 with DEP participants.[5] The average length of the interviews was 15 minutes and 33 seconds. The response rate was 20.3%.

Table 3-1 summarizes the population, sample frame, and number of survey completes, by jurisdiction and technology.

Table 3-1. Sampling Approach for Participant Survey

	DEC		DEP	
Technology	# of Projects in Population (Main Channel)	# of Completes	# of Projects in Population (Main Channel)	# of Completes
Total	9,288	127	2,949	94
Lighting	8,243	71	2,392	70
Non-Lighting	1,045	56	373	22
HVAC	*467*	*36*	*170*	*17*
Food Service Products	*470*	*11*	*203*	*5*
Pumps and Drives	*75*	*5*	--	--
Process Equipment	*28*	*4*	--	--
Information Technology	*5*	--	--	--
EEB Lighting	--	--	182	*2*
EEB HVAC	--	--	2	–

Process Weights

Our sample design was based on the needs of the FR analysis and oversampled projects with larger savings and projects with non-lighting technologies. To ensure that aggregated responses to process questions are representative of the population, we developed process weights. Process weights were calculated as the stratum's percentage of projects in the population divided by its percentage of projects in the sample, within each jurisdiction. Table 3-2 summarizes the process weights.

[5] The survey excluded participants in the online store and the midstream channel.

Table 3-2. Participant Survey Process Weights

Stratum	Population (Projects)		Survey Completes		Weight
	Count	%	Count	%	
DEC					
Lighting Small	6,415	69%	22	17%	3.99
Lighting Medium	1,667	18%	25	20%	0.91
Lighting Large	161	2%	24	19%	0.09
Non-Lighting Small	839	9%	37	29%	0.31
Non-Lighting	176	2%	14	11%	0.17
Non-Lighting Large	30	0.3%	5	4%	0.08
Total DEC	**9,288**	**100%**	**127**	**100%**	
DEP					
Lighting Small	1,720	58%	29	31%	1.89
Lighting Medium	738	25%	26	28%	0.90
Lighting Large	116	4%	17	18%	0.22
Non-Lighting Small	244	8%	13	14%	0.60
Non-Lighting	111	4%	3	3%	1.18
Non-Lighting Large	20	1%	6	6%	0.11
Total DEP	**2,949**	**100%**	**94**	**100%**	

3.5 Trade Ally Survey

We conducted an online survey with trade allies who had completed at least one project through the Non-Residential Prescriptive Program during the evaluation period. The goals of this survey were to support the estimation of trade ally TA SO attributable to the program and to examine process-related questions, such as program impacts on trade ally business practices, trade ally satisfaction with the program, awareness of the program among customers, barriers to participation in the program, and trade ally training.

We sent an email invitation to each company that completed at least one project through the Non-Residential Prescriptive Program during the evaluation period, i.e., we attempted a census of trade ally companies. As such, our data collection approach was not sample-based, and the concept of sampling precision does not apply. To promote participation in the survey, we offered an incentive of $50 to the first 30 trade allies who completed the survey, and an additional $50 incentive to a randomly selected group of 25 trade allies.

Overall, 111 DEC and 32 DEP trade allies completed the online survey. The response rate was 18.2%.

3.6 Database Review

We received various data extracts from the program tracking database, each containing a subset of the data needed in support of our evaluation. Our team of energy data scientists and engineers merged and cleaned these data and created a single dataset that reflects program activity during the evaluation period and that could be used for the gross impact analysis and survey sampling. Key data cleaning activities included development of project IDs, development of ex ante savings (by merging per-unit savings into the tracking data and multiplying those by measure quantities), verification of installation dates, removal of duplicate and otherwise ineligible records (e.g., those not achieving the minimum efficiency level), and cleaning of respondent and trade ally contact information for sampling purposes.

3.7 Engineering Desk Reviews and Site Visits

To verify measure quantities tracked by the program, our engineering team performed 145 desk reviews of main channel projects, sampled by technology. The desk reviews consisted of a thorough examination of all available program documentation for the projects, including applications, invoices, and specifications sheets. Additionally, we followed up with site contacts to confirm quantities, as necessary. Our team also performed 38 site visits (32 DEC; 6 DEP) to confirm measure quantities and other key project parameters of incented projects.

To select projects for desk reviews, we used a stratified random sampling approach, stratifying by technology and project savings (Table 3-3). The projects selected for site visits were a subset of the 145 desk review projects (nested sample), selected at random. We targeted a precision level of 10% at 90% confidence for each technology.

Table 3-3. Summary of Desk Reviews and Site Visits

Technology	Number of Projects		
	Population (Main Channel)	Desk Reviews	Site Visits
Lighting	10,635	53	12
Food Service Products	673	30	5
HVAC	637	30	10
Pumps and Drives	75	15	5
Information Technology	28	5	0
Process Equipment	5	10	5
EEB Lighting	182	2	1
EEB HVAC	2	0	0
Total	**12,237**	**145**	**38**

3.8 Deemed Savings Review

To verify per-unit savings values in the program tracking database, our engineering team performed a deemed savings review of key measures incented during the evaluation period.[6] The program provided incentives for 204 unique measures, and our deemed savings review included 66 of these measures, accounting for 93% of ex ante savings. For each of these 66 measures, we reviewed existing program documents, assumptions, TRMs, and other resources as applicable to determine the appropriateness of the per-unit savings values. We then recommended changes to per-unit savings for several measures, based on the review of materials.

[6] The deemed savings review covered the data available as of the time of the data pull for this task (i.e., through July 31, 2016), rather than the full evaluation period through February 28, 2017. It included measures in all three delivery channels.

4. Gross Impact Evaluation

Our gross impact evaluation included four main evaluation activities: a program database review, a desk review of a sample of projects, site visits of a sample of projects, and a review of Duke Energy's ex ante (deemed) savings assumptions. While the desk reviews and site visits focused on projects completed through the program's main channel, we did include midstream channel and online store measures in the deemed savings review and also applied gross impact realization rates to midstream channel and online store measures.

4.1 Methodology

The first step in the gross impact evaluation was to perform a database review. This review consisted of several steps. First, we reviewed and merged various data extracts from the program tracking database and developed unique project identifiers. Second, we calculated ex ante savings, by technology, by multiplying per-unit database savings by measure quantities. Third, we verified dates of installation, identified duplicate records, and checked for any other qualifying parameters that may disqualify measures (e.g., not achieving the minimum efficiency level). The database review resulted in a clean dataset that reflects the eligible population of program projects with complete data required to estimate savings, including measure- and project-level ex ante savings. We used this dataset to select measures for the deemed savings review, to select projects for the engineering desk reviews and site visits, and to develop technology- and program-level ex ante gross impacts.

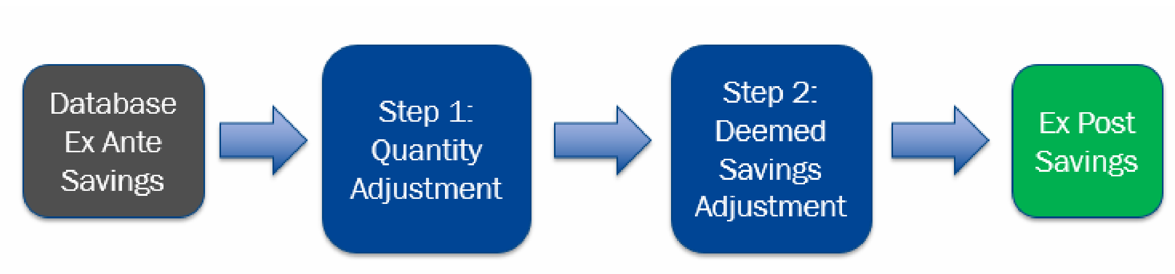
Following the database review, the evaluation team used a combination of desk reviews, site visits, and a deemed savings review to estimate ex post (verified) gross impacts. The methodology consisted of a two-step process to adjust the ex ante savings from the program tracking database:

- **Step 1: Quantity Adjustment:** Based on 145 desk reviews and 38 site visits, we developed technology-specific quantity adjustment factors, which we applied to the measure quantities in the program tracking database. The sample included both DEC and DEP projects, but did not target specific quota for each jurisdiction.

- **Step 2: Deemed Savings Adjustment:** Based on the deemed savings review, we developed measure-specific per-unit savings adjustment factors, which we applied to the per-unit measure savings in the program tracking database.

Figure 4-1 depicts this process.

Figure 4-1. Gross Impact Evaluation Approach



4.1.1 Quantity Adjustment

The purpose of the desk reviews and site visits was to verify measure quantities included in the program tracking database. We began by performing desk reviews for a sample of 145 main channel projects, sampled by technology (see Table 3-3 above). We reviewed all available project documentation for sampled projects, including the project application; any supplied calculations, invoices, specification sheets, and inspection forms; and any other project-specific data made available to our team. For all sampled projects, we compared measure types and quantities listed on project documents with measure types and quantities listed in the program tracking database to ensure consistency and to check for any errors. Additionally, we followed up with site contacts to confirm quantities if there were significant, unexplained differences between project documents and the database.

Following the desk reviews, we selected a random sample of 35 projects[7] from among the desk review projects (nested sample) to perform site visit inspections of measure quantities. We used the site visits to confirm installation of the energy-efficient measure(s) and other project-specific parameters as applicable (e.g., type, size). We developed an on-site data collection plan, which documented the general on-site data collection approach, including final sample sizes; the timeline for the visits; the data to be collected during the visits; the requirements for technicians, such as badging and apparel; and any safety or training requirements.

We included projects identified in the database as “EEB Lighting” and “EEB HVAC” in our original sample, but learned through the desk reviews and site visits that the project documentation for these projects was incomplete and not consistent with other projects, which made it difficult to verify measure installations.[8] We were therefore not able to verify measure quantities for EEB lighting and EEB HVAC projects and applied a default realization rate of 100% to those projects.

Based on information from both desk reviews and site visits, we developed technology-level quantity adjustment factors. While the desk reviews and site visits only included main channel projects, we applied the technology-level adjustment factors to all program-incented measures, including those incented through the online store and the midstream channel.

4.1.2 Deemed Savings Adjustment

The purpose of the deemed savings review was to review per-unit savings assumptions for key measures incented through the Non-Residential Prescriptive Program. Because of the large number of unique measures incented during the evaluation period (a total of 204), we focused our efforts on the measures that accounted for the largest share of program savings.[9] We included measures incented through the Main channel as well as the online store and the midstream channel in this review.

Table 4-1 presents the number of measures incented through the program, as well as those selected for review, by technology. As seen in Table 4-1, the deemed savings review included 66 measures that accounted for 93% of total ex ante program savings. For the measures not covered by the deemed savings

[7] We targeted 35 sites, but completed 38, as we overscheduled to ensure that any last-minute cancellations would not affect the targeted sample of 35 sites.

[8] For example, one sampled EEB lighting project appeared to be a New Construction project and included only baseline and installed lighting power density calculations, making it difficult to verify the exact quantities of fixtures in each room. Additionally, the project included HVAC measures, and the amount of savings from lighting measures versus HVAC measures could not be discerned from the project documentation.

[9] The measure selection for the deemed savings review was based on the data available at the time of the data pull for this task, i.e., through July 31, 2016, rather than the full evaluation period through February 28, 2017.

review (accounting for the remaining 7% of total ex ante savings), we maintained existing per-unit ex ante assumptions.

Table 4-1. Summary of Measures Reviewed

Technology	All Measures[A]		Reviewed Measures		
	Number	Ex Ante Savings (kWh)	Number	Ex Ante Savings (kWh)	% of Total Ex Ante Savings
Lighting	83	120,429,112	54	117,423,913	98%
Food Service Products	43	9,892,610	2	7,924,384	80%
Pumps and Drives	8	5,868,817	3	5,827,024	99%
HVAC	63	5,775,575	5	1,701,603	29%
Information Technology	4	3,318,558	2	2,927,158	88%
Process Equipment	3	1,122,447	0	0	0%
Total	**204**	**146,407,119**	**66**	**135,804,082**	**93%**

[A] This table includes measures incented through July 31, 2016, rather than for the full evaluation period. As a result, total ex ante savings in this table do not match program totals in other parts of the report.

For the selected measures, we reviewed all program-supplied ex ante documentation and exchanged several rounds of questions with Duke Energy to clarify specific assumptions. We leveraged a variety of TRMs, including the Arkansas TRM, the Illinois TRM, the Indiana TRM, the Mid-Atlantic TRM, the Tennessee Valley Authority TRM, and the Wisconsin TRM, as well as ASHRAE, ENERGY STAR®, and other references, as needed.

The full, measure-level deemed savings review, including the supporting spreadsheet, can be found in Appendix).

4.2 Gross Impact Results

Table 4-2 summarizes the overall gross energy impacts for DEC and DEP (including savings from all three delivery channels) resulting from the two-step adjustment approach described above. The overall realization rates are greater than 100%, driven mainly by deemed savings review adjustments. The quantity adjustment resulted in a slight decrease to savings for lighting measures, but this decrease was offset by the savings increases from the deemed savings review. We describe these adjustments in more detail below.

Table 4-2. Overall Gross Energy (kWh) Impacts

Technology	DEC			DEP		
	Ex Ante kWh	Realization Rate	Ex Post kWh	Ex Ante kWh	Realization Rate	Ex Post kWh
Lighting	294,891,311	107%	315,354,420	62,195,290	116%	72,231,570
Pumps and Drives	10,267,207	100%	10,267,207	0	N/A	0
HVAC	7,956,142	104%	8,302,759	1,491,559	100%	1,491,559
Food Service Products	13,673,591	36%	4,911,371	1,623,748	50%	807,334
Information Technology	3,321,658	100%	3,331,277	0	N/A	0
Process Equipment	1,604,575	98%	1,577,738	0	N/A	0
EEB – Lighting	0	N/A	0	9,376,146	100%	9,376,146
EEB – HVAC	0	N/A	0	29,252	100%	29,252

Technology	DEC			DEP		
	Ex Ante kWh	Realization Rate	Ex Post kWh	Ex Ante kWh	Realization Rate	Ex Post kWh
Totals	331,714,484	104%	343,744,772	74,715,994	112%	83,935,861

Table 4-3 summarizes the overall gross demand impacts for DEC and DEP (including savings from all three delivery channels) resulting from the two-step adjustment approach described above.

- The overall summer demand realization rates are greater than 100%, driven mainly by deemed savings adjustments to lighting.
- The overall winter demand realization rates are significantly higher than 100%, driven mainly by deemed savings adjustments to lighting measures. The program did not claim winter demand savings for several lighting measures, but we added them for ex post.

We describe these adjustments in more detail below.

Table 4-3. Overall Gross Demand Impacts

Technology	DEC			DEP		
	Ex Ante kW	Realization Rate	Ex Post kW	Ex Ante kW	Realization Rate	Ex Post kW
Summer Demand Impacts						
Lighting	50,556	106%	53,762	11,000	104%	11,431
Pumps and Drives	1,481	100%	1,481	0	N/A	0
HVAC	2,255	83%	1,862	365	100%	365
Food Service Products	1,976	22%	440	156	34%	54
Information Technology	145	101%	146	0	N/A	0
Process Equipment	310	99%	306	0	N/A	0
EEB - Lighting	0	N/A	0	760	100%	760
EEB - HVAC	0	N/A	0	4	100%	4
Totals	**56,723**	**102%**	**57,997**	12,286	**103%**	**12,614**
Winter Demand Impacts						
Lighting	17,127	304%	52,102	5,888	188%	11,047
Pumps and Drives	1,598	100%	1,598	0	N/A	0
HVAC	844	81%	684	239	100%	239
Food Service Products	1,946	22%	419	160	33%	53
Information Technology	212	92%	195	0	N/A	0
Process Equipment	310	99%	306	0	N/A	0
EEB - Lighting	0	N/A	0	589	100%	589
EEB - HVAC	0	N/A	0	1	100%	1
Totals	22,035	**251%**	**55,304**	6,877	**173%**	**11,930**

The following subsections provide more detailed results from the quantity and deemed savings adjustment analyses.

4.2.1 Quantity Adjustment

Based on our desk reviews and site visits, we adjusted the quantities for 6 of the 145 sampled projects. Of the six adjustments, five were relatively minor, while the sixth adjustment, for a food service project, had a significant impact on the food service products realization rates. This food service project (enrollment number PSN15-0000072017) had a tracked quantity of 1,500 Full Size Holding Cabinets, but project documents showed a quantity of 1. We confirmed through a follow-up call with the customer that the quantity of 1 was correct.

Table 4-4 summarizes the quantity adjustments that we made to the six projects.

Table 4-4. Summary of Adjusted Projects

Sample Project #	Measure	Unit of Measure	Quantity		
			Database	Desk Review	Site Visit
#1	Holding Cabinet Full Size Insulated	Cabinet	1,500	1	N/A[A]
#2	Variable Speed Drive Air Compressors	Horsepower	216	200	N/A
#3	Variable Speed Drive Air Compressors	Horsepower	232	200	N/A
#4	LED Lamps	Lamps	1,344	1,344	1,171
#5	T12HO 8ft 2 lamp retrofit	Fixtures	55	55	38
#6	LED Lamps	Lamps	396	396	257
#7–#145	Various	Various	All quantities verified		

[A] Project was not selected for a site visit, but we confirmed via a call with the customer that the desk review quantity (1) was correct.

The quantity adjustments for the six projects resulted in adjustments to lighting, food service products, and process equipment technologies, as shown in Table 4-5. We did not make any adjustments to the other technologies because we did not find any discrepancies in our sample for those technologies. We achieved relative precision of ±2% for lighting projects, ±14% for food service products, and ±1% for process equipment, and ±0% for all other technologies at the 90% confidence level.

Table 4-5. Quantity Adjustments

Technology	DEC Quantity Adjustments			DEP Quantity Adjustments		
	Energy Savings (kWh)	Summer Peak Demand (kW)	Winter Peak Demand (kW)	Energy Savings (kWh)	Summer Peak Demand (kW)	Winter Peak Demand (kW)
Lighting	99%	99%	97%	99%	99%	97%
Pumps and Drives	100%	100%	100%	N/A	N/A	N/A
HVAC	100%	100%	100%	100%	100%	100%
Food Service Products	50%	34%	33%	50%	34%	33%
Information Technology	100%	100%	100%	N/A	N/A	N/A
Process Equipment	98%	99%	99%	N/A	N/A	N/A
EEB - Lighting	N/A	N/A	N/A	100%	100%	100%
EEB - HVAC	N/A	N/A	N/A	100%	100%	100%
Totals	**97%**	**96%**	**92%**	**98%**	**98%**	**96%**

4.2.2 Deemed Savings Adjustment

The deemed savings review resulted in modifications to per-unit savings assumptions for lighting, HVAC, food service, and information technology equipment. No adjustments were made for pumps and drives or process equipment. The deemed savings review resulted in the following adjustments:

- Lighting
  - Incorporated measure-specific annual operating hours, which generally increased lighting energy savings.[10]
  - Updated pre- and post-wattages, coincidence factors, and waste heat factors, as applicable, based on more recent and more relevant studies, which resulted in slight increases and decreases to savings that mostly cancelled each another out.
  - Estimated winter demand savings for four measure types (LED High Bay, High Bay Fluorescent, LED Panel, and LED Tube), which were not included in ex ante per-unit savings assumptions. This significantly increased winter demand savings.
- HVAC
  - Developed a new savings methodology for chillers to be consistent with several TRMs, which resulted in slight increases to energy savings and decreases to summer demand savings.
  - Removed winter demand savings for chillers as chillers would not typically operate during winter months, resulting in a decrease to winter demand savings.
- Food Service Products
  - Revised the savings methodology for Holding Cabinets to reflect the latest ENERGY STAR® Calculator assumptions. This resulted in a reduction of nearly 50% in energy savings, as well as summer and winter demand savings.
- Information Technology
  - Used three separate methods for ex post savings to develop an average savings for server virtualization, which resulted in minor adjustments to ex ante savings.

Table 4-6 summarizes the results of the deemed savings review, by technology. The full, measure-level deemed savings review, including the supporting spreadsheet, can be found in the Appendix.

[10] Ex post lighting hours of use reflect average annual operating hours, based on the program tracking database (a lighting metering study was outside the scope of this evaluation; however, a lighting metering study is planned for the next evaluation cycle.). Ex ante values were based on a combination of previous studies, night-time hours (for exterior lighting), and other unsourced assumptions.

Table 4-6. Deemed Savings Adjustments

Technology	DEC Deemed Savings Adjustments			DEP Deemed Savings Adjustments		
	Energy Savings (kWh)	Summer Peak Demand (kW)	Winter Peak Demand (kW)	Energy Savings (kWh)	Summer Peak Demand (kW)	Winter Peak Demand (kW)
Lighting	108%	108%	315%	117%	105%	194%
Pumps and Drives	100%	100%	100%	N/A	N/A	N/A
HVAC	104%	83%	81%	100%	100%	100%
Food Service Products	72%	65%	64%	100%	100%	100%
Information Technology	100%	101%	92%	N/A	N/A	N/A
Process Equipment	100%	100%	100%	N/A	N/A	N/A
EEB - Lighting	N/A	N/A	N/A	100%	100%	100%
EEB - HVAC	N/A	N/A	N/A	100%	100%	100%
Totals	**106%**	**105%**	**263%**	**114%**	**105%**	**181%**

5. Net-to-Gross Analysis

5.1 Methodology

Our net-to-gross (NTG) analysis includes consideration of free-ridership (FR), participant spillover (PSO), and trade ally spillover (TA SO). FR and PSO are based on the participant telephone survey, while TA SO is based on the online trade ally survey. The net-to-gross ratio (NTGR) is calculated as follows:

$$NTGR = 1 - FR + PSO + TA\,SO$$

5.1.1 Free-Ridership

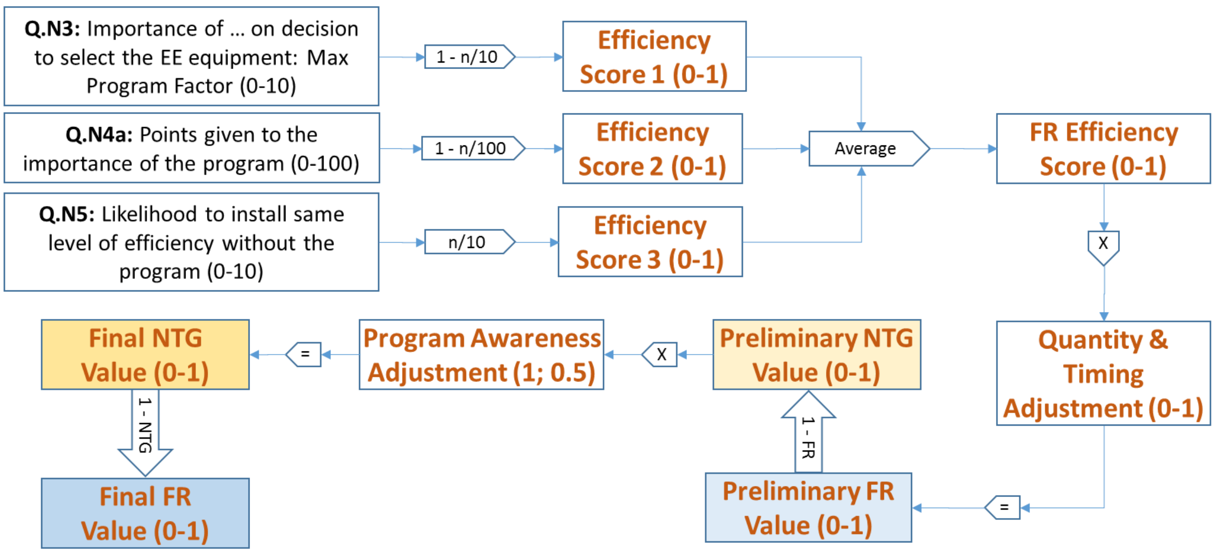
Free-riders are program participants who would have completed the same energy efficiency upgrade without the program. FR scores represent the percentage of savings that would have been achieved in the absence of the program. FR scores can range from 0% (not a free-rider, i.e., the participant *would not* have completed the project without the program) to 100% (a full free-rider, i.e., the participant *would* have completed the project without the program). FR scores between 0% and 100% represent partial free-riders, i.e., participants who were to some degree influenced by the program to complete the energy efficiency upgrade.

FR survey questions focus on the importance of various program factors[11] on the decision to install energy-efficient equipment, as well as on the likelihood of making the same upgrades in the absence of the program (the counterfactual). These questions are used to determine program influence on levels of efficiency and on measure quantity (where applicable) and project timing. We developed three measurements of program influence on levels of efficiency and used consistency checks in cases where inconsistent responses were given. Responses about measure quantity and project timing are used to adjust the efficiency-based FR rate, allowing the program to receive credit in cases where the program influenced project size and timing rather than, or in addition to, the level of efficiency. A second adjustment, the Program Awareness Adjustment, is applied in cases where participants reported having learned about the program *after* they selected the equipment for which they received an incentive. This adjustment, if applied, reduces a respondent's program attribution (1 – FR) by 50%.

Figure 5-1 presents a diagram of the FR algorithm used for this evaluation, including references to question numbers. A more detailed description of the algorithm can be found in the Appendix.

[11] Program factors asked about in the survey include program incentive, previous experience with the program, recommendation from a Duke Energy representative, information from the Non-Residential Prescriptive Program/program marketing materials, previous experience with the equipment (if through prior participation in a Duke Energy program), expected savings (if they found out about them from a Duke Energy representative), and financial criteria (if the incentive moved the project within the acceptable range).

Figure 5-1. Overview of Free-Ridership Algorithm



We developed separate FR estimates for the four analysis groups: DEC lighting, DEC non-lighting, DEP lighting, and DEP non-lighting. We explored the possibility of developing separate FR estimates for the various non-lighting technologies (i.e., HVAC; process equipment; pumps and drives; food service products; and information technology). However, due to the small number of unique customers who completed non-lighting projects, we did not obtain enough responses to develop statistically valid FR estimates at the technology level.

We developed FR estimates for each of the four analysis groups and for the two jurisdictions as follows:

- We first aggregated FR estimates to the stratum level, weighting the sampled projects within each stratum by their ex post gross savings. For the DEC and DEP non-lighting groups, we combined the strata for large and medium projects, due to a relatively low number of responses.
- For each analysis group, we developed a FR value by applying ex post savings weights to reflect the relative contribution of each stratum to the group's overall savings.
- For both jurisdictions, we developed a FR value by applying ex post savings weights to reflect the relative contribution of the two technologies (lighting and non-lighting) to the jurisdiction's overall savings.

5.1.2 Participant Spillover

PSO refers to additional energy efficiency upgrades participants made after their participation in the Non-Residential Prescriptive Program that were influenced by the program but for which they did not receive a program incentive. PSO was estimated across both jurisdictions and is expressed as a percentage of program savings.

To determine if a survey respondent is eligible for SO savings, we asked a series of questions about additional energy efficiency installations that they made without receiving an incentive and the degree to which the program influenced their decision to install the efficient equipment. The survey included two program influence questions:

SP2a. On a scale of 0-10, where 0 means “no influence” and 10 means “greatly influenced,” how much did your experience with the <PROGRAM> influence your decision to install high-efficiency equipment on your own?

SP2b. If you had NOT participated in the <PROGRAM>, how likely is it that <COMPANY> would still have installed this additional energy-efficient equipment? Please use a 0–10 scale, where 0 means you “definitely WOULD NOT have implemented this equipment” and 10 means you “definitely WOULD have implemented this equipment.”

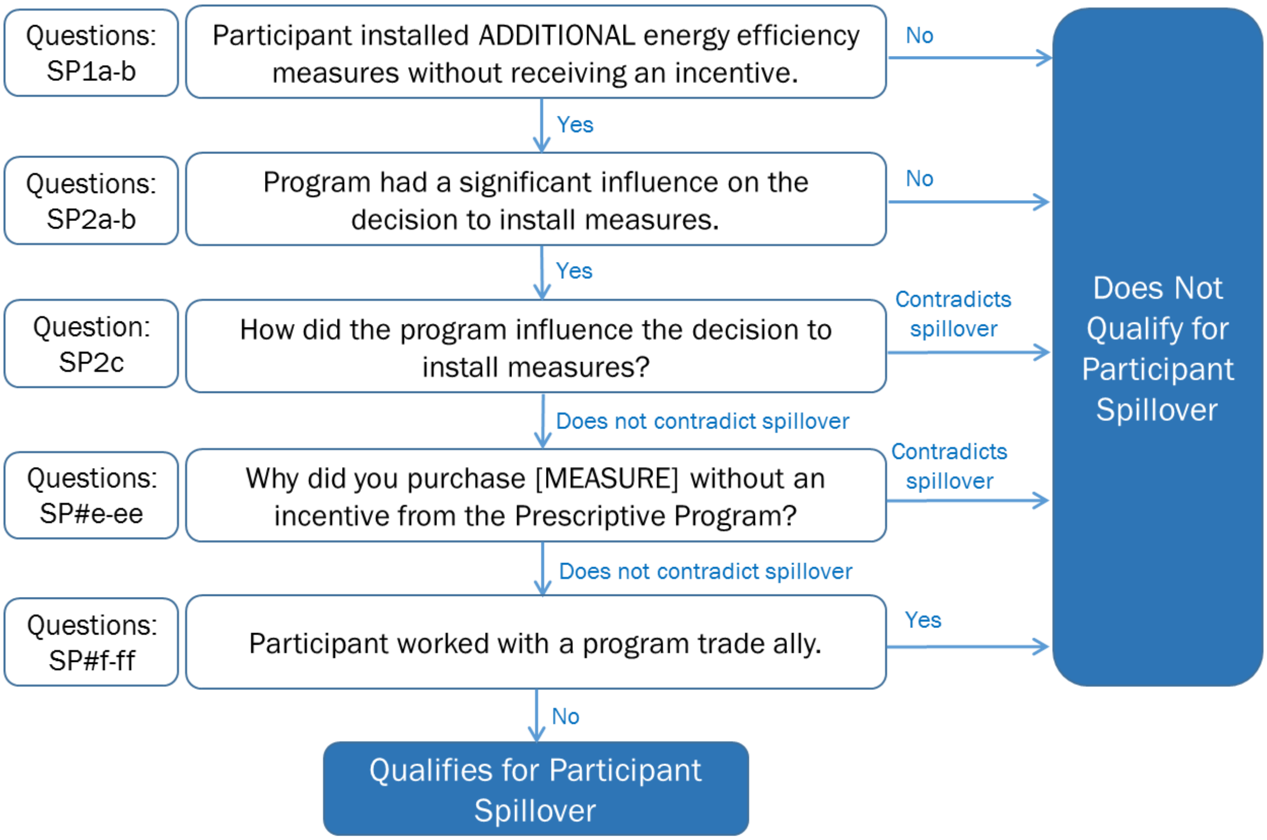
To supplement these numeric responses, we asked open-ended questions about how the program influenced the decision to make the energy efficiency installations and why the participant made the installations without a program incentive. A respondent’s additional energy efficiency installations were deemed eligible for SO if two conditions were met: the Program Influence Factor (see below) was greater than 7.0 and the open-ended responses did not contradict that the installations were eligible for SO. The Program Influence Factor is defined as follows:

$$Program\ Influence\ Factor = (SP2a\ Response + (10 - SP2b\ Response)) \div 2$$

In addition, we applied a third SO eligibility condition: that the participant did *not* work with a participating trade ally. This condition was necessary because this evaluation also estimated TA SO. When estimating SO from multiple sources, it is important to avoid double-counting. In the case of this evaluation, double-counting could occur if participants and trade allies report SO installations from the same projects. We avoided such double-counting by determining if the participant’s SO project was completed by a trade ally who was in the sample frame for the TA SO survey (i.e., they completed at least one project through the Non-Residential Prescriptive Program during the evaluation period). If so, the SO reported by the participant was excluded from the PSO estimate as it will be captured through the TA SO analysis (see next section).

Figure 5-2 presents a diagram of the PSO eligibility determination used for this evaluation, including references to question numbers.

Figure 5-2. Participant Eligibility for Spillover – Methodology



Participants with SO from lighting measures were asked a few additional survey questions about their installations, including the type and number of light bulbs installed and replaced, and whether they were installed in a conditioned space. We limited these follow-up survey questions to lighting measures since lighting is the most common PSO technology. We also conducted follow-up calls to collect more information for all SO measures, such as baseline and efficient wattages, ages of equipment, and hours of use. We then used methods consistent with the deemed savings review and appropriate TRMs to develop SO savings for each measure.

The PSO Rate is calculated using the following formula:

$$PSO\ Rate = \frac{SO\ for\ each\ Measure\ in\ Sample}{Ex\ Post\ Gross\ Impacts\ in\ Sample}$$

5.1.3 Trade Ally Spillover

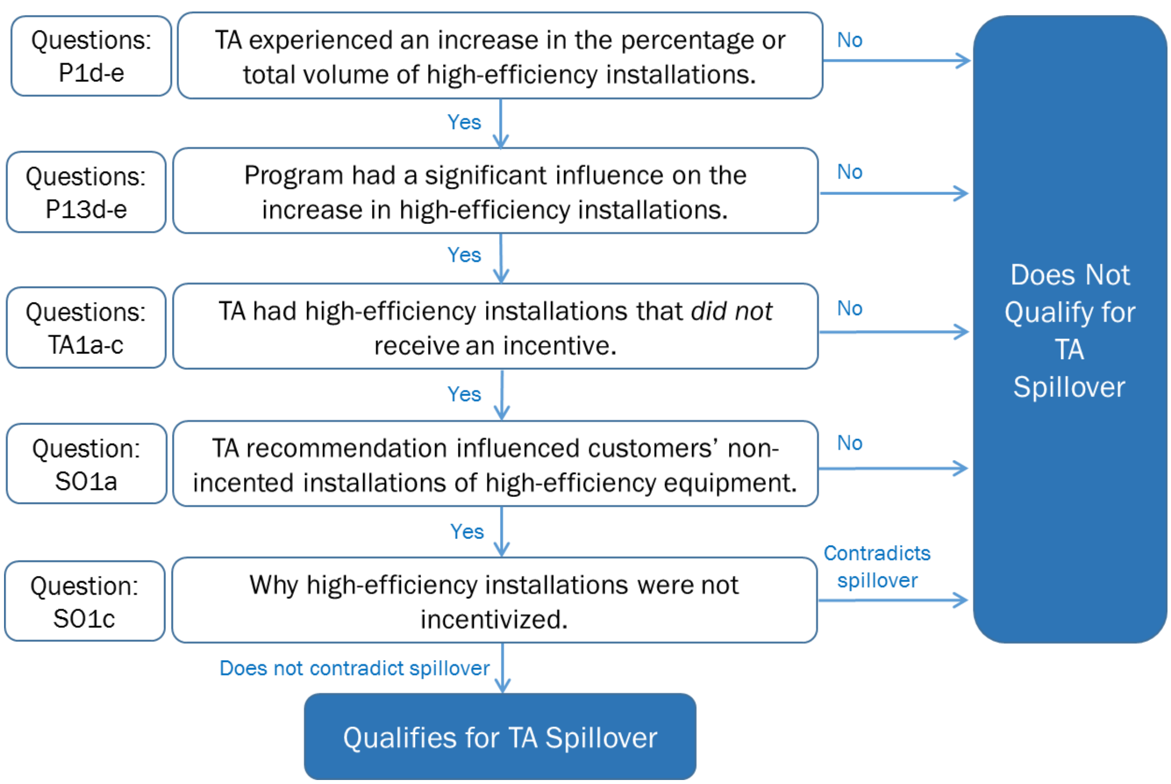
TA SO refers to non-incented energy efficiency upgrades made by customers who were influenced by a participating trade ally who was in turn influenced by the Non-Residential Prescriptive Program. TA SO was estimated across both jurisdictions and is expressed as a percentage of program savings. This section presents a high-level overview of the TA SO methodology. A more detailed description of the methodology can be found in the Appendix.

To determine if a trade ally is eligible for SO savings, the online survey asked a series of SO-related questions. We considered a trade ally eligible for SO if the following conditions were met:

- Since working with the Non-Residential Prescriptive Program, either the trade ally's percentage of high-efficiency installations increased or the trade ally's total volume of high-efficiency installations increased.
- The trade ally rated the importance of the Non-Residential Prescriptive Program on at least one of these increases an 8, 9, or 10 (on a scale of 0 to 10).
- The trade ally reported having installed high-efficiency equipment without an incentive from the Non-Residential Prescriptive Program during the evaluation period.
- The trade ally gave a rating of 8, 9, or 10 (on a scale of 0 to 10) for the importance of their recommendation on installations of high-efficiency equipment that *did not* receive an incentive from the Non-Residential Prescriptive Program.
- The trade ally's open-ended response about why customers with high-efficiency installations did not receive an incentive from the program did not contradict that non-incented, high-efficiency installations qualified as SO.

Figure 5-3 presents a diagram of the TA SO eligibility determination used for this evaluation, including references to question numbers.

Figure 5-3. Trade Ally Eligibility for Spillover – Methodology



For each respondent that met these qualifying conditions, we determined SO savings from the non-incented, high-efficiency installations through:

- Survey questions about:
  - The respective shares of the TA's total high-efficiency installations that did and did not receive a program incentive
  - The size of non-incented, high-efficiency installations relative to those that did receive an incentive (resulting in a "Size Adjustment" factor)
- Program tracking data on the savings associated with the Non-Residential Prescriptive Program projects for that respondent

For the trade allies who met the five qualifying conditions listed above, SO savings were considered to be equal to the savings of their non-incented, high-efficiency installations. SO for each qualifying trade ally is calculated using the following steps:

1. We first determined overall (unadjusted) savings from all energy efficient installations (incented and non-incented) made by the trade ally during the evaluation period. This is estimated by dividing the savings in the program tracking database (reflecting incented savings) by the percentage of the trade ally's efficient installations that received an incentive. It is calculated as:

   kWh Savings from All TA installations =

   Savings from Program Database / % Efficient Installations That Received Incentive

2. We then subtracted from that overall savings estimate the savings already tracked in the database. The resulting value represents savings from energy efficient installations that did not receive an incentive, assuming that non-incented projects have the same size as incented ones.
3. In the final step, we apply a size adjustment to reflect that non-incented projects might be of a different size (often smaller) compared to incented projects.

The overall equation for estimating respondent-level TA SO is:

$$\text{TA SO Savings (kWh)} = \left(\frac{\mathit{Savings\ from\ Program\ Database}}{\begin{matrix}\mathit{\%\ Efficient\ Installations}\\ \mathit{That\ Received\ Incentive}\end{matrix}} - \begin{matrix}\mathit{Savings\ from}\\ \mathit{Program\ Database}\end{matrix}\right) * \mathit{Size\ Adjustment}$$

To extrapolate savings to the program, we developed a Respondent SO Ratio by dividing the sum of the estimated SO savings by total program savings associated with all survey respondents. We then applied this Respondent SO Ratio to program savings associated with all trade allies (whether a survey respondent or not) to derive the overall SO estimate (in MWh).[12] Finally, we estimated the Program-level SO Ratio by dividing the overall SO estimate (in MWh) by total program ex post savings (in MWh). This final step is necessary to normalize the SO rate to the entire Non-Residential Prescriptive Program, taking into account that some customers complete projects without a trade ally.

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[12] We excluded one respondent trade ally from this SO extrapolation method due to a SO ratio that we do not consider representative of non-responding trade allies. The TA SO results section (Section 5.2.3) and the Appendix provide more detail on this analysis.

5.2 NTG Results

We estimate the program-level NTGR to be 78.7% for DEC and 85.8% for DEP. For both jurisdictions, the lighting NTGR is higher (81.0% DEC; 86.4% DEP) compared to the non-lighting NTGR (59.3% DEC; 67.9% DEP).

Table 5-1 presents the individual NTG components (i.e., FR, PSO, and TA SO) and the resulting NTGRs by technology group (i.e., lighting and non-lighting) and jurisdiction. The NTGR is calculated as 1 – FR + PSO + TA SO.

Table 5-1. Summary of DEC and DEP NTG Results

Technology	FR	PSO	TA SO	NTGR*
DEC				
Lighting	26.3%	0.06%	7.2%	81.0%
Non-Lighting	48.0%			59.3%
DEC Total	**28.5%**	**0.06%**	**7.2%**	**78.7%**
DEP				
Lighting	20.8%	0.06%	7.2%	86.4%
Non-Lighting	39.4%			67.9%
DEP Total	**21.4%**	**0.06%**	**7.2%**	**85.8%**

^NTGR = 1 – FR + PSO + TA SO

5.2.1 Free-Ridership

A total of 217 total participants provided valid responses to the FR questions in the participant survey and were included in the FR analysis.[13] Of these respondents, 71 represented DEC lighting projects, 55 DEC non-lighting, 69 DEP lighting, and 22 DEP non-lighting. Using the algorithm summarized in Section 5.1.1 above, we estimate program-level FR to be 29% for DEC and 21% for DEP. In both DEC and DEP territories, FR levels are higher for non-lighting projects (48% DEC; 39% DEP) than for lighting projects (26% DEC; 21% DEP).[14]

Participants' free-ridership related survey responses show the following:

- **Efficiency:** Participants generally reported a high degree of program influence on the efficiency level of their projects, resulting in savings-weighted Efficiency FR Scores of 0.31 for DEC and 0.25 for DEP. Key findings for the three efficiency sub-scores include:
  - Most participants provided an importance rating of 10 (on a scale of 0 to 10, where 10 means "very important") for at least one program component, most often the incentive.
  - When asked to divide 100 points to reflect the importance of the program versus other factors, DEC and DEP participants allocated a savings-weighted average of 63 and 72 points, respectively, to the program.

[13] Two survey respondents were excluded from the FR analysis due to incomplete responses to key FR questions and another two were excluded because they were "EEB lighting" projects with unconfirmed technologies.

[14] The relative precision, at 90% confidence, for these estimates (based on 1 – FR) is: DEC Total: 6.1%, DEP Total: 5.9%, DEC Lighting: 6.5%, DEP Lighting: 6.1%, DEC Non-Lighting: 15.9%, DEP Non-Lighting: 12.4%.

  - The average likelihood of participants to have selected the same level of efficiency without the program was 5.2 for DEC and 4.2 for DEP.

- **Quantity:** The program had a significant influence on the scope of many incented projects, with participants reporting that 52% of the efficient measures in DEC and 64% of the efficient measures in DEP would not have been installed at the same time without the program. Notably, the share of non-lighting measures that would not have been installed at the same time without the program (8% DEC; 25% DEP) is much smaller than the share of lighting measures (57% DEC; 65% DEP), suggesting that customers have more flexibility in the scope of lighting projects and that the program was successful in encouraging them to make additional upgrades.

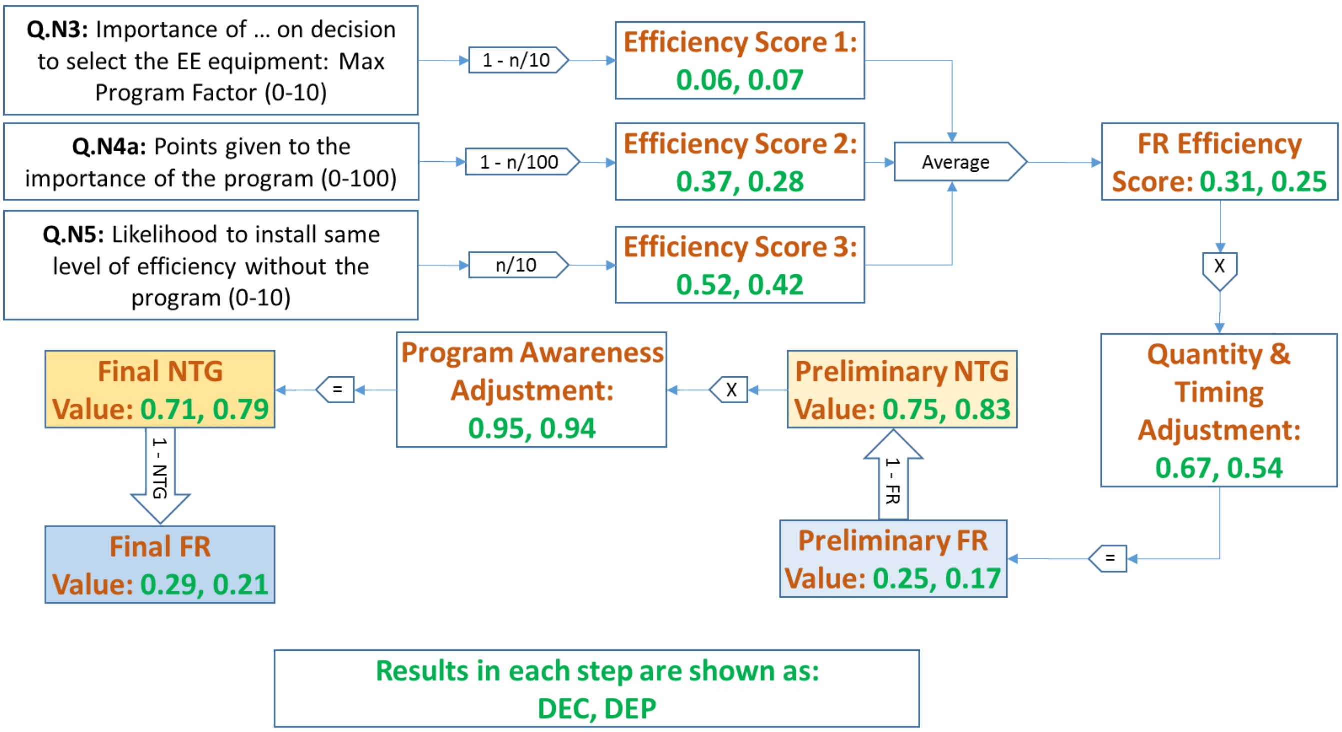
- **Timing:** Responses to the timing questions show trends similar to the quantity questions: Participants reported that the program was responsible for a greater acceleration of DEP projects and of lighting projects. The resulting timing adjustment factors, applied to the quantity that participants would not have installed at the same time without the program, are 0.41 and 0.55 for DEP and DEC lighting projects, respectively, and 0.79 and 0.96 for DEP and DEC non-lighting projects, respectively.

- **Quantity and Timing Adjustment:** Combining the responses to the quantity and timing questions resulted in an overall Quantity and Timing Adjustment of 0.67 for DEC and 0.54 for DEP, meaning that the program can claim credit for one-third (1 − 0.67 = 0.33) to almost one half (1 – 0.54 = 0.46) of savings that would be considered free-rider savings based on efficiency alone.

- **Program Awareness:** Few participants reported having learned about the program *after* they selected the equipment for which they received an incentive. For these participants, we reduced the Preliminary NTGR by 50%, resulting in a program-level adjustment of 0.95 for DEC and 0.94 for DEP.

Figure 5-4 summarizes the program-level results of the FR analysis, by jurisdiction, using the same diagram as in Figure 5-1.

Figure 5-4. Program-Level Free-Ridership Results

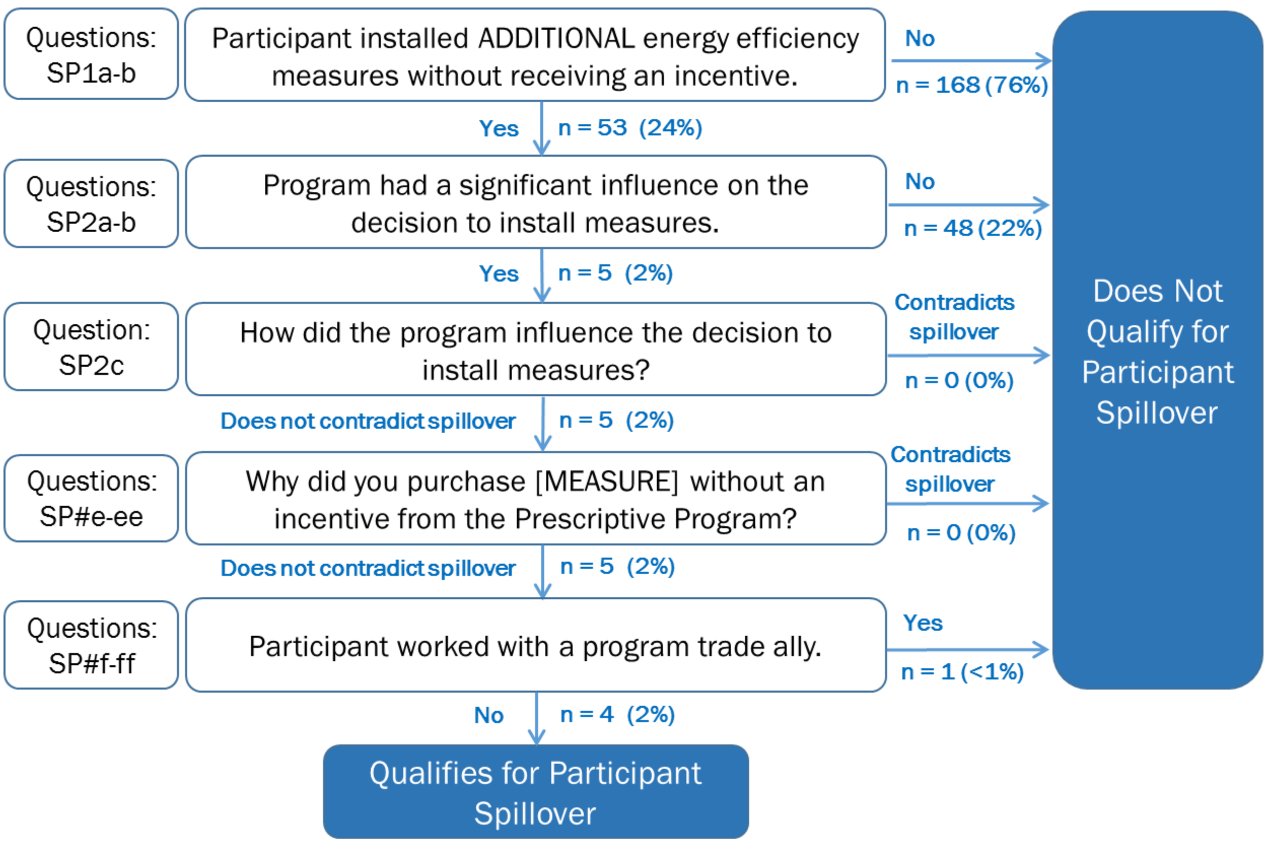


5.2.2 Participant Spillover

A total of 221 participants completed the SO questions in the participant survey and were included in the PSO analysis. The majority of these participants did not install any additional energy efficiency measures without receiving an incentive (76%) or did install additional measures but were not influenced by the program (22%). Of the five responding participants (2%) who installed additional measures and were influenced by the program, one worked with a program trade ally and four (2% of all responding participants) qualified for SO.

Figure 5-5 summarizes the analysis of PSO eligibility, using the same diagram as in Figure 5-2.

Figure 5-5. Participant Eligibility for Spillover – Results



We called the four respondents who qualified for PSO to get more-detailed information on their SO installations. The installed spillover measures included 55 lighting controls and 4 T8 lighting fixtures. One participant also installed a “Big Ass Fans” brand ceiling fan, for which we were could not estimate SO savings because we were unable to contact this participant for additional information.[15] Table 5-2 summarizes the results of the measure-level SO analysis.

Table 5-2. Summary of Measure-Level Participant Spillover

	Measure	Quantity	Analysis Approach	kWh Savings	
				Per unit	**Total**
#1	Lighting Controls	40	Illinois TRM v6.0 methodology, supplemented with customer-specific inputs.	135.3	5,410
#2	Lighting Controls	15		281.4	4,221
#3	T8 Lighting Fixtures	4		415.8	1,663
#4	Big Ass Fan	Unknown	n/a	Unable to estimate	
				Total	11.294

[15] In order to calculate SO savings for this fan installation we would need to know the number of fans installed, the size of the building, and if the building is air conditioned.

To determine the program-level SO rate, we divided the SO savings estimated for the survey respondents by the total ex post gross savings of the sampled projects completed by the 221 survey respondents, yielding a rate of 0.06%.

$$\textit{PSO Rate} = \frac{\textit{SO for each Measure in Sample}}{\textit{Ex Post Gross Impacts in Sample}} = \frac{\textit{11,294 kWh}}{\textit{19,310,953 kWh}} = \textit{0.06\%}$$

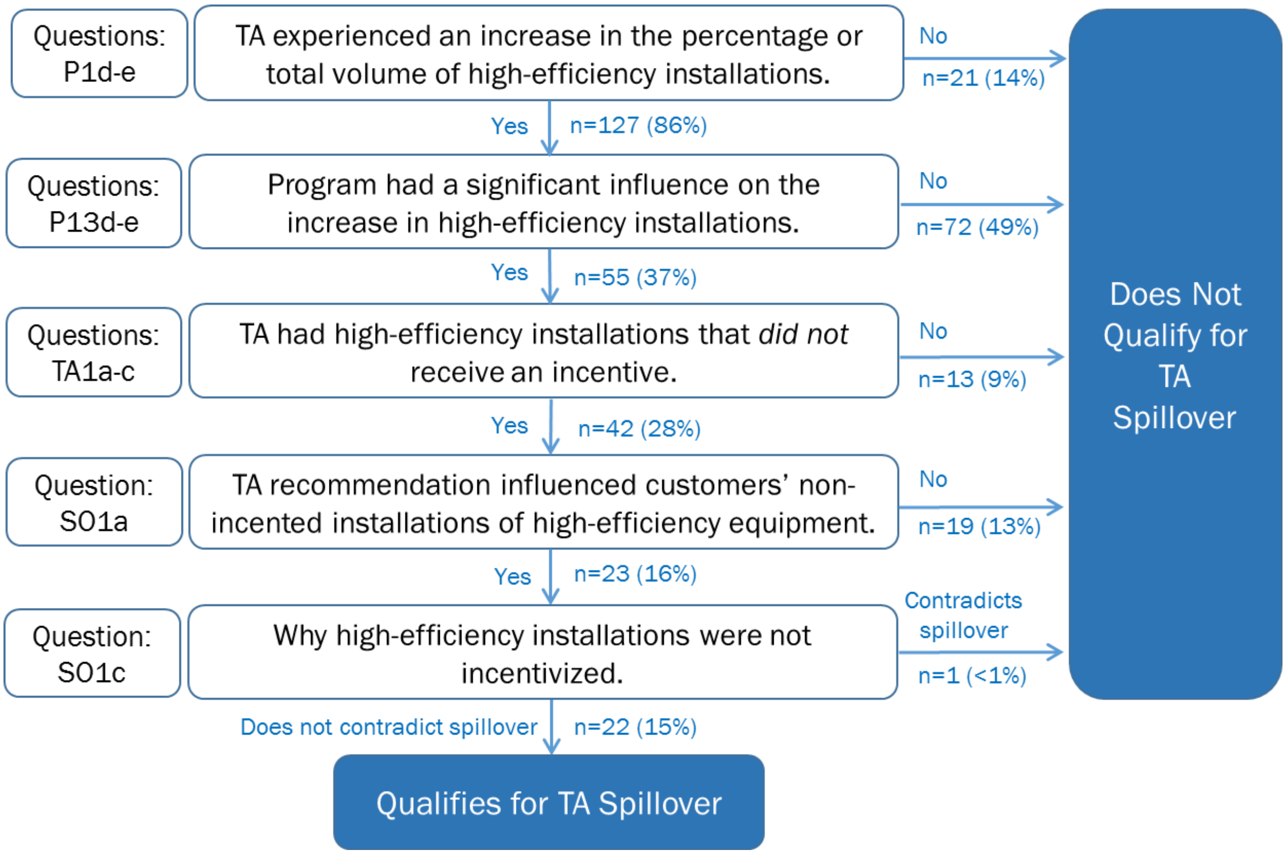
5.2.3 Trade Ally Spillover

A total of 148 trade allies completed the spillover section of the online survey. The majority of responding trade allies reported increases in either the percentage or the total volume of their high efficiency installations (86%), and close to half of these (43%) attribute these increases to the program. Trade allies commonly credit the available program incentive—and the resulting shorter payback or increased return-on-investment (ROI) for their customers—with the increases in energy-efficient installations. Trade allies also noted a range of other, non-program, factors that have contributed to the increase in their high-efficiency sales over time, including decreasing material costs, increased customer knowledge and awareness of high-efficiency measures (especially around LED measures), and state-based energy code requirements.

Most trade allies (78%) report having had at least one high-efficiency project that did not receive a program incentive during the evaluation period. On average, trade allies reported that 16% of their installations during the evaluation period were standard efficiency, while 65% were high efficiency and received an incentive, and 20% were high efficiency and did not receive an incentive. On average, non-incented, high-efficiency installations are smaller in size, about 62%, compared to projects that receive an incentive from the Non-Residential Prescriptive Program.

Overall, 15% of responding TAs qualified for SO. Those that did not qualify experienced no increase in their energy-efficient installations (14%), were not influenced by the program (49%), did not have any non-incented, high-efficiency installations (9%), or did not think that their recommendations influenced their customers' choice of non-incented, high-efficiency equipment (13%). Figure 5-6 summarizes these SO eligibility results.

Figure 5-6. Trade Ally Eligibility for Spillover



Trade allies who qualify for SO most often indicate that the high-efficiency installations were completed without an incentive because of the project's timing (i.e., customer could or would not complete paperwork), because the customer was opted-out of the program, because the customer was interested in high-efficiency measures not covered by the program, and/or due to the incentive level.

We estimated SO savings for each of the trade allies who qualify for SO (22 respondents, or 15%) using (1) the trade ally's program savings from the program tracking database and (2) their survey responses on the share of high-efficiency installations that received a program incentive and on the relative size of incented and non-incented projects (see the formula in Section 5.1.3). These respondent-level SO savings ranged from 431 kWh to 11,076,762 kWh.

Table 5-3 summarizes the results of the respondent-level TA SO savings.

Table 5-3. Summary of Respondent-Level Trade Ally Spillover

Trade Ally	Number of Non-Residential Projects	Percent of Energy Efficient Installations that Did Not Receive an Incentive	Estimated Spillover Savings (kWh)
#1	125	20%	624,511
#2	2	88%	442,989
#3	32	95%	427,447
#4	35	28%	408,591
#5	6	67%	316,297
#6	46	26%	234,654
#7	7	33%	178,163
#8	36	10%	44,879
#9	10	25%	37,482
#10	6	25%	19,631
#11	9	20%	16,800
#12	28	15%	15,446
#13	22	10%	12,248
#14	7	6%	8,723
#15	3	10%	5,308
#16	1	37%	3,707
#17	74	5%	3,455
#18	6	30%	3,178
#19	65	1%	2,970
#20	1	37%	878
#21	1	10%	431
Subtotal			2,807,787
#22	149	83%	11,076,762

Of the 22 trade allies who qualified for spillover, the spillover savings from 21 (accounting for 2,808 MWh) were used to extrapolate spillover savings to the population.[16] Following the analytical steps outlined in the Appendix, we estimated a Respondent SO Rate (excluding Trade Ally #22) of 4.6% and a Program TA SO Rate (again excluding Trade Ally #22) of 4.1%. Adding the SO savings of Trade Ally #22 increases the overall Program TA SO Rate to 7.2%, our final estimate of the program's TA SO.

5.3 Net Impact Results

Table 5-4 and Table 5-5 present the ex post net impacts for the DEC and DEP Non-Residential Prescriptive Program, respectively, that result from applying the evaluation NTGRs to ex post gross savings. Note that for the midstream channel and the online store, we apply a default NTGR of 1.0 since we did not conduct NTGR research for these two program delivery channels.

[16] We excluded Trade Ally #22 from this SO extrapolation method due to a SO ratio that we do not consider representative of non-responding trade allies. The Appendix provides more detail on this analysis.

The DEC program realized net savings of approximately 287 GWh during the evaluation period. The main channel contributed 212 GWh to this total while the midstream channel contributed 65 GWh and the online store contributed 10 GWh. The largest share of net savings came from lighting projects, with 92% of the main channel net savings and 68% of total DEC net savings.

Table 5-4. Summary of DEC Net Program Savings

Technology	Ex Post Gross			NTGR	Ex Post Net		
	Energy Savings (kWh)	Summer Peak Demand (kW)	Winter Peak Demand (kW)		Energy Savings (kWh)	Summer Peak Demand (kW)	Winter Peak Demand (kW)
Main Channel	268,914,950	44,373	42,064		211,751,454	35,026	33,382
Lighting	*240,987,942*	*40,161*	*38,891*	*0.81*	*195,187,673*	*32,528*	*31,500*
Pumps and Drives	*10,267,207*	*1,481*	*1,598*	*0.59*	*6,089,581*	*878*	*948*
HVAC	*7,869,879*	*1,840*	*656*	*0.59*	*4,667,702*	*1,091*	*389*
Food Service Products	*4,889,807*	*439*	*418*	*0.59*	*2,900,193*	*260*	*248*
Information Technology	*3,322,377*	*146*	*195*	*0.59*	*1,970,534*	*87*	*116*
Process Equipment	*1,577,738*	*306*	*306*	*0.59*	*935,772*	*181*	*181*
Midstream Channel	65,238,691	11,731	11,376	1.00	65,238,691	11,731	11,376
Online Store	9,591,131	1,893	1,864	1.00	9,591,131	1,893	1,864
DEC TOTAL	343,744,772	57,997	55,304		286,581,276	48,651	46,622

The DEP program realized net savings of approximately 73 GWh during the evaluation period. The main channel contributed 67 GWh to this total while the midstream channel contributed 6 GWh and the online store contributed less than 0.1 GWh. Similar to DEC, the largest share of net savings came from lighting projects, with 85% of the main channel net savings and 78% of total DEP net savings.

Table 5-5. Summary of DEP Net Program Savings

Technology	Ex Post Gross			NTGR	Ex Post Net		
	Energy Savings (kWh)	Summer Peak Demand (kW)	Winter Peak Demand (kW)		Energy Savings (kWh)	Summer Peak Demand (kW)	Winter Peak Demand (kW)
Main Channel	77,664,493	11,581	10,936		66,708,433	9,933	9,399
Lighting	*65,966,238*	*10,398*	*10,053*	*0.86*	*57,025,896*	*8,989*	*8,691*
HVAC	*1,485,524*	*366*	*239*	*0.68*	*1,008,938*	*248*	*162*
Food Service Products	*807,334*	*54*	*53*	*0.68*	*548,325*	*36*	*36*
EEB - Lighting	*9,376,146*	*760*	*589*	*0.86*	*8,105,406*	*657*	*509*
EEB - HVAC	*29,252*	*4*	*1*	*0.68*	*19,867*	*3*	*1*
Midstream Channel	6,227,819	1,026	987	1.00	6,227,819	1,026	987
Online Store	43,549	6	7	1.00	43,549	6	7
DEP TOTAL	83,935,861	12,614	11,930		72,979,800	10,966	10,393

6. Process Evaluation

6.1 Researchable Questions

The process evaluation focused on program processes, customer and trade ally satisfaction with the program, program strengths and weaknesses, barriers to participation from the customer and trade ally perspective, and opportunities for program improvement. Our research focused on areas of change, e.g., the introduction of BEAs to the Non-Residential Prescriptive Program, as well as areas of interest identified by program staff. We explored the following main topic areas:

- Barriers to program participation and how these barriers can be addressed
- Program strengths and opportunities for improvements
- Customer and trade ally satisfaction with program processes
- Effects of the Non-Residential Prescriptive Program on trade ally practices

Process-related research questions included:

- What are the sources of program information for participating customers?
- How effective are the program implementation and data-tracking practices?
- Are participants and trade allies satisfied with their program experiences?
- How effective has the addition of BEAs been in increasing program participation?
- What is the level of awareness and interest in the online store among program participants?
- What is the level of awareness and interest in the midstream channel among program participants and trade allies?
- What are the program's strengths and weaknesses and opportunities for program improvement?
- What are the key barriers to the installation of energy-efficient equipment and program participation?
- How likely are participants to participate again?
- How has the DEP transition from the Energy Efficiency for Business Program to the Non-Residential Prescriptive Program incentive structure gone?

6.2 Methodology

The process evaluation relied primarily on the program staff interviews, program materials review, BEA interviews, and our analysis of responses to the participant and trade ally surveys. Each of these activities is described in more detail in Section 3.

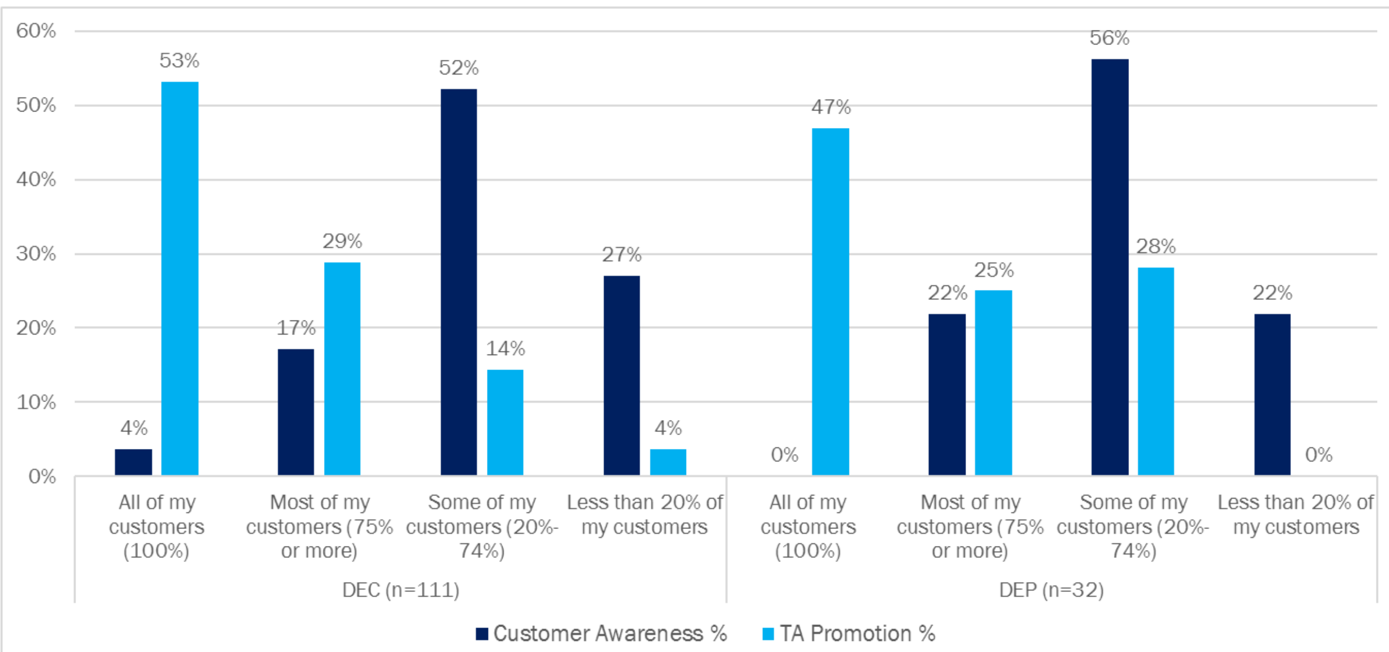
6.3 Key Findings

6.3.1 Customer Awareness and Sources of Program Information

The Non-Residential Prescriptive Program relies on Duke Energy staff—including program staff, BEAs, and Large Business Account Managers—and trade allies working together to drive customer awareness of and participation in the program. We explored customer awareness and sources of program information through the participant survey, the trade ally survey, and the BEA interviews.

We asked trade allies about the percentage of their customers who are already aware of the Non-Residential Prescriptive Program before they discuss it with them and about the percentage of their customers to whom they promote the program. Not surprisingly, we received diametrically opposed responses to these two questions. While few trade allies (4% DEC; 0% DEP) believe that all of their customers are already aware of the program, approximately half of the surveyed trade allies (53% DEC; 47% DEP) promote the program to all of their customers. The majority of trade allies (52% DEC; 56% DEP) reported that somewhere between 20% and 74% of their customers are aware of the Non-Residential Prescriptive Program before they discuss it with them.

Figure 6-1. Customer Awareness and Promotion of the Non-Residential Prescriptive Program, Trade Ally Perspective



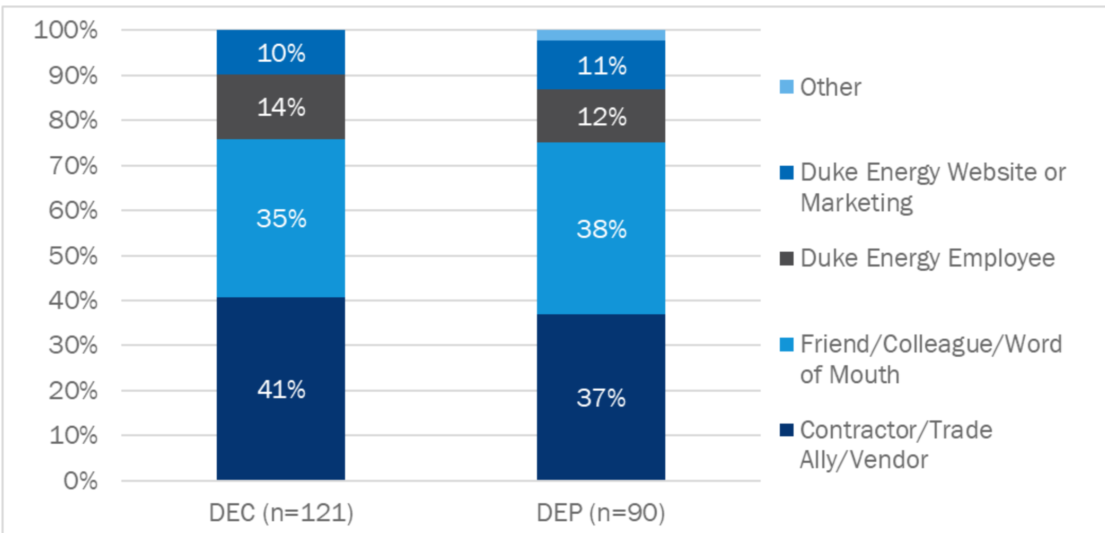
These results confirm that there is an awareness gap among Duke Energy business customers, and that trade allies play an important role in closing that gap. When asked about reasons for not promoting the program to all of their customers, trade allies mentioned several, including that the project needs to be completed quickly, that the customer is opted-out of the program, that the customer is not interested in high-efficiency equipment, that the desired high-efficiency equipment does not qualify for the program, and that the financial incentive is not high enough to justify participation.

Results from the participant survey confirm the important role that contractors and trade allies play in driving customer awareness of and participation in the program: Many participants (41% DEC; 37% DEP) first heard about the Non-Residential Prescriptive Program from a contractor or trade ally. Moreover, 87% of DEC participants and 85% of DEP participants worked with a contractor to select their energy-efficient equipment, and 73% in both jurisdictions worked with a contractor to install the incented equipment.

In addition to contractors and trade allies, word of mouth (35% DEC; 38% DEP) was a common source of awareness, suggesting that participants are generally satisfied with their experience and are recommending the program to others (see also discussion in Section 6.3.2 below). In contrast, direct outreach by Duke Energy—including Duke Energy staff, the program website, and program marketing materials—was the source of awareness for less than one-quarter of participants (24% DEC; 23% DEP).

Figure 6-2 summarizes these results.

Figure 6-2. Participant Sources of Program Information



6.3.2 Barriers to Energy Efficiency and Participation in Non-Residential Prescriptive Program

Understanding the barriers that customers face in installing energy-efficient equipment and participating in the Non-Residential Prescriptive Program is an important first step in increasing program participation. Therefore, our research explored these barriers with trade allies, participants, and BEAs.

Barriers to Installing Energy-Efficient Equipment

Not surprisingly, financial issues rank high in responses from both trade allies and participants when asked about general barriers to installing energy efficient equipment. Among participants, the higher cost of energy-efficient equipment is the number one barrier by both DEC (51%) and DEP (30%) participants. Relatedly, 5% of DEC participants and 10% of DEP participants mentioned access to financing or capital for energy improvements as a barrier. Few DEC and DEP participants consider uncertainty about the energy savings from improvements or lack of knowledge about energy-efficient options a barrier to undertaking energy efficiency projects. Notably, 23% of DEC participants and 33% of DEP participants see no barriers to energy efficiency.

Trade allies reported similar barriers faced by their customers, with the higher upfront cost mentioned by more than half of trade allies (56% DEC; 53% DEP). Fewer trade allies (14% DEC; 9% DEP) than participants believe there are no barriers to installing energy efficient equipment.

Table 6-1. Barriers to Installing Energy-Efficient Equipment

	DEC		DEP	
Barriers to Installing Energy-Efficient Equipment (Multiple Response)	**Trade Allies (n=111)**	**Participants (n=127)**	**Trade Allies (n=32)**	**Participants (n=94)**
No Barriers	14%	23%	9%	33%
Higher Cost of Energy-Efficient Equipment	56%	51%	53%	30%
Access to Financing or Capital for Energy Improvements	20%	5%	25%	10%
Uncertainty about the savings from Energy Efficient Improvements	2%	5%	3%	5%
Lack of Knowledge of Energy-Efficient Options	2%	1%	3%	5%

Barriers to Program Participation

Many participants (37% DEC; 45% DEP) and trade allies (53% DEC; 34% DEP) reported that they see no barriers to participating in the program. Among DEC respondents, 18% of trade allies and 10% of participants cited financial considerations—including the cost of the equipment, available budgets, and access to capital—as barriers to participation; among DEP respondents, 28% of trade allies and 8% of participants cited this barrier.

The paperwork and application process associated with participating in the Non-Residential Prescriptive Program were also commonly cited barriers to participation, mentioned by 12% (DEC) and 13% (DEP) of trade allies and 20% (DEC) and 9% (DEP) of participants. A less frequent, but still commonly cited barrier by both trade allies and participants is the incentive levels offered by the program.

Table 6-2 summarizes the most commonly mentioned barriers to program participation.

Table 6-2. Barriers to Participating in the Non-Residential Prescriptive Program

	DEC		DEP	
Barriers to Program Participation (Multiple Response)	**Trade Allies (n=111)**	**Participants (n=127)**	**Trade Allies (n=32)**	**Participants (n=94)**
No barriers	54%	37%	34%	45%
Financial reasons	18%	10%	28%	8%
Paperwork, application process, and time required to participate	12%	20%	13%	9%
Incentive levels	3%	8%	9%	8%

BEAs largely echoed the perspective of trade allies and participants with respect to barriers to participation in the Non-Residential Prescriptive Program. Interviewed DEC/DEP BEAs consider the application process and paperwork a barrier to participation, noting that small and medium-sized businesses in particular may not have sufficient staff resources to identify and complete a project through the program and that the time commitment for paperwork may be too high. Despite identifying this as a barrier, BEAs also think that the application process has been improved over time and that the program was making strides in this area.

BEAs also mentioned upfront costs and access to capital and financing as barriers to energy efficiency in general and to program participation, especially for small and medium-sized businesses. One BEA also noted that sometimes there is a barrier generated by competing messages in the market about technologies and programs offered by Duke and others. Duke Energy is promoting many programs and opportunities, while trade allies are also conducting their own marketing and promotion efforts for specific technologies. This can create confusion for customers.

The program's use of DesignLights Consortium (DLC)-listed lighting projects was also noted by the interviewed BEAs as a barrier to participation. Customers may see that a piece of lighting equipment is DLC-listed and think that it will be eligible for an incentive, without understanding that the program sets limits on how the equipment can be used. BEAs noted that this can be a frustration for customers.

Suggestions for Reducing Barriers to Program Participation

Trade allies, participants, and BEAs offered suggestions for overcoming barriers to program participation. We summarize these below.

- **Increase program support and guidance during the participation process.** 20 percent of DEC participants and 8% of DEP participants noted increased program support and guidance as ways to reduce the barriers that they face.

- **Increase program marketing and outreach.** While few participants and trade allies reported lack of program awareness as a barrier to participation, several nevertheless suggested that the program should increase and improve program marketing and communications. This was, in fact, the most common suggestion provided by DEP trade allies (22%). Suggested increased outreach could be in the form of mailed information as well as personal interaction between Duke Energy representatives and customers. One trade ally suggested that Duke Energy provide trade allies with funds (based on performance metrics) that can be used to actively advertise the program to their current and potential customers to increase awareness of the program and energy-efficient options.

- **Increase incentives for eligible measures.** Higher incentives—either for specific measures or across the board—was the most common recommendation for reducing barriers to program participation provided by DEC trade allies (11%). The same suggestion was provided by 6% of DEC participants and DEP trade allies and by 8% of DEC participants. While few trade allies and participants mentioned incentive levels as a primary barrier to program participation, more financial support from the program would address cost barriers, which trade allies consider the most important barrier. One interviewed BEA felt that the lighting incentives offered by the program were possibly too high, while other categories of equipment, such as HVAC, were lower than they should be to make the offerings attractive to customers.

- **Simplify the application process.** Both trade allies and participants feel that the program could simplify the application process in order to reduce the time commitment required to participate. Trade ally suggestions included further automating the application submittal process using digital options, providing easy-to-find information about how to participate in the program, requiring less information during the application process, and reducing the application timeline.

- **Improve the selection of eligible measures.** Many TAs suggested that the program could make more frequent updates to its list of eligible products. They listed multiple types of energy-efficient equipment that they believe should be eligible for an incentive through the program. Most are lighting measures, such as tubular LED bulbs; high-output lighting, such as high-bay LEDs and "corn cob LEDs"; LED floodlights; low-wattage TLEDs; or generally a wider range of LED bulbs and fixtures. BEAs suggested removing the use requirements for DLC-listed lighting measures in order to reduce the need for additional research participants have to do to ensure their selected equipment will qualify.

6.3.3 Program Satisfaction

The participant and trade ally surveys explored satisfaction with the Non-Residential Prescriptive Program overall, as well as with individual program components. All satisfaction questions asked respondents to rate their satisfaction on a scale of 0 to 10, where 0 means "extremely dissatisfied" and 10 means "extremely satisfied." Consistent with Duke Energy's practices, we categorized numeric responses as follows:

- 0 to 4 = "Dissatisfied"
- 5 to 7 = "Neutral"
- 8 to 10 = "Satisfied"

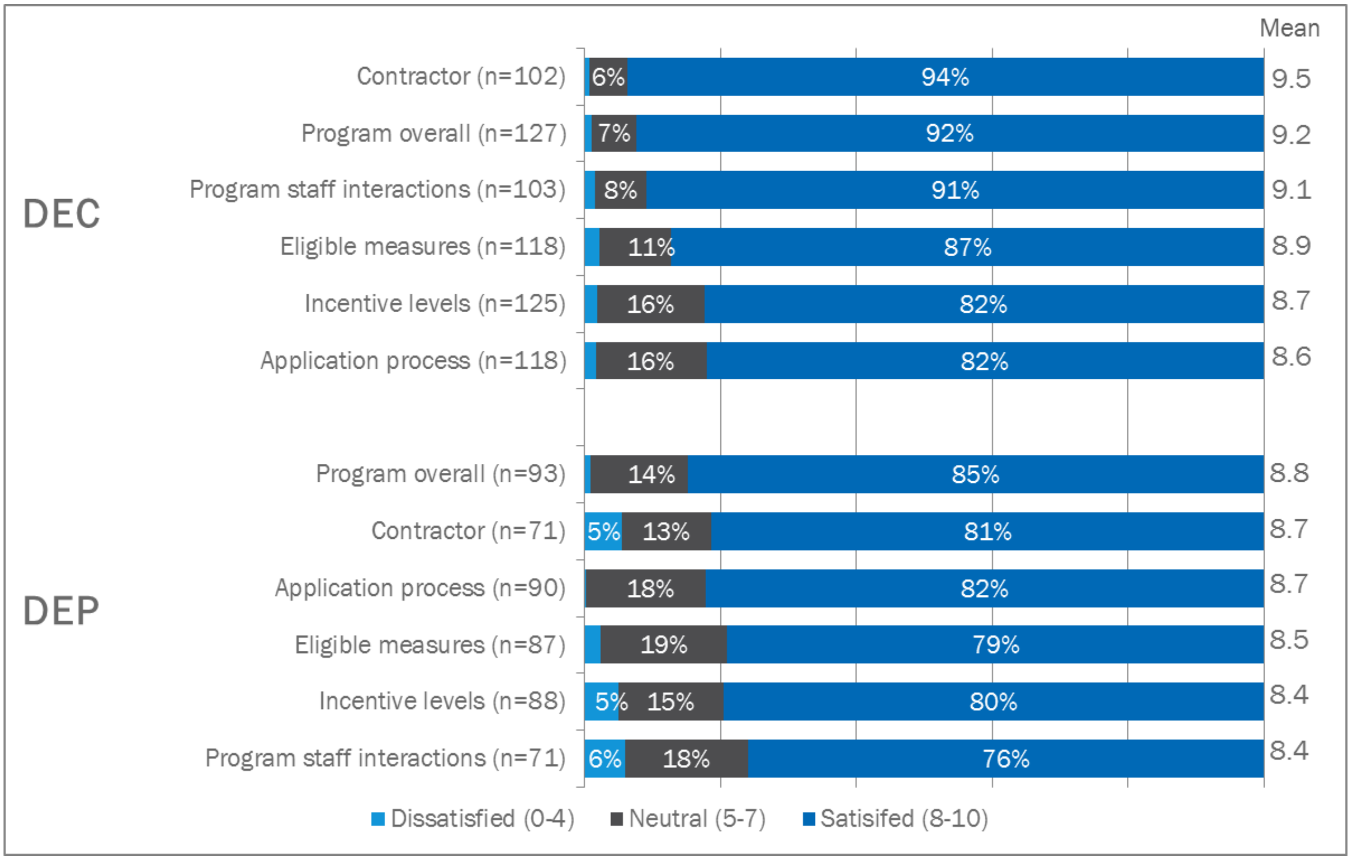
Participant Satisfaction

Both DEC and DEP participants were generally highly satisfied with their program experience overall and with most program components. All program components included in the survey received a mean rating of 8.4 or higher. Of particular note, the program overall was rated an average of 8.8 by DEP participants and 9.2 by DEC participants, the highest and second highest rating for the respective territories.

Most of the ratings did not show statistically significant differences between DEC and DEP participants, with the exception of satisfaction with the contractor and satisfaction with program staff interactions. The mean contractor satisfaction rating was 9.5 for DEC participants, the highest of all satisfaction ratings, compared to 8.8 for DEP participants. Overall, 94% of DEC participants were "satisfied" with their contractor compared to 81% of DEP participants. Similarly, 91% of DEC participants were satisfied with their program staff interactions compared to only 76% of DEP participants, the lowest share of "satisfied" participants of any program component and in both jurisdictions.

Figure 6-3 summarizes the responses to the participant satisfaction questions.

Figure 6-3. Participant Satisfaction with Program Components



Participants were also asked about the likelihood that they would again participate in the Non-Residential Prescriptive Program in the next year and whether they would recommend the program to other businesses.

- Consistent with the high satisfaction ratings, 75% of DEC participants and 84% of DEP participants considered themselves “somewhat likely” or “very likely” to participate again within the next year. Of those who said that they are “not very likely” or “not at all likely” to participate again, the vast majority said that they do not need any new equipment in the near future. Notably, 25% of DEC participants and 27% of DEP participants are repeat participants—i.e., they had already participated prior to the project about which we contacted them—indicating a potential to maintain robust and repeat participation.
- When asked how likely they are to recommend the program to other businesses like their own, 93% of DEC participants and 78% of DEP participants said that they are very likely to recommend the program. Only 1% in each jurisdiction are “not at all likely” to recommend the program to others.

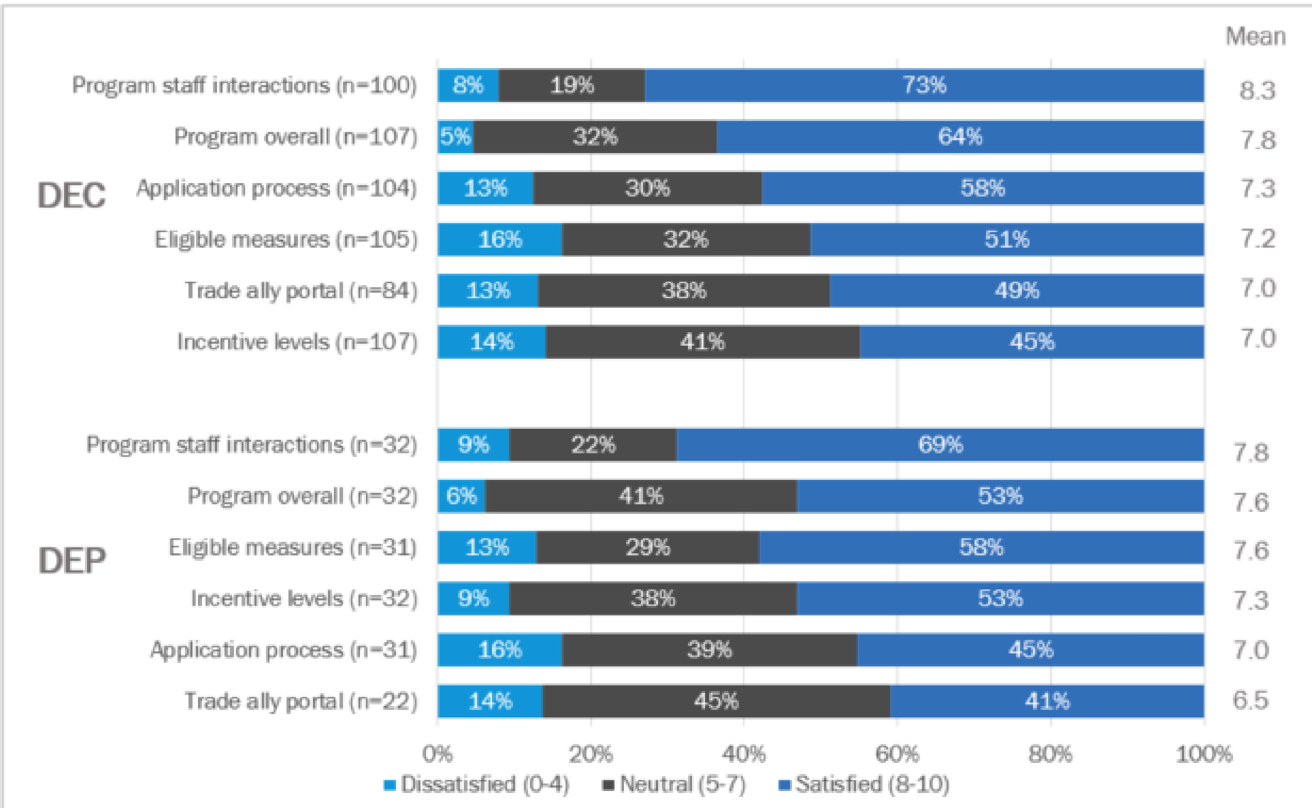
Trade Ally Satisfaction

In general, trade allies were satisfied with the program, but gave satisfaction ratings slightly lower than those given by participants. Mean satisfaction ratings from trade allies ranged from 6.5 to 8.3. In both jurisdictions, trade allies gave the highest ratings to their interaction with program staff (mean rating of 8.3 for DEC and 7.8 for DEP trade allies) and the second highest ratings to the program overall (7.8 DEC; 7.6

DEP). Areas of lower satisfaction included the application process (particularly among DEP trade allies), the trade ally online portal, and the incentive levels.

Figure 6-4 summarizes the trade ally satisfaction ratings. Following the figure, we provide additional information shared by trade allies who provided "dissatisfied" or "neutral" satisfaction ratings.

Figure 6-4. Trade Ally Satisfaction with Program Components



- DEP trade allies gave the second lowest ratings to the **application process**, with only 45% considering themselves "satisfied" with the process. Among DEC trade allies, the "satisfied" ratings for the application process were somewhat higher, at 58%, although this difference is not statistically significant. Trade allies who are less than satisfied with the application process most often noted that it takes too long and is too complicated. Trade allies also noted that the program and its forms change too often. For DEP trade allies, this observation is likely at least partially related to the recent transition of the program's incentive structure and the accompanying changes in the application forms.

  Below are a few representative quotations from trade allies with a "dissatisfied" or "neutral" satisfaction rating:

  > *"It's too cumbersome. Can't find the forms online when we want them. Program changes too much it confuses customers; it slows down projects."*

  > *"It seemed complicated to me, and ever changing."*

"Too many different versions are out there and every time I got a form from my suppliers it was different than what I would find online. Never really sure which one was the correct form."

"It is frustrating trying to figure out what forms to use. The forms seem to change and are not the same throughout [North Carolina]."

- Trade allies also provided lower satisfaction ratings (mean rating of 7.0 for DEC and 6.5 for DEP) for the **trade ally online portal**. The most common challenges with the online portal among TAs were the perception that it is not user friendly and the inability to make edits, resulting in the need to reenter data. Many trade allies reported that they had not yet used the online portal.
- Trade allies also provided lower satisfaction ratings (mean rating of 7.0 for DEC and 7.3 for DEP) for the **incentive levels** available through the program. Many of the comments made by those who provided satisfaction scores less than 8 for the program incentive levels and the equipment eligible for incentives are specific to certain technology types. The examples below present a snapshot of some typical comments that trade allies made to explain why they are less than satisfied with the incentive levels:

"High-quality, high-efficiency exterior area lighting is very expensive. The costs of commodity grade building mount has dropped and the current incentive levels are appropriate for wall packs but not in line with pole mount or many LED fixtures over 15' mounting height."

"Incentive levels leave much to be desired. Companies taking advantage will push the cheapest product to make the most money on installation, which will underbid another company who uses higher-quality fixtures."

"They may be right where they need to be, but even with the incentive program I've had customers choose not to use the high efficiency products just due to upfront costs. If the incentives are kept high more customers would choose the high efficiency option. I've sold mostly LED hi-bay equivalents, 2'x4' LED panels, and LED tubes. In the 2017 changes, the LED panel rebates were cut in half and I believe the LED tubes were eliminated altogether. We were reaching a point in the market where the lowering product costs combined with the incentive rebates were making it possible for many more customers to move in that direction, but with the reduced incentives it reset that back to where many small business customers can't swing the upfront costs."

"LEDs are still pretty expensive. The difference between upgrading to T-5s versus LED is narrow. Seems LEDs should be higher to encourage skipping fluorescence [sic] of any level."

6.3.4 Business Energy Advisors

Duke Energy introduced BEAs in the fall of 2014. The primary responsibility of BEAs has been to work with small and medium-sized customers who do not have designated account managers, to generate interest in the Non-Residential Prescriptive Program, and to assist customers with the participation process. In addition, BEAs spend some of their time promoting other Duke Energy programs, such as back-up generation, small business energy efficiency, and outdoor lighting.

Five BEAs have their primary assignment in the DEC and DEP service territories. Customers are assigned to BEAs based on geographic regions in the DEC and DEP service territories. In addition, BEAs have responsibility for chain accounts across the state. BEAs reported that they are each assigned between 800 and 4,000 customers representing between 300 and 700 parent accounts.

Our interviews with the BEA manager and three of the five DEC/DEP BEAs covered various topics, including outreach and perceived customer awareness of the program, barriers to customer participation, and strengths and challenges of the BEA role.[17] We also asked participating customers if they had worked with a BEA on energy efficiency, and, if so, about their interactions with the BEA.

Customer Outreach and Awareness

BEAs use a mix of approaches to communicate with customers about the Non-Residential Prescriptive Program. The three interviewed BEAs reported that they adjust their customer outreach approach based on their location and to address specific customer segments. BEAs located in the Carolinas reported that they try to focus their outreach on face-to-face meetings when possible, while also using phone calls and email to interact with potential participants. BEAs not local to the Carolinas leverage phone calls and email more heavily to interact with customers; however, they also spend time traveling to the service territory to visit with customers on a quarterly basis and utilize other local Duke Energy staff to make face-to-face contact when necessary.

BEAs noted that since they have been involved with the program in late 2014, they have worked to build and update email contact lists for their assigned customers and to develop the ability to target specific customer segments with email messages that promote certain program opportunities applicable to those segments. BEAs also noted that they consider the preferences of specific customers once they know them and will tailor their outreach approach to what works best for the customer.

Interviewed BEAs reported that they contact and work with between 50 and 160 customer contacts per month. When conducting outreach to customers, BEAs focus their efforts on the prescriptive program offerings; however, BEAs reported that they also spend between 10% and 35% of their time informing customers about other Duke Energy offerings.

When talking to a customer, the BEAs generally try to determine what opportunities the customer is interested in. They attempt to gather more information about the customer's equipment, what they would like to install, and whether they have already selected a vendor. BEAs typically try to share information about the incentives, and provide information about how to find trade allies on Duke Energy's website. BEAs reported that they also help customers with the application process, in particular if it is the customer's first time submitting an application to the program or if they have purchased equipment without the assistance of a trade ally.

Strengths and Challenges of the BEA Role

BEAs and their manager noted a number of strengths of the BEA role. A primary advantage is their unique role of focusing solely on promoting energy efficiency while staying out of account management issues that could otherwise divert their customers' attention. BEAs believe that their promotion and outreach to small and medium-sized customers has been effective in driving participation in the program. In addition to raising awareness, BEAs are able to provide one-on-one support to their customers, who would otherwise not receive any direct support from the program or Duke Energy because they fall below the threshold for large account management.

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[17] We interviewed the BEA manager and BEAs in April and July 2016, respectively. Therefore, conclusions from those interviews presented here do not reflect program changes or changes to the BEA role that have occurred since 2016. However, program staff indicated that no significant BEA changes occurred since the interviews were conducted.

In terms of challenges, BEAs and their manager noted that the number of customers assigned to BEAs was large and that the administrative requirements of serving such a large volume of customers was challenging. BEAs noted that they can each have more than 700 customers representing 3,000 to 4,000 accounts, which makes it difficult to provide one-on-one services and to reach all customers with targeted outreach. BEA management was aware of these challenges, noting that, at the time of our interview in the spring of 2016, processes and systems for BEA outreach were still under development with a goal of reducing the BEAs' administrative burden.

BEAs also noted in 2016 that they do not have the ability to access applications directly in the application processing system. As a result, if a customer has an issue with the application, such as missing information, the BEA cannot directly review the application and discuss it with the customer. BEAS felt that having a way to view an application in the processing system would help them better serve their customers and troubleshoot issues more directly. Related to this issue, BEAs noted that the processing times for applications were an issue for their customers. In particular, if an application needs to be resubmitted due to missing information or other issues, the processing timeline restarts which can further delay a customer's incentive payment.

Customer Interaction with BEAs

To gauge the effectiveness of BEAs in informing customers about the Non-Residential Prescriptive Program and in promoting participation, we asked participants several questions about their interactions with BEAs. Participants reported the following:

- Only 2% of DEC and DEP participants first heard about the program from a BEA.
- Only 6% of DEC participants and 7% of DEP participants reported that they had directly worked with a BEA on energy efficiency. However, an additional 19% of DEC participants and 20% of DEP participants reported that they had communicated with a BEA about energy efficiency or Duke's energy-efficiency programs. Participants who either directly worked or communicated with a BEA reported the following:
  - The most common way for DEC participants to first come into contact with a BEA was receiving a call or email from a BEA (36%), followed by a referral from other Duke staff (16%). Notably, a majority of DEP participants who had interacted with a BEA (59%) reported that they initiated the first contact with the BEA.
  - About half of participants (46% DEC; 52% DEP) who worked or communicated with a BEA interacted with the BEA only 1 or 2 times, while 23% of DEC participants and 12% of DEP participants interacted with a BEA 10 or more times.
  - DEC participants (54%) are more likely to work with BEAs on project scoping compared to DEP participants (23%). The most common BEA interaction of DEP participants was to provide support with the application process (37%). Table 6-3 summarizes common interactions between BEAs and participants.

Table 6-3. Participant Interactions with BEAs

Aspects of the Project where the BEA Assisted (multiple response)	DEC (n=55)	DEP (n=29)
Project Scoping	54%	23%
Application Process	30%	37%
Answering Questions About Available Program Incentives	22%	6%
Assisting at all Stages of Participation	4%	4%
Don't Know/Refused	8%	20%

  - Among those who interacted with a BEA, 85% (DEC) and 68% (DEP) thought that the BEA was very or somewhat influential in their decision to participate in the program.
  - Most participants were satisfied with their BEA interaction, giving a mean rating of 7.8 (DEC) and 8.4 (DEP) on a 0 to 10 scale. Those who were dissatisfied (a rating of 0 to 4) reported that the BEAs were not knowledgeable about the specific equipment they planned to install and requirements for eligibility.
- Overall, a quarter of participants (25% DEC; 27% DEP) reported interacting with a BEA, a remarkable share given that the BEAs are still a relatively new addition to the program's outreach team. It should also be noted that this share is based on all program survey respondents, including those who are not targeted by BEAs because of their size. These results are therefore likely to understate the share of small and medium-sized businesses that have worked or communicated with a BEA.

6.3.5 Program Influence on Trade Ally Business Practices

Since trade allies are a primary driver of program promotion, having direct contact with customers at the time of equipment selection and installation, our research explored the influence the program has on them. We explored two aspects of program influence on trade allies: program training provided to trade allies and changes to trade ally business practices as a result of their participation in the program.

Trade Ally Training

The Non-Residential Prescriptive Program offers several training opportunities to its trade allies, including general program training, sales training, and online portal training. While the EEB program used to require new trade allies to attend program training, this requirement was removed in an effort to synchronize EEB and Smart $aver requirements. As a result, the program does not currently require trade allies to attend a formal training when they submit paperwork to become a program trade ally.

Under the current design, the Duke Energy trade ally outreach team reaches out to trade allies when they join the program and provides introductory information on the program and its processes. The team also conducts many of the program trainings and webinars. According to program staff, when the online portal launched, the trade ally outreach team conducted webinars for 400 trade allies.

To gauge trade ally awareness and satisfaction with the training opportunities provided by the program, our online survey included several questions on this topic. Following is a summary of our findings:

- Overall, 43% of interviewed DEC trade allies and 44% of DEP trade allies have participated in one or more trainings provided by the program. Of those who attended any training, the largest share (54% DEC; 79% DEP) attended program training and about half attended online portal training. The larger share of DEP trade allies who have attended program training is likely due to the fact that this was, until recently, a participation requirement.

Table 6-4 summarizes the trainings that trade allies reported completing.

Table 6-4. Trade Ally Program Training Participation

Trade Ally Program Training Participation (multiple response)	DEC (n=48)	DEP (n=14)
Program Training	54%	79%
Online Application Portal Training	48%	50%
Sales Training	27%	14%
Other Training Offered Through Program	19%	0%

- Trade allies who have participated in program trainings generally found them to be useful, with 62% of DEC trade allies and 38% of DEP trade allies rating the usefulness of the program training greater than an 8 (on a scale of 0 to 10). Only 7% of DEC trade allies and 5% of DEP trade allies found the training to be not useful. All three types of training received similar mean usefulness ratings, ranging from 6.7 to 7.5.

- Trade allies who have not participated in any training said that they were not aware of it (52% DEC; 61% DEP), did not have the time for it (17% DEC; 6% DEP), or did not feel they needed any training (13% DEC; 11% DEP).

Program Influence on Trade Ally Business Practices

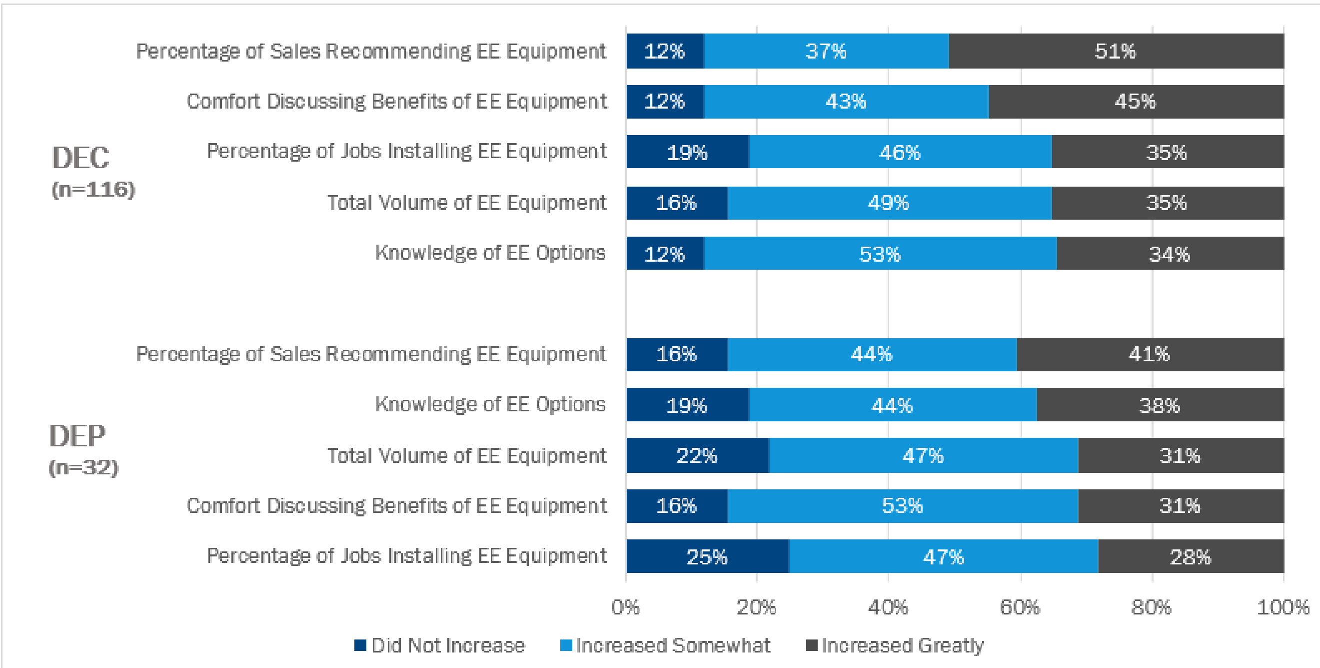
In support of the TA SO analysis, we asked trade allies a series of questions about how their participation in the Non-Residential Prescriptive Program has affected the energy efficiency components of their business. Responses to these questions were used as qualifying conditions for the TA SO analysis (see Section 5.2.3), but they also provide insights into energy efficiency-related aspects of trade allies who participate in the program.

We asked trade allies two sets of questions about five aspects of energy efficiency. The first set of questions asked if each aspect had changed since the trade ally started participating in the Non-Residential Prescriptive Program; the second set asked to what degree the program influenced that change. The five aspects are:

- Their knowledge of high-efficiency equipment options
- Their comfort discussing the benefits of high-efficiency equipment with customers
- The percentage of sales situations in which they recommend high-efficiency equipment
- The percent of jobs installing high-efficiency equipment
- The total volume of high-efficiency equipment sold

In response to questions about changes, trade allies reported increases in all of these energy efficiency-related aspects of their business, with the least change reported by DEP trade allies regarding the percentage of their jobs that were high-efficiency installations (25% reported no change). The aspect for which the highest share of trade allies reported significant increases was the percent of sales recommending high-efficiency equipment (DEC 51%; DEP 41%). Only 4% of DEC trade allies and 3% of DEP trade allies reported that none of the five aspects had increased since they became a TA. Figure 6-5 summarizes these responses.

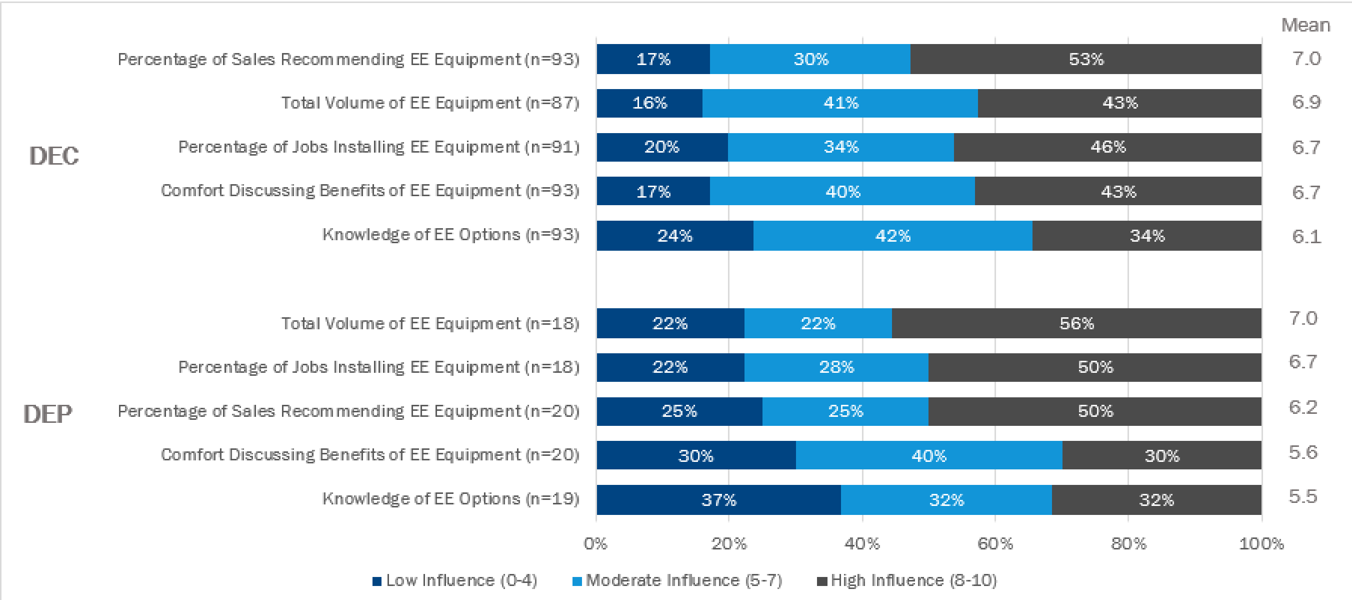
Figure 6-5. Increases in Energy Efficiency-Related Business Aspects since Becoming a Non-Residential Prescriptive Program Trade Ally



Trade allies generally credited the program with the highest influence on the increases in sales recommendations and energy-efficient installations (total volume and percentage of jobs). This is not surprising, given that the incentive provides trade allies with a strong sales proposition. The program's influence on the comfort of discussing benefits of high-efficiency equipment and on knowledge of high-efficiency options was rated lower—particularly in DEP territory, where less than one-third of those with increases attributed a high influence (a rating of 8 or higher) to the program—indicating that factors other than the Non-Residential Prescriptive Program have helped educate the market about energy efficiency. Trade allies named several other factors that contributed to the uptick in their energy efficiency-related business practices, including increases in customer knowledge and product quality and decreases in prices, particularly related to LEDs, as well as state-based energy code requirements.

Figure 6-6 summarizes trade ally responses on the influence of the Non-Residential Prescriptive Program on the changes to their business practices.

Figure 6-6. Trade Ally Attribution of Business Practice Changes to the Non-Residential Prescriptive Program



6.3.6 Online Store

The Non-Residential Prescriptive Program also offers an online store where participants can buy discounted equipment. Products available from the online store include basic lighting products (e.g., LEDs, CFLs, exit signs) as well as select non-lighting measures (e.g., programmable thermostats, low flow showerheads). The price for products available through the online store reflect incentives equivalent to those available through the main channel. As a result, customers do not need to file an application for incentives when they make a purchase, thereby simplifying the process of purchasing energy-efficient equipment.

While the focus of this evaluation was on the main channel, we asked participants about their awareness and use of the online store. Both awareness and use of the online store are significantly higher among DEC participants than DEP participants: Of DEC participants, 46% are aware of it, 36% have visited it, and 13% have made a purchase. In comparison, only 22% of DEP participants are aware of the online store, 8% have visited it, and just 1% have made a purchase. Table 6-5 summarizes awareness and use of the online store.

Table 6-5. Awareness and Use of the Online Store

	DEC	DEP
Aware	46%	22%
Visited	36%	8%
Made Purchase	13%	1%

The differences in participant awareness and use of the online store are likely due to the timing of the store's introduction in the two jurisdictions: It was available to DEC customers in early 2016 but did not roll-out in DEP service territory until December of 2016. Interviewed DEP program participants would therefore have had less time to learn about and use the online store compared to DEC participants.

Overall, 75% of DEC participants and 62% of DEP participants said that they were very or somewhat likely to make a purchase within the next year. Notably, significantly more DEP participants (21%) said that they were not at all likely to make a purchase within the next year than DEC participants (4%). The main reasons for being unlikely to make a purchase from the online store included existing vendor relationships or specific purchasing requirements, and not needing any new equipment.

6.3.7 Online Portal

Participant Perspective

In March 2016, the Non-Residential Prescriptive Program rolled out an online application portal for customers and trade allies among DEC customers.[18] The online portal was introduced to DEP customers in January 2017. The online portal is intended to streamline the application process for customers and trade allies by allowing them to start applications online, to select measures, to copy common information between applications, and to track submitted applications. According to program staff, both customers and trade allies had requested an online portal in the past. Participants and trade allies are not required to use the online system to submit applications, and paper applications are still accepted by the program.

We explored participant awareness and use of the online portal in the participant survey, finding the following:

- 37% of DEC participants and 28% of DEP participants are aware of the customer online portal.
- 16% of DEC and 12% of DEP participants have previously used it.
  - Of online portal users, the majority (63% DEC; 70% DEP) are using it to submit applications. Application tracking is less common, with 35% of DEC users and only 5% of DEP users having used the portal this way.

BEAs noted that participants have reacted favorably to the online portal. From their perspective, it has been an improvement to the program by allowing participants to track the status of their applications. However, they echoed survey findings by noting that awareness of the online portal was still low among participants.

While relatively few participants during our evaluation period were aware of or had used the online portal, this number is expected to increase over time. Since the online portal was introduced to DEP customers in January 2017, only one month prior to the close of the evaluation period, it is not surprising that uptake of this feature was low among the interviewed participants.

Trade Ally Perspective

The trade ally survey also included questions about the online portal, asking trade allies about their awareness of the online portal, whether they have used it, how they have used it, what percentage of applications they submit through the online portal, and their satisfaction with it.

Trade ally awareness of the online portal is high (76% DEC; 72% DEP). More than half (54%) of DEC trade allies have used the online portal, while slightly fewer (44%) of DEP trade allies have. Among online portal users, the most common use was submitting applications (92% DEC; 79% DEP). Trade allies who have used this function report submitting an average of 73% (DEC) and 50% (DEP) of applications online.

[18] The program tested the online portal with a small subset of trade allies and customers prior to the full launch.

Table 6-6 summarizes trade ally uses of the online portal.

Table 6-6. Uses of the Online Portal Among Trade Allies

Use	DEC	DEP
Submit Applications	92%	79%
Track Status of Applications	70%	57%
Access Program Materials	43%	36%

When asked about their satisfaction with the portal, 49% of DEC trade allies and 41% of DEP trade allies said that they were satisfied with the online portal (a rating of 8 or higher on a scale of 0 to 10). The most common challenges with the portal were the perception that it is not user friendly (25% DEC; 17% DEP) and the inability to make edits, resulting in the need to reenter data. Below are a few representative quotations from trade allies with a “dissatisfied” or “neutral” satisfaction rating:

> *“Sometimes the interface can be cumbersome, but overall it is functional.”*

> *“It was closed down at one point, then reopened at another web address. Communication on this transition was poor. All of these portals and information on the programs are hard to find on the Duke Energy Website. I don't recall any ‘training’ or good explanations for specific applications that would have made it easier for me to use the online portal.”*

> *“I have not had information on how to access this portal. I would like to know more and to be able to access the portal plus attend some training by Duke Energy personnel.”*

> *“It would be useful to be able to auto populate data for customers that have multiple sites (i.e., chain and retail customers). This would save a lot of time. Alternatively, having a multi-location application would help too.”*

> *“There is no way to archive old applications. I have to go through pages to find the applications that I am looking for. I do not want to delete them but would like to make the [sic] inactive or have a filter by year.”*

According to staff from the trade ally outreach team, the trade ally response to the launch of the online portal had been favorable. The outreach team was trained on the functionalities of the portal so that they can respond to inquiries from trade allies.

7. Conclusions and Recommendations

7.1 Conclusions

During the evaluation period, non-residential customers completed 12,855 projects through the DEC Smart $aver Program and 3,186 projects through the DEP Energy Efficiency for Business Program. These projects generated approximately 287 GWh (DEC) and 73 GWh (DEP) of net energy savings, 49 MW (DEC) and 11 MW (DEP) of net summer peak demand savings, and 47 MW (DEC) and 10 MW (DEP) of net winter peak demand savings. Seventy-four percent of DEC net energy savings and 91% of DEP net energy savings were generated through the program's main delivery channel, with the remainder coming from purchases through the program's midstream channel and online store. Lighting accounted for the majority of program projects and savings.

Our gross impact analysis found realization rates for energy savings of over 100% for the DEC and DEP programs overall. Realization rates for summer demand savings were also over 100% for both DEC and DEP, generally due to deemed savings adjustments to lighting. Winter demand savings saw the largest change to realization rates, with DEC at 251% and DEP at 173%. These realization rates were driven by the program not claiming winter demand savings for several lighting measures. Our desk reviews and site visits found relatively few data tracking issues with respect to the quantities of installed measures. We adjusted the quantities for 6 of the 145 sampled projects. Of the six discrepancies, five were relatively minor, while one adjustment for a food service project had a significant impact on the food service realization rate.

Based on our net impact analysis, the program-level NTGR for the Non-Residential Prescriptive Program is 78.7% for DEC and 85.8% for DEP. For both jurisdictions, the lighting NTGR is higher (81.0% DEC; 86.4% DEP) compared to the non-lighting NTGR (59.3% DEC; 67.9% DEP). We estimate overall program-level FR for DEC to be 28.5% and 21.4% for DEP. PSO and TA SO are 0.06% and 7.2% respectively.

Table 7-1 summarizes the net-to-gross results of our evaluation.

Table 7-1. Summary of DEC and DEP NTG Results

Technology	FR	PSO	TA SO	NTGR*
DEC				
Lighting	26.3%	0.06%	7.2%	81.0%
Non-Lighting	48.0%			59.3%
DEC Total	**28.5%**	**0.06%**	**7.2%**	**78.7%**
DEP				
Lighting	20.8%	0.06%	7.2%	86.4%
Non-Lighting	39.4%			67.9%
DEP Total	**21.4%**	**0.06%**	**7.2%**	**85.8%**

*NTGR = 1 – FR + PSO + TA SO

Table 7-2 and Table 7-3 summarize ex post gross and net savings for the evaluation period for DEC and DEP, respectively.

Table 7-2. Summary of DEC Ex Post Gross and Net Savings

Technology	Ex Post Gross			NTGR	Ex Post Net		
	Energy Savings (kWh)	Summer Peak Demand (kW)	Winter Peak Demand (kW)		Energy Savings (kWh)	Summer Peak Demand (kW)	Winter Peak Demand (kW)
Main Channel	268,914,950	44,373	42,064		211,751,454	35,026	33,382
Lighting	*240,987,942*	*40,161*	*38,891*	*0.81*	*195,187,673*	*32,528*	*31,500*
Pumps and Drives	*10,267,207*	*1,481*	*1,598*	*0.59*	*6,089,581*	*878*	*948*
HVAC	*7,869,879*	*1,840*	*656*	*0.59*	*4,667,702*	*1,091*	*389*
Food Service Products	*4,889,807*	*439*	*418*	*0.59*	*2,900,193*	*260*	*248*
Information Technology	*3,322,377*	*146*	*195*	*0.59*	*1,970,534*	*87*	*116*
Process Equipment	*1,577,738*	*306*	*306*	*0.59*	*935,772*	*181*	*181*
Midstream Channel	*65,238,691*	11,731	11,376	1.00	*65,238,691*	11,731	11,376
Online Store	*9,591,131*	1,893	1,864	1.00	*9,591,131*	1,893	1,864
DEC TOTAL	343,744,772	57,997	55,304		286,581,276	48,651	46,622

Table 7-3. Summary of DEP Ex Post Gross and Net Savings

Technology	Ex Post Gross			NTGR	Ex Post Net		
	Energy Savings (kWh)	Summer Peak Demand (kW)	Winter Peak Demand (kW)		Energy Savings (kWh)	Summer Peak Demand (kW)	Winter Peak Demand (kW)
Main Channel	77,664,493	11,581	10,936		66,708,433	9,933	9,399
Lighting	*65,966,238*	*10,398*	*10,053*	*0.86*	*57,025,896*	*8,989*	*8,691*
HVAC	*1,485,524*	*366*	*239*	*0.68*	*1,008,938*	*248*	*162*
Food Service Products	*807,334*	*54*	*53*	*0.68*	*548,325*	*36*	*36*
EEB - Lighting	*9,376,146*	*760*	*589*	*0.86*	*8,105,406*	*657*	*509*
EEB - HVAC	*29,252*	*4*	*1*	*0.68*	*19,867*	*3*	*1*
Midstream Channel	*6,227,819*	1,026	987	1.00	*6,227,819*	1,026	987
Online Store	*43,549*	6	7	1.00	*43,549*	6	7
DEP TOTAL	83,935,861	12,614	11,930		72,979,800	10,966	10,393

Our process evaluation found a program that is operating effectively, with satisfied participants that are generating significant numbers of projects and energy savings. The program has gone through a number of transitions shortly before and during the evaluation period. Key program design and implementation changes include:

- The EEB and Smart $aver programs, which operated separately in DEP and DEC territory, were brought into closer alignment. This included changing the DEP incentive structure from a watts-reduced approach to a per-unit incentive.

- Application and incentive processing—previously carried out by external contractors—was brought in-house. Applications are now processed through a Salesforce-integrated system.
- In the fall of 2014, the Non-Residential Prescriptive Program added BEAs to its roster of program staff. The primary responsibility of BEAs is to work with small and medium-sized customers to generate interest and participation in the Non-Residential Prescriptive Program and to assist customers with the participation process.
- In March 2016, the program rolled out an online application portal for DEC customers and trade allies. The online portal was introduced to DEP customers in January 2017. This online portal was designed to streamline and ease the participation process.
- The program opened the online store to DEC customers in early 2016 and to DEP customers in December 2016.

Our process evaluation sought to explore customer and trade ally awareness and use of some of these new program features and to assess how effective they were in streamlining program processes and reducing barriers to participation. However, the timing of these changes, relative to our evaluation period, means that some participating customers and trade allies may not have been exposed to the new features or may have experienced them during the time of transition, when the new processes may not have been fully functional. As such, some of the findings presented in this report, while reflective of participants during the evaluation period, may not be fully representative of current participants. We note in the detailed discussion in this report where this might be the case.

Overall, our process evaluation found the following:

Sources of Information

- Contractors and trade allies continue to be an important source of information for customers.
  - 41% of DEC and 37% of DEP participants first learned about the program from a trade ally or contractor.
  - 87% of DEC participants and 85% of DEP participants worked with a contractor or vendor to select equipment.
  - Word of mouth (35% DEC; 38% DEP) was another common source of awareness, suggesting that participants are generally satisfied with their experience and are recommending the program to others.

Barriers to Energy Efficiency and Participation

- Higher cost of energy efficient equipment and access to financing/capital are key barriers to installing energy-efficient equipment.
- Trade allies and participants consider financial considerations; paperwork, application processes, and time required to participate; and incentive levels to be the barriers to program participation. However, a large number of trade allies and participants do not see any barriers to program participation.

Satisfaction

- Participants are highly satisfied with the program overall and all program components, rating no component less than an average score of 8.4 on a scale of 0 to 10. The program overall was rated an average of 8.8 by DEP participants and 9.2 by DEC participants, the highest and second highest rating for the respective territories.
  - 75% of DEC participants and 84% of DEP participants are very or somewhat likely to participate again.
  - 93% of DEC participants and 78% DEP participants are very likely to recommend the program to other businesses.
- Trade allies are somewhat less satisfied with program processes than participants, but still rated their satisfaction with all program factors an average of 6.5 or higher. Trade allies in both territories gave their highest average ratings to program staff interactions and the program overall.

Business Energy Advisor Interactions

- Twenty-five percent of DEC and 27% of DEP participants have had energy efficiency-related interactions with a BEA.
  - The most common reason for interaction with the BEA was for program scoping (54% DEC) and application support (37% DEP).
  - 85% of DEC and 68% of DEP participants who worked with a BEA said the BEA was very or somewhat influential in their decision to participate in the program.

Online Portal

- Relatively few participants (37% DEC; 28% DEP) are aware of the customer online portal. Fewer still have used the portal (16% DEC; 12% DEP). The most common use was to submit applications (63% DEC; 70% DEP).
- Trade ally awareness of the portal is high (76% DEC; 72% DEP). More than half of DEC trade allies (54%) have used the portal, while slightly fewer DEP trade allies (44%) have.

Online Store

- Moderate numbers of main channel participants (46% DEC; 22% DEP) are aware of the online store. Fewer—13% of DEC participants and 1% of DEP participants—have made a purchase from the store. The later rollout of the online store to DEP customers may explain their lower awareness and use of this program channel.
  - 75% of DEC participants and 62% of DEP participants said that they were very or somewhat likely to make a purchase within the next year.
  - Barriers to making a purchase from the online store include existing vendor relationships, specific company purchasing requirements, or having no need for additional equipment.

Trade Ally Business Practices

- Nearly all trade allies reported an increase in one or more high-efficiency aspects of their business, and most of those trade allies said that the program was at least somewhat influential in those increases.
  - The aspect for which the highest share of trade allies reported significant increases was percent of sales recommending high-efficiency equipment (DEC 51%; DEP 41%).
- Trade allies generally credited the program with the highest influence on the increases in sales recommendations and energy-efficient installations (total volume and percentage of jobs).
- Less than half of trade allies have participated in program-sponsored training.
  - Of those who attended any training, the largest share (54% DEC; 79% DEP) attended program training, and about half attended online portal training.
  - The main reasons for not participating in any training were a lack of awareness that the program offered training, a lack of time to participate, and a lack of need for training.

7.2 Recommendations

Through our research, we identified several opportunities for program improvement.

Increase Promotion of Lesser-Known Program Components

While the program is performing well and generating savings, there are program components that can be further promoted and improved to create even higher levels of participation. The BEAs represent a strong opportunity for the program to reach small- and medium-sized businesses and increase program knowledge and participation among this group. Increased operational support could be provided to the BEAs to facilitate more targeted communications and knowledge transfer to customers at the key moment when they are selecting equipment for their projects.

The program should also make attempts to increase promotion of the online store and the online portal, particularly among DEP customers for whom these components are still relatively new. The online store represents an opportunity for customers with relatively simple projects (primarily lighting) to purchase equipment in a streamlined fashion and could drive increased participation. BEAs in particular should promote this option to their customers, as it might be well suited for the needs of smaller businesses. At the same time, the program should emphasize the online portal in communications with customers and trade allies as a mechanism to streamline the application process and as a way for these key stakeholders to receive vital information about the program.

Finally, the program periodically provides training to trade allies in the form of in-person meetings and webinars. However, knowledge of and participation in these trainings was relatively low among surveyed trade allies. Since the trainings address some of the areas of lower trade ally satisfaction (e.g., application processing, the online portal), there is an opportunity for the program to better educate trade allies, remove some of the obstacles to participation, and increase satisfaction. The program might also consider making an introductory training mandatory, to ensure that all trade allies are aware of key program processes and requirements. Some similar programs that have lists of registered trade allies do require this.[19] In some cases, they also require attendance in annual meetings, to inform trade allies of important changes to the program.

Consider More Frequent Updates of Eligible Measure List, Especially for Lighting Measures

Many trade allies install non-incented high-efficiency equipment, and many of these installations are not completed through the program because the measures are not on the program's list of eligible equipment. Trade allies listed multiple types of energy-efficient equipment—mostly lighting measures—that they think should be eligible for a program incentive: tubular LED bulbs; high-output lighting, such as high-bay LEDs and "corn cob LEDs"; LED floodlights; low-wattage TLEDs; and generally, a wider range of LED bulbs and fixtures.

While relying on third-party lists of qualifying equipment, such as those from the DLC and ENERGY STAR®, allows the program to reduce its administrative burden, the program may be missing opportunities for increasing participation and realizing more savings. Lighting still represents an excellent source of program savings, and levels of FR are low compared to non-lighting measures. As such, staying current with newer and better lighting technologies represents an opportunity for the program to continue capturing lighting-related savings.

Continue to Improve and Streamline the Application Process

The program has taken steps to improve the application process, including bringing the application processing system in-house and offering an online application system for participants and trade allies. Nevertheless, the online portal is the lowest-rated program components for trade allies. While the evaluation team did not have direct access to the online portal, we recommend that the program collect specific feedback from portal users and explore implementing solutions to the most commonly cited challenges. Among suggestions provided by trade allies surveyed in support of this evaluation were a function to auto-populate data for customers with multiple sites, allowing a multi-location application, and including an archive or filter function.

Improve Data Collection and Tracking Processes

Our review and processing of program tracking data revealed a number of issues that, if addressed, would allow program staff to better track program activity and would also facilitate evaluation efforts. In particular, areas that can be improved include the following:

- **Create unique identifiers for participants and trade allies.** During interviews and conversations, program staff noted two difficulties related to data tracking: (1) an inability to identify and enumerate unique customers in the participation data and (2) difficulty identifying inactive trade allies for potential removal from the program's trade ally list. Creating a unique identifier for each participating customer and each participating trade ally would solve both of these problems and would allow program staff to easily tabulate program activity, identify top- and low-performing trade allies, identify repeat customers, and better target specific types of customer or trade ally. Assigning unique

[19] Examples of similar business programs that have trade ally training requirements include NIPSCO's Business Energy Efficiency Program, which requires new TAs to complete an orientation session; ComEd's Smart Ideas® Energy Efficiency Program, which requires new TAs to attend a Trade Ally Basic Training class and one launch event per program year; SDG&E's C&I programs, which require new TAs to participate in the Trade Professional Program Essentials training; and PG&E's C&I programs, which require new TAs to attend the Trade Professional Alliance 101 Seminar before participating in the programs.

identifiers could also help with auto-populating certain information in the online portal, as suggested by one trade ally to streamline the application process.

- **Perform additional quality assurance steps on the data entered into the program tracking database.** While our impact analysis generally found few data tracking issues, one major error in quantity significantly affected the realization rate of food service equipment. Additional checks on entered data, e.g., for outlier values, could help prevent such issues in the future.
- **Ensure that information collected on the application is complete and consistently entered into the program tracking database.** Missing data encountered during our evaluation included operational information, such as hours of use, as well as customer contact information. Collecting and entering more complete technical and operational data will enable more accurate estimates of program impacts while more complete customer contact information will support program outreach efforts.

8. Summary Form

Duke Energy Carolinas/Progress Non-Residential Prescriptive Program

The Duke Energy Carolinas/Progress Non-Residential Prescriptive Incentive Program provides incentives to commercial and industrial customers for a range of measures including lighting; HVAC systems; motors, pumps, and variable frequency drives (VFDs); process equipment; food service products; and information technology equipment. The program works with trade allies to promote the program and drive participation. The program also offers an online Business Savings Store where DEC/DEP customers can purchase a subset of products offered by the program main channel at comparable incentive levels. The program also offers a midstream channel that works with distributors to provide incented products to customers.

Date	March 25, 2018
Region(s)	Duke Energy Carolinas/Duke Energy Progress
Evaluation Period	DEC: August 1, 2015 to February 28, 2017 DEP: March 1, 2016 to February 28, 2017
Total kWh Savings	DEC: 286,581,276 kWh (net ex post) DEP: 72,979,800 kWh (net ex post)
Coincident kW Impact (net ex post)	DEC: 48,651 kW (summer); 46,622 kW (winter) DEP: 10,966 kW (summer); 10,393 kW (winter)
Measure Life	Not evaluated
Net-to-Gross Ratio	DEC: 78.7% overall; 81.0% lighting; 59.3% non-lighting DEP: 85.8% overall; 86.4% lighting; 67.9% non-lighting
Process Evaluation	Yes
Previous Evaluation(s)	DEC: Duke Energy Carolinas Smart $aver® Prescriptive Incentive Program, July 17, 2016 DEP: 2014 EM&V Report for the Energy Efficiency for Business Program, October 30, 2015

The evaluation team performed a gross and net impact using a multi-step process.

For the gross impact analysis, we first reviewed program tracking data and develop a comprehensive database of program measures and ex ante savings. We then conducted desk reviews and site visits to confirm database quantities for projects completed through the main program channel. We also reviewed and adjusted, where warranted, ex ante per-unit "deemed" savings. Finally, we estimated ex post gross energy and demand savings, by technology, based on the quantity and per-unit deemed savings adjustments.

The net impact evaluation relied on participant and trade ally interviews in order to quantify free-ridership, participant spillover, and trade ally spillover. We estimated overall net-to-gross ratios for DEC and DEP program, as well as net-to-gross ratios for lighting and non-lighting for each territory. These net-to-gross ratios were multiplied by the ex post gross savings to determine net program impacts for DEC and DEP.

We also performed a process analysis that investigated customer awareness of the program, program satisfaction, barriers to participation and installing energy efficient equipment, program influence on trade ally business practices, and new program features such as the online portal, the online store, and the business energy advisors.

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Duke Energy Carolina/ Duke Energy Progress

Non-Residential Prescriptive Program Evaluation Report – Appendices

March 25, 2018

Opinion Dynamics

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Appendix A. DSMore Table

The Excel spreadsheet containing measure-level inputs for Duke Energy Analytics is provided as a separate file. Per-measure savings values in the spreadsheet are based on the gross and net impact analysis reported above. Measure life estimates have not been updated as part of this evaluation since it was not part of the evaluation scope.

Appendix B. Respondent-Level Free-Ridership Methodology

This appendix outlines our approach for calculating respondent-level FR values based on questions in the telephone participant survey. The approach estimates program influence on project efficiency and allows for two types of adjustments: The first adjustment considers program influence on the quantity and timing of installed equipment, and the second adjustment is applied if the respondent became aware of the Non-Residential Prescriptive Program *after* making the decision to implement the energy efficiency project. The following calculations are used:

- Preliminary FR Value = [(Efficiency Score 1 + Efficiency Score 2 + Efficiency Score 3) ÷ 3] x Quantity and Timing Adjustment Factor
- Preliminary NTG Value = 1 – Preliminary FR Value
- Final NTG Value = Preliminary NTG Value x Program Awareness Adjustment Factor
- Final FR Value = 1 – Final NTG Value

The following sections describe the questions and algorithms used to estimate respondent-level FR values.

Program Influence on Project Efficiency

The telephone survey included a series of questions to determine the influence that the Non-Residential Prescriptive Program had on the efficiency level of the incented project. Based on these questions, we developed three FR efficiency scores for each respondent, which were averaged to calculate the respondent's overall Efficiency FR Score. FR scores can range from 0 to 1, where 0 means no FR (i.e., full credit for the program) and 1 means full FR (i.e., no credit for the program).

The overall Efficiency FR Score is composed of the following sub-scores:

- **Efficiency FR Score 1 – Rating of program factors (Q.N3):** Participants are asked to rate (on a scale of 0 to 10) the importance of several program and non-program factors on their decision to select energy-efficient equipment rather than a less efficient alternative. This FR score is based on the maximum rating given to any of the program factors and is calculated as[1]:

  1 – (Maximum Program Factor Rating ÷ 10)

- **Efficiency FR Score 2 – Allocation of points to the Non-Residential Prescriptive Program (Q.N4):** Participants are asked to allocate a total of 100 points between the Non-Residential Prescriptive Program and other factors that influenced the efficiency level of the incented project. This FR score is calculated as:

  1 – (Points Allocated to Program ÷ 100)

- **Efficiency FR Score 3 – Likelihood to install same level of efficiency without the program (Q.N5):** Participants are asked to rate (on a scale of 0 to 10) the likelihood that they would have installed the same level of efficiency without the program. This FR score is calculated as:

  Likelihood to install without the program ÷ 10

[1] Several factors asked about in the survey can be considered either a program factor or a non-program factor, depending on the response to a follow-up question: previous experience with this type of equipment, financial criteria, expected energy savings.

In addition to the efficiency questions that are direct inputs into the FR algorithm, the survey contains several consistency checks. These are designed to resolve inconsistent responses to the three concepts of efficiency. For example, if the respondent gives a high importance rating to at least one program factor in Q.N3 but also gives a high rating for the likelihood of installing the same equipment without the program in Q.N5, a follow-up question tries to resolve this discrepancy. The consistency checks consist of an open-ended question where the respondent is asked to explain the earlier numeric responses and a question that gives the respondent the opportunity to change one or more of the earlier answers.

Key Survey Questions

N3. My next few questions are about your decision to select energy efficient equipment rather than a less efficient alternative. Specifically, I would like you to rate the importance of Duke Energy's <PROGRAM> as well as other factors that might have influenced your decision to select the energy efficient <TECHNOLOGY> equipment.

For each rating, please use a scale from 0 to 10, where 0 means "not at all important" and 10 means "extremely important". [RECORD 0 to 10; 96=Not Applicable; 98=Don't Know; 99=Refused]

(Interviewer Note: Prompt for a numeric rating if not given, for example "So what rating would that be, on a 0 to 10 scale?"... If respondent says "We would not have done it", prompt with "So would you rate that as extremely important, or a 10 on a 0 to 10 scale?")

a. [ASK IF S2=1] Your previous experience with the <PROGRAM>
b. The availability of the PROGRAM incentive
c. [ASK IF V1a=1] A recommendation from the vendor or contractor who helped you with the choice of the equipment
d. Previous experience with this type of equipment
e. [ASK IF V3a=1 OR V3b=1 OR V3c=1 OR V3d=1 OR V4=4,5,6,7] A recommendation from a Duke Energy representative (IF NEEDED: This could be an Account Manager, Business Advisor, Energy Efficiency Engineer, or <PROGRAM> staff)
f. Information from <PROGRAM> or Duke Energy marketing materials
g. Standard practice in your business or industry
h. Corporate policy or guidelines
i. Financial criteria, such as payback or return on the investment
j. The expected energy savings

N3o. Were there any other factors we haven't discussed that were influential in your decision to select the energy efficient <TECHNOLOGY> equipment? [OPEN END; 96=Nothing else influential]

[ASK IF N3o=00]
N3oo. Using the same 0 to 10 scale, where 0 means "not at all important" and 10 means "extremely important", how would you rate the influence of this factor (IF NEEDED: <N3o RESPONSE>)? [RECORD 0 to 10; 98=Don't Know; 99=Refused]

[ASK IF N3d=8,9,10 AND S2=1]
N3dx. You indicated that previous experience with this type of equipment was important in your decision to select the energy efficient <TECHNOLOGY> equipment. Was this previous experience associated with equipment you installed with an earlier Duke Energy incentive, or did you install that equipment on your own?

1. (With Duke Energy incentive)
2. (On my own/No Duke Energy incentive)
3. (Both)
8. (Don't know)
9. (Refused)

[ASK IF N3i=8,9,10]

N3ix. You indicated that financial criteria were important in your decision to select the <TECHNOLOGY> equipment. Which of the following statements best applies to this project:

01. The <PROGRAM> rebate moved the project within the acceptable range of our financial criteria
02. The project met our required financial criteria even without the rebate
03. The project didn't meet our required financial criteria, even with the rebate
00. (Other, specify)
98. (Don't know)
99. (Refused)

[ASK IF N3j=8,9,10]

N3jx. You indicated that the expected energy savings were important in your decision to select the energy efficient <TECHNOLOGY> equipment. How did you find out about the savings this equipment could achieve?

01. (contractor/vendor)
02. (Duke Energy Account Manager)
03. (Duke Energy Business Energy Advisor)
04. (Duke Energy Program Staff)
05. (Prior experience with equipment)
00. (Other, specify)
98. (Don't know)
99. (Refused)

Thinking about this differently, I would like you to compare the importance of the Duke Energy Non-Residential Incentive Program with the importance of other factors in your decision to select the energy efficient <TECHNOLOGY> equipment.

N4. To make this comparison, assume you have a TOTAL of 100 points that reflect the influence on your decision to install the energy efficient <TECHNOLOGY> equipment. I would now like you to SPLIT those 100 points between: (1) the <PROGRAM>, including support from Duke Energy staff; and (2) other factors.

How many points would you give to the importance of... [RECORD 0 to 100; 998=Don't Know; 999=Refused]

N4a. the <PROGRAM>, including support from Duke Energy staff
N4b. other factors

Now I would like you to think about the action you WOULD HAVE taken with regard to the installation of this <TECHNOLOGY> equipment if the Non-Residential Incentive Program HAD NOT BEEN available.

[IF EFFICIENCY LEVEL IS NOT APPLICABLE, SKIP TO N6a]

N5. Without the program, what is the likelihood that the equipment would have had the same efficiency level? Please use a scale from 0 to 10, where 0 is “Not at all likely” and 10 is “Extremely likely”. [RECORD 0-10; 98=Don’t Know; 99=Refused]

Quantity and Timing Adjustment Factor

In addition to influencing the efficiency of a project, the Non-Residential Prescriptive Program can affect the quantity and timing of the installed energy-efficient equipment.[2] Because decisions about measure quantity and installation timing are often correlated, we calculated a combined “Quantity and Timing Adjustment Factor.” This factor can range from 0 to 1, where a lower value means a greater quantity and timing adjustment, i.e. more credit to the program. The Quantity and Timing Adjustment Factor is multiplied by the Efficiency FR Score.

The survey first asks respondents how much of the installed energy efficient equipment would have been installed at the same time without the program (Q.N6a/b). Only the quantity that would not have been installed at the same time is eligible to receive the quantity and timing credit.

Respondents are then asked if they would have installed the remaining quantity later (Q.N7) and, if so, how much later (QN7a). The response, expressed as the number of months the program accelerated the project, is translated into a timing adjustment, using the following formula:[3]

Timing Adjustment = 1 – (# Months Accelerated – 6) ÷ 42

Substituting the midpoint of the Q.N7a response for *# Months Accelerated* results in the following adjustments:

- Same time: 1.0
- Up to 6 months later: 1.0
- 7–12 months later: 0.93
- 1–2 years later: 0.71
- 2–3 years later: 0.43
- 3–4 years later: 0.14
- More than 4 years later: 0.0
- Don’t know/Refused: 1.0

The timing adjustment can range from 0 to 1. A smaller adjustment value means a greater reduction in FR, because the program resulted in a greater acceleration of the project.

The Quantity and Timing Adjustment Factor is then calculated by multiplying the percentage of the project that would not have been installed at the same time without the program by the timing adjustment and

[2] For some measures, the concept of quantity is not applicable. For projects with those measures, questions about quantity are skipped and the quantity adjustment factor is set to 1.0, i.e., no FR adjustment is applied.

[3] The timing adjustment is capped at 1.0, i.e., if the *# Months Accelerated* is 6 months or less, the adjustment is equal to 1.0 and no adjustment is applied. If a respondent cannot provide a valid response, i.e., the response is “Don’t know” or “Refused,” the adjustment is set to 1.0 as well.

adding this product to the percentage of the project that would have been installed at the same time without the program. We used the following formula for this calculation:

Quantity and Timing Adjustment Factor =

*(% Not Installed at Same Time * Timing Adjustment) + % Installed at Same Time*

If the respondent does not provide valid responses to the initial quantity (Q.N6a) and timing (Q.N7) questions, the Quantity and Timing Adjustment Factor is set to 1.0, i.e., no reduction in FR. If the respondent cannot provide valid responses to the more specific quantity (Q.N6b) and timing (Q.N7a) questions, we apply average values based on the other survey responses.

Key Survey Questions

[IF TUNEUP=1 SKIP TO N7a]
N6a. Without the program, would you have installed the same quantity of <u>energy efficient</u> equipment in <DATE> or would you have installed less?
1. Same quantity
2. Less
3. (More)
8. (Don't know)
9. (Refused)

[ASK IF N6a=2, ELSE SKIP TO CC2a]
N6b. As best as you can, please estimate the percentage of the energy efficient <TECHNOLOGY> equipment that you would have installed in <DATE> without the program. [NUMERIC OPEN END, 0 to 100%; 998=Don't Know; 999=Refused]

[IF N6b<=100% CALCULATE N_INSTALL = 100% – N6b]

[ASK IF N6b<50%]
N6c. Why would you have installed that much less energy efficient equipment? [OPEN END]

[ASK IF N6b<100%]
N7. Without the program, would you have installed the remaining <N_INSTALL> percent of the energy efficient <TECHNOLOGY> equipment at a later time?
1. Yes
2. No
8. (Don't Know)
9. (Refused)

[ASK IF N7=1 OR IF TUNEUP=1]
N7a. Without the program, when do you think you would have installed the energy efficient <TECHNOLOGY> equipment? Please answer relative to the date that you ACTUALLY installed the equipment.
01. (at the same time)
02. (up to 6 months later)
03. (7 months to 1 year later)
04. (more than 1 year up to 2 years later)
05. (more than 2 years up to 3 years later)

06. (more than 3 years up to 4 years later)
07. (more than 4 years later)
08. (Never)
98. (Don't know)
99. (Refused)

[ASK IF N7a=4,5,6,7]
N7b. Why would it have been that much later? [OPEN END]

Program Awareness Adjustment Factor

While the Quantity and Timing Adjustment Factor can *reduce* FR but not increase it, the Program Awareness Adjustment can only *increase* FR. This adjustment is applied if the respondent reports in Q.N1 and Q.N2 that they first learned about the Non-Residential Prescriptive Program *after* making the decision to implement the incented project. Since such a response contradicts that the program could have had a meaningful impact on the decision-making process, the Preliminary NTG Value (based on the overall Efficiency FR Score and the Quantity and Timing Adjustment, calculated as 1 – Preliminary FR Value) is multiplied by 0.5, i.e., program influence is reduced by half. If the respondent reports first learning about the program *before* making the decision to implement the incented project, the adjustment is set to 1.0 (i.e., no reduction in the NTG value and thus no increase in FR).

Key Survey Questions

N1. When did you first learn about Duke Energy's <PROGRAM>? Was it BEFORE or AFTER you selected the <TECHNOLOGY> equipment for which you received the incentive?
1. (Before)
2. (After)
8. (Don't know)
9. (Refused)

[ASK IF N1=2]
N2. Just to confirm, you found out about the incentive available through Duke Energy's <PROGRAM> after you had already decided to implement the energy efficient <TECHNOLOGY> project?
01. Yes, after
02. No, before
00. (Other, specify)
98. (Don't know)
99. (Refused)

Appendix C. Trade Ally Spillover Methodology

The objective of the TA SO analysis was to determine the program's influence on non-incented installations of energy-efficient measures during the evaluation periods. As discussed in Section 5.1.3 of the main report, we used an online survey of trade allies to gather data for this evaluation. We identified SO candidates through questions asked in the survey and determined savings for qualifying projects to develop a quantitative estimate of SO, relative to total program savings. The SO method captures SO as reported by trade allies, which may include SO at participant facilities and at non-participant facilities.

The remainder of this appendix details our methods of determining if a trade ally qualifies for SO savings, and of quantifying SO savings.

Trade Ally Eligibility for Spillover

The trade ally online survey asked a series of questions to determine if any high-efficiency installations completed by respondents outside of the program qualified as SO. We considered non-incented high-efficiency installations of equipment by trade allies to be SO if all five conditions listed in Table C-1 were met.

Table C-1. Non-Residential Prescriptive Program Trade Ally Spillover Qualifiers

Qualifier	Description	Conditions to Satisfy Qualifier
1	The percentage of the trade ally's installations that are high efficiency and/or the total volume of high-efficiency installations increased since the contractor became a trade ally.	*PI1d = 2 or 3 AND/OR PI1e = 2 or 3*
2	The trade ally rated the program as important to at least one of these increases.	*PI3d = 8, 9, or 10 AND/OR PI3e = 8, 9, or 10*
3	The trade ally installed at least some high-efficiency equipment that did not receive an incentive.	*TA1c > 0% OR (TA1c = 998 AND TA2a = 1 AND (TA2b > 0 OR "Don't know"))*
4	The trade ally's recommendation was influential in the customer's choice of high-efficiency equipment over standard efficiency equipment in instances where the equipment did not receive an incentive from the program.	*SO1a = 8, 9, or 10*
5	The open-ended response about why customers with high-efficiency projects did not receive an incentive did not contradict findings from other qualifiers that the non-incented high-efficiency installations can be considered SO.	*SO1c does not contradict that the non-incented high-efficiency installations can be considered SO.*

Qualifier 1 Question

PI1. Since <TRADEALLY_NAME> became a <PROGRAM> trade ally, have any of the following aspects changed and if so, by how much? *[1=Did not increase; 2=Increased Somewhat; 3=Increased Greatly]*

- *d.* *The percentage of jobs in which <TRADEALLY_NAME> installs high efficiency equipment in Duke Energy's <JURISDICTION> service territory*
- *e.* *The total volume of high efficiency equipment <TRADEALLY_NAME> installs in Duke Energy's <JURISDICTION> service territory*

Qualifier 2 Questions

PI3. On a scale of 0 to 10, where 0 is "not at all influential" and 10 is "extremely influential," please rate the influence of the <PROGRAM> on the increase in… [SCALE 0-10; 98=Don't know]

d. The percentage of jobs in which <TRADEALLY_NAME> installs high efficiency equipment in the Duke Energy <JURISDICTION> service territory

e. The total volume of high efficiency equipment <TRADEALLY_NAME> installs in the Duke Energy <JURISDICTION> service territory

Qualifier 3 Questions

TA1. Approximately what percentage of your total equipment installations (in terms of dollars) was… (Please provide your best estimate, if unsure of exact percentages.) (Standard efficiency products meet the Federal minimum standard for energy consumption, but are no more energy-efficient than the standard requires.) [0% TO 100%; 998=DON'T KNOW]

a Standard Efficiency

b High Efficiency – that DID RECEIVE an incentive from Duke Energy

c High Efficiency - that DID NOT RECEIVE an incentive from Duke Energy

[ASK IF TA1c=998]

TA2a. Between <EVALPERIOD>, did any of your customers in Duke Energy's <JURISDICTION> service territory install high efficiency equipment that did not receive a Duke Energy incentive? [1=Yes; 2=No; 8=Don't Know]

[ASK IF TA2a=1]

TA2b. Approximately, how many of your projects in Duke Energy's <JURISDICTION> service territory between <EVALPERIOD> used high efficiency equipment but did not receive a <PROGRAM> incentive? [NUMERIC OPEN END; 998=Don't know]

Qualifier 4 Question

SO1a. How influential was your recommendation on your customers' choice of high efficiency equipment over standard efficiency equipment? (0=Not at all influential; 10=Extremely influential) [SCALE 0-10; 98=Don't know]

Qualifier 5 Question

SO1c. Why do you think that these customers did not participate in the <PROGRAM> even though they installed high efficiency equipment? [OPEN END]

We coded open-ended responses to SO1c. If the respondent's answers conflicted with findings from other qualifiers that the project is SO, we excluded the respondent from SO calculations.

Estimation of Spillover Savings for Individual Trade Allies

For the trade allies who met the five main qualifying conditions outlined above, SO savings were considered to be equal to the savings of their non-incented, high-efficiency installations. SO for each qualifying trade ally (i) is calculated using Equation C-1. Data inputs to this formula are from the online survey and the program tracking database; they are further described below.

Equation C-1

$$\text{TA Spillover Savings (kWh)}_i = \left(\frac{\text{Savings from Program Database}_i}{\text{\% Efficient Installations that Received Incentive}_i} - \text{Savings from Program Database}_i \right) * \text{Size Adjustment}_i$$

Percentage of Eligible Equipment Installations That Received Incentive

We used survey questions TA1b and TA1c to determine the share of efficient installations that received an incentive (Equation C-2).

Equation C-2

$$\textit{\% of Efficient Installations That Received Incentive} = \frac{TA1b}{TA1b + TA1c}$$

Questions

TA1. Approximately what percentage of your total equipment installations (in terms of dollars) was… (Please provide your best estimate, if unsure of exact percentages.) [0% TO 100%; 998=DON'T KNOW]

a. Standard Efficiency
b. High Efficiency - that DID RECEIVE an incentive from Duke Energy
c. High Efficiency - that DID NOT RECEIVE an incentive from Duke Energy

If the respondent was unable to provide the percentage of total equipment installations that were high-efficiency and did not receive an incentive (Q.TA1c), we used responses from questions TA2a and TA2b, as well as the number of respondent projects in the program-tracking database, to estimate this percentage (Equation C-3). If the respondent said that none of the customers installed high efficiency equipment without receiving an incentive, as indicated in TA2a, we set TA2b equal to 0.

TA2a. Between <EVALPERIOD>, did any of your customers in Duke Energy's <JURISDICTION> service territory install high efficiency equipment that did not receive a Duke Energy incentive?

1. Yes
2. No
8. Don't know

[ASK IF TA2a=1]
TA2b. Approximately, how many of your projects in Duke Energy's <JURISDICTION> service territory between <EVALPERIOD> used high efficiency equipment but did not receive a <PROGRAM> incentive? [NUMERIC OPEN END; 998=Don't know]

If the respondent was unable to provide an answer for TA2a or TA2b, we assumed the percentage of high efficiency equipment that did not receive a Duke Energy incentive was equal to the average percentage among all respondents (34%).

Equation C-3

$$\textit{\% of High Efficiency Equipment Installations That Did Not Receive Incentive} = \frac{TA2b}{TA2b + \textit{Number of Projects from Program Database}}$$

Size Adjustment

High-efficiency projects that did not receive an incentive may not be the same size as those that did receive an incentive. We therefore developed an adjustment to account for this possibility. We adjusted the average size of a respondent's projects in the database up or down using responses to survey questions RS1a, RS1b, and RS1c, as shown in Table C-2.

Table C-2. Size Adjustment for Non-Incented, High-Efficiency Installations

Non-incented, high-efficiency projects are … compared to incented ones (RS1a)	How much smaller/larger? (RS1b/RS1c)	Analysis Adjustment Value
Smaller	Less than a quarter of the size	12.5%
	A quarter of the size	25%
	Half the size	50%
	Three-quarters of the size	75%
	More than three-quarters of the size	87.5%
	Don't know	32.6% *(average of all respondents RS1a= "Smaller")*
About the Same Size	n/a	100%
Larger	Less than one-and-a-quarter times the size	112.5%
	One-and-a-quarter times the size	125%
	One-and-a-half times the size	150%
	One-and-three-quarters times the size	175%
	Twice the size	200%
	More than twice the size	212.5%
	Don't know	*Not estimated (only one response received for RS1a="Larger")*
Don't Know	Don't know	62.8% *(average of all respondents)*

Questions

RS1a. In terms of cost, how large were the projects that installed high efficiency equipment but did NOT receive an incentive?

1. Smaller than projects that received an incentive
2. About the same size as projects that received an incentive
3. Larger than projects that received an incentive
8. Don't know

[ASK IF RS1a=1]

RS1b. Approximately, how much smaller would you say were high efficiency projects that DID NOT receive a Duke Energy incentive compared to projects that DID receive an incentive?

For example, if the average cost of high efficiency projects that did NOT receive an incentive is $15,000 and the average cost of projects that DID receive an incentive is $20,000, your answer would be $15,000 / $20,000 = 75%, or "three quarters of the size".

1. *More than three quarters of the size*
2. *Three quarters of the size*
3. *Half the size*
4. *A quarter of the size*
5. *Less than a quarter of the size*
8. *Don't know*

[ASK IF RS1a=3]

RS1c. Approximately, how much larger would you say were high efficiency projects that DID NOT receive a Duke Energy incentive compared to projects that DID receive an incentive?

For example, if the average cost of high efficiency projects that did NOT receive an incentive is $25,000 and the average cost of projects that DID receive an incentive is $20,000, your answer would be $25,000 / $20,000 = 125%, or "one and a quarter times the size".

1. *Less than one and a quarter times the size*
2. *One and a quarter times the size*
3. *One and a half times the size*
4. *One and three quarters times the size*
5. *Twice the size*
6. *More than twice the size*
8. *Don't know*

Estimation of Program-Level Spillover Savings

To estimate the SO savings for all trade allies, respondent-level results were extrapolated using the four steps described below. Note that we excluded one trade ally with outlier SO (Trade Ally #22 in Table 5-3 of the main report) from the first two extrapolation steps. Since the respondent-level SO from this trade ally accounted for 78% of total respondent SO and would have significantly affected overall TA SO results, we attempted to conduct a follow-up interview to confirm key responses. Despite multiple attempts to re-contact this ally, by both Opinion Dynamics and Duke Energy staff, we were not able to confirm the responses. As a result, we decided to include this trade ally's spillover, but not extrapolate it to the population.

Step 1: Respondent SO Rate

We first developed a respondent SO rate by dividing the sum of all respondents' estimated SO savings by the total program savings of all respondents (Equation C-4). Both the numerator and denominator excluded Trade Ally #22.

Equation C-4

$$\text{Respondent SO Rate} = \frac{\text{Respondent SO Savings}}{\text{Respondent Program Savings}}$$

Step 2: Extrapolated TA SO Savings

We then applied the Respondent SO Rate calculated in Equation C-4 to all program savings associated with TAs, excluding Trade Ally #22 (Equation C-5). This calculation derives the Extrapolated TA SO Savings (in kWh).

Equation C-5

$$\text{Extrapolated TA SO Savings} = \text{Respondent SO Rate} * \text{All Trade Ally Program Savings}$$

Step 3: Total TA SO Savings

To account for the SO savings from Trade Ally #22, we added their respondent-level SO savings to the Extrapolated TA SO Savings (Equation C-6).

Equation C-6

$$\text{Total TA SO Savings} = \text{Extrapolated TA SO Savings} + \text{Trade Ally \#22 SO Savings}$$

Step 4: Program TA SO Rate

Finally, we estimated the Program TA SO Rate by dividing the Total TA SO Savings (in kWh), developed in Equation C-6, by total program-level ex post gross savings (in kWh), including savings from projects completed by a trade ally and projects completed without a trade ally (Equation C-7). This step is necessary to allow for the Program TA SO Rate to be applied to the program as a whole, instead of only to projects completed by a trade ally.

Equation C-7

$$\text{Program TA SO Rate} = \frac{\text{Total TA SO Savings}}{\text{All Program Savings}}$$

Appendix D. Participant Telephone Survey Instrument

Opinion Dynamics

DEC Smart $aver® Prescriptive Incentive Program/DEP Energy Efficiency for Business Program

Participant Telephone Survey

May 9, 2017 – FINAL

Sample Variables

<PROGRAM1>	IF DEC: Smart Saver Prescriptive Incentive Program IF DEP: Energy Efficiency for Business Program
<PROGRAM2>	IF DEC: Smart Saver Program IF DEP: Energy Efficiency for Business Program
<NAME>	Customer contact name
<COMPANY>	Company name
<ADDRESS>	Location of project installation
<DATE>	Month and year of incentive
<TECHNOLOGY>	The technology about which free-ridership questions are asked
<MEAS1-4>	Measures installed as part of the <TECHNOLOGY> project
<TUNEUP>	Flag if only measure is tune-up
UTIL	Utility, 1=DEC, 2=DEP
MEAS_COUNT	COUNT OF MEASURES

Introduction

Hello, my name is __________ calling on behalf of Duke Energy. We are speaking with business customers who have participated in Duke Energy's <PROGRAM1> in North and South Carolina.
May I please speak with <NAME>?

[IF NOT AVAILABLE OR NO CONTACT NAME]
May I please speak with the person that is most knowledgeable about an energy efficient project that <COMPANY> undertook at <ADDRESS>?

[READ WHEN CORRECT CONTACT IS ON THE PHONE]

I am calling about an energy efficiency project that <COMPANY> completed through Duke Energy's <PROGRAM1> at <ADDRESS> and for which you received an incentive in <DATE>. We are conducting a short survey with customers who have participated in this program.
[IF NEEDED: Duke Energy plans to use the information from this survey to improve the energy efficiency programs and services it offers to its business customers.]
All responses will remain confidential. Results will only be reported in aggregate with other responses.

For quality control purposes, this call may be monitored or recorded.

[IF NEEDED: THIS SURVEY USUALLY TAKES ABOUT 15 MINUTES.]

Screening/Background

I would first like to verify some information about the project.

SC1. Our records indicate that in <DATE>, <COMPANY> received an incentive from Duke Energy's <PROGRAM1> for a project implemented at <ADDRESS>. Is that correct?

- 01. (Yes, participated as described)
- 02. (Yes, participated but at another location)
- 03. (Yes, participated but at different time)
- 04. (NO, did NOT participate in program)
- 00 (Other, specify)
- 98 (Don't know)
- 99 (Refused)

[ASK IF SC1=4,98,99, ELSE SKIP TO S1]
SC2. Is there someone else within the company who might know more about your company's participation in the <PROGRAM2>?

1. Yes
2. No [THANK AND TERMINATE]

[ASK IF SC2=1]
SC3. We would like to contact the person who is most knowledgeable about your company's participation in the <PROGRAM2>. Could you give us this person's name and phone number?

- 00. Yes
- 96. No
- 98. (Don't know)
- 99. (Refused)

[IF SC3=1, TAKE DOWN NAME AND NUMBER; ELSE THANK AND TERMINATE, please read "Thank you for your time and help with this study"]

Sources of Information

I first have a few general questions.

S1. How did you first hear about the <PROGRAM2>? (Interviewer note: If respondent says Duke employee or representative, probe if it is an Account Manager or Business Energy Advisor. If not, record under 08 and note the type of Duke employee.)
- 1. (Duke Energy Account Manager)
- 2. (Duke Energy Business Energy Advisor)
- 3. (Duke Energy Website)
- 4. (Contractor/Trade Ally/Vendor)
- 5. (Email)
- 6. (Bill insert)
- 7. (Friend/colleague/word of mouth)
- 08. (Duke Energy Employee – Other, specify)
- 00. (Other, specify)
- 98. (Don't know)
- 99. (Refused)

S2. Had <COMPANY> participated in the <PROGRAM1> before?
- 1. Yes
- 2. No
- 8. (Don't know)
- 9. (Refused)

Free Ridership Module

My next few questions are about the <TECHNOLOGY> project that you implemented through the <PROGRAM2> at <ADDRESS>. Based on my records, the <TECHNOLOGY> project included the following measures:
- <MEAS1>
- <MEAS2>
- <MEAS3>
- <MEAS4>
- [READ IF MEAS_COUNT>4]: As well as other <TECHNOLOGY> measures.

[READ IF TUNEUP=1: Note that some questions in this survey refer to energy efficient “equipment”. For those questions, please think about the chiller tune ups for which you received an incentive.]

Selection of the Equipment

V1a. [IF TUNEUP=0: Did a contractor or vendor help you with the SELECTION of this equipment? / IF TUNEUP=1: Did a contractor recommend that you perform the tune up?]
- 1. Yes
- 2. No
- 8. (Don't Know)
- 9. (Refused)

[ASK IF V1a=1]
V1b. Who was the contractor or vendor you worked with? (Interviewer note: We are looking for the company name, not the individual.) [OPEN END]

[SKIP IF TUNEUP=1]
V2a. Did a contractor or vendor help you with the INSTALLATION of this equipment?
1. Yes
2. No
8. (Don't Know)
9. (Refused)

[ASK IF V2a=1]
V2b. Who was the contractor or vendor you worked with? (Interviewer note: We are looking for the company name, not the individual.) [OPEN END; 96=SAME CONTRACTOR]

V3. Do you work directly with any of the following Duke Energy representatives regarding energy efficiency? Do you work with … [1=Yes, 2=No, 8=Don't know, 9=Refused]
a. Duke Energy Account Managers?
b. Duke Energy Business Energy Advisors?
c. Duke Energy Energy Efficiency Engineers?
d. <PROGRAM2> staff?

V4. Thinking about the <TECHNOLOGY> equipment for which you received the incentive from Duke Energy, who was most influential in identifying and recommending the <TECHNOLOGY> equipment? (Note to interviewer: If they mention someone from Duke, please probe for response options 4-7).
01. (me/respondent)
02. (someone else from within the company)
03. (contractor/vendor)
04. (Duke Energy Account Manager)
05. (Duke Energy Business Energy Advisor)
06. (Duke Energy/<PROGRAM2> Staff)
07. (Duke Energy/Energy Efficiency Engineer)
00. (Other, specify)
98. (Don't know)
99. (Refused)

Timing of Decision Making

N1. When did you first learn about Duke Energy's <PROGRAM2>? Was it BEFORE or AFTER you selected the <TECHNOLOGY> equipment for which you received the incentive?
1. (Before)
2. (After)
8. (Don't know)
9. (Refused)

[ASK IF N1=2]
N2. Just to confirm, you found out about the incentive available through Duke Energy's <PROGRAM2> after you had already decided to implement the energy efficient <TECHNOLOGY> project?
01. Yes, after

02. No, before
00. (Other, specify)
98. (Don't know)
99. (Refused)

Rating of Factors

N3. My next few questions are about your decision to select energy efficient equipment rather than a less efficient alternative. Specifically, I would like you to rate the importance of Duke Energy's <PROGRAM2> as well as other factors that might have influenced your decision to select the energy efficient <TECHNOLOGY> equipment.

I will read you a list of factors. For each factor, please rate its importance on a scale from 0 to 10, where 0 means "not at all important" and 10 means "extremely important". If something does not apply, please let me know.

How important in your selection of the energy efficient equipment was... [RECORD 0 to 10; 96=Not Applicable; 98=Don't Know; 99=Refused] [ROTATE]

(Interviewer Note: Prompt for a numeric rating if not given, for example "So what rating would that be, on a 0 to 10 scale?"... If respondent says "We would not have done it", prompt with "So would you rate that as extremely important, or a 10 on a 0 to 10 scale?")

a. [ASK IF S2=1] Your previous experience with the <PROGRAM2>
b. The availability of the PROGRAM incentive
c. [ASK IF V1a=1] A recommendation from the vendor or contractor who helped you with the choice of the equipment
d. Previous experience with this type of equipment
e. [ASK IF V3a=1 OR V3b=1 OR V3c=1 OR V3d=1 OR V4=4,5,6,7] A recommendation from a Duke Energy representative (IF NEEDED: This could be an Account Manager, Business Advisor, Energy Efficiency Engineer, or <PROGRAM2> staff)
f. Information from <PROGRAM2> or Duke Energy marketing materials
g. Standard practice in your business or industry
h. Corporate policy or guidelines
i. Financial criteria, such as payback or return on the investment
j. The expected energy savings

N3o. Were there any other factors I haven't asked about that were influential in your decision to select the energy efficient <TECHNOLOGY> equipment? [OPEN END; 96=Nothing else influential]

[ASK IF N3o=00]
N3oo. Using the same 0 to 10 scale, where 0 means "not at all important" and 10 means "extremely important", how would you rate the influence of this factor (IF NEEDED: <N3o RESPONSE>)? [RECORD 0 to 10; 98=Don't Know; 99=Refused]

[ASK IF N3d=8,9,10 AND S2=1]
N3dx. You indicated that previous experience with this type of equipment was important in your decision to select the energy efficient <TECHNOLOGY> equipment. Was this previous experience associated with

equipment you installed with an earlier Duke Energy incentive, or did you install that equipment on your own?

1. (With Duke Energy incentive)
2. (On my own/No Duke Energy incentive)
3. (Both)
8. (Don't know)
9. (Refused)

[ASK IF N3i=8,9,10]

N3ix. You indicated that financial criteria were important in your decision to select the energy efficient <TECHNOLOGY> equipment. Which of the following statements best applies to this project:

01. The <PROGRAM2> rebate moved the project within the acceptable range of our financial criteria
02. The project met our required financial criteria even without the rebate
03. The project didn’t meet our required financial criteria, even with the rebate
00. (Other, specify)
98. (Don’t know)
99. (Refused)

[ASK IF N3j=8,9,10]

N3jx. You indicated that the expected energy savings were important in your decision to select the energy efficient <TECHNOLOGY> equipment. How did you find out about the savings this equipment could achieve?

01. (contractor/vendor)
02. (Duke Energy Account Manager)
03. (Duke Energy Business Energy Advisor)
04. (Duke Energy Program Staff)
05. (Prior experience with equipment)
00. (Other, specify)
98. (Don’t know)
99. (Refused)

Relative Importance of Program and Other Factors

Thinking about this differently, I would like you to compare the importance of the Duke Energy <PROGRAM2> with the importance of other factors in your decision to select the energy efficient <TECHNOLOGY> equipment.

N4. To make this comparison, assume you have a TOTAL of 100 points that reflect the influence on your decision to install the energy efficient <TECHNOLOGY> equipment. I would now like you to SPLIT those 100 points between: (1) the <PROGRAM2>, including support from Duke Energy staff; and (2) other factors.

How many points would you give to the importance of… [RECORD 0 to 100; 998=Don’t Know; 999=Refused]

N4a. the <PROGRAM2>, including support from Duke Energy staff
N4b. other factors

[CALCULATE VARIABLE “TOTALPTS” AS: N4a + N4b; IF N4a=998, 999 OR N4b=998, 999, SET “TOTALPTS”=ZERO]

N4x. [READ IF TOTALPTS<>100 OR BLANK] The points you gave to the program and to other factors should add up to 100, but they currently add up to <TOTALPTS>. Let’s go back to the points you would give to the program and to other factors.
1. (Ok, go back) [GO BACK TO N4a AND N4b]
2. (No, don’t go back) [GO TO NEXT QUESTION]

Consistency Check #1: Program Factor Ratings Vs. Relative Importance of Program

[ASK IF (N4a>70 AND ALL OF (N3a, N3b, N3e, N3f)=MISSING,0,1,2)]

CC1a. You just gave <N4a RESPONSE> points to the importance of the program. I would interpret that to mean that the program was quite important to your decision to install the <TECHNOLOGY> equipment. But earlier, when I asked about the importance of individual elements of the program, I recorded some answers that would imply that they were not that important to you.

Specifically, you provided the following importance ratings:

- [SHOW IF N3a<>MISSING] <N3a RESPONSE> for your previous experience with the <PROGRAM2>
- <N3b RESPONSE> for the program incentive
- [SHOW IF N3e<>MISSING] <N3e RESPONSE> for the recommendation from a Duke Energy representative
- <N3f RESPONSE> for the Information from <PROGRAM2> or Duke Energy marketing materials

Just to make sure I understand this properly, can you explain how the <PROGRAM2> was important in your decision to install the energy efficient equipment? [OPEN END]

[ASK IF N4a<30 AND ANY ONE OF (N3a, N3b, N3e, N3f=8,9,10)]

CC1b. You just gave <N4a RESPONSE> points to the importance of the program. I would interpret that to mean that the program was not very important to your decision to install the <TECHNOLOGY> equipment. But earlier, when I asked about the importance of individual elements of the program, I recorded some answers that would imply that they were very important to you.

Specifically, you provided the following importance ratings:

- [SHOW IF N3a>7] <N3a RESPONSE> for your previous experience with the <PROGRAM2>
- [SHOW IF N3b>7] <N3b RESPONSE> for the program incentive
- [SHOW IF N3e>7] <N3e RESPONSE> for the recommendation from a Duke Energy representative
- [SHOW IF N3f>7] <N3f RESPONSE> for the Information from the <PROGRAM2> or Duke Energy marketing materials

Just to make sure I understand this properly, can you explain why the <PROGRAM2> was not very important in your decision to install the energy efficient equipment? [OPEN END]

CC1c. Would you like to provide a new response for either the importance ratings or the points allocation or both?

1 (Change importance ratings)
2 (Change points allocation)
3 (Change both)
4 (No, don't change)
8 (Don't know)
9 (Refused)

[ASK IF CC1c=1,3; READ BACK OLD RESPONSES, IF NECESSARY; RECORD 0 to 10; 96=Not Applicable; 98=Don't Know; 99=Refused]
How important in your selection of the energy efficient equipment was… (Repeat scale, if needed)

[SHOW IF (N4a>70 AND N3a=0,1,2) OR (N4a<30 AND N3a=8,9,10)] N3a_NEW: your previous experience with the <PROGRAM2>
[SHOW IF (N4a>70 AND N3b=0,1,2) OR (N4a<30 AND N3b=8,9,10)] N3b_NEW: the program incentive
[SHOW IF (N4a>70 AND N3e=0,1,2) OR (N4a<30 AND N3e=8,9,10)] N3e_NEW: the recommendation from a Duke Energy representative
[SHOW IF (N4a>70 AND N3f=0,1,2) OR (N4a<30 AND N3f=8,9,10)] N3f_NEW: the Information from the <PROGRAM2> or Duke Energy marketing materials
[ASK IF CC1c=2,3; READ BACK OLD RESPONSES, IF NECESSARY; RECORD 0 to 100; 998=Don't Know; 999=Refused]
N4a_NEW: How many points would you give to the <PROGRAM2>?
N4b_NEW: How many points would you give to other factors?

[MAP ORIGINAL RESPONSES INTO THESE NEW VARIABLES FOR RESPONDENTS WHO DID NOT TRIGGER THE CONSISTENCY CHECK; CREATE NEW VARIABLES= "##_UPD".]

Likelihood of Installation without Program (Counterfactual)

Now I would like you to think about the action you WOULD HAVE taken with regard to the installation of this <TECHNOLOGY> equipment if the <PROGRAM2> HAD NOT BEEN available.

N5. Without the program, what is the likelihood that the equipment would have had the same efficiency level? Please use a scale from 0 to 10, where 0 is "Not at all likely" and 10 is "Extremely likely". [RECORD 0-10; 98=Don't Know; 99=Refused]

[IF TUNEUP=1 SKIP TO N7a]
N6a. Without the program, would you have installed the same quantity of <u>energy efficient</u> equipment in <DATE> or would you have installed less?
1. Same quantity
2. Less
3. (More)
8. (Don't know)
9. (Refused)

[ASK IF N6a=2, ELSE SKIP TO CC2a]

N6b. As best as you can, please estimate the percentage of the energy efficient <TECHNOLOGY> equipment that you would have installed in <DATE> without the program. [NUMERIC OPEN END, 0 to 100%; 998=Don't Know; 999=Refused]

[IF N6b<=100% CALCULATE N_INSTALL = 100% – N6b]

[ASK IF N6b<50%]

N6c. Why would you have installed that much less energy efficient equipment? [OPEN END]

[ASK IF N6b<100%]

N7. Without the program, would you have installed the remaining <N_INSTALL> percent of the energy efficient <TECHNOLOGY> equipment at a later time?

1. Yes
2. No
8. (Don't Know)
9. (Refused)

[ASK IF N7=1 OR IF TUNEUP=1]

N7a. Without the program, when do you think you would have installed the energy efficient <TECHNOLOGY> equipment? Please answer relative to the date that you ACTUALLY installed the equipment.

01. (at the same time)
02. (up to 6 months later)
03. (7 months to 1 year later)
04. (more than 1 year up to 2 years later)
05. (more than 2 years up to 3 years later)
06. (more than 3 years up to 4 years later)
07. (more than 4 years later)
08. (Never)
98. (Don't know)
99. (Refused)

[ASK IF N7a=4,5,6,7]

N7b. Why would it have been that much later? [OPEN END]

Consistency Check #2: Incentive Rating Vs. Likelihood

[ASK IF N3b_UPD=8,9,10 AND N5=8,9,10; ELSE SKIP TO ADDITIONAL PROJECTS]

I have a follow-up question on one of your earlier responses.

CC2a. When you answered <N3b_UPD RESPONSE> for the question about the influence of the incentive, I would interpret that to mean that the incentive was quite important in your selection of the efficiency level. Then, when you answered <N5 RESPONSE> for how likely you would be to install the same level of efficiency without the incentive, it sounds like the incentive was not very important.

I want to check to see if I am misunderstanding your answers or if the questions may have been unclear. Will you explain the role the incentive played in your decision to install this efficient equipment? [OPEN END]

CC2b. Would you like me to change your score on the importance of the incentive, which you gave a rating of <N3b_UPD RESPONSE>, or change the likelihood you would have installed the same level of efficiency without the incentive which you gave a rating of <N5 RESPONSE>? Or we can change both if you wish?

1. (Change importance of incentive rating)
2. (Change likelihood to install the same equipment rating)
3. (Change both)
4. (No, don't change)
8. (Don't know)
9. (Refused)

[ASK IF CC2b=1,3; READ BACK OLD RESPONSES, IF NECESSARY; RECORD 0 to 10; 98=Don't Know; 99=Refused]
N3b_NEW2: How important in your selection of the energy efficient equipment was the program incentive (Repeat scale, if needed)

[ASK IF CC2b=2,3; READ BACK OLD RESPONSES, IF NECESSARY; RECORD 0 to 10; 98=Don't Know; 99=Refused]
N5_NEW: likelihood of installing the same efficiency level without the program (Repeat scale, if needed)

[MAP ORIGINAL RESPONSES INTO THESE NEW VARIABLES FOR RESPONDENTS WHO DID NOT TRIGGER THE CONSISTENCY CHECK; CREATE NEW VARIABLES= "N3b_FNL" AND "N5_FNL".]

Spillover Module

Thank you for discussing the <TECHNOLOGY> project that you completed through the <PROGRAM2>. Next, I would like to discuss any energy efficiency improvements you might have made without receiving an incentive from Duke Energy.

SP1a. Since receiving the incentive for the project we just discussed, did you make any ADDITIONAL energy efficiency improvements at this facility or at your other facilities within Duke Energy's [IF DEC: Carolinas; IF DEP: Progress] service territory that did NOT receive an incentive from Duke Energy?

1. Yes
2. No
8. (Don't know)
9. (Refused)

[ASK IF SP1a=1, ELSE SKIP TO PROCESS MODULE]

SP1b. Have you applied, or do you still plan to apply, for a Duke Energy incentive for these energy efficiency improvements?

1. Yes
2. No
8. (Don't know)
9. (Refused)

[ASK IF SP1b=2, ELSE SKIP TO PROCESS MODULE]

SP2a. On a scale of 0-10, where 0 means "no influence" and 10 means "greatly influenced," how much did your experience with the <PROGRAM1> influence your decision to install high efficiency equipment on your own? [SCALE 0-10; 98=Don't know, 99=Refused]

SP2b. If you had NOT participated in the <PROGRAM1>, how likely is it that <COMPANY> would still have installed this additional energy efficient equipment? Please use a 0 to 10 scale, where 0 means you "definitely WOULD NOT have implemented this equipment" and 10 means you "definitely WOULD have implemented this equipment". [SCALE 0-10; 98=Don't know, 99=Refused]

[CALCULATE SP_SCORE:

- IF SP2a<>98,99 AND SP2b<>98,99, THEN SP_SCORE = (SP2a+(10-SP2b))/2
- IF SP2a<>98,99 AND SP2b=98,99, THEN SP_SCORE = SP2a
- IF SP2a=98,99 AND SP2b<>98,99, THEN SP_SCORE = 10-SP2b]

[ASK IF SP_SCORE>7, ELSE SKIP TO PROCESS MODULE]

SP2c. How did your experience with the <PROGRAM2> influence your decision to install high efficiency equipment on your own? [OPEN END]

First Spillover Measure

SP3a. What was the first energy efficient improvement that you made without a Duke Energy incentive? (IF RESPONSE IS GENERAL, E.G., "LIGHTING EQUIPMENT", PROBE FOR SPECIFIC MEASURE. PROBE FROM LIST, IF NECESSARY.)

1. (Lighting: LED lamps)
2. (Lighting: T8 lamps) (Note that this is a type of linear fluorescent lamps)
3. (Lighting: T5 lamps) (Note that this is a type of linear fluorescent lamps)
4. (Lighting: Highbay Fixtures)
5. (Lighting: CFLs)
6. (Lighting: Controls or Occupancy sensors)
7. (Cooling: Chiller)
8. (Cooling: Unitary/Split Air Conditioning System)
9. (Motors: Variable Frequency Drives (VFD/VSD))
10. (Motors: Efficient motors)
11. (Food service products: Anti-sweat controls)

12. (Food service products: EC motor for WALK-IN cooler/freezer)
13. (Food service products: EC motor for REACH-IN cooler/freezer)
14. (Process equipment)
15. (Information technology)
00. (Other, specify)
96. (Didn't install any measures)
98. (Don't know)
99. (Refused)

[SKIP TO PROCESS MODULE IF SP3a=96, 98, 99]
[ASK IF SP3a=1-6, ELSE SKIP TO SP3e]
SP3b. How many <SP3a RESPONSE> did you install without receiving an incentive (IF NEEDED: Probe for best estimate) [NUMERIC OPEN END; 0-995; Don't know=998, Refused=999]
SP3c. Generally, what type of light bulbs did the <SP3a RESPONSE> [READ IF SP3a=1-5: replace; READ IF SP3a=6: control]?
1. (Incandescent lamps)
2. (CFLs)
3. (LEDs)
4. (Halogen lamps)
5. (Linear fluorescent T12s)
6. (Linear fluorescent T8s)
00. (Other – specify)
98. (Don't know)
99. (Refused)

SP3d. Were the majority of <SP3a RESPONSE> installed in areas that use space cooling and heating?
1. (Cooling Only)
2. (Heating Only)
3. (Cooling and Heating)
4. (Neither Cooling nor Heating)
8. (Don't know)
9. (Refused)

SP3e. Why did you purchase the <SP3a RESPONSE> without an incentive from the <PROGRAM2>? [MULTIPLE RESPONSE, UP TO 3]
01. (Takes too long to get approval)
02. (No time to participate, needed equipment immediately)
03. (The equipment did not qualify)
04. (The amount of the incentive wasn't large enough)
05. (Did not know the program was available)
06. (There was no program available)
07. (Had reached the maximum incentive amount)
00. (Other, specify)
98. (Don't know)
99. (Refused)

[ASK IF SP3e=3]
SP3ee. Why didn't the equipment qualify? [OPEN END]

SP3f. Did a contractor or vendor help you with the SELECTION of this equipment?
1. Yes
2. No
8. (Don't Know)
9. (Refused)

[ASK IF SP3f=1]
SP3ff. Who was the contractor or vendor you worked with? (Interviewer note: We are looking for the company name, not the individual.) [OPEN END]

Second Spillover Measure

SP4. Did you implement any other energy efficient measures without a Duke Energy incentive?
1. Yes
2. No
8. (Don't know)
9. (Refused)

[ASK IF SP4=1, ELSE SKIP TO SP6]
SP4a. What other measure did you implement? (IF RESPONSE IS GENERAL, E.G., "LIGHTING EQUIPMENT", PROBE FOR SPECIFIC MEASURE. PROBE FROM LIST, IF NECESSARY.)
1. (Lighting: LED lamps)
2. (Lighting: T8 lamps) (Note that this is a type of linear fluorescent lamps)
3. (Lighting: T5 lamps) (Note that this is a type of linear fluorescent lamps)
4. (Lighting: Highbay Fixtures)
5. (Lighting: CFLs)
6. (Lighting: Controls or Occupancy sensors)
07. (Cooling: Chiller)
08. (Cooling: Unitary/Split Air Conditioning System)
09. (Motors: Variable Frequency Drives (VFD/VSD))
10. (Motors: Efficient motors)
11. (Food service products: Anti-sweat controls)
12. (Food service products: EC motor for WALK-IN cooler/freezer)
13. (Food service products: EC motor for REACH-IN cooler/freezer)
14. (Process equipment)
15. (Information technology)
00. (Other, specify)
96. (There was no second measure)
98. (Don't know)
99. (Refused)

[ASK IF SP4a=1-6, ELSE SKIP TO SP4e]
SP4b. How many <SP4a RESPONSE> did you install without receiving an incentive (IF NEEDED: Probe for best estimate) [NUMERIC OPEN END; 0-995; Don't know=998, Refused=999]

SP4c. Generally, what type of light bulbs did the <SP4a RESPONSE> [READ IF SP4a=1-5: replace; READ IF SP4a=6: control]?

1. (Incandescent lamps)
2. (CFLs)
3. (LEDs)
4. (Halogen lamps)
5. (Linear fluorescent T12s)
6. (Linear fluorescent T8s)

00. (Other – specify)
98. (Don't know)
99. (Refused)

SP4d. Were the majority of <SP4a RESPONSE> installed in areas that use space cooling and heating?

1. (Cooling Only)
2. (Heating Only)
3. (Cooling and Heating)
4. (Neither Cooling nor Heating)
8. (Don't know)
9. (Refused)

SP4e. Why did you purchase the <SP4a RESPONSE> without an incentive from the <PROGRAM2>? [MULTIPLE RESPONSE, UP TO 3]

01. (Takes too long to get approval)
02. (No time to participate, needed equipment immediately)
03. (The equipment did not qualify)
04. (The amount of the incentive wasn't large enough)
05. (Did not know the program was available)
06. (There was no program available)
07. (Had reached the maximum incentive amount)
00. (Other, specify)
98. (Don't know)
99. (Refused)

[ASK IF SP4e=3]
SP4ee. Why didn't the equipment qualify? [OPEN END]

SP4f. Did a contractor or vendor help you with the SELECTION of this equipment?

1. Yes
2. No
8. (Don't Know)
9. (Refused)

[ASK IF SP4f=1]
SP4ff. Who was the contractor or vendor you worked with? (Interviewer note: We are looking for the company name, not the individual.) [OPEN END; 96=Same as for other measure, 98=Don't know, 99=Refused]

Third Spillover Measure

SP5. Did you implement any other energy efficient measures without a Duke Energy incentive?

1. Yes

2. No
8. (Don't know)
9. (Refused)

[ASK IF SP5=1, ELSE SKIP TO SP6]

SP5a. What other measure did you implement? (IF RESPONSE IS GENERAL, E.G., "LIGHTING EQUIPMENT", PROBE FOR SPECIFIC MEASURE. PROBE FROM LIST, IF NECESSARY.)

1. (Lighting: LED lamps)
2. (Lighting: T8 lamps) (Note that this is a type of linear fluorescent lamps)
3. (Lighting: T5 lamps) (Note that this is a type of linear fluorescent lamps)
4. (Lighting: Highbay Fixtures)
5. (Lighting: CFLs)
6. (Lighting: Controls or Occupancy sensors)
07. (Cooling: Chiller)
08. (Cooling: Unitary/Split Air Conditioning System)
09. (Motors: Variable Frequency Drives (VFD/VSD))
10. (Motors: Efficient motors)
11. (Food service products: Anti-sweat controls)
12. (Food service products: EC motor for WALK-IN cooler/freezer)
13. (Food service products: EC motor for REACH-IN cooler/freezer)
14. (Process equipment)
15. (Information technology)
00. (Other, specify)
96. (There was no third measure)
98. (Don't know)
99. (Refused)

[ASK IF SP5a=1-6, ELSE SKIP TO SP5e]

SP5b. How many <SP5a RESPONSE> did you install without receiving an incentive (IF NEEDED: Probe for best estimate) [NUMERIC OPEN END; 0-995; Don't know=998, Refused=999]

SP5c. Generally, what type of light bulbs did the <SP5a RESPONSE> [READ IF SP5a=1-5: replace; READ IF SP5a=6: control]?

1. (Incandescent lamps)
2. (CFLs)
3. (LEDs)
4. (Halogen lamps)
5. (Linear fluorescent T12s)
6. (Linear fluorescent T8s)
00. (Other – specify)
98. (Don't know)
99. (Refused)

SP5d. Were the majority of <SP5a RESPONSE> installed in areas that use space cooling and heating?

1. (Cooling Only)
2. (Heating Only)
3. (Cooling and Heating)
4. (Neither Cooling nor Heating)
8. (Don't know)
9. (Refused)

SP5e. Why did you purchase the <SP5a RESPONSE> without an incentive from the <PROGRAM2>? [MULTIPLE RESPONSE, UP TO 3]

01. (Takes too long to get approval)
02. (No time to participate, needed equipment immediately)
03. (The equipment did not qualify)
04. (The amount of the incentive wasn't large enough)
05. (Did not know the program was available)
06. (There was no program available)
07. (Had reached the maximum incentive amount)
00. (Other, specify)
98. (Don't know)
99. (Refused)

[ASK IF SP5e=3]
SP5ee. Why didn't the equipment qualify? [OPEN END]

SP5f. Did a contractor or vendor help you with the SELECTION of this equipment?

1. Yes
2. No
8. (Don't Know)
9. (Refused)

[ASK IF SP5f=1]
SP5ff. Who was the contractor or vendor you worked with? (Interviewer note: We are looking for the company name, not the individual.) [OPEN END; 96=Same as for other measure, 98=Don't know, 99=Refused]

SP6. Thank you for sharing this information with us. We may have follow-up questions about the equipment you installed without an incentive. Would you be willing to speak briefly with a member of our team?
(IF NEEDED: This follow-up survey would happen within a few weeks of this interview and would only take a few minutes.)

00. Yes [RECORD NAME AND PHONE NUMBER]
96. No
98. (Don't know)
99. (Refused)

Process Module

My final set of questions are about your experience and satisfaction with the <PROGRAM1>.

Business Energy Advisors

[ASK IF V3b<>1]

B0. Have you ever communicated with a Duke Energy Business Energy Advisor about energy efficiency or the energy efficiency programs that Duke offers for their business customers? (IF NEEDED: This could be by phone, email, or in person.) (IF NEEDED: Business Energy Advisors are Duke staff that work with small and medium sized businesses to provide them information about energy efficiency opportunities in the <PROGRAM2>, and assist them with the participation process.)

1. Yes
2. No
8. (Don't know)
9. (Refused)

[ASK IF B0=1 OR V3b=1, ELSE SKIP TO EE1]

B1. [READ IF V3b=1: You noted earlier that you worked with a Duke Energy Business Energy Advisor.] How did you first come into contact with the Business Energy Advisor? Did you…

01. Receive a call or email from the advisor?
02. Reach out to the advisor via phone or email?
03. Contact the advisor through the Duke Energy website?
00. (Other, specify)
98. (Don't know)
99. (Refused)

B2. Approximately, how many times did you have contact with the Business Energy Advisor, either via phone, email, or in-person? [NUMERIC OPEN END; 1-80; 98=Don't know, 99=Refused]

B3. What aspects of the <TECHNOLOGY> project did the advisor help you with?

01. (Project scoping)
02. (The application process)
03. (Identifying and contacting a trade ally)
04. (Answering questions about available program incentives)
00. (Other, specify)
98. (Don't know)
99. (Refused)

B4. How influential was the Business Energy Advisor in your decision to participate in the <PROGRAM2>. Would you say…

1. Very influential
2. Somewhat influential
3. Not very influential
4. Not at all influential
8. (Don't know)
9. (Refused)

B5a. On a scale of 0 to 10, where 0 is “Extremely Dissatisfied” and 10 is “Extremely Satisfied”, how would you rate your satisfaction with the Business Energy Advisor with whom you worked? [SCALE 0-10; 98=Don’t know, 99=Refused]

[ASK IF B5a<5]
B5b. Why did you give that rating? [OPEN END]

Energy Efficiency Store

EE1. Are you aware that Duke Energy has an online Energy Efficiency Store for business customers, where customers can purchase energy efficiency products at a discounted price?
1. Yes
2. No
8. (Don’t know)
9. (Refused)

[ASK IF EE1=1]
EE2. Have you ever visited the Energy Efficiency Store’s webpage?
1. Yes
2. No
8. (Don’t know)
9. (Refused)

[ASK IF EE2=1]
EE3. Have you ever purchased energy efficient equipment from the online Energy Efficiency Store?
1. Yes
2. No
8. (Don’t know)
9. (Refused)

[ASK IF EE3=1]
EE4a. On a scale of 0 to 10, where 0 is “Extremely Dissatisfied” and 10 is “Extremely Satisfied”, how would you rate your satisfaction with your use of the Energy Efficiency Store? [SCALE 0-10; 98=Don’t know, 99=Refused]

[ASK IF EE4a<5]
EE4b. Why did you give that rating? [OPEN END]

[READ IF EE1<>1 or EE2<>1: The online Energy Efficiency Store offers customers instant incentives on the purchase of a limited number of measures. The incentives in the Store are consistent with the incentives offered through the regular <PROGRAM1>.]

EE5a. How likely are you to make a purchase through Duke Energy’s Energy Efficiency Store within the next year? Would you say…
1. Very likely
2. Somewhat likely
3. Not very likely
4. Not at all likely
6. (Need more information)

8. (Don't know)
9. (Refused)

[ASK IF EE5a=3,4]
EE5b. Why are you not likely to make a purchase through the Energy Efficiency Store?
01. (Don't have enough information)
02. (Don't need any new equipment)
03. (Equipment I need is not available)
04. (Incentives aren't high enough)
00. (Other, specify)
98. (Don't know)
99. (Refused)

Online Customer Portal

OP1. Are you aware that Duke Energy has a customer portal where customers can submit applications for energy efficiency projects and track the status of their applications?
1. Yes
2. No
8. (Don't know)
9. (Refused)

[ASK IF OP1=1]
OP2. Have you ever used the online portal?
1. Yes
2. No
8. (Don't know)
9. (Refused)

[ASK IF OP2=1]
OP3. How did you use the online portal? [MULTIPLE RESPONSE, UP TO 3]
01. (Submit applications)
02. (Track status of applications)
00. (Other, specify)
98. (Don't know)
99. (Refused)

[ASK IF OP2=2]
OP4. Why have you not used the online portal? [OPEN END; 96=No specific reason, 98=Don't know, 99=Refused]

Satisfaction

SAT1. I'm interested in how satisfied you are with different aspects of the <PROGRAM1>. On a scale of 0 to 10, where 0 is "Extremely Dissatisfied" and 10 is "Extremely Satisfied", how would you rate your satisfaction with… (Interviewer note: these satisfaction questions are asking specifically about Duke's prescriptive, not custom, program. Respondents may have participated in both. If there is uncertainty from the respondent about which we are referring to, please clarify that we are asking about prescriptive) [SCALE 0-10; 96=Not applicable, 98=Don't know, 99=Refused] [ROTATE]

a. The application process
b. The measures that are eligible for incentives through the <PROGRAM1>
c. The incentive levels
d. [ASK IF V2a=1] The contractor who helped you install the equipment
e. Your interactions with <PROGRAM1> staff
f. The <PROGRAM1> overall [ANCHOR]

[ASK IF SAT1a<5]
SAT2a. Your response suggests that you are not fully satisfied with the application process. Why did you give this rating? [OPEN END]

[ASK IF SAT1b<5]
SAT2b. Your response suggests that you are not fully satisfied with the measures eligible for incentives. What specific measures would you like the program to add? [OPEN END]

[ASK IF SAT1c<5]
SAT2c. Your response suggests that you are not fully satisfied with the incentive levels. Which measures do you think should have different incentive levels? [OPEN END]

[ASK IF SAT1d<5]
SAT2d. Your response suggests that you are not fully satisfied with the contractor who helped you install the equipment. Why did you give this rating? [OPEN END]

[ASK IF SAT1e<5]
SAT2e. Your response suggests that you are not fully satisfied with your interactions with <PROGRAM1> staff. Why did you give this rating? [OPEN END]

[ASK IF SAT1f<5]
SAT2f. Your response suggests that you are not fully satisfied with the <PROGRAM1> overall. Why did you give this rating? [OPEN END]

SAT3a. How likely are you to participate in the <PROGRAM1> again, within the next year? Would you say…

1. Very likely
2. Somewhat likely
3. Not very likely
4. Not at all likely
8. (Don't know)
9. (Refused)

[ASK IF SAT3a=3,4]
SAT3b. Why are you not likely to participate in the program again?

01. (Was not satisfied with the program)
02. (Don't need any new equipment)
03. (Equipment I need is not available)
04. (Incentives aren't high enough)
00. (Other, specify)
98. (Don't know)
99. (Refused)

SAT4a. How likely are you to recommend the <PROGRAM1> to other businesses like yours? Would you say...
1. Very likely
2. Somewhat likely
3. Not very likely
4. Not at all likely
8. (Don't know)
9. (Refused)

[ASK IF SAT4a=3,4]
SAT4b. Why are you not likely to recommend the <PROGRAM1> to other businesses?
01. (Was not satisfied with the program)
02. (Selection of eligible equipment)
03. (Incentives levels)
04. (Paperwork/Application process)
00. (Other, specify)
98. (Don't know)
99. (Refused)

Barriers to Participation

BR1a. What do you view as the main barriers, if any, to participating in the <PROGRAM1>? [MULTIPLE RESPONSE, UP TO 5]
01. (Paperwork/Application process/Time required to complete application)
02. (Selection of equipment available through the <PROGRAM1>)
03. (Incentive levels)
04. (Knowledge of incentives and eligible products)
00. (Other, specify)
96. (None – don't see any barriers)
97. (Same as just mentioned)
98. (Don't know)
99. (Refused)

[SKIP IF BR1a=96,98,99]
BR1b. What could Duke Energy do to reduce these barriers to participation in the <PROGRAM1>? [OPEN END]

BR2. And more generally, what do you view as the main barriers to making energy efficient improvements at your facility? [MULTIPLE RESPONSE, UP TO 5] (IF NEEDED: This is independent of participation in the program.)
01. (Higher cost of energy efficient equipment)
02. (Access to financing or capital for energy improvements)

03. (Difficulty finding information on how to improve energy efficiency)
04. (Uncertainty about the savings from energy efficiency improvements)
05. (Lease structure / We are renters)
06. (Difficult to find contractors)
00. (Other, specify)
96. (None – don't see any barriers)
98. (Don't know)
99 (Refused)

Firmographics

You are almost done! I just have a few general questions about your company.

F1. What is the business type of the facility located at <ADDRESS>? (PROBE, IF NECESSARY)
01. (K-12 School)
02. (College/University)
03. (Grocery)
04. (Medical)
05. (Hotel/Motel)
06. (Light Industry)
07. (Heavy Industry)
08. (Office)
09. (Restaurant)
10. (Retail/Service)
11. (Government)
00. (Other, specify)
98. (Don't know)
99. (Refused)

F2. Which of the following best describes the ownership of this facility?
1. My company owns and occupies this facility
2. My company owns this facility but it is rented to someone else
3. My company rents this facility
8. (Don't know)
9. (Refused)

F3a. How many employees, full plus part-time, are employed at this facility? [NUMERIC OPEN END, 0 TO 2000; 9998=Don't know, 9999=Refused]

[ASK IF F3a=9998]

F3b. Do you know the approximate number of employees? Would you say it is…?

1. Less than 10
2. 10-49
3. 50-99
4. 100-249
5. 250-499
6. 500 or more
8. (Don't know)
9. (Refused)

F4. What is the primary heating fuel for your facility?

1. (Electricity)
2. (Gas)
00. (Other – specify)
98. (Don't know)
99. (Refused)

Those are all the questions I have for you today. Thank you again for your participation!

Appendix E. Trade Ally Online Survey Instrument

Opinion Dynamics

DEC Smart $aver® Prescriptive Incentive Program / DEP Energy Efficiency for Business Program

Trade Ally Internet Survey

May 26, 2017 – FINAL

Sample Variables

<PROGRAM1>	IF DEC (1): Smart $aver Prescriptive Incentive Program IF DEP (2): Energy Efficiency for Business Program
<PROGRAM2>	IF DEC (1): Smart $aver Program IF DEP (2): Energy Efficiency for Business Program
<JURISDICTION>	IF DEC (1): Carolinas IF DEP (2): Progress
<NAME>	Trade ally contact name
<TRADEALLY_NAME>	Trade ally company name
<COUNT>	Number of projects completed by trade ally (from tracking database)
<EVALPERIOD>	IF DEC (1): August 2015 and February 2017 IF DEP (2): March 2016 and February 2017

Email Invitation

Email address: DukeEnergyResearch@opiniondynamics.com

Sender name: Duke Energy Research

Subject line: Duke Energy Needs Your Help - Important Trade Ally Survey

Dear <NAME>,

As a valued trade ally of the Duke Energy <JURISDICTION> <PROGRAM2>, we are interested in getting feedback regarding <TRADEALLY_NAME>’s experience in the program. The information collected in this survey is intended to help Duke Energy improve its <PROGRAM2> for both business customers and trade allies like you. To ensure that your responses are anonymous, Duke Energy has hired a third-party research firm, Opinion Dynamics, to conduct this survey.

You can access the survey by clicking on the link below:

[INSERT UNIQUE URL TO SURVEY]

If you would like to complete the survey in more than one session, or if you need to exit out of the survey for any reason, you can return to the last question you answered by clicking on the link from this email. You can use your computer, smart phone, or tablet to complete this survey.

Your assistance is critical to this important study. As a token of our appreciation, we will provide a $50 gift card to the first 30 trade allies that respond to this survey. In addition, we will raffle off ten more $50 gift cards among those responding by June 16th, 2017.

If you have any questions or difficulties completing this survey, please contact Opinion Dynamics, the company administering this survey, at nmckay@opiniondynamics.com. If you have any questions about this study, please feel free to contact Monica Redman at Monica.Redman@duke-energy.com or 513-287-3319.

Thank you in advance for your assistance!

Sincerely,

Monica Redman

Opening Screen

Thank you for agreeing to participate in this survey about Duke Energy's <PROGRAM1>. We are interested in your experience with the program and the impact it may have had on your business. Duke Energy plans to use the information from this survey to improve the energy efficiency programs and services it offers to its business customers.

All responses will remain confidential and will only be reported in aggregate with other responses.

If you experience any technical issues with this survey, please contact Opinion Dynamics, the company administering this survey, at nmckay@opiniondynamics.com.

Screening/Background

The first few questions are about <TRADEALLY_NAME> and its participation in Duke Energy's <PROGRAM 1>.

SC0a. Which of the following best describes your business?
- 01. Contractor
- 02. Engineering Firm
- 03. Energy Service Company (ESCO)
- 04. Equipment Vendor/Distributor
- 05. Equipment Manufacturer
- 00. Other [SPECIFY]

SC0b. What type of equipment, if any, is your company's area of expertise? *Please select all that apply.* [MULTIPLE RESPONSE; UP TO 5]
- 01. Lighting
- 02. HVAC

03. Process equipment
04. Motors, pumps, VFDs
05. Food service products
06. Information technology
07. Compressed air equipment
00. Other [SPECIFY]
96. No area of expertise

SC0c. For how many years has <TRADEALLY_NAME> participated in Duke Energy's <PROGRAM1>?
1. Less than a year
2. One year
3. Two years
4. Three years
5. Four years
6. Five years or more
8. Don't know

SC1. Our records indicate that <TRADEALLY_NAME> completed <COUNT> project(s) through the Duke Energy <JURISDICTION> <PROGRAM 1> between <EVALPERIOD>.

Do you recall <TRADEALLY_NAME> completing this number of projects?
1. Yes
2. No
8. Unsure

[ASK IF SC1=2 OR 8]
SC1a. Approximately how many projects did <TRADEALLY_NAME> complete through the Duke Energy <JURISDICTION> <PROGRAM1> between <EVALPERIOD>? [NUMERIC OPEN END; 9998=Don't know]

[ASK IF SC1a=0, 9998]
SC2. Is there someone else within the company who might know more about your company's involvement in the <PROGRAM1> in North or South Carolina?
1. Yes
2. No [THANK AND TERMINATE]

[ASK IF SC2=1]
SC3. We would like to contact the person who is knowledgeable about your company's involvement in the <PROGRAM1> in North or South Carolina. Could you give us this person's name and email address?
1. Yes [SPECIFY, THANK AND TERMINATE]
2. No [THANK AND TERMINATE]

Market Effects and Spillover Module

Program Influence on Business Practices

The next few questions are about the influence of the <PROGRAM1> on your business in the Duke Energy <JURISDICTION> service territory.

PI1. Since <TRADEALLY_NAME> became a <PROGRAM2> trade ally, have any of the following aspects changed and if so, by how much?

		1 - Did not Increase	2 - Increased Somewhat	3 - Increased Greatly
a	Your knowledge of high efficiency options	❍	❍	❍
b	Your comfort level in discussing the benefits of high efficiency equipment with your customers	❍	❍	❍
c	The percentage of sales situations in which you <u>recommend</u> high efficiency equipment	❍	❍	❍
d	The percentage of jobs in which <TRADEALLY_NAME> <u>installs</u> high efficiency equipment in Duke Energy's <JURISDICTION> service territory	❍	❍	❍
e	The total volume of high efficiency equipment <TRADEALLY_NAME> <u>installs</u> in Duke Energy's <JURISDICTION> service territory	❍	❍	❍

[ASK IF ANY IN PI1a-e=2 OR 3, ELSE SKIP TO Process Module]

PI2. Did the <PROGRAM2> (including the program incentive and any training, information, or other support that the program provided) contribute at all to these increases?

1 Yes
2 No
8 Don't know

[ASK IF PI2=1, ELSE SKIP TO Process Module]

PI3. On a scale of 0 to 10, where 0 is "not at all influential" and 10 is "extremely influential," please rate the influence of the <PROGRAM2> on the increase in... [SHOW ONLY ASPECTS WHERE PI1a-e=2 OR 3]

a	Your knowledge of high efficiency options	[0-10]
b	Your comfort level in discussing the benefits of high efficiency with your customers	[0-10]
c	The percentage of sales situations in which you <u>recommend</u> high efficiency equipment	[0-10]
d	The percentage of jobs in which <TRADEALLY_NAME> <u>installs</u> high efficiency equipment in the Duke Energy <JURISDICTION> service territory	[0-10]
e	The total volume of high efficiency equipment <TRADEALLY_NAME> installs in the Duke Energy <JURISDICTION> service territory	[0-10]

[ASK IF PI3d=6,7,8,9,10 OR PI3e=6,7,8,9,10, ELSE SKIP TO PI5]

PI4. Please describe how the <PROGRAM2> was influential in increasing…

a. [SHOW IF PI3d=6,7,8,9,10] the **percentage of jobs** in which <TRADEALLY_NAME> installs high efficiency equipment in the Duke Energy <JURISDICTION> service territory? [OPEN END]

b. [SHOW IF PI3e=6,7,8,9,10] the **total volume of high efficiency equipment** <TRADEALLY_NAME> installs in the Duke Energy <JURISDICTION> service territory? [OPEN END]

PI5. Did any factors, other than the <PROGRAM2>, contribute to the increases you mentioned?

1 Yes
2 No
8 Don't know

[ASK IF PI5=1]

PI5a. What were those factors? [OPEN END]

PI6a. Has your participation in the <PROGRAM2> affected your business practices in any other ways?

1 Yes
2 No
8 Don't know

[ASK IF PI6a=1]

PI6b. How has your participation in the <PROGRAM2> affected your business practices? [OPEN END]

Trade Ally Installations

For the next questions, please think about all of your jobs in Duke Energy's <JURISDICTION> service territory between <EVALPERIOD>.

TA1. Approximately what percentage of your total equipment installations (in terms of dollars) was…

Please provide your best estimate, if unsure of exact percentages. [0% TO 100%; 998=DON'T KNOW]

a Standard Efficiency [REQUIRE RESPONSE]
b High Efficiency - that DID RECEIVE an incentive from Duke Energy [REQUIRE RESPONSE]
c High Efficiency - that DID NOT RECEIVE an incentive from Duke Energy [REQUIRE RESPONSE]

Standard efficiency products meet the Federal minimum standard for energy consumption, but are no more energy-efficient than the standard requires.

IF ANY TA1a-c=MISSING, show error message: Please provide a response to each equipment category listed above. If you are unable to provide an estimate for a particular category, please select 'don't know'.

[CALCULATE "TOTAL %" TA1a+TA1b+TA1c]; IF NONE OF TA1a-c=998 AND TOTAL<>100%, show error message: The equipment breakdown you just provided sums to [TOTAL %] but it should sum to 100%. Would you please revise your answer so that it sums to 100%? If you are unable to provide an estimate for a particular category, please select 'don't know'.

Please click either arrow below to return to the previous page and revise your answer.

[ASK IF TA1c=998]

TA2a. Between <EVALPERIOD>, did any of your customers in Duke Energy's <JURISDICTION> service territory install high efficiency equipment that did not receive a Duke Energy incentive?

1. Yes
2. No
8. Don't know

[ASK IF TA2a=1]

TA2b. Approximately, how many of your projects in Duke Energy's <JURISDICTION> service territory between <EVALPERIOD> used high efficiency equipment but did not receive a <PROGRAM2> incentive? [NUMERIC OPEN END; 998=DON'T KNOW]

Spillover Determination

[SKIP TO PROCESS MODULE, IF TA1b=0% OR 100% OR TA1c=0% OR 100% OR TA2a=2,8]

For the following questions, please think about the [SHOW IF TA1c<>998: TA1c% of] installations <TRADEALLY_NAME> completed in Duke Energy's <JURISDICTION> service territory that were HIGH EFFICIENCY BUT THAT DID NOT RECEIVE AN INCENTIVE from Duke Energy.

SO1a. How influential was your recommendation on your customers' choice of high efficiency equipment over standard efficiency equipment?

Not at all Influential										Extremely Influential
0	1	2	3	4	5	6	7	8	9	10

SO1b. What type of high efficiency equipment did your customers install without an incentive from Duke Energy? [OPEN END]

SO1c. Why do you think that these customers did not participate in the <PROGRAM2> even though they installed high efficiency equipment? [OPEN END]

Relative Size of Projects

[SKIP TO PROCESS MODULE, IF PI3d<6 AND PI3e<6]

RS1a. In terms of cost, how large were the projects that installed high efficiency equipment but did NOT receive an incentive?

1. Smaller than projects that received an incentive
2. About the same size as projects that received an incentive
3. Larger than projects that received an incentive
8. Don't know

[ASK IF RS1a=1]

RS1b. Approximately, how much smaller would you say were high efficiency projects that DID NOT receive a Duke Energy incentive compared to projects that DID receive an incentive?

For example, if the average cost of high efficiency projects that did NOT receive an incentive is $15,000 and the average cost of projects that DID receive an incentive is $20,000, your answer would be $15,000 / $20,000 = 75%, or "three quarters of the size".

1. More than three quarters of the size
2. Three quarters of the size
3. Half the size
4. A quarter of the size
5. Less than a quarter of the size
8. Don't know

[ASK IF RS1a=3]

RS1c. Approximately, how much larger would you say were high efficiency projects that DID NOT receive a Duke Energy incentive compared to projects that DID receive an incentive?

For example, if the average cost of high efficiency projects that did NOT receive an incentive is $25,000 and the average cost of projects that DID receive an incentive is $20,000, your answer would be $25,000 / $20,000 = 125%, or "one and a quarter times the size".

1. Less than one and a quarter times the size
2. One and a quarter times the size
3. One and a half times the size
4. One and three quarters times the size
5. Twice the size
6. More than twice the size
8. Don't know

Process Module

Customer Awareness and Barriers to Participation

The next few questions are about your customers and their awareness of, and interest in, energy efficiency and the <PROGRAM1>.

AW1. How many of your customers are aware of options for energy efficiency upgrades at their facilities?

1. All of my customers (100%)
2. Most of my customers (75% or more)
3. Some of my customers (20% - 74%)
4. Less than 20% of my customers
5. None of my customers

AW2. How many of your customers already know about the <PROGRAM1> before you discuss it with them?
1. All of my customers (100%)
2. Most of my customers (75% or more)
3. Some of my customers (20% - 74%)
4. Less than 20% of my customers
5. None of my customers

AW3a. How often do you promote the <PROGRAM1> to your customers? Would you say you promote it to…
1. All of my customers (100%)
2. Most of my customers (75% or more)
3. Some of my customers (20% - 74%)
4. Less than 20% of my customers
5. None of my customers

[ASK IF AW3a<>1]
AW3b. When you do not promote the <PROGRAM1> to your customers, what are the reasons? [OPEN END]

AW4. What do you view as the main barriers that prevent your customers from installing energy efficient equipment? [OPEN END]

AW5a. What do you view as the main barriers that prevent your customers from participating in the <PROGRAM1>? [OPEN END; 96=No barriers to participation]

[SKIP IF AW5a=96]
AW5b. What could Duke Energy do to reduce these barriers to customer participation in the <PROGRAM1>? [OPEN END]

Trade Ally Training

The next set of questions is about training provided by the <PROGRAM2>.

TR1. Have you participated in any training provided by the <PROGRAM2>?
1. Yes
2. No

[ASK IF TR1=1, ELSE SKIP TO TR4]
TR2. Which of the following trainings have you participated in? Please select all that apply. [ROTATE; MULTIPLE RESPONSE; UP TO 5]
01. Program training
02. Sales training
03. Online application portal training
00. Other [SPECIFY] [ANCHOR]

[LOOP THROUGH TR3a-d FOR EACH TRAINING SELECTED IN TR2]
TR3a. When did you receive the [TRAINING TYPE] from Duke Energy? [MULTIPLE RESPONSE]
1. 2014
2. 2015
3. 2016
4. 2017
8. Don't know

TR3b. How useful was the [TRAINING TYPE]?

Not at all useful										Extremely useful
0	1	2	3	4	5	6	7	8	9	10

[ASK IF TR3b<5]
TR3c. What would have made the [TRAINING TYPE] more useful? [OPEN END]

[ASK IF TR3b>5]
TR3d. What was the most useful about the [TRAINING TYPE]? [OPEN END]

[ASK IF TR1=2]
TR4. Why have you not participated in a <PROGRAM2> training? [OPEN END]

[SKIP IF TR1=2]
TR5a. Is there any other type of training that Duke Energy could provide that would help you promote the <PROGRAM2>?
1. Yes
2. No

[ASK IF TR5a=1]
TR5b. What type of training would be helpful to you? [OPEN END]

Online Application Portal

The next few questions are about your experience with Duke Energy's Online Application Portal.
OP1. Are you aware that Duke Energy has an online portal where trade allies can submit applications for energy efficiency projects, track the status of their applications, and access program information?
1. Yes
2. No

[ASK IF OP1=1, ELSE SKIP TO NEXT SECTION]
OP2. Have you ever used the online portal?
1. Yes
2. No

[ASK IF OP2=1, ELSE SKIP TO OP5]
OP3. How have you used the online portal? Have you used it to… *Please select all that apply.* [MULTIPLE RESPONSE, up to 4]
01. Submit applications
02. Track the status of applications

03. Access program materials
00. (Other, specify)

[ASK IF OP3=1]
OP4. Approximately, what percentage of applications for the <PROGRAM1> do you submit through the online portal? [NUMERIC OPEN END: 0-100%; 998=Don't know]

[ASK IF OP2=2]
OP5. Why have you not used the online portal? [OPEN END]

Contractor Experience and Satisfaction with the Program

The next few questions are about your experience with the <PROGRAM1>.
SAT1. How would you rate your satisfaction with the following components of the <PROGRAM1>? [ROTATE]

Extremely Dissatisfied 0	1	2	3	4	5	6	7	8	9	Extremely Satisfied 10	Not applicable

g. The application process
h. The measures that are eligible for incentives through the <PROGRAM1>
i. The incentive levels
j. The <PROGRAM2> Trade Ally Online Portal
k. Your interactions with <PROGRAM2> staff
l. The <PROGRAM1> overall [ANCHOR]

[ASK IF SAT1a<8]
SAT2a. Your response suggests that you are not fully satisfied with the application process. Why did you give this rating? [OPEN END]

[ASK IF SAT1b<8]
SAT2b. Your response suggests that you are not fully satisfied with the measures eligible for incentives. What specific measures would you like the program to add? [OPEN END]

[ASK IF SAT1c<8]
SAT2c. Your response suggests that you are not fully satisfied with the incentive levels. Which measures do you think should have different incentive levels? [OPEN END]

[ASK IF SAT1d<8]
SAT2d. Your response suggests that you are not fully satisfied with the <PROGRAM2> Trade Ally Online Portal. Why did you give this rating? [OPEN END]

[ASK IF SAT1e<8]
SAT2e. Your response suggests that you are not fully satisfied with your interactions with <PROGRAM2> staff. Why did you give this rating? [OPEN END]

[ASK IF SAT1f<8]
SAT2f. Your response suggests that you are not fully satisfied with the <PROGRAM1> overall. Why did you give this rating? [OPEN END]

Firmographics

You are almost done. The last few questions are general questions about your company.

F1. Approximately how many TOTAL COMMERCIAL OR INDUSTRIAL PROJECTS does your company implement in a typical year in Duke Energy's <JURISDICTION> service territory? *If unsure, please provide your best estimate.* [NUMERIC OPEN END; 1-9000, 9998=Don't know]

F2. How many employees does your company have? [OPEN END]

F3. Would you consider your company to be local, regional, national, or international in size?
1. Local
2. Regional
3. National
4. International

F4. What are the key business sectors your company serves? *Please select all that apply.* [MULTIPLE RESPONSE; UP TO 6]
01. K-12 School
02. College/University
03. Grocery
04. Medical
05. Hotel/Motel
06. Light Industry
07. Heavy Industry
08. Office
09. Restaurant
10. Retail/Service
11. Government
00. Other [SPECIFY]

Final Screen

Gift cards to the first 30 respondents will be awarded based on the date and time this survey is submitted. To be eligible to receive a $50 gift card, please complete the following information.
If you do not wish to provide this information, you may leave this page blank and continue to the next screen to submit your responses.

Name:
Email address:

Electronic gift cards will be emailed to the email address provided above. If you prefer to receive your gift card via mail, please check the box below and provide your mailing address.

□ I prefer to receive a gift card by mail
Mailing address: ____________________

This concludes the survey. Thank you again for your participation!
Please click the SUBMIT button to submit your responses.

[After submitting the survey, respondents will be directed to the Duke Energy Smart $aver® Incentive Program website: https://www.duke-energy.com/business/products/smartsaver]

Appendix F. Participant Telephone Survey Cross-Tabulations

This Appendix contains detailed results from the participant telephone survey. We provide results in the form of Wincross tables with a breakdown of survey results by jurisdiction and technology (lighting and non-lighting).

Survey Summary

Program	Non-Residential Prescriptive Smart $aver Energy Efficiency for Business
Jurisdiction	DEC & DEP
Survey Type	Telephone (CATI)
Target Population	Program participants
Dates Fielded	May 4 - June 14, 2017
Number of Completes[4]	221
Response Rate	20.3%
Average Survey Time for Completes	15 min 33 sec

[4] A total of 221 participants completed the survey. Four records were dropped from questions N1 to N7b to reflect their exclusion from the free-ridership analysis.

Duke Non-Residential Prescriptive

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Weighted

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Table qrec_s1 Page 1

Duke Non-Residential Prescriptive

S1. I first have a few general questions. How did you first hear about the program?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	127 100.0%	94 100.0%	113 100.0%	14 100.0%	82 100.0%	12 100.0%
Total Valid Responses	125	91	113	13	79	12
Total Responses (Unweighted)	127	94	71	56	72	22
Total Valid Responses (Unweighted)	121	90	70	51	69	21
Contractor/Trade Ally/ Vendor	51 40.7%	33 36.9%	46 40.5%	5 41.9% F	32 40.9% F	1 10.1%
Friend/Colleague/Word of Mouth	43 34.2%	28 31.0%	41 36.2% D	2 16.0%	27 34.0% F	1 11.0%
Duke Energy Account Manager	11 8.9%	2 2.4%	9 8.0%	2 17.1% F	2 2.7%	0 0.9%
Duke Energy Employee - Please Specify Type of	5 3.7%	6 6.3%	4 3.6%	1 4.4%	6 7.1%	0 0.9%
Duke Energy Website	5 4.2%	4 4.5%	4 3.7%	1 8.2%	1 1.4%	3 25.1% E
Past Experience	1 0.9%	6 7.1%	1 0.9%	0 1.3%	3 3.5%	4 31.1% DE
Bill Insert	3 2.1%	4 4.7%	2 1.8%	1 4.9%	3 3.8%	1 11.0%
Other Duke Outreach	4 3.4%	2 2.2%	4 3.5%	0 2.4%	2 2.6%	-

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qrec_s1 Page 2
(Continued)
Duke Non-Residential Prescriptive

S1. I first have a few general questions. How did you first hear about the program?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Duke Energy Business Energy Advisor	2 1.5%	2 2.3%	2 1.7%	-	2 2.7%	-
Email	0 0.4%	0 0.2%	-	0 3.8%	0 0.3%	-
Other Specify	-	2 2.3%	-	-	1 1.1%	1 10.0%
Don't Know	2 1.3%	3 3.3%	0 0.1%	2 10.8% C	3 3.7%	0 0.9%
Refused	-	-	-	-	-	-

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qs2 Page 3

Duke Non-Residential Prescriptive

S2. Had <company> participated in the <program> before?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	127 100.0%	94 100.0%	113 100.0%	14 100.0%	82 100.0%	12 100.0%
Total Responses (Unweighted)	127 100.0%	94 100.0%	71 100.0%	56 100.0%	72 100.0%	22 100.0%
Yes	32 25.3%	25 26.8%	26 23.1%	6 42.3% c	21 25.3%	4 36.7%
No	84 66.3%	64 67.9%	77 68.3%	7 51.2%	57 69.3%	7 58.3%
(Don't know)	11 8.4%	5 5.4%	10 8.6%	1 6.5%	4 5.4%	1 5.0%
(Refused)	-	-	-	-	-	-

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qv1a Page 4

Duke Non-Residential Prescriptive

V1a. Did a contractor or vendor help you with the SELECTION of this equipment?/Did a contractor recommend that you perform the tune up?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	127 100.0%	94 100.0%	113 100.0%	14 100.0%	82 100.0%	12 100.0%
Total Responses (Unweighted)	127 100.0%	94 100.0%	71 100.0%	56 100.0%	72 100.0%	22 100.0%
Yes	111 87.1%	80 84.6%	99 88.3%	11 77.9%	71 86.1%	9 74.2%
No	16 12.4%	12 12.4%	13 11.6%	3 18.7%	9 10.5%	3 25.8%
(Don't know)	0 0.3%	-	0 0.2%	0 1.2%	-	-
(Refused)	0 0.2%	3 3.0%	-	0 2.2%	3 3.4%	-

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qv1b Page 5

Duke Non-Residential Prescriptive

V1b. Who was the contractor or vendor you worked with?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	111 100.0%	80 100.0%	99 100.0%	11 100.0%	71 100.0%	9 100.0%
Total Responses (Unweighted)	106 100.0%	80 100.0%	63 100.0%	43 100.0%	63 100.0%	17 100.0%
Open ended response	71 64.2%	54 67.5%	60 60.8%	11 94.4% C	46 65.2%	8 85.3%
(Don't know)	40 35.8%	26 32.5%	39 39.2% D	1 5.6%	25 34.8%	1 14.7%
(Refused)	-	-	-	-	-	-

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qv2a Page 6

Duke Non-Residential Prescriptive

V2a. Did a contractor or vendor help you with the INSTALLATION of this equipment?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	127 100.0%	94 100.0%	113 100.0%	14 100.0%	82 100.0%	12 100.0%
Total Responses (Unweighted)	127 100.0%	94 100.0%	71 100.0%	56 100.0%	72 100.0%	22 100.0%
Yes	92 72.6%	69 73.5%	80 70.9%	12 85.5% c	59 72.1%	10 83.2%
No	35 27.4%	25 26.5%	33 29.1% d	2 14.5%	23 27.9%	2 16.8%
(Don't know)	-	-	-	-	-	-
(Refused)	-	-	-	-	-	-

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qv2b Page 7

Duke Non-Residential Prescriptive

V2b. Who was the contractor or vendor you worked with?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	92 100.0%	69 100.0%	80 100.0%	12 100.0%	59 100.0%	10 100.0%
Total Responses (Unweighted)	104 100.0%	72 100.0%	56 100.0%	48 100.0%	55 100.0%	17 100.0%
Open ended response	18 20.0%	20 29.5%	15 18.8%	3 27.9%	17 28.3%	4 37.0%
(Same contractor: <QV1B: O>)	38 41.2%	25 35.7%	31 38.4%	7 59.8% c	21 35.3%	4 38.1%
(Don't know)	35 37.8%	24 34.5%	33 41.7% D	1 12.2%	21 36.1%	2 25.0%
(Refused)	1 1.0%	0 0.3%	1 1.1%	-	0 0.4%	-

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qv3a Page 8

Duke Non-Residential Prescriptive

V3a. Do you work with ... Duke Energy Account Managers?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	127 100.0%	94 100.0%	113 100.0%	14 100.0%	82 100.0%	12 100.0%
Total Responses (Unweighted)	127 100.0%	94 100.0%	71 100.0%	56 100.0%	72 100.0%	22 100.0%
Yes	28 21.7%	15 15.5%	23 20.0%	5 35.0%	11 13.9%	3 26.8%
No	95 74.9%	74 78.6%	86 76.5%	9 62.9%	66 80.2%	8 68.2%
(Don't know)	0 0.2%	4 3.8%	-	0 2.2%	3 3.7%	1 5.0%
(Refused)	4 3.1%	2 2.0%	4 3.5%	-	2 2.3%	-

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qv3b Page 9

Duke Non-Residential Prescriptive

V3b. Do you work with ... Duke Energy Business Energy Advisors?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	127 100.0%	94 100.0%	113 100.0%	14 100.0%	82 100.0%	12 100.0%
Total Responses (Unweighted)	127 100.0%	94 100.0%	71 100.0%	56 100.0%	72 100.0%	22 100.0%
Yes	7 5.8%	6 6.7%	6 5.4%	1 8.9%	4 4.8%	2 20.0%
No	117 91.8%	87 92.1%	104 92.7%	12 85.0%	78 94.7% f	9 74.1%
(Don't know)	3 2.4%	1 1.2%	2 1.9%	1 6.1%	0 0.5%	1 5.9%
(Refused)	-	-	-	-	-	-

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qv3c Page 10

Duke Non-Residential Prescriptive

V3c. Do you work with ... Duke Energy Energy Efficiency Engineers?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	127 100.0%	94 100.0%	113 100.0%	14 100.0%	82 100.0%	12 100.0%
Total Responses (Unweighted)	127 100.0%	94 100.0%	71 100.0%	56 100.0%	72 100.0%	22 100.0%
Yes	8 6.3%	6 6.1%	5 4.8%	3 18.2% c	3 3.9%	2 20.9%
No	119 93.6%	85 90.3%	107 95.2% d	12 80.6%	77 93.5% F	8 68.3%
(Don't know)	0 0.1%	3 3.6%	-	0 1.2%	2 2.6%	1 10.8%
(Refused)	-	-	-	-	-	-

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qv3d Page 11

Duke Non-Residential Prescriptive

V3d. Do you work with ... <program> staff?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	127 100.0%	94 100.0%	113 100.0%	14 100.0%	82 100.0%	12 100.0%
Total Responses (Unweighted)	127 100.0%	94 100.0%	71 100.0%	56 100.0%	72 100.0%	22 100.0%
Yes	15 11.5%	13 13.5%	11 10.0%	3 23.8%	10 12.2%	3 22.5%
No	111 87.4%	78 82.9%	100 89.1% d	11 73.8%	70 85.3%	8 66.6%
(Don't know)	0 0.3%	3 3.5%	0 0.1%	0 2.4%	2 2.5%	1 10.9%
(Refused)	1 0.7%	-	1 0.8%	-	-	-

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Appendix F. Participant Telephone Survey Cross-Tabulations

Table qrec_v4 Page 12

Duke Non-Residential Prescriptive

rec_V4. Who was most influential in identifying and recommending the equipment?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	127 100.0%	94 100.0%	113 100.0%	14 100.0%	82 100.0%	12 100.0%
Total Responses (Unweighted)	127 100.0%	94 100.0%	71 100.0%	56 100.0%	72 100.0%	22 100.0%
Contractor/Vendor	82 64.3%	56 59.2%	73 64.5%	9 62.5%	49 60.3%	6 51.5%
Me/Respondent	14 11.0%	15 16.3%	12 10.7%	2 13.6%	14 17.0%	1 11.8%
Someone Else From Within the Company	17 13.0%	8 8.7%	14 12.5%	2 17.4% F	8 9.8%	0 0.9%
Duke Energy Account Manager	4 3.4%	-	4 3.5%	0 2.2%	-	-
Duke Energy/ Staff	1 0.7%	1 1.3%	1 0.8%	-	-	1 9.9%
Duke Energy/Energy Efficiency Engineers	-	1 0.6%	-	-	-	1 5.0%
Duke Energy Business Energy Advisor	0 0.2%	-	-	0 2.2%	-	-
Duke Marketing	-	-	-	-	-	-
Duke Staff (not specified)	-	-	-	-	-	-
Other Specify	9 7.2%	9 9.6%	9 7.9%	0 2.2%	8 10.3%	1 5.0%
Don't Know	-	4 4.3%	-	-	2 2.6%	2 15.9%

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qrec_v4 Page 13
(Continued)
Duke Non-Residential Prescriptive

rec_V4. Who was most influential in identifying and recommending the equipment?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Refused	0 0.1%	-	0 0.1%	-	-	-

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qn1 Page 14

Duke Non-Residential Prescriptive

N1. When did you first learn about Duke Energy's <program>? Was it BEFORE or AFTER you selected the <TECH> equipment for which you received the incentive?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	127 100.0%	89 100.0%	113 100.0%	14 100.0%	77 100.0%	12 100.0%
Total Responses (Unweighted)	126 100.0%	91 100.0%	71 100.0%	55 100.0%	69 100.0%	22 100.0%
(Before)	107 84.5%	82 91.4%	98 86.7% D	9 66.6%	71 91.6%	11 90.0% D
(After)	18 14.2%	5 5.9%	15 13.2%	3 22.3% F	5 6.0%	1 5.0%
(Don't know)	2 1.3%	2 1.7%	0 0.1%	2 11.1% C	1 1.2%	1 5.0%
(Refused)	-	1 1.0%	-	-	1 1.2%	-

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qn2 Page 15

Duke Non-Residential Prescriptive

N2. Just to confirm, you found out about the incentive available through Duke Energy's <program> after you had already decided to implement the energy efficient <TECH> project?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	18 100.0%	5 100.0%	15 100.0%	3 100.0%	5 100.0%	1 100.0%
Total Responses (Unweighted)	21 100.0%	7 100.0%	8 100.0%	13 100.0%	6 100.0%	1 100.0%
Yes, after	13 72.7%	5 100.0%	11 72.6%	2 73.5%	5 100.0%	1 100.0%
No, before	-	-	-	-	-	-
(Other: Specify)	1 5.1%	-	0 0.6%	1 26.5%	-	-
(Don't know)	4 22.2%	-	4 26.8%	-	-	-
(Refused)	-	-	-	-	-	-

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qn3a Page 16

Duke Non-Residential Prescriptive

N3a. How important in your selection of the energy efficient equipment was... Your previous experience with the <program>?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	32 100.0%	23 100.0%	26 100.0%	6 100.0%	19 100.0%	4 100.0%
Total Valid Responses	30	21	24	6	17	4
Total Responses (Unweighted)	44	22	18	26	14	8
Total Valid Responses (Unweighted)	40	19	16	24	12	7
Net 0-4	2 5.1%	-	1 3.8%	1 10.7%	-	-
0 - Not at all important	-	-	-	-	-	-
1	-	-	-	-	-	-
2	1 4.1%	-	1 3.8%	0 5.4%	-	-
3	0 1.0%	-	-	0 5.4%	-	-
4	-	-	-	-	-	-
Net 5-7	13 43.9%	5 22.4%	13 51.6% D	1 11.3%	3 16.4%	2 49.8% d

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qn3a Page 17
(Continued)
Duke Non-Residential Prescriptive

N3a. How important in your selection of the energy efficient equipment was... Your previous experience with the <program>?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
5	0 0.6%	2 9.0%	0 0.8%	-	-	2 49.8%
6	4 13.9%	2 9.1%	4 16.5%	0 3.0%	2 11.1%	-
7	9 29.4% b	1 4.3%	8 34.4%	0 8.3%	1 5.3%	-
Net 8-10	15 51.0%	16 77.6%	11 44.6%	5 78.0% c	14 83.6% c	2 50.2%
8	3 10.6%	6 28.2%	2 7.5%	1 23.4%	6 34.5%	-
9	6 19.3%	2 9.1%	4 16.5%	2 31.2%	2 11.1%	-
10 - Extremely important	6 21.1%	8 40.3%	5 20.6%	1 23.4%	6 38.1%	2 50.2%
(Not applicable)	2 6.5%	2 6.5%	2 7.0%	0 4.2%	1 4.8%	1 13.6%
(Don't know)	-	-	-	-	-	-
(Refused)	-	1 3.9%	-	-	1 4.8%	-
Mean	7.7	8.4	7.7	8.0	8.6	7.5

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qn3b Page 18

Duke Non-Residential Prescriptive

N3b. How important in your selection of the energy efficient equipment was... The availability of the PROGRAM incentive?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	127 100.0%	89 100.0%	113 100.0%	14 100.0%	77 100.0%	12 100.0%
Total Valid Responses	127	84	113	14	72	12
Total Responses (Unweighted)	126	91	71	55	69	22
Total Valid Responses (Unweighted)	126	87	71	55	65	22
Net 0-4	2 1.7%	1 1.5%	-	2 15.1% F	1 1.6%	0 0.9%
0 - Not at all important	2 1.4%	0 0.3%	-	2 12.9%	0 0.3%	-
1	-	0 0.1%	-	-	-	0 0.9%
2	-	-	-	-	-	-
3	0 0.2%	1 1.1%	-	0 2.2%	1 1.3%	-
4	-	-	-	-	-	-
Net 5-7	21 16.2%	19 23.2%	17 14.7%	4 28.3%	16 22.6%	3 26.5%
5	5 3.8%	10 12.0% a	4 3.5%	1 5.7%	7 9.8%	3 25.6% D

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qn3b Page 19
(Continued)
Duke Non-Residential Prescriptive

N3b. How important in your selection of the energy efficient equipment was... The availability of the PROGRAM incentive?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
6	3 2.4%	3 3.2%	2 1.6%	1 9.1%	3 3.8%	-
7	13 10.0%	7 7.9%	11 9.6%	2 13.5% f	6 9.1%	0 0.9%
Net 8-10	104 82.1%	63 75.4%	96 85.3% D	8 56.5%	54 75.8%	9 72.6%
8	31 24.3% b	9 11.0%	28 24.9% e	3 19.2%	6 8.7%	3 24.9%
9	9 7.1%	6 6.6%	8 7.4%	1 4.3%	5 6.8%	1 5.0%
10 - Extremely important	64 50.7%	48 57.8%	60 52.9% d	5 33.1%	43 60.3%	5 42.7%
(Not applicable)	-	4 4.2%	-	-	4 4.9%	-
(Don't know)	-	2 2.0%	-	-	2 2.3%	-
(Refused)	-	-	-	-	-	-
Mean	8.7	8.6	8.9 D	7.1	8.7	8.1

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qn3c Page 20

Duke Non-Residential Prescriptive

N3c. How important in your selection of the energy efficient equipment was... A recommendation from the vendor or contractor who helped you with the choice of the equipment?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	110 100.0%	75 100.0%	99 100.0%	11 100.0%	66 100.0%	9 100.0%
Total Valid Responses	110	75	99	11	66	9
Total Responses (Unweighted)	105	77	63	42	60	17
Total Valid Responses (Unweighted)	105	77	63	42	60	17
Net 0-4	1 1.0%	3 4.0%	1 0.9%	0 1.6%	2 3.5%	1 7.9%
0 - Not at all important	-	0 0.3%	-	-	0 0.3%	-
1	-	0 0.3%	-	-	0 0.3%	-
2	1 0.8%	-	1 0.9%	-	-	-
3	-	1 0.9%	-	-	-	1 7.9%
4	0 0.2%	2 2.5%	-	0 1.6%	2 2.9%	-
Net 5-7	12 11.0%	15 20.0%	10 10.5%	2 15.9%	11 17.3%	4 40.1% de

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qn3c Page 21
(Continued)
Duke Non-Residential Prescriptive

N3c. How important in your selection of the energy efficient equipment was... A recommendation from the vendor or contractor who helped you with the choice of the equipment?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
5	5 4.9%	6 8.1%	5 4.9%	0 4.5%	4 5.6%	2 26.8% de
6	1 1.1%	5 6.5%	1 1.2%	-	4 5.6%	1 13.3%
7	6 5.1%	4 5.3%	4 4.4%	1 11.5%	4 6.1%	-
Net 8-10	97 88.0%	57 76.0%	88 88.6%	9 82.5% F	52 79.2% f	5 52.0%
8	24 21.3%	19 25.5%	21 21.0%	3 24.3%	17 26.2%	2 20.2%
9	17 15.9%	8 10.5%	16 16.0%	2 14.9%	7 11.0%	1 6.7%
10 - Extremely important	56 50.8%	30 40.0%	51 51.6%	5 43.3%	28 42.0%	2 25.0%
(Not applicable)	-	-	-	-	-	-
(Don't know)	-	-	-	-	-	-
(Refused)	-	-	-	-	-	-
Mean	8.9	8.3	8.9	8.7 f	8.4	7.1

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qn3d Page 22

Duke Non-Residential Prescriptive

N3d. How important in your selection of the energy efficient equipment was... Previous experience with this type of equipment?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	127 100.0%	89 100.0%	113 100.0%	14 100.0%	77 100.0%	12 100.0%
Total Valid Responses	96	65	85	11	54	10
Total Responses (Unweighted)	126	91	71	55	69	22
Total Valid Responses (Unweighted)	93	64	51	42	46	18
Net 0-4	37 38.6%	21 32.2%	35 41.6% D	2 15.7%	19 35.8% F	1 12.8%
0 - Not at all important	19 19.6%	9 14.3%	18 21.1%	1 8.5%	9 16.7% f	0 1.1%
1	5 5.4%	5 7.3%	5 5.8%	0 2.8%	5 8.6%	-
2	11 11.2% b	2 2.9%	11 12.6%	-	2 3.5%	-
3	2 2.1%	3 4.8%	2 2.1%	0 1.6%	2 3.5%	1 11.7%
4	0 0.3%	2 2.9%	-	0 2.8%	2 3.5%	-
Net 5-7	15 15.5%	16 24.3%	14 16.0%	1 11.6%	14 26.2%	1 14.0%

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qn3d Page 23
(Continued)
Duke Non-Residential Prescriptive

N3d. How important in your selection of the energy efficient equipment was... Previous experience with this type of equipment?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
5	5 5.3%	7 11.0%	4 5.0%	1 7.2%	6 10.7%	1 13.0%
6	1 0.7%	5 7.3%	0 0.4%	0 2.8%	5 8.6%	-
7	9 9.6%	4 6.0%	9 10.6%	0 1.6%	4 6.9%	0 1.1%
Net 8-10	44 45.8%	28 43.5%	36 42.4%	8 72.7% C	21 38.0%	7 73.2% E
8	12 12.5%	10 15.4%	10 11.8%	2 18.0%	7 12.7%	3 29.6%
9	7 7.4%	4 6.5%	6 7.2%	1 9.5%	3 5.5%	1 11.7%
10 - Extremely important	25 25.9%	14 21.7%	20 23.4%	5 45.1% c	11 19.8%	3 31.9%
(Not applicable)	25 19.8%	25 27.8%	22 19.6%	3 21.6%	23 29.6%	2 15.9%
(Don't know)	1 0.7%	-	1 0.8%	-	-	-
(Refused)	5 3.9%	-	5 4.3%	-	-	-
Mean	5.6	5.8	5.3	7.6 C	5.4	7.7 E

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qn3e Page 24

Duke Non-Residential Prescriptive

N3e. How important in your selection of the energy efficient equipment was... A recommendation from a Duke Energy representative?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	35 100.0%	21 100.0%	28 100.0%	8 100.0%	15 100.0%	5 100.0%
Total Valid Responses	33	16	28	6	11	5
Total Responses (Unweighted)	59	28	27	32	17	11
Total Valid Responses (Unweighted)	50	24	25	25	14	10
Net 0-4	8 23.5%	1 4.4%	6 22.1%	2 30.2%	-	1 13.8%
0 - Not at all important	6 19.1%	-	5 18.5%	1 21.9%	-	-
1	0 0.9%	-	-	0 5.4%	-	-
2	1 2.7%	-	1 3.3%	-	-	-
3	0 0.8%	1 4.4%	0 0.3%	0 3.0%	-	1 13.8%
4	-	-	-	-	-	-
Net 5-7	7 21.8%	4 22.0%	5 19.5%	2 32.8%	2 21.5%	1 23.2%
5	1 3.6%	2 10.2%	0 0.3%	1 19.1% c	0 4.0%	1 23.2%

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qn3e Page 25
(Continued)
Duke Non-Residential Prescriptive

N3e. How important in your selection of the energy efficient equipment was... A recommendation from a Duke Energy representative?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
6	4 12.3%	-	4 14.8%	-	-	-
7	2 5.9%	2 11.9%	1 4.3%	1 13.7%	2 17.5%	-
Net 8-10	18 54.7%	12 73.5%	16 58.4%	2 37.0%	8 78.5%	3 63.0%
8	6 16.7%	2 10.8%	5 18.5%	0 8.2%	1 10.4%	1 11.8%
9	5 16.4%	4 26.5%	5 17.8%	1 9.8%	4 39.0%	-
10 - Extremely important	7 21.6%	6 36.2%	6 22.1%	1 19.1%	3 29.1%	3 51.2%
(Not applicable)	2 5.5%	5 23.2%	0 0.7%	2 23.3% c	5 30.2% Cf	0 2.0%
(Don't know)	-	-	-	-	-	-
(Refused)	-	-	-	-	-	-
Mean	6.4	8.3	6.6	5.5	8.7	7.6

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qn3f Page 26

Duke Non-Residential Prescriptive

N3f. How important in your selection of the energy efficient equipment was... Information from Smart Saver or Duke Energy marketing materials?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	127 100.0%	89 100.0%	113 100.0%	14 100.0%	77 100.0%	12 100.0%
Total Valid Responses	119	82	105	14	70	12
Total Responses (Unweighted)	126	91	71	55	69	22
Total Valid Responses (Unweighted)	119	81	65	54	59	22
Net 0-4	26 22.1%	23 28.4%	21 19.8%	5 39.7% C	20 28.9%	3 25.8%
0 - Not at all important	14 12.1%	10 11.6%	12 11.5%	2 16.7%	9 12.8%	1 5.0%
1	5 4.5%	4 4.6%	5 4.8%	0 2.3%	4 5.4%	-
2	1 1.0%	5 5.9%	0 0.1%	1 8.1% c	5 6.7% c	0 0.9%
3	5 3.9%	4 4.9%	4 3.5%	1 6.8%	3 4.0%	1 10.0%
4	1 0.7%	1 1.4%	-	1 5.8%	-	1 9.9%
Net 5-7	33 27.9%	26 32.3%	29 27.9%	4 28.0%	21 30.7%	5 41.5%

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qn3f Page 27
(Continued)
Duke Non-Residential Prescriptive

N3f. How important in your selection of the energy efficient equipment was... Information from Smart Saver or Duke Energy marketing materials?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
5	8 6.8%	12 14.2%	6 6.1%	2 12.8%	8 11.3%	4 30.8%
6	9 8.0%	4 4.9%	9 8.6%	0 3.5%	4 5.6%	0 0.9%
7	16 13.1%	11 13.2%	14 13.3%	2 11.6%	10 13.7%	1 9.9%
Net 8-10	59 50.0%	32 39.3%	55 52.3% d	4 32.4%	28 40.4%	4 32.7%
8	13 10.7%	16 19.7%	11 10.6%	2 11.2%	14 20.5%	2 15.0%
9	8 6.8%	4 5.0%	7 6.4%	1 9.9%	4 5.7%	0 0.9%
10 - Extremely important	39 32.5% B	12 14.5%	37 35.2% ED	2 11.3%	10 14.1%	2 16.8%
(Not applicable)	4 3.2%	7 7.5%	4 3.3%	0 2.2%	7 8.6%	-
(Don't know)	4 3.1%	1 1.0%	4 3.5%	-	1 1.2%	-
(Refused)	-	-	-	-	-	-
Mean	6.7	5.8	6.9 D	5.2	5.7	6.0

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qn3g Page 28

Duke Non-Residential Prescriptive

N3g. How important in your selection of the energy efficient equipment was... Standard practice in your business or industry?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	127 100.0%	89 100.0%	113 100.0%	14 100.0%	77 100.0%	12 100.0%
Total Valid Responses	109	73	97	12	63	10
Total Responses (Unweighted)	126	91	71	55	69	22
Total Valid Responses (Unweighted)	107	75	59	48	56	19
Net 0-4	16 14.6%	8 11.1%	14 14.4%	2 16.5%	7 11.0%	1 11.6%
0 - Not at all important	9 8.5%	3 4.4%	8 8.3%	1 9.9%	3 5.1%	-
1	4 4.1%	-	4 4.1%	0 4.0%	-	-
2	0 0.3%	3 3.8%	-	0 2.6%	3 4.5%	-
3	-	1 1.2%	-	-	1 1.4%	-
4	2 1.7%	1 1.6%	2 1.9%	-	-	1 11.6%
Net 5-7	28 26.0%	17 22.8%	26 27.0%	2 17.3%	14 23.1%	2 20.8%
5	21 19.0%	6 7.7%	20 20.6% d	1 6.6%	5 7.7%	1 8.0%

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qn3g Page 29
(Continued)
Duke Non-Residential Prescriptive

N3g. How important in your selection of the energy efficient equipment was... Standard practice in your business or industry?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
6	5 5.0%	3 3.9%	5 5.4%	0 1.4%	2 3.4%	1 6.9%
7	2 1.9%	8 11.2% a	1 1.0%	1 9.2%	8 12.1% C	1 5.9%
Net 8-10	65 59.4%	48 66.1%	57 58.6%	8 66.2%	41 65.9%	7 67.6%
8	24 21.9%	11 15.4%	21 21.7%	3 23.9%	10 16.7%	1 6.9%
9	10 9.6%	6 7.7%	9 9.2%	1 12.5%	3 5.1%	2 23.2% e
10 - Extremely important	30 27.9%	31 43.1%	27 27.7%	4 29.8%	28 44.0%	4 37.4%
(Not applicable)	9 6.8%	12 13.1%	7 6.4%	1 10.1%	10 12.9%	2 15.0%
(Don't know)	10 7.5%	3 3.1%	9 7.9%	1 4.4%	3 3.6%	-
(Refused)	-	2 2.1%	-	-	2 2.4%	-
Mean	6.9	7.8	6.9	7.2	7.8	8.1

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qn3h Page 30

Duke Non-Residential Prescriptive

N3h. How important in your selection of the energy efficient equipment was... Corporate policy or guidelines?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	127 100.0%	89 100.0%	113 100.0%	14 100.0%	77 100.0%	12 100.0%
Total Valid Responses	105	70	94	12	60	11
Total Responses (Unweighted)	126	91	71	55	69	22
Total Valid Responses (Unweighted)	106	72	59	47	52	20
Net 0-4	29 27.3%	17 23.9%	24 25.5%	5 42.0% F	16 26.2% f	1 11.0%
0 - Not at all important	12 11.2%	5 7.6%	11 11.7%	1 6.7%	5 9.0%	-
1	6 6.2%	2 2.7%	5 5.2%	2 13.6%	2 3.2%	-
2	6 6.0%	5 6.6%	5 5.2%	1 12.1%	5 7.7%	-
3	2 2.3%	-	2 2.2%	0 2.7%	-	-
4	2 1.7%	5 7.1%	1 1.1%	1 6.8%	4 6.4%	1 11.0%
Net 5-7	33 31.5%	19 27.5%	31 32.8%	2 21.1%	16 26.2%	4 34.2%
5	25 24.0%	13 18.3%	24 25.3%	2 13.6%	10 16.5%	3 28.6%

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qn3h Page 31
(Continued)
Duke Non-Residential Prescriptive

N3h. How important in your selection of the energy efficient equipment was... Corporate policy or guidelines?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
6	5 4.8%	3 4.8%	5 5.4%	-	3 4.7%	1 5.6%
7	3 2.7%	3 4.3%	2 2.0%	1 7.5%	3 5.1%	-
Net 8-10	43 41.2%	34 48.6%	39 41.7%	4 36.9%	28 47.5%	6 54.8%
8	14 13.7%	10 14.3%	13 14.1%	1 10.5%	8 13.9%	2 16.7%
9	6 6.0%	6 7.9%	6 6.2%	0 4.1%	4 6.4%	2 16.5%
10 - Extremely important	23 21.5%	19 26.4%	20 21.4%	3 22.3%	16 27.3%	2 21.6%
(Not applicable)	19 15.0%	15 16.9%	17 15.3%	2 12.3%	14 18.0%	1 10.0%
(Don't know)	2 1.3%	3 3.4%	1 0.9%	1 4.4%	3 3.9%	-
(Refused)	1 0.7%	1 1.0%	1 0.8%	-	1 1.2%	-
Mean	5.8	6.4	5.8	5.4	6.3	7.2 D

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qn3i Page 32

Duke Non-Residential Prescriptive

N3i. How important in your selection of the energy efficient equipment was... Financial criteria, such as payback or return on the investment?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	127 100.0%	89 100.0%	113 100.0%	14 100.0%	77 100.0%	12 100.0%
Total Valid Responses	127	88	113	14	76	12
Total Responses (Unweighted)	126	91	71	55	69	22
Total Valid Responses (Unweighted)	126	89	71	55	67	22
Net 0-4	1 0.9%	2 2.4%	0 0.1%	1 7.9% c	2 2.0%	1 5.0%
0 - Not at all important	0 0.2%	0 0.2%	-	0 2.2%	0 0.3%	-
1	-	0 0.5%	-	-	0 0.6%	-
2	0 0.2%	-	-	0 2.2%	-	-
3	0 0.1%	-	-	0 1.2%	-	-
4	0 0.3%	2 1.7%	0 0.1%	0 2.2%	1 1.2%	1 5.0%
Net 5-7	15 12.1%	8 9.2%	12 10.7%	3 23.8% c	5 6.4%	3 26.5% e

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qn3i Page 33
(Continued)
Duke Non-Residential Prescriptive

N3i. How important in your selection of the energy efficient equipment was... Financial criteria, such as payback or return on the investment?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
5	5	4	4	1	4	0
	3.8%	4.4%	3.5%	6.3%	5.0%	0.9%
6	5	0	4	1	0	-
	4.0%	0.2%	3.6%	6.9%	0.3%	
7	5	4	4	1	1	3
	4.3%	4.5%	3.5%	10.7%	1.2%	25.6%
						E
Net 8-10	110	78	101	10	70	8
	86.9%	88.4%	89.2%	68.3%	91.5%	68.5%
			D		f	
8	20	19	18	2	16	4
	15.8%	21.9%	16.0%	13.5%	20.7%	30.0%
9	18	10	15	3	10	0
	14.0%	11.8%	13.4%	19.2%	13.5%	0.9%
				F	f	
10 - Extremely important	72	48	67	5	44	4
	57.1%	54.7%	59.8%	35.5%	57.4%	37.6%
			D			
(Not applicable)	-	0	-	-	0	-
		0.2%			0.3%	
(Don't know)	-	1	-	-	1	-
		1.0%			1.2%	
(Refused)	-	-	-	-	-	-
Mean	9.0	8.9	9.1	8.0	9.0	8.3
			D			

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qn3j Page 34

Duke Non-Residential Prescriptive

N3j. How important in your selection of the energy efficient equipment was... The expected energy savings?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	127 100.0%	89 100.0%	113 100.0%	14 100.0%	77 100.0%	12 100.0%
Total Valid Responses	127	89	113	14	77	12
Total Responses (Unweighted)	126	91	71	55	69	22
Total Valid Responses (Unweighted)	126	90	71	55	68	22
Net 0-4	6 4.4%	2 2.8%	4 3.7%	1 9.7%	2 2.5%	1 5.0%
0 - Not at all important	0 0.3%	-	-	0 2.8%	-	-
1	0 0.1%	-	0 0.1%	-	-	-
2	0 0.1%	-	-	0 1.2%	-	-
3	0 0.4%	2 2.8%	-	0 3.4%	2 2.5%	1 5.0%
4	4 3.5%	-	4 3.6%	0 2.2%	-	-
Net 5-7	10 8.0%	9 10.0%	7 6.0%	3 23.7% C	8 9.8%	1 10.8%
5	1 0.9%	3 3.5%	0 0.1%	1 7.9% c	3 3.9%	0 0.9%

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qn3j Page 35
(Continued)
Duke Non-Residential Prescriptive

N3j. How important in your selection of the energy efficient equipment was... The expected energy savings?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
6	5 3.8%	0 0.5%	4 3.5%	1 5.7%	0 0.6%	-
7	4 3.3%	5 6.0%	3 2.4%	1 10.1%	4 5.4%	1 9.9%
Net 8-10	111 87.6%	78 87.3%	102 90.3% D	9 66.6%	68 87.7%	10 84.2%
8	22 17.2%	19 21.6%	20 17.6%	2 14.1%	15 19.5%	4 34.9% d
9	9 7.1%	7 7.7%	7 6.3%	2 13.3% f	7 8.8%	0 0.9%
10 - Extremely important	80 63.3%	52 57.9%	75 66.3% D	5 39.2%	46 59.4%	6 48.5%
(Not applicable)	-	-	-	-	-	-
(Don't know)	-	0 0.2%	-	-	0 0.3%	-
(Refused)	-	-	-	-	-	-
Mean	9.0	8.9	9.1 D	7.9	9.0	8.6

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qrec_n3om1 Page 36

Duke Non-Residential Prescriptive

N3o. Were there any other factors I haven't asked about that were influential in your decision to select the energy efficient equipment?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	127 100.0%	88 100.0%	113 100.0%	14 100.0%	76 100.0%	12 100.0%
Total Responses (Unweighted)	126 100.0%	89 100.0%	71 100.0%	55 100.0%	67 100.0%	22 100.0%
Product performance/ appearance	6 5.0%	8 9.5%	6 5.4%	0 2.2%	7 9.5%	1 9.9%
Maintenance/reliability	0 0.3%	4 4.3%	0 0.1%	0 2.2%	4 5.0%	-
Environmental benefit	1 0.7%	1 1.0%	1 0.8%	-	1 1.2%	-
Pricing/Cost	1 0.8%	1 0.7%	1 0.8%	0 0.6%	-	1 5.0%
Safety	1 0.7%	-	1 0.8%	-	-	-
Equipment warranty	0 0.2%	-	0 0.1%	0 1.2%	-	-
Open ended response	1 0.8%	2 2.1%	-	1 7.5%	2 2.5%	-
Nothing Else Influential	116 91.3%	71 80.6%	104 91.9%	12 86.3%	62 80.7%	10 80.1%
Don't Know	0 0.1%	-	0 0.1%	-	-	-
Refused	-	2 1.7%	-	-	1 1.2%	1 5.0%

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qn3oo Page 37

Duke Non-Residential Prescriptive

N3oo. How would you rate the influence of this other factor?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	11 100.0%	17 100.0%	9 100.0%	2 100.0%	15 100.0%	2 100.0%
Total Responses (Unweighted)	20 100.0%	15 100.0%	11 100.0%	9 100.0%	13 100.0%	2 100.0%
Net 0-4	-	-	-	-	-	-
0 - Not at all important	-	-	-	-	-	-
1	-	-	-	-	-	-
2	-	-	-	-	-	-
3	-	-	-	-	-	-
4	-	-	-	-	-	-
Net 5-7	6 57.6%	-	6 65.5%	0 20.4%	-	-
5	1 11.9%	-	1 10.1%	0 20.4%	-	-
6	1 8.3%	-	1 10.1%	-	-	-
7	4 37.3%	-	4 45.3%	-	-	-
Net 8-10	5 42.4%	17 100.0% A	3 34.5%	2 79.6%	15 100.0% C	2 100.0%

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qn3oo Page 38
(Continued)
Duke Non-Residential Prescriptive

N3oo. How would you rate the influence of this other factor?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
8	0 4.4%	5 31.0%	-	0 25.1%	4 26.8%	1 66.3%
9	2 14.3%	2 9.0%	1 10.1%	1 34.1%	1 6.1%	1 33.7%
10 - Extremely important	3 23.6%	10 60.0%	2 24.3%	0 20.4%	10 67.2%	-
(Don't know)	-	-	-	-	-	-
(Refused)	-	-	-	-	-	-
Mean	7.7	9.3 a	7.6	8.1	9.4 c	8.3

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qn3dx Page 39

Duke Non-Residential Prescriptive

N3dx. You indicated that previous experience with this type of equipment was important in your decision to select the energy efficient <TECH> equipment. Was this previous experience associated with equipment you installed with an earlier Duke Energy incent

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	12 100.0%	8 100.0%	9 100.0%	3 100.0%	6 100.0%	2 100.0%
Total Responses (Unweighted)	20 100.0%	9 100.0%	5 100.0%	15 100.0%	5 100.0%	4 100.0%
(With Duke Energy incentive)	6 49.4%	2 19.0%	5 54.0%	1 37.1%	1 16.4%	1 25.0%
(On my own/No Duke Energy incentive)	6 46.7%	5 58.1%	4 45.0%	2 51.4%	3 50.7%	2 75.0%
(Both)	0 3.9%	-	0 1.0%	0 11.5%	-	-
(Don't know)	-	1 11.4%	-	-	1 16.4%	-
(Refused)	-	1 11.4%	-	-	1 16.4%	-

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qn3ix Page 40

Duke Non-Residential Prescriptive

N3ix. You indicated that financial criteria were important in your decision to select the energy efficient <TECH> equipment. Which of the following statements best applies to this project:

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	110 100.0%	78 100.0%	101 100.0%	10 100.0%	70 100.0%	8 100.0%
Total Responses (Unweighted)	103 100.0%	75 100.0%	66 100.0%	37 100.0%	59 100.0%	16 100.0%
The <program> rebate moved the project within the acceptable range of our financial criteria	96 87.3%	60 76.5%	92 91.4% D	4 44.2%	55 78.9%	5 56.1%
The project met our required financial criteria even without the rebate	8 7.3%	11 13.9%	4 3.7%	4 45.2% C	7 10.4%	4 43.9% E
The project didn't meet our required financial criteria, even with the rebate	5 4.2%	3 3.6%	4 4.0%	1 6.5%	3 4.0%	-
(Other: Specify)	0 0.4%	-	-	0 4.1%	-	-
(Don't know)	1 0.8%	5 6.0% a	1 0.9%	-	5 6.7%	-
(Refused)	-	-	-	-	-	-

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qn3jx Page 41

Duke Non-Residential Prescriptive

N3jx. You indicated that the expected energy savings were important in your decision to select the energy efficient <TECH> equipment. How did you find out about the savings this equipment could achieve?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	111 100.0%	78 100.0%	102 100.0%	9 100.0%	68 100.0%	10 100.0%
Total Responses (Unweighted)	100 100.0%	76 100.0%	63 100.0%	37 100.0%	57 100.0%	19 100.0%
(Contractor/Vendor)	57 51.4%	41 53.3%	53 52.5%	4 39.2%	39 57.4% F	3 25.9%
(Duke Energy Account Manager)	1 0.9%	1 1.4%	1 1.0%	-	1 1.7%	-
(Duke Energy Business Energy Advisor)	-	-	-	-	-	-
(Duke Energy Program Staff)	1 0.8%	1 1.2%	1 0.9%	-	1 1.3%	-
(Prior experience with equipment)	11 9.5%	4 4.6%	10 9.7%	1 6.7%	3 4.5%	1 5.9%
(Other: Specify)	40 35.8%	28 35.5%	35 34.1%	5 54.2% c	21 30.7%	7 68.2% E
(Don't know)	-	3 3.9%	-	-	3 4.5%	-
(Refused)	2 1.6%	-	2 1.8%	-	-	-

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qn4a Page 42

Duke Non-Residential Prescriptive

N4a. How many points would you give to the importance of... the <program>, including support from Duke Energy staff?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	127 100.0%	89 100.0%	113 100.0%	14 100.0%	77 100.0%	12 100.0%
Total Responses (Unweighted)	126 100.0%	91 100.0%	71 100.0%	55 100.0%	69 100.0%	22 100.0%
0	2 1.5%	4 4.2%	1 0.8%	1 7.2%	4 4.9%	-
2	-	1 1.3%	-	-	-	1 9.9%
5	0 0.2%	-	-	0 2.2%	-	-
10	1 0.7%	2 2.1%	0 0.1%	1 5.7%	2 2.4%	-
20	3 2.4%	4 4.4%	2 1.6%	1 8.9%	4 4.9%	0 0.9%
25	0 0.4%	3 3.4%	-	0 3.4%	2 2.4%	1 9.9%
30	7 5.5%	3 2.9%	6 5.2%	1 7.2%	2 2.4%	1 5.9%
40	8 6.6%	6 6.8%	8 7.2%	0 2.2%	4 4.8%	2 19.9% De
50	29 22.6%	13 14.8%	26 23.3%	2 16.6%	12 15.6%	1 10.0%
60	22 17.1%	14 16.1%	21 18.7% D	1 4.7%	13 16.9%	1 10.9%

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qn4a Page 43
(Continued)
Duke Non-Residential Prescriptive

N4a. How many points would you give to the importance of... the <program>, including support from Duke Energy staff?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
65	0 0.2%	-	-	0 2.2%	-	-
70	23 18.2% B	5 5.3%	23 20.1% eD	0 2.2%	4 5.3%	1 5.0%
75	4 3.1%	7 8.3%	2 1.9%	2 12.9% c	7 9.6%	-
80	14 10.7%	6 7.0%	12 10.6%	2 12.3%	6 7.2%	1 5.9%
85	-	2 2.7%	-	-	2 2.3%	1 5.0%
90	4 3.3%	9 9.5%	4 3.5%	0 1.8%	8 10.2%	1 5.0%
95	4 3.3%	-	4 3.5%	0 1.2%	-	-
100	5 4.0%	7 7.6%	4 3.5%	1 7.9%	5 7.0%	1 11.8%
(Don't know)	0 0.1%	-	-	0 1.2%	-	-
(Refused)	-	3 3.4%	-	-	3 3.9%	-
Mean	60.5	58.7	61.6 d	51.3	59.6	52.9

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qn4b Page 44

Duke Non-Residential Prescriptive

N4b. And how many points would you give to the importance of... other factors?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	127 100.0%	89 100.0%	113 100.0%	14 100.0%	77 100.0%	12 100.0%
Total Responses (Unweighted)	126 100.0%	91 100.0%	71 100.0%	55 100.0%	69 100.0%	22 100.0%
0	4 3.2%	6 6.6%	3 2.7%	1 7.9%	4 5.8%	1 11.8%
5	4 3.3%	-	4 3.5%	0 1.2%	-	-
10	4 3.3%	9 9.5%	4 3.5%	0 1.8%	8 10.2%	1 5.0%
15	-	2 2.7%	-	-	2 2.3%	1 5.0%
20	14 10.7%	6 7.0%	12 10.6%	2 12.3%	6 7.2%	1 5.9%
25	4 3.1%	7 8.3%	2 1.9%	2 12.9% c	7 9.6%	-
30	23 18.2% B	5 5.3%	23 20.1% eD	0 2.2%	4 5.3%	1 5.0%
35	0 0.2%	-	-	0 2.2%	-	-
40	22 17.1%	12 14.0%	21 18.7% D	1 4.7%	11 14.5%	1 10.9%
50	29 22.6%	13 14.8%	26 23.3%	2 16.6%	12 15.6%	1 10.0%

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qn4b Page 45
(Continued)
Duke Non-Residential Prescriptive

N4b. And how many points would you give to the importance of... other factors?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
60	8 6.6%	6 6.8%	8 7.2%	0 2.2%	4 4.8%	2 19.9% De
70	3 2.3%	3 2.9%	2 1.7%	1 7.2%	2 2.4%	1 5.9%
75	0 0.4%	3 3.4%	-	0 3.4%	2 2.4%	1 9.9%
80	3 2.4%	4 4.4%	2 1.6%	1 8.9%	4 4.9%	0 0.9%
90	1 0.7%	2 2.1%	0 0.1%	1 5.7%	2 2.4%	-
95	0 0.2%	-	-	0 2.2%	-	-
98	-	1 1.3%	-	-	-	1 9.9%
99	-	1 1.0%	-	-	1 1.2%	-
100	2 1.5%	2 2.1%	1 0.8%	1 7.2%	2 2.4%	-
(Don't know)	0 0.1%	-	-	0 1.2%	-	-
(Refused)	5 3.9%	7 7.6%	5 4.3%	-	7 8.8%	-
Mean	38.8	41.1	37.6	48.7 c	40.0	47.1

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qcc1bm1 Page 46

Duke Non-Residential Prescriptive

CC1b. You just gave <N4a_pts> points to the importance of the program. I would interpret that to mean that the program was not very important to your decision to install the <TECH> equipment. But earlier, when I asked about the importance of individual ele

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	4 100.0%	7 100.0%	3 100.0%	1 100.0%	6 100.0%	1 100.0%
Total Responses (Unweighted)	9 100.0%	4 100.0%	4 100.0%	5 100.0%	3 100.0%	1 100.0%
Open ended response	4 100.0%	7 100.0%	3 100.0%	1 100.0%	6 100.0%	1 100.0%
(Don't know)	-	-	-	-	-	-
(Refused)	-	-	-	-	-	-

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qcc1c Page 47

Duke Non-Residential Prescriptive

CC1c. Would you like to provide a new response for either the importance ratings or the points allocation or both?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	5 100.0%	7 100.0%	3 100.0%	2 100.0%	6 100.0%	1 100.0%
Total Responses (Unweighted)	10 100.0%	4 100.0%	4 100.0%	6 100.0%	3 100.0%	1 100.0%
(Change importance ratings)	1 20.0%	-	1 32.3%	-	-	-
(Change points allocation)	0 3.8%	2 27.6%	-	0 10.0%	2 33.3%	-
(Change both)	-	-	-	-	-	-
(No, don't change)	3 69.4%	5 72.4%	2 67.7%	1 72.0%	4 66.7%	1 100.0%
(Don't know)	-	-	-	-	-	-
(Refused)	0 6.8%	-	-	0 18.0%	-	-

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qn3a_fnl Page 48

Duke Non-Residential Prescriptive

N3a_FINAL: How important in your selection of the energy efficient equipment was... your previous experience with the <program>?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	32 100.0%	23 100.0%	26 100.0%	6 100.0%	19 100.0%	4 100.0%
Total Valid Responses	30	21	24	6	17	4
Total Responses (Unweighted)	44	22	18	26	14	8
Total Valid Responses (Unweighted)	40	19	16	24	12	7
Net 0-4	2 5.1%	-	1 3.8%	1 10.7%	-	-
0 - Not at all important	-	-	-	-	-	-
1	-	-	-	-	-	-
2	1 4.1%	-	1 3.8%	0 5.4%	-	-
3	0 1.0%	-	-	0 5.4%	-	-
4	-	-	-	-	-	-
Net 5-7	13 43.9%	5 22.4%	13 51.6% D	1 11.3%	3 16.4%	2 49.8% d

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qn3a_fnl Page 49
(Continued)
Duke Non-Residential Prescriptive

N3a_FINAL: How important in your selection of the energy efficient equipment was... your previous experience with the <program>?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
5	0 0.6%	2 9.0%	0 0.8%	-	-	2 49.8%
6	4 13.9%	2 9.1%	4 16.5%	0 3.0%	2 11.1%	-
7	9 29.4% b	1 4.3%	8 34.4%	0 8.3%	1 5.3%	-
Net 8-10	15 51.0%	16 77.6%	11 44.6%	5 78.0% c	14 83.6% c	2 50.2%
8	3 10.6%	6 28.2%	2 7.5%	1 23.4%	6 34.5%	-
9	6 19.3%	2 9.1%	4 16.5%	2 31.2%	2 11.1%	-
10 - Extremely important	6 21.1%	8 40.3%	5 20.6%	1 23.4%	6 38.1%	2 50.2%
(Not applicable)	2 6.5%	2 6.5%	2 7.0%	0 4.2%	1 4.8%	1 13.6%
(Don't know)	-	-	-	-	-	-
(Refused)	-	1 3.9%	-	-	1 4.8%	-
Mean	7.7	8.4	7.7	8.0	8.6	7.5

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qn3b_upd Page 50

Duke Non-Residential Prescriptive

N3b_UPDATED: How important in your selection of the energy efficient equipment was... the program incentive?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	127 100.0%	89 100.0%	113 100.0%	14 100.0%	77 100.0%	12 100.0%
Total Valid Responses	127	84	113	14	72	12
Total Responses (Unweighted)	126	91	71	55	69	22
Total Valid Responses (Unweighted)	126	87	71	55	65	22
Net 0-4	2 1.7%	1 1.5%	-	2 15.1% F	1 1.6%	0 0.9%
0 - Not at all important	2 1.4%	0 0.3%	-	2 12.9%	0 0.3%	-
1	-	0 0.1%	-	-	-	0 0.9%
2	-	-	-	-	-	-
3	0 0.2%	1 1.1%	-	0 2.2%	1 1.3%	-
4	-	-	-	-	-	-
Net 5-7	21 16.2%	19 23.2%	17 14.7%	4 28.3%	16 22.6%	3 26.5%
5	5 3.8%	10 12.0% a	4 3.5%	1 5.7%	7 9.8%	3 25.6% D

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qn3b_upd Page 51
(Continued)
Duke Non-Residential Prescriptive

N3b_UPDATED: How important in your selection of the energy efficient equipment was... the program incentive?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
6	3 2.4%	3 3.2%	2 1.6%	1 9.1%	3 3.8%	-
7	13 10.0%	7 7.9%	11 9.6%	2 13.5% f	6 9.1%	0 0.9%
Net 8-10	104 82.1%	63 75.4%	96 85.3% D	8 56.5%	54 75.8%	9 72.6%
8	31 24.3% b	9 11.0%	28 24.9% e	3 19.2%	6 8.7%	3 24.9%
9	9 7.1%	6 6.6%	8 7.4%	1 4.3%	5 6.8%	1 5.0%
10 - Extremely important	64 50.7%	48 57.8%	60 52.9% d	5 33.1%	43 60.3%	5 42.7%
(Not applicable)	-	4 4.2%	-	-	4 4.9%	-
(Don't know)	-	2 2.0%	-	-	2 2.3%	-
(Refused)	-	-	-	-	-	-
Mean	8.7	8.6	8.9 D	7.1	8.7	8.1

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qn3e_fnl Page 52

Duke Non-Residential Prescriptive

N3e_FINAL: How important in your selection of the energy efficient equipment was... the recommendation from a Duke Energy representative?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	35 100.0%	21 100.0%	28 100.0%	8 100.0%	15 100.0%	5 100.0%
Total Valid Responses	33	16	28	6	11	5
Total Responses (Unweighted)	59	28	27	32	17	11
Total Valid Responses (Unweighted)	50	24	25	25	14	10
Net 0-4	8 23.5%	1 4.4%	6 22.1%	2 30.2%	-	1 13.8%
0 - Not at all important	6 19.1%	-	5 18.5%	1 21.9%	-	-
1	0 0.9%	-	-	0 5.4%	-	-
2	1 2.7%	-	1 3.3%	-	-	-
3	0 0.8%	1 4.4%	0 0.3%	0 3.0%	-	1 13.8%
4	-	-	-	-	-	-
Net 5-7	7 21.8%	4 22.0%	5 19.5%	2 32.8%	2 21.5%	1 23.2%
5	1 3.6%	2 10.2%	0 0.3%	1 19.1% c	0 4.0%	1 23.2%

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qn3e_fnl Page 53
(Continued)
Duke Non-Residential Prescriptive

N3e_FINAL: How important in your selection of the energy efficient equipment was... the recommendation from a Duke Energy representative?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
6	4 12.3%	-	4 14.8%	-	-	-
7	2 5.9%	2 11.9%	1 4.3%	1 13.7%	2 17.5%	-
Net 8-10	18 54.7%	12 73.5%	16 58.4%	2 37.0%	8 78.5%	3 63.0%
8	6 16.7%	2 10.8%	5 18.5%	0 8.2%	1 10.4%	1 11.8%
9	5 16.4%	4 26.5%	5 17.8%	1 9.8%	4 39.0%	-
10 - Extremely important	7 21.6%	6 36.2%	6 22.1%	1 19.1%	3 29.1%	3 51.2%
(Not applicable)	2 5.5%	5 23.2%	0 0.7%	2 23.3% c	5 30.2% Cf	0 2.0%
(Don't know)	-	-	-	-	-	-
(Refused)	-	-	-	-	-	-
Mean	6.4	8.3	6.6	5.5	8.7	7.6

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qn3f_fnl Page 54

Duke Non-Residential Prescriptive

N3f_FINAL: How important in your selection of the energy efficient equipment was... the Information from <program> or Duke Energy marketing materials?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	127 100.0%	89 100.0%	113 100.0%	14 100.0%	77 100.0%	12 100.0%
Total Valid Responses	119	82	105	14	70	12
Total Responses (Unweighted)	126	91	71	55	69	22
Total Valid Responses (Unweighted)	119	81	65	54	59	22
Net 0-4	26 22.1%	23 28.4%	21 19.8%	5 39.7% C	20 28.9%	3 25.8%
0 - Not at all important	14 12.1%	10 11.6%	12 11.5%	2 16.7%	9 12.8%	1 5.0%
1	5 4.5%	4 4.6%	5 4.8%	0 2.3%	4 5.4%	-
2	1 1.0%	5 5.9%	0 0.1%	1 8.1% c	5 6.7% c	0 0.9%
3	5 3.9%	4 4.9%	4 3.5%	1 6.8%	3 4.0%	1 10.0%
4	1 0.7%	1 1.4%	-	1 5.8%	-	1 9.9%
Net 5-7	34 28.7%	26 32.3%	30 28.8%	4 28.0%	21 30.7%	5 41.5%

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qn3f_fnl Page 55
(Continued)
Duke Non-Residential Prescriptive

N3f_FINAL: How important in your selection of the energy efficient equipment was... the Information from <program> or Duke Energy marketing materials?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
5	9 7.6%	12 14.2%	7 6.9%	2 12.8%	8 11.3%	4 30.8%
6	9 8.0%	4 4.9%	9 8.6%	0 3.5%	4 5.6%	0 0.9%
7	16 13.1%	11 13.2%	14 13.3%	2 11.6%	10 13.7%	1 9.9%
Net 8-10	58 49.2%	32 39.3%	54 51.4% d	4 32.4%	28 40.4%	4 32.7%
8	13 10.7%	16 19.7%	11 10.6%	2 11.2%	14 20.5%	2 15.0%
9	7 6.0%	4 5.0%	6 5.5%	1 9.9%	4 5.7%	0 0.9%
10 - Extremely important	39 32.5% B	12 14.5%	37 35.2% ED	2 11.3%	10 14.1%	2 16.8%
(Not applicable)	4 3.2%	7 7.5%	4 3.3%	0 2.2%	7 8.6%	-
(Don't know)	4 3.1%	1 1.0%	4 3.5%	-	1 1.2%	-
(Refused)	-	-	-	-	-	-
Mean	6.6	5.8	6.8 D	5.2	5.7	6.0

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qn4a_upd Page 56

Duke Non-Residential Prescriptive

N4a_UPDATED: How many points would you give to the <program>?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	127 100.0%	89 100.0%	113 100.0%	14 100.0%	77 100.0%	12 100.0%
Total Responses (Unweighted)	126 100.0%	91 100.0%	71 100.0%	55 100.0%	69 100.0%	22 100.0%
0	2 1.5%	2 2.1%	1 0.8%	1 7.2%	2 2.4%	-
2	-	1 1.3%	-	-	-	1 9.9%
5	0 0.2%	-	-	0 2.2%	-	-
10	1 0.7%	2 2.1%	0 0.1%	1 5.7%	2 2.4%	-
20	3 2.4%	4 4.4%	2 1.6%	1 8.9%	4 4.9%	0 0.9%
25	0 0.2%	3 3.4%	-	0 2.2%	2 2.4%	1 9.9%
30	7 5.5%	3 2.9%	6 5.2%	1 7.2%	2 2.4%	1 5.9%
40	9 6.7%	6 6.8%	8 7.2%	0 3.4%	4 4.8%	2 19.9% de
50	29 22.6%	13 14.8%	26 23.3%	2 16.6%	12 15.6%	1 10.0%
60	22 17.1%	14 16.1%	21 18.7% D	1 4.7%	13 16.9%	1 10.9%

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qn4a_upd Page 57
(Continued)
Duke Non-Residential Prescriptive

N4a_UPDATED: How many points would you give to the <program>?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
65	0 0.2%	-	-	0 2.2%	-	-
70	23 18.2% B	5 5.3%	23 20.1% eD	0 2.2%	4 5.3%	1 5.0%
75	4 3.1%	7 8.3%	2 1.9%	2 12.9% c	7 9.6%	-
80	14 10.7%	6 7.0%	12 10.6%	2 12.3%	6 7.2%	1 5.9%
85	-	2 2.7%	-	-	2 2.3%	1 5.0%
90	4 3.3%	9 9.5%	4 3.5%	0 1.8%	8 10.2%	1 5.0%
95	4 3.3%	-	4 3.5%	0 1.2%	-	-
100	5 4.0%	9 9.7%	4 3.5%	1 7.9%	7 9.4%	1 11.8%
998	0 0.1%	-	-	0 1.2%	-	-
999	-	3 3.4%	-	-	3 3.9%	-
Mean	60.49	60.89	61.59 d	51.51	62.18	52.87

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qn4b_upd Page 58

Duke Non-Residential Prescriptive

N4b_NEW: How many points would you give to other factors?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	127 100.0%	89 100.0%	113 100.0%	14 100.0%	77 100.0%	12 100.0%
Total Responses (Unweighted)	126 100.0%	91 100.0%	71 100.0%	55 100.0%	69 100.0%	22 100.0%
0	4 3.2%	8 8.7%	3 2.7%	1 7.9%	6 8.2%	1 11.8%
5	4 3.3%	-	4 3.5%	0 1.2%	-	-
10	4 3.3%	9 9.5%	4 3.5%	0 1.8%	8 10.2%	1 5.0%
15	-	2 2.7%	-	-	2 2.3%	1 5.0%
20	14 10.7%	6 7.0%	12 10.6%	2 12.3%	6 7.2%	1 5.9%
25	4 3.1%	7 8.3%	2 1.9%	2 12.9% c	7 9.6%	-
30	23 18.2% B	5 5.3%	23 20.1% eD	0 2.2%	4 5.3%	1 5.0%
35	0 0.2%	-	-	0 2.2%	-	-
40	22 17.1%	12 14.0%	21 18.7% D	1 4.7%	11 14.5%	1 10.9%
50	29 22.6%	13 14.8%	26 23.3%	2 16.6%	12 15.6%	1 10.0%

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qn4b_upd Page 59
(Continued)
Duke Non-Residential Prescriptive

N4b_NEW: How many points would you give to other factors?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
60	9 6.7%	6 6.8%	8 7.2%	0 3.4%	4 4.8%	2 19.9% de
70	3 2.3%	3 2.9%	2 1.7%	1 7.2%	2 2.4%	1 5.9%
75	0 0.2%	3 3.4%	-	0 2.2%	2 2.4%	1 9.9%
80	3 2.4%	4 4.4%	2 1.6%	1 8.9%	4 4.9%	0 0.9%
90	1 0.7%	2 2.1%	0 0.1%	1 5.7%	2 2.4%	-
95	0 0.2%	-	-	0 2.2%	-	-
98	-	1 1.3%	-	-	-	1 9.9%
99	-	1 1.0%	-	-	1 1.2%	-
100	2 1.5%	-	1 0.8%	1 7.2%	-	-
998	0 0.1%	-	-	0 1.2%	-	-
999	5 3.9%	7 7.6%	5 4.3%	-	7 8.8%	-
Mean	38.81	38.78	37.57	48.49 c	37.36	47.13

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qn5 Page 60

Duke Non-Residential Prescriptive

N5. Without the program, what is the likelihood that the equipment would have had the same efficiency level? Please use a scale from 0 to 10, where 0 is 'Not at all likely' and 10 is 'Extremely likely'.

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	127 100.0%	89 100.0%	113 100.0%	14 100.0%	77 100.0%	12 100.0%
Total Responses (Unweighted)	126 100.0%	91 100.0%	71 100.0%	55 100.0%	69 100.0%	22 100.0%
Net 0-4	49 38.6%	46 51.6%	46 41.0% D	3 19.0%	45 57.9% F	1 10.9%
0 - Not at all likely	28 22.1%	22 24.2%	26 23.2%	2 13.3%	20 26.4% f	1 10.0%
1	1 0.7%	4 4.2%	1 0.8%	-	4 4.9%	-
2	10 7.9%	7 8.1%	10 8.9%	-	7 9.3%	-
3	0 0.1%	8 8.5% A	0 0.2%	-	8 9.8% C	-
4	10 7.7%	6 6.6%	9 8.0%	1 5.7%	6 7.5%	0 0.9%
Net 5-7	29 22.5%	16 18.1%	26 22.9%	3 19.8%	12 15.4%	4 35.8%
5	17 13.5%	8 8.6%	16 14.0%	1 9.1%	6 8.4%	1 10.0%
6	5 4.1%	1 1.0%	4 3.5%	1 8.5%	1 1.2%	-
7	6 5.0%	8 8.5%	6 5.3%	0 2.2%	5 5.8%	3 25.8% De

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qn5 Page 61
(Continued)
Duke Non-Residential Prescriptive

N5. Without the program, what is the likelihood that the equipment would have had the same efficiency level? Please use a scale from 0 to 10, where 0 is 'Not at all likely' and 10 is 'Extremely likely'.

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Net 8-10	41	25	33	8	19	6
	32.4%	28.1%	29.1%	58.8%	25.0%	48.3%
				C		e
8	5	12	4	1	11	1
	3.9%	13.5%	3.6%	5.9%	14.8%	5.0%
		a			C	
9	6	0	6	1	-	0
	5.1%	0.2%	5.2%	4.4%		1.8%
10 - Extremely likely	30	13	23	7	8	5
	23.4%	14.3%	20.3%	48.5%	10.1%	41.5%
				C		E
(Don't know)	4	1	4	0	0	1
	3.3%	1.2%	3.5%	1.2%	0.6%	5.0%
(Refused)	4	1	4	0	1	-
	3.3%	1.0%	3.5%	1.2%	1.2%	
Mean	5.2	4.4	4.9	7.2	4.0	7.4
				C		E

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qn6a Page 62

Duke Non-Residential Prescriptive

N6a. Without the program, would you have installed the same quantity of energy efficient equipment in <date> or would you have installed less?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	127 100.0%	89 100.0%	113 100.0%	14 100.0%	77 100.0%	12 100.0%
Total Responses (Unweighted)	126 100.0%	91 100.0%	71 100.0%	55 100.0%	69 100.0%	22 100.0%
Same quantity	29 22.5%	26 29.3%	18 16.4%	10 71.9% C	18 23.5%	8 66.6% E
Less	94 74.1%	60 67.6%	91 80.4% D	3 23.7%	56 72.9% F	4 33.4%
(More)	0 0.2%	-	-	0 2.2%	-	-
(Don't know)	2 1.4%	2 2.1%	2 1.6%	-	2 2.4%	-
(Refused)	2 1.7%	1 1.0%	2 1.6%	0 2.2%	1 1.2%	-

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qn6b Page 63

Duke Non-Residential Prescriptive

N6b. As best as you can, please estimate the percentage of the energy efficient <TECH> equipment that you would have installed in <date> without the program.

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	94 100.0%	60 100.0%	91 100.0%	3 100.0%	56 100.0%	4 100.0%
Total Responses (Unweighted)	61 100.0%	62 100.0%	49 100.0%	12 100.0%	53 100.0%	9 100.0%
0	29 30.5%	26 42.7%	28 30.4%	1 33.3%	25 43.6%	1 29.9%
7	-	-	-	-	-	-
10	1 1.0%	5 8.0%	1 1.0%	-	5 8.6%	-
20	13 13.7% b	2 3.3%	13 14.2% e	-	2 3.4%	0 2.7%
25	4 4.7%	7 11.6%	4 4.5%	0 9.4%	6 10.3%	1 29.5%
33	0 0.3%	-	-	0 9.4%	-	-
50	8 8.1%	5 7.5%	7 7.7%	1 18.8%	4 7.9%	0 2.7%
55	-	-	-	-	-	-
70	4 4.2%	1 1.4%	4 4.4%	-	0 0.4%	1 15.0%
75	0 0.1%	1 1.5%	0 0.1%	-	1 1.6%	-

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qn6b Page 64
(Continued)
Duke Non-Residential Prescriptive

N6b. As best as you can, please estimate the percentage of the energy efficient <TECH> equipment that you would have installed in <date> without the program.

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
80	0 0.3%	3 4.3%	-	0 9.4%	2 3.4%	1 17.6%
100	-	-	-	-	-	-
(Don't know)	4 4.4%	-	4 4.4%	0 5.2%	-	-
(Refused)	8 8.5%	1 1.9%	8 8.8%	-	1 2.0%	-
Mean	18.2	17.0	17.8	27.8	15.4	34.7

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qn6cm1 Page 65

Duke Non-Residential Prescriptive

N6c. Why would you have installed that much less energy efficient equipment?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	69 100.0%	48 100.0%	67 100.0%	2 100.0%	46 100.0%	2 100.0%
Total Responses (Unweighted)	42 100.0%	45 100.0%	34 100.0%	8 100.0%	41 100.0%	4 100.0%
Open ended response	69 100.0%	48 100.0%	67 100.0%	2 100.0%	46 100.0%	2 100.0%
(Don't know)	-	-	-	-	-	-
(Refused)	-	-	-	-	-	-

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qn7 Page 66

Duke Non-Residential Prescriptive

N7. Without the program, would you have installed the remaining <N_INSTALL> percent of the energy efficient <TECH> equipment at a later time?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	82 100.0%	59 100.0%	79 100.0%	3 100.0%	55 100.0%	4 100.0%
Total Responses (Unweighted)	57 100.0%	60 100.0%	46 100.0%	11 100.0%	51 100.0%	9 100.0%
Yes	46 56.4%	36 61.6%	44 56.3%	2 60.4%	34 61.1%	3 67.4%
No	25 30.0%	19 31.7%	24 30.0%	1 29.7%	17 31.6%	1 32.6%
(Don't know)	11 13.6%	2 3.6%	11 13.7%	0 9.9%	2 3.8%	-
(Refused)	-	2 3.2%	-	-	2 3.4%	-

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qn7a Page 67

Duke Non-Residential Prescriptive

N7a. Without the program, when do you think you would have installed the energy efficient <TECH> equipment? Please answer relative to the date that you ACTUALLY installed the equipment.

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	46	36	44	2	34	3
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Total Responses (Unweighted)	29	37	22	7	31	6
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
(at the same time)	-	-	-	-	-	-
(up to 6 months later)	4	-	4	0	-	-
	9.3%		9.0%	16.4%		
(7 months to 1 year later)	13	8	12	1	7	2
	27.6%	23.3%	27.0%	41.8%	19.9%	66.0%
						e
(more than 1 year up to 2 years later)	11	10	10	1	10	0
	23.8%	26.6%	23.4%	32.7%	28.1%	7.9%
(more than 2 years up to 3 years later)	1	10	1	-	10	1
	2.2%	27.7%	2.3%		28.1%	22.2%
		A			C	
(more than 3 years up to 4 years later)	-	0	-	-	0	-
		0.6%			0.6%	
(more than 4 years later)	5	4	5	-	4	-
	10.8%	11.3%	11.3%		12.2%	
(Never)	-	-	-	-	-	-
(Don't know)	4	2	4	0	2	0
	9.0%	5.3%	9.0%	9.1%	5.4%	3.9%
(Refused)	8	2	8	-	2	-
	17.3%	5.2%	18.0%		5.6%	

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qrec_n7bm1 Page 68

Duke Non-Residential Prescriptive

N7b. Why would it have been that much later?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	17 100.0%	24 100.0%	16 100.0%	1 100.0%	23 100.0%	1 100.0%
Total Responses (Unweighted)	17 100.0%	25 100.0%	15 100.0%	2 100.0%	22 100.0%	3 100.0%
Financial considerations	9 52.4%	21 87.5% A	8 50.6%	1 100.0%	20 87.1% c	1 100.0%
Replace on failure	-	3 11.6%	-	-	3 12.0%	-
Timing with other projects/installations	4 24.0%	0 0.9%	4 25.0%	-	0 0.9%	-
Lower priority	4 23.5%	-	4 24.4%	-	-	-
Open ended response	-	-	-	-	-	-
Don't Know	-	-	-	-	-	-
Refused	-	-	-	-	-	-

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qcc2am1 Page 69

Duke Non-Residential Prescriptive

CC2a. When you answered <qN3b_upd> for the question about the influence of the incentive, I would interpret that to mean that the incentive was quite important in your selection of the efficiency level. Then, when you answered <qN5> for

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	22 100.0%	16 100.0%	18 100.0%	4 100.0%	14 100.0%	3 100.0%
Total Responses (Unweighted)	32 100.0%	18 100.0%	15 100.0%	17 100.0%	12 100.0%	6 100.0%
Open ended response	13 61.2%	9 57.1%	11 60.6%	3 64.2%	8 57.7%	1 54.1%
(Don't know)	8 34.6%	7 42.9%	6 34.4%	1 35.8%	6 42.3%	1 45.9%
(Refused)	1 4.1%	-	1 5.1%	-	-	-

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Appendix F. Participant Telephone Survey Cross-Tabulations

Table qcc2b Page 70

Duke Non-Residential Prescriptive

CC2b. Would you like me to change your score on the importance of the incentive or change the likelihood, or both?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	22 100.0%	16 100.0%	18 100.0%	4 100.0%	14 100.0%	3 100.0%
Total Responses (Unweighted)	32 100.0%	18 100.0%	15 100.0%	17 100.0%	12 100.0%	6 100.0%
(Change importance of incentive rating)	7 30.6%	2 11.6%	6 32.3%	1 23.1%	2 13.8%	-
(Change likelihood to install the same equipment rating)	1 4.1%	0 0.7%	1 5.1%	-	-	0 4.1%
(Change both)	0 1.8%	2 11.6%	-	0 9.7%	2 13.8%	-
(No, don't change)	9 39.8%	11 65.1%	6 35.4%	2 59.5%	8 59.3%	2 95.9% d
(Don't know)	0 1.4%	-	-	0 7.7%	-	-
(Refused)	5 22.2%	2 11.1%	5 27.2%	-	2 13.2%	-

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qn3b_new2 Page 71

Duke Non-Residential Prescriptive

N3b _NEW2. How important in your selection of the energy efficient equipment was... the program incentive?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	7 100.0%	4 100.0%	6 100.0%	1 100.0%	4 100.0%	-
Total Valid Responses	3	4	2	1	4	-
Total Responses (Unweighted)	8	2	3	5	2	-
Total Valid Responses (Unweighted)	7	2	2	5	2	-
Net 0-4	1 39.4%	-	-	1 93.8%	-	-
0 - Not at all important	1 19.7%	-	-	1 46.9%	-	-
1	0 9.9%	-	-	0 23.4%	-	-
2	-	-	-	-	-	-
3	0 9.9%	-	-	0 23.4%	-	-
4	-	-	-	-	-	-
Net 5-7	-	-	-	-	-	-
5	-	-	-	-	-	-

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qn3b_new2 Page 72
(Continued)
Duke Non-Residential Prescriptive

N3b _NEW2. How important in your selection of the energy efficient equipment was... the program incentive?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
6	-	-	-	-	-	-
7	-	-	-	-	-	-
Net 8-10	2 60.6%	4 100.0% a	2 100.0% D	0 6.2%	4 100.0%	-
8	0 2.6%	-	-	0 6.2%	-	-
9	-	-	-	-	-	-
10 - Extremely important	2 58.0%	4 100.0% A	2 100.0%	-	4 100.0%	-
(Don't know)	-	-	-	-	-	-
(Refused)	4 55.9%	-	4 68.6%	-	-	-
Mean	6.4	10.0	10.0 D	1.4	10.0	-

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qn5_new Page 73

Duke Non-Residential Prescriptive

N5_NEW. Without the program, what is the likelihood that the equipment would have had the same efficiency level?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	1 100.0%	2 100.0%	1 100.0%	0 100.0%	2 100.0%	0 100.0%
Total Responses (Unweighted)	3 100.0%	2 100.0%	1 100.0%	2 100.0%	1 100.0%	1 100.0%
Net 0-4	-	-	-	-	-	-
0 - Not at all likely	-	-	-	-	-	-
1	-	-	-	-	-	-
2	-	-	-	-	-	-
3	-	-	-	-	-	-
4	-	-	-	-	-	-
Net 5-7	-	-	-	-	-	-
5	-	-	-	-	-	-
6	-	-	-	-	-	-
7	-	-	-	-	-	-
Net 8-10	1 100.0%	2 100.0%	1 100.0%	0 100.0%	2 100.0%	0 100.0%

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qn5_new Page 74
(Continued)
Duke Non-Residential Prescriptive

N5_NEW. Without the program, what is the likelihood that the equipment would have had the same efficiency level?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
8	0 6.3%	-	-	0 20.9%	-	-
9	1 69.9%	-	1 100.0%	-	-	-
10 - Extremely likely	0 23.8%	2 100.0% A	-	0 79.1%	2 100.0%	0 100.0%
(Don't know)	-	-	-	-	-	-
(Refused)	-	-	-	-	-	-
Mean	9.2	10.0	9.0	9.6	10.0	10.0

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qn3b_fnl Page 75

Duke Non-Residential Prescriptive

N3b _FINAL. How important in your selection of the energy efficient equipment was... the program incentive?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	127 100.0%	89 100.0%	113 100.0%	14 100.0%	77 100.0%	12 100.0%
Total Valid Responses	127	84	113	14	72	12
Total Responses (Unweighted)	126	91	71	55	69	22
Total Valid Responses (Unweighted)	126	87	71	55	65	22
Net 0-4	3 2.6%	1 1.5%	-	3 24.0% F	1 1.6%	0 0.9%
0 - Not at all important	2 1.9%	0 0.3%	-	2 17.3%	0 0.3%	-
1	0 0.2%	0 0.1%	-	0 2.2%	-	0 0.9%
2	-	-	-	-	-	-
3	1 0.5%	1 1.1%	-	1 4.4%	1 1.3%	-
4	-	-	-	-	-	-
Net 5-7	21 16.2%	19 23.2%	17 14.7%	4 28.3%	16 22.6%	3 26.5%
5	5 3.8%	10 12.0% a	4 3.5%	1 5.7%	7 9.8%	3 25.6% D

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qn3b_fnl Page 76
(Continued)
Duke Non-Residential Prescriptive

N3b _FINAL. How important in your selection of the energy efficient equipment was... the program incentive?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
6	3 2.4%	3 3.2%	2 1.6%	1 9.1%	3 3.8%	-
7	13 10.0%	7 7.9%	11 9.6%	2 13.5% f	6 9.1%	0 0.9%
Net 8-10	103 81.1%	63 75.4%	96 85.3% D	7 47.7%	54 75.8%	9 72.6% d
8	29 23.2% B	7 8.8%	27 24.1% E	2 15.4%	4 6.1%	3 24.9% e
9	9 7.1%	6 6.6%	8 7.4%	1 4.3%	5 6.8%	1 5.0%
10 - Extremely important	64 50.9%	50 60.1%	61 53.7% D	4 28.0%	45 62.9%	5 42.7%
(Not applicable)	-	4 4.2%	-	-	4 4.9%	-
(Don't know)	-	2 2.0%	-	-	2 2.3%	-
(Refused)	-	-	-	-	-	-
Mean	8.6	8.7	8.9 D	6.4	8.8	8.1 D

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qn5_fnl Page 77

Duke Non-Residential Prescriptive

N5_FINAL. Without the program, what is the likelihood that the equipment would have had the same efficiency level?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	127 100.0%	89 100.0%	113 100.0%	14 100.0%	77 100.0%	12 100.0%
Total Responses (Unweighted)	126 100.0%	91 100.0%	71 100.0%	55 100.0%	69 100.0%	22 100.0%
Net 0-4	49 38.6%	46 51.6%	46 41.0% D	3 19.0%	45 57.9% F	1 10.9%
0 - Not at all likely	28 22.1%	22 24.2%	26 23.2%	2 13.3%	20 26.4% f	1 10.0%
1	1 0.7%	4 4.2%	1 0.8%	-	4 4.9%	-
2	10 7.9%	7 8.1%	10 8.9%	-	7 9.3%	-
3	0 0.1%	8 8.5% A	0 0.2%	-	8 9.8% C	-
4	10 7.7%	6 6.6%	9 8.0%	1 5.7%	6 7.5%	0 0.9%
Net 5-7	29 22.5%	16 18.1%	26 22.9%	3 19.8%	12 15.4%	4 35.8%
5	17 13.5%	8 8.6%	16 14.0%	1 9.1%	6 8.4%	1 10.0%
6	5 4.1%	1 1.0%	4 3.5%	1 8.5%	1 1.2%	-
7	6 5.0%	8 8.5%	6 5.3%	0 2.2%	5 5.8%	3 25.8% De

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qn5_fnl Page 78
(Continued)
Duke Non-Residential Prescriptive

N5_FINAL. Without the program, what is the likelihood that the equipment would have had the same efficiency level?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Net 8-10	41 32.4%	25 28.1%	33 29.1%	8 58.8% C	19 25.0%	6 48.3% e
8	5 3.9%	10 11.4%	4 3.6%	1 5.9%	10 12.4% c	1 5.0%
9	6 5.1%	0 0.1%	6 5.2%	1 4.4%	-	0 0.9%
10 - Extremely likely	30 23.4%	15 16.6%	23 20.3%	7 48.5% C	10 12.6%	5 42.4% E
(Don't know)	4 3.3%	1 1.2%	4 3.5%	0 1.2%	0 0.6%	1 5.0%
(Refused)	4 3.3%	1 1.0%	4 3.5%	0 1.2%	1 1.2%	-
Mean	5.2	4.5	4.9	7.2 C	4.0	7.4 E

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qsp1a Page 79

Duke Non-Residential Prescriptive

SP1a. Since receiving the incentive for the project we just discussed, did you make any ADDITIONAL energy efficiency improvements at this facility or at your other facilities within Duke Energy's [IF DEC: Carolinas; IF DEP: Progress] service territory that did NOT receive an incentive from Duke Energy?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	127 100.0%	94 100.0%	113 100.0%	14 100.0%	82 100.0%	12 100.0%
Total Responses (Unweighted)	127 100.0%	94 100.0%	71 100.0%	56 100.0%	72 100.0%	22 100.0%
Yes	30 23.4%	21 22.0%	26 23.2%	4 24.9%	16 19.0%	5 42.6% e
No	93 72.9%	71 76.0%	83 73.3%	10 69.5%	65 78.7%	7 57.4%
(Don't know)	5 3.6%	2 2.0%	4 3.5%	1 4.3%	2 2.3%	-
(Refused)	0 0.1%	-	-	0 1.2%	-	-

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qsp1b Page 80

Duke Non-Residential Prescriptive

SP1b. Have you applied, or do you still plan to apply, for a Duke Energy incentive?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	30 100.0%	21 100.0%	26 100.0%	4 100.0%	16 100.0%	5 100.0%
Total Responses (Unweighted)	33 100.0%	23 100.0%	19 100.0%	14 100.0%	13 100.0%	10 100.0%
Yes	10 34.5%	7 31.5%	9 34.3%	1 35.8%	4 25.1%	3 51.2%
No	18 61.8%	10 49.2%	17 65.7% d	1 33.3%	8 49.3%	2 48.8%
(Don't know)	1 2.7%	4 19.3%	-	1 22.2%	4 25.6%	-
(Refused)	0 1.0%	-	-	0 8.7%	-	-

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qsp2a Page 81

Duke Non-Residential Prescriptive

SP2a. How much did your experience with the program influence your decision to install high efficiency equipment on your own?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	18 100.0%	10 100.0%	17 100.0%	1 100.0%	8 100.0%	2 100.0%
Total Responses (Unweighted)	20 100.0%	10 100.0%	15 100.0%	5 100.0%	6 100.0%	4 100.0%
Net 0-4	10 52.6%	3 26.3%	9 54.4%	0 26.2%	1 11.8%	2 71.6% e
0 - No influence	10 52.1%	3 26.3%	9 53.9%	0 26.2%	1 11.8%	2 71.6% e
1	-	-	-	-	-	-
2	-	-	-	-	-	-
3	-	-	-	-	-	-
4	0 0.5%	-	0 0.5%	-	-	-
Net 5-7	2 12.6%	2 24.4%	2 10.6%	0 40.7%	2 24.6%	1 24.1%
5	1 7.6%	-	1 5.3%	0 40.7%	-	-
6	-	-	-	-	-	-
7	1 5.0%	2 24.4%	1 5.3%	-	2 24.6%	1 24.1%

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qsp2a Page 82
(Continued)
Duke Non-Residential Prescriptive

SP2a. How much did your experience with the program influence your decision to install high efficiency equipment on your own?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Net 8-10	6 34.8%	5 49.2%	6 34.9%	0 33.1%	5 63.7% f	0 4.3%
8	0 2.1%	1 8.9%	-	0 33.1%	1 11.8%	-
9	4 22.2%	-	4 23.8%	-	-	-
10 - Greatly influenced	2 10.4%	4 40.3%	2 11.2%	-	4 51.9%	0 4.3%
(Don't know)	-	-	-	-	-	-
(Refused)	-	-	-	-	-	-
Mean	3.96	6.45	3.91	4.68	7.85	2.12

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qsp2b Page 83

Duke Non-Residential Prescriptive

SP2b. If you had NOT participated in the program, how likely is it that <COMPANY> would still have installed this additional energy efficient equipment?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	18 100.0%	10 100.0%	17 100.0%	1 100.0%	8 100.0%	2 100.0%
Total Responses (Unweighted)	20 100.0%	10 100.0%	15 100.0%	5 100.0%	6 100.0%	4 100.0%
Net 0-4	5 28.2%	5 46.2%	5 30.1%	-	4 51.9%	1 28.4%
0 - definitely WOULD NOT have implemented this equipment	1 6.0%	1 6.9%	1 6.4%	-	-	1 28.4%
1	-	-	-	-	-	-
2	-	2 20.7%	-	-	2 27.4%	-
3	0 0.5%	2 18.6%	0 0.5%	-	2 24.6%	-
4	4 21.7%	-	4 23.2%	-	-	-
Net 5-7	4 21.8%	3 27.5%	4 21.8%	0 21.4%	3 36.3%	-
5	3 15.4%	2 18.6%	3 16.5%	-	2 24.6%	-
6	0 0.9%	-	-	0 14.5%	-	-
7	1 5.4%	1 8.9%	1 5.3%	0 6.9%	1 11.8%	-

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qsp2b Page 84
(Continued)
Duke Non-Residential Prescriptive

SP2b. If you had NOT participated in the program, how likely is it that <COMPANY> would still have installed this additional energy efficient equipment?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Net 8-10	9 50.0%	3 26.3%	8 48.1%	1 78.6%	1 11.8%	2 71.6% e
8	-	-	-	-	-	-
9	0 0.5%	1 5.9%	0 0.5%	-	-	1 24.1%
10 - definitely WOULD have implemented this equipment	9 49.5%	2 20.5%	8 47.5%	1 78.6%	1 11.8%	1 47.5%
(Don't know)	-	-	-	-	-	-
(Refused)	-	-	-	-	-	-
Mean	7.09	5.10	6.94	9.21	4.51	6.92

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qsp2cm1 Page 85

Duke Non-Residential Prescriptive

SP2c. How did your experience with the program influence your decision to install high efficiency equipment on your own?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	6 100.0%	4 100.0%	6 100.0%	-	4 100.0%	0 100.0%
Total Responses (Unweighted)	4 100.0%	4 100.0%	4 100.0%	-	3 100.0%	1 100.0%
Open ended response	6 100.0%	4 97.4%	6 100.0%	-	4 100.0%	-
(Don't know)	-	0 2.6%	-	-	-	0 100.0%
(Refused)	-	-	-	-	-	-

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qsp3a Page 86

Duke Non-Residential Prescriptive

SP3a. What was the first energy efficient improvement that you made without a Duke Energy incentive?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	6 100.0%	4 100.0%	6 100.0%	-	4 100.0%	0 100.0%
Total Responses (Unweighted)	4 100.0%	4 100.0%	4 100.0%	-	3 100.0%	1 100.0%
(Lighting: LED lamps)	0 1.6%	2 46.1%	0 1.6%	-	2 47.3%	-
(Lighting: T8 lamps)(Note that this is a type of linear fluorescent lamps)	-	2 46.1%	-	-	2 47.3%	-
(Lighting: T5 lamps)(Note that this is a type of linear fluorescent lamps)	-	-	-	-	-	-
(Lighting: Highbay Fixtures)	-	-	-	-	-	-
(Lighting: CFLs)	-	-	-	-	-	-
(Lighting: Controls or Occupancy sensors)	2 30.9%	-	2 30.9%	-	-	-
(Cooling: Chiller)	-	-	-	-	-	-
(Cooling: Unitary/Split Air Conditioning System)	-	-	-	-	-	-
(Motors: Variable Frequency Drives (VFD/ VSD))	-	-	-	-	-	-

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qsp3a Page 87
(Continued)
Duke Non-Residential Prescriptive

SP3a. What was the first energy efficient improvement that you made without a Duke Energy incentive?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
(Motors: Efficient motors)	-	-	-	-	-	-
(Food service products: Anti-sweat controls)	-	-	-	-	-	-
(Food service products: EC motor for WALK-IN cooler/freezer)	-	-	-	-	-	-
(Food service products: EC motor for REACH-IN cooler/freezer)	-	-	-	-	-	-
(Process equipment)	-	-	-	-	-	-
(Information technology)	-	-	-	-	-	-
(Other, specify)	-	0 7.9%	-	-	0 5.4%	0 100.0%
(Didn't install any measures)	-	-	-	-	-	-
(Don't know)	-	-	-	-	-	-
(Refused)	4 67.5%	-	4 67.5%	-	-	-

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qsp3b Page 88

Duke Non-Residential Prescriptive

SP3b. How many of this equipment did you install without receiving an incentive?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	2 100.0%	4 100.0%	2 100.0%	-	4 100.0%	-
Total Responses (Unweighted)	3 100.0%	2 100.0%	3 100.0%	-	2 100.0%	-
3	1 47.6%	-	1 47.6%	-	-	-
4	-	2 50.0%	-	-	2 50.0%	-
20	0 4.8%	-	0 4.8%	-	-	-
40	1 47.6%	-	1 47.6%	-	-	-
500	-	2 50.0%	-	-	2 50.0%	-
(Don't know)	-	-	-	-	-	-
(Refused)	-	-	-	-	-	-

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qsp3c Page 89

Duke Non-Residential Prescriptive

SP3c. Generally, what type of light bulbs did the <SP3a RESPONSE> replace/control?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	2 100.0%	4 100.0%	2 100.0%	-	4 100.0%	-
Total Responses (Unweighted)	3 100.0%	2 100.0%	3 100.0%	-	2 100.0%	-
(Incandescent lamps)	-	-	-	-	-	-
(CFLs)	-	-	-	-	-	-
(LEDs)	1 52.4%	2 50.0%	1 52.4%	-	2 50.0%	-
(Halogen lamps)	-	-	-	-	-	-
(Linear fluorescent T12s)	-	-	-	-	-	-
(Linear fluorescent T8s)	1 47.6%	-	1 47.6%	-	-	-
(Other, specify:)	-	2 50.0%	-	-	2 50.0%	-
(Don't know)	-	-	-	-	-	-
(Refused)	-	-	-	-	-	-

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qsp3d Page 90

Duke Non-Residential Prescriptive

SP3d. Were the majority of the <SP3a RESPONSE> installed in areas that use space cooling and heating?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	2 100.0%	4 100.0%	2 100.0%	-	4 100.0%	-
Total Responses (Unweighted)	3 100.0%	2 100.0%	3 100.0%	-	2 100.0%	-
(Cooling Only)	-	-	-	-	-	-
(Heating Only)	-	-	-	-	-	-
(Cooling and Heating)	2 100.0%	2 50.0%	2 100.0%	-	2 50.0%	-
(Neither Cooling nor Heating)	-	2 50.0%	-	-	2 50.0%	-
(Don't know)	-	-	-	-	-	-
(Refused)	-	-	-	-	-	-

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qsp3em1 Page 91

Duke Non-Residential Prescriptive

SP3e. Why did you purchase the <SP3a RESPONSE> without an incentive from the program?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	2 100.0%	4 100.0%	2 100.0%	-	4 100.0%	0 100.0%
Total Responses (Unweighted)	3 100.0%	4 100.0%	3 100.0%	-	3 100.0%	1 100.0%
(Takes too long to get approval)	-	-	-	-	-	-
(No time to participate, needed equipment immediately)	-	-	-	-	-	-
(The equipment did not qualify)	-	-	-	-	-	-
(The amount of the incentive wasn't large enough)	1 47.6%	-	1 47.6%	-	-	-
(Did not know the program was available)	-	2 46.1%	-	-	2 47.3%	-
(There was no program available)	-	0 5.3%	-	-	0 5.4%	-
(Had reached the maximum incentive amount)	-	-	-	-	-	-
(Other: Specify)	1 52.4%	2 48.6%	1 52.4%	-	2 47.3%	0 100.0%
(Don't know)	-	-	-	-	-	-
(Refused)	-	-	-	-	-	-

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qsp3f Page 92

Duke Non-Residential Prescriptive

SP3f. Did a contractor or vendor help you with the SELECTION of this equipment?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	2 100.0%	4 100.0%	2 100.0%	-	4 100.0%	0 100.0%
Total Responses (Unweighted)	3 100.0%	4 100.0%	3 100.0%	-	3 100.0%	1 100.0%
Yes	1 52.4%	2 51.4%	1 52.4%	-	2 52.7%	-
No	1 47.6%	2 48.6%	1 47.6%	-	2 47.3%	0 100.0%
(Don't know)	-	-	-	-	-	-
(Refused)	-	-	-	-	-	-

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qsp3ffm1 Page 93

Duke Non-Residential Prescriptive

SP3ff. Who was the contractor or vendor you worked with?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	1 100.0%	2 100.0%	1 100.0%	-	2 100.0%	-
Total Responses (Unweighted)	2 100.0%	2 100.0%	2 100.0%	-	2 100.0%	-
Open ended response	1 100.0% B	0 10.3%	1 100.0% E	-	0 10.3%	-
(Don't know)	-	2 89.7%	-	-	2 89.7%	-
(Refused)	-	-	-	-	-	-

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qsp4 Page 94

Duke Non-Residential Prescriptive

SP4. Did you implement any other energy efficient measures without a Duke Energy incentive?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	2 100.0%	4 100.0%	2 100.0%	-	4 100.0%	0 100.0%
Total Responses (Unweighted)	3 100.0%	4 100.0%	3 100.0%	-	3 100.0%	1 100.0%
Yes	-	-	-	-	-	-
No	2 100.0%	4 100.0%	2 100.0%	-	4 100.0%	0 100.0%
(Don't know)	-	-	-	-	-	-
(Refused)	-	-	-	-	-	-

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qsp4a Page 95

Duke Non-Residential Prescriptive

SP4a. What other measure did you implement?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	1 100.0%	-	1 100.0%	-	-	-
Total Responses (Unweighted)	1 100.0%	-	1 100.0%	-	-	-
(Lighting: LED lamps)	1 100.0%	-	1 100.0%	-	-	-
(Lighting: T8 lamps)	-	-	-	-	-	-
(Lighting: T5 lamps)	-	-	-	-	-	-
(Lighting: Highbay Fixture Replacement)	-	-	-	-	-	-
(Lighting: CFLs)	-	-	-	-	-	-
(Lighting: Controls / Occupancy sensors)	-	-	-	-	-	-
(Cooling: Chiller)	-	-	-	-	-	-
(Cooling: Unitary/Split Air Conditioning System)	-	-	-	-	-	-
(Motors: Variable Frequency Drives (VFD/ VSD))	-	-	-	-	-	-
(Motors: Efficient motors)	-	-	-	-	-	-
(Food service products: Anti-sweat controls)	-	-	-	-	-	-

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qsp4a Page 96
(Continued)
Duke Non-Residential Prescriptive

SP4a. What other measure did you implement?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
(Food service products: EC motor for WALK-IN cooler/freezer)	-	-	-	-	-	-
(Food service products: EC motor for REACH-IN cooler/freezer)	-	-	-	-	-	-
(Process equipment)	-	-	-	-	-	-
(Information technology)	-	-	-	-	-	-
(Other, specify)	-	-	-	-	-	-
(Didn't install any additional measures)	-	-	-	-	-	-
(Don't know)	-	-	-	-	-	-
(Refused)	-	-	-	-	-	-

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qsp6 Page 97

Duke Non-Residential Prescriptive

SP6. Thank you for sharing this information with us. We may have follow-up questions about the equipment you installed without an incentive. Would you be willing to speak briefly with a member of our team?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	2 100.0%	4 100.0%	2 100.0%	-	4 100.0%	0 100.0%
Total Responses (Unweighted)	3 100.0%	4 100.0%	3 100.0%	-	3 100.0%	1 100.0%
Yes	2 100.0%	4 100.0%	2 100.0%	-	4 100.0%	0 100.0%
No	-	-	-	-	-	-
(Don't know)	-	-	-	-	-	-
(Refused)	-	-	-	-	-	-

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qb0 Page 98

Duke Non-Residential Prescriptive

B0. Have you ever communicated with a Duke Energy Business Energy Advisor about energy efficiency or the energy efficiency programs that Duke offers for their business customers?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	120 100.0%	88 100.0%	107 100.0%	13 100.0%	78 100.0%	10 100.0%
Total Responses (Unweighted)	115 100.0%	86 100.0%	65 100.0%	50 100.0%	68 100.0%	18 100.0%
Yes	24 20.0%	19 21.4%	16 15.2%	8 58.8% C	16 19.9%	3 33.5%
No	91 76.0%	66 75.4%	86 80.8% D	5 36.4%	60 76.5%	6 66.5% d
(Don't know)	5 4.0%	2 2.2%	4 3.9%	1 4.8%	2 2.4%	-
(Refused)	-	1 1.0%	-	-	1 1.2%	-

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qrec_b1 Page 99

Duke Non-Residential Prescriptive

B1. You noted earlier that you worked with a Duke Energy Business Energy Advisor. How did you first come into contact with the Business Energy Advisor?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total	31 100.0%	25 100.0%	22 100.0%	9 100.0%	19 100.0%	6 100.0%
Total Responses (Unweighted)	55 100.0%	29 100.0%	20 100.0%	35 100.0%	18 100.0%	11 100.0%
Receive a Call or Email From the Advisor?	11 36.2%	4 14.6%	8 37.1%	3 34.0%	2 12.7%	1 21.4%
Reach Out to the Advisor Via Phone or	4 13.9%	15 59.0% A	2 8.6%	2 27.2%	12 63.7% C	2 42.8%
contact the advisor through the duke energy website?	1 4.0%	1 2.4%	-	1 13.9%	-	1 10.7%
Referral from other Duke staff	5 16.1%	1 2.8%	4 17.8%	1 11.7%	-	1 12.6%
Onsite visit	-	1 4.0%	-	-	1 4.7%	0 1.9%
Referral from contractor/ vendor	5 15.3%	-	4 18.7%	1 6.9%	-	-
Other Specify	4 14.3%	2 7.5%	4 17.8%	0 5.4%	2 9.7%	-
Don't know	0 0.3%	2 9.6%	-	0 0.9%	2 9.3%	1 10.7%
Refused	-	-	-	-	-	-

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qb2 Page 100

Duke Non-Residential Prescriptive

B2. Approximately, how many times did you have contact with the Business Energy Advisor?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total	31 100.0%	25 100.0%	22 100.0%	9 100.0%	19 100.0%	6 100.0%
Total Responses (Unweighted)	55 100.0%	29 100.0%	20 100.0%	35 100.0%	18 100.0%	11 100.0%
1	6 18.2% b	1 2.4%	5 21.9%	1 8.9%	-	1 10.7%
2	9 27.9%	12 49.1%	6 26.4%	3 31.6%	12 63.3% c	-
3	7 21.8%	2 7.5%	5 22.8%	2 19.3%	2 9.7%	-
4	1 4.7%	1 3.6%	1 4.5%	0 5.3%	1 4.7%	-
5	1 2.4%	1 3.3%	0 0.4%	1 7.3%	0 1.1%	1 10.7%
6	0 0.8%	3 10.4%	0 0.4%	0 1.9%	2 9.7%	1 12.6%
7	-	0 0.9%	-	-	0 1.1%	-
8	0 1.3%	-	-	0 4.4%	-	-
10	5 14.6%	1 2.4%	4 19.1%	0 3.5%	-	1 10.7%
12	1 2.5%	2 9.7%	-	1 8.9%	1 5.8%	1 23.3%

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qb2 Page 101
(Continued)
Duke Non-Residential Prescriptive

B2. Approximately, how many times did you have contact with the Business Energy Advisor?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
15	1 2.9%	-	1 4.1%	-	-	-
20	0 1.0%	-	-	0 3.5%	-	-
24	0 0.5%	-	-	0 1.9%	-	-
30	0 1.0%	-	-	0 3.5%	-	-
(Don't know)	0 0.3%	2 8.4%	0 0.4%	-	1 4.7%	1 21.4%
(Refused)	-	1 2.4%	-	-	-	1 10.7%

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qrec_b3m1_1 Page 102

Duke Non-Residential Prescriptive

B3m1. What aspects of the project did the advisor help you with?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	31 100.0%	25 100.0%	22 100.0%	9 100.0%	19 100.0%	6 100.0%
Total Responses (Unweighted)	55 100.0%	29 100.0%	20 100.0%	35 100.0%	18 100.0%	11 100.0%
Project Scoping	17 53.5% B	6 22.8%	15 67.0% ED	2 19.7%	4 20.1%	2 32.1%
The Application Process	9 30.0%	9 36.7%	7 30.5%	3 28.7%	7 34.9%	2 42.8%
Identifying and Contacting a Trade Ally	0 1.0%	2 9.9%	-	0 3.5%	2 9.7%	1 10.7%
Answering Questions About Available Program Incentives	7 22.3%	1 5.8%	4 19.9%	3 28.5% F	1 6.9%	0 1.9%
Identifying eligible equipment	-	-	-	-	-	-
Helped with participation at all stages	1 4.5%	1 3.6%	1 4.1%	0 5.4%	1 4.7%	-
Increased awareness of the program or answerwed general questions	-	0 0.4%	-	-	-	0 1.9%
Savings/incentive estimation	-	1 4.5%	-	-	1 5.8%	-
Other Specify	1 2.0%	-	-	1 6.9%	-	-
Don't Know	2 7.3%	5 19.5%	0 1.6%	2 21.6%	4 19.0%	1 21.4%

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qrec_b3m1_1 Page 103
(Continued)
Duke Non-Residential Prescriptive

B3m1. What aspects of the project did the advisor help you with?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Refused	0 1.0%	-	-	0 3.5%	-	-

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qb4 Page 104

Duke Non-Residential Prescriptive

B4. How influential was the Business Energy Advisor in your decision to participate in the <program>. Would you say...

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	31 100.0%	25 100.0%	22 100.0%	9 100.0%	19 100.0%	6 100.0%
Total Responses (Unweighted)	55 100.0%	29 100.0%	20 100.0%	35 100.0%	18 100.0%	11 100.0%
Very influential	8 26.2%	10 38.9%	5 23.3%	3 33.5%	8 40.3%	2 34.0%
Somewhat influential	19 59.3% B	7 29.3%	17 75.9% ED	2 17.7%	6 31.0%	1 23.3%
Not very influential	1 4.3%	2 6.0%	-	1 15.2%	1 4.7%	1 10.7%
Not at all influential	3 9.2%	5 19.9%	0 0.8%	3 30.1% C	4 19.4%	1 21.4%
(Don't know)	0 1.0%	1 2.4%	-	0 3.5%	-	1 10.7%
(Refused)	-	1 3.6%	-	-	1 4.7%	-

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Appendix F. Participant Telephone Survey Cross-Tabulations

Table qb5a Page 105

Duke Non-Residential Prescriptive

B5a. On a scale of 0 to 10, where 0 is 'Extremely Dissatisfied' and 10 is 'Extremely Satisfied', how would you rate your satisfaction with the Business Energy Advisor with whom you worked?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	31 100.0%	25 100.0%	22 100.0%	9 100.0%	19 100.0%	6 100.0%
Total Responses (Unweighted)	55 100.0%	29 100.0%	20 100.0%	35 100.0%	18 100.0%	11 100.0%
Net 0-4	5 16.1%	2 7.5%	4 18.3%	1 10.8%	2 9.7%	-
0 - Extremely dissatisfied	4 12.8%	2 7.5%	4 17.8%	-	2 9.7%	-
1	-	-	-	-	-	-
2	1 2.5%	-	-	1 8.9%	-	-
3	0 0.8%	-	0 0.4%	0 1.9%	-	-
4	-	-	-	-	-	-
Net 5-7	5 15.6%	4 15.6%	4 18.3%	1 8.9%	2 10.8%	2 32.1%
5	0 1.3%	-	0 0.4%	0 3.5%	-	-
6	-	0 0.9%	-	-	0 1.1%	-
7	4 14.3%	4 14.7%	4 17.8%	0 5.4%	2 9.7%	2 32.1% d

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qb5a Page 106
(Continued)
Duke Non-Residential Prescriptive

B5a. On a scale of 0 to 10, where 0 is 'Extremely Dissatisfied' and 10 is 'Extremely Satisfied', how would you rate your satisfaction with the Business Energy Advisor with whom you worked?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Net 8-10	21	19	14	7	15	4
	66.3%	76.9%	63.5%	73.4%	79.4%	67.9%
8	1	4	1	0	4	-
	3.5%	15.6%	4.1%	1.9%	20.1%	
9	2	2	1	1	1	1
	5.5%	6.9%	4.1%	8.9%	5.8%	10.7%
10 - Extremely Satisfied	18	14	12	6	10	3
	57.4%	54.4%	55.3%	62.6%	53.5%	57.2%
(Don't know)	0	-	-	0	-	-
	1.0%			3.5%		
(Refused)	0	-	-	0	-	-
	1.0%			3.5%		
Mean	7.8	8.4	7.5	8.6	8.2	8.9

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qrec_b5bm1 Page 107

Duke Non-Residential Prescriptive

B5bm1. Why did you give that rating?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	5 100.0%	2 100.0%	4 100.0%	1 100.0%	2 100.0%	-
Total Responses (Unweighted)	6 100.0%	1 100.0%	2 100.0%	4 100.0%	1 100.0%	-
Interaction was minimal	1 14.8%	2 100.0% A	0 2.2%	1 67.8%	2 100.0% C	-
Insufficient information from BEA	4 85.2%	-	4 97.8%	0 32.2%	-	-
Open ended response	-	-	-	-	-	-
Don't Know	-	-	-	-	-	-
Refused	-	-	-	-	-	-

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qee1 Page 108

Duke Non-Residential Prescriptive

EE1. Are you aware that Duke Energy has an online Energy Efficiency Store, where customers can purchase energy efficiency products at a discounted price?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	127 100.0%	94 100.0%	113 100.0%	14 100.0%	82 100.0%	12 100.0%
Total Responses (Unweighted)	127 100.0%	94 100.0%	71 100.0%	56 100.0%	72 100.0%	22 100.0%
Yes	59 46.4% B	21 22.1%	50 44.5% E	9 61.2%	15 17.7%	6 52.6% E
No	68 53.6%	73 77.9% A	63 55.5%	6 38.8%	68 82.3% CF	6 47.4%
(Don't know)	-	-	-	-	-	-
(Refused)	-	-	-	-	-	-

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qee2 Page 109

Duke Non-Residential Prescriptive

EE2. Have you ever visited the Energy Efficiency Store's webpage?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	59 100.0%	21 100.0%	50 100.0%	9 100.0%	15 100.0%	6 100.0%
Total Responses (Unweighted)	68 100.0%	29 100.0%	33 100.0%	35 100.0%	17 100.0%	12 100.0%
Yes	46 78.4% B	7 36.0%	39 77.7% E	7 81.9% F	5 37.7%	2 31.9%
No	13 21.6%	13 64.0% A	11 22.3%	2 18.1%	9 62.3% C	4 68.1% D
(Don't know)	-	-	-	-	-	-
(Refused)	-	-	-	-	-	-

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qee3 Page 110

Duke Non-Residential Prescriptive

EE3. Have you ever purchased energy efficient equipment from the online Energy Efficiency Store?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	46 100.0%	7 100.0%	39 100.0%	7 100.0%	5 100.0%	2 100.0%
Total Responses (Unweighted)	52 100.0%	13 100.0%	23 100.0%	29 100.0%	8 100.0%	5 100.0%
Yes	16 35.6%	1 17.9%	14 35.8%	2 34.6%	1 24.5%	-
No	30 64.2%	6 82.1%	25 64.0%	5 65.4%	4 75.5%	2 100.0% D
(Don't know)	0 0.2%	-	0 0.2%	-	-	-
(Refused)	-	-	-	-	-	-

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qee4a Page 111

Duke Non-Residential Prescriptive

EE4a. On a scale of 0 to 10, where 0 is 'Extremely Dissatisfied' and 10 is 'Extremely Satisfied', how would you rate your satisfaction with your use of the Energy Efficiency Store?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	16 100.0%	1 100.0%	14 100.0%	2 100.0%	1 100.0%	-
Total Responses (Unweighted)	15 100.0%	3 100.0%	7 100.0%	8 100.0%	3 100.0%	-
Net 0-4	0 0.6%	-	0 0.7%	-	-	-
0 - Extremely dissatisfied	-	-	-	-	-	-
1	-	-	-	-	-	-
2	-	-	-	-	-	-
3	0 0.6%	-	0 0.7%	-	-	-
4	-	-	-	-	-	-
Net 5-7	1 7.4%	-	1 6.5%	0 12.5%	-	-
5	-	-	-	-	-	-
6	-	-	-	-	-	-
7	1 7.4%	-	1 6.5%	0 12.5%	-	-
Net 8-10	14 86.5%	1 100.0%	12 86.3%	2 87.5%	1 100.0%	-

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qee4a Page 112
(Continued)
Duke Non-Residential Prescriptive

EE4a. On a scale of 0 to 10, where 0 is 'Extremely Dissatisfied' and 10 is 'Extremely Satisfied', how would you rate your satisfaction with your use of the Energy Efficiency Store?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
8	5 28.6%	0 16.2%	4 29.2%	1 25.0%	0 16.2%	-
9	-	1 67.5%	-	-	1 67.5%	-
10 - Extremely Satisfied	10 57.9%	0 16.2%	8 57.1%	2 62.5%	0 16.2%	-
(Don't know)	1 5.5%	-	1 6.5%	-	-	-
(Refused)	-	-	-	-	-	-
Mean	9.1	9.0	9.1	9.1	9.0	-

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qrec_ee4bm1 Page 113

Duke Non-Residential Prescriptive

EE4bm1. Why did you give that rating?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	0 100.0%	-	0 100.0%	-	-	-
Total Responses (Unweighted)	1 100.0%	-	1 100.0%	-	-	-
Issue with order, equipment not received	0 100.0%	-	0 100.0%	-	-	-
Open ended response	-	-	-	-	-	-
Don't Know	-	-	-	-	-	-
Refused	-	-	-	-	-	-

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qee5a Page 114

Duke Non-Residential Prescriptive

EE5a. How likely are you to make a purchase through Duke Energy's Energy Efficiency Store within the next year? Would you say...

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	127 100.0%	94 100.0%	113 100.0%	14 100.0%	82 100.0%	12 100.0%
Total Responses (Unweighted)	127 100.0%	94 100.0%	71 100.0%	56 100.0%	72 100.0%	22 100.0%
Very likely	35 27.3%	21 22.3%	32 28.3%	3 19.1%	18 22.3%	3 21.8%
Somewhat likely	60 47.3%	38 40.0%	55 48.6%	5 37.2% f	36 43.5% F	2 15.9%
Not very likely	22 17.3%	8 8.1%	19 17.0%	3 19.4%	6 7.6%	1 11.8%
Not at all likely	5 4.0%	19 20.6% A	3 2.8%	2 13.8%	15 18.4% C	4 35.6% d
(Need more information)	1 0.9%	0 0.2%	0 0.1%	1 7.7% c	0 0.3%	-
(Don't know)	1 1.0%	5 4.9%	1 0.8%	0 2.7%	3 3.4%	2 14.9%
(Refused)	3 2.2%	4 3.9%	3 2.4%	-	4 4.5%	-

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qrec_ee5b Page 115

Duke Non-Residential Prescriptive

EE5b. Why are you not likely to make a purchase through the Energy Efficiency Store?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	27 100.0%	27 100.0%	22 100.0%	5 100.0%	21 100.0%	6 100.0%
Total Responses (Unweighted)	38 100.0%	32 100.0%	19 100.0%	19 100.0%	22 100.0%	10 100.0%
Don't Have Enough Information	0 1.5%	2 8.6%	0 0.4%	0 6.5%	2 10.9%	-
Don't Need Any New Equipment	12 46.2%	7 27.1%	11 49.4%	1 31.5%	7 31.0%	1 12.4%
Equipment I Need is Not Available	0 0.3%	-	0 0.4%	-	-	-
Incentives Aren't High Enough	1 2.3%	-	-	1 13.1%	-	-
Difficulty using website/ finding information	-	-	-	-	-	-
Existing supplier/ Company purchasing rules	7 24.5%	12 42.8%	5 23.7%	1 28.6%	8 39.7%	3 54.3%
Preference for avoiding self installation	-	-	-	-	-	-
Pricing	-	1 5.2%	-	-	0 1.0%	1 20.8%
Lack of time to research	-	-	-	-	-	-
Other Specify	6 21.7%	3 13.0%	5 22.0%	1 20.3%	3 13.1%	1 12.4%
Don't Know	-	-	-	-	-	-

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qrec_ee5b Page 116
(Continued)
Duke Non-Residential Prescriptive

EE5b. Why are you not likely to make a purchase through the Energy Efficiency Store?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Refused	1 3.4%	1 3.4%	1 4.1%	-	1 4.2%	-

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qop1 Page 117

Duke Non-Residential Prescriptive

OP1. Are you aware that Duke Energy has a customer portal where customers can submit applications for energy efficiency projects and track the status of their applications?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	127 100.0%	94 100.0%	113 100.0%	14 100.0%	82 100.0%	12 100.0%
Total Responses (Unweighted)	127 100.0%	94 100.0%	71 100.0%	56 100.0%	72 100.0%	22 100.0%
Yes	48 37.4%	27 28.3%	40 35.4%	8 53.1%	18 21.6%	9 74.2% dE
No	79 62.6%	67 71.7%	73 64.6%	7 46.9% f	64 78.4% F	3 25.8%
(Don't know)	-	-	-	-	-	-
(Refused)	-	-	-	-	-	-

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qop2 Page 118

Duke Non-Residential Prescriptive

OP2. Have you ever used the online portal?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	48 100.0%	27 100.0%	40 100.0%	8 100.0%	18 100.0%	9 100.0%
Total Responses (Unweighted)	62 100.0%	36 100.0%	31 100.0%	31 100.0%	19 100.0%	17 100.0%
Yes	20 42.1%	11 41.4%	15 38.2%	5 62.8%	5 27.2%	6 69.6% E
No	28 57.9%	16 58.6%	25 61.8%	3 37.2%	13 72.8% F	3 30.4%
(Don't know)	-	-	-	-	-	-
(Refused)	-	-	-	-	-	-

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qrec_op3m1 Page 119

Duke Non-Residential Prescriptive

OP3m1. How did you use the online portal?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	20 100.0%	11 100.0%	15 100.0%	5 100.0%	5 100.0%	6 100.0%
Total Responses (Unweighted)	33 100.0%	16 100.0%	12 100.0%	21 100.0%	5 100.0%	11 100.0%
Submit Applications	5 23.2%	8 69.9% A	1 9.0%	3 68.7% C	2 43.7%	6 90.3% e
Track Status of Applications	7 35.0% b	1 5.4%	6 38.7%	1 23.1%	-	1 9.7%
Researching options	0 1.5%	1 8.2%	-	0 6.5%	1 18.8%	-
Other, Specify	8 40.2% B	1 8.2%	8 52.3% D	0 1.7%	1 18.8%	-
Don't Know	-	1 8.2%	-	-	1 18.8%	-
Refused	-	-	-	-	-	-

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qrec_op4m1 Page 120

Duke Non-Residential Prescriptive

OP4m1.Why have you not used the online portal?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	28 100.0%	16 100.0%	25 100.0%	3 100.0%	13 100.0%	3 100.0%
Total Responses (Unweighted)	29 100.0%	20 100.0%	19 100.0%	10 100.0%	14 100.0%	6 100.0%
No Need	1 3.4%	2 11.6%	-	1 32.9%	2 14.1%	-
Insufficient time	1 4.3%	1 7.2%	1 4.1%	0 6.1%	1 8.7%	-
Lack of information about use	-	-	-	-	-	-
Vendor's responsibility	6 20.7%	5 33.6%	5 20.6%	1 22.0%	5 39.8%	0 3.9%
Not the account holder/ No access	1 3.6%	2 13.0%	1 4.1%	-	2 15.7%	-
Prefer paper application	1 3.6%	1 7.6%	1 4.1%	-	-	1 43.8%
Recently learned about it/No opportunity	1 3.6%	1 5.8%	1 4.1%	-	1 7.0%	-
Difficult to use	-	0 0.7%	-	-	-	0 3.9%
Open ended response	1 3.3%	1 3.8%	1 3.7%	-	-	1 22.2%
No Specific Reason	11 39.0%	2 16.0%	10 39.7%	1 32.9%	2 14.7%	1 22.2%
Don't Know	4 15.1%	0 0.7%	4 16.1%	0 6.1%	-	0 3.9%

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qrec_op4m1 Page 121
(Continued)
Duke Non-Residential Prescriptive

OP4m1.Why have you not used the online portal?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Refused	1 3.3%	-	1 3.7%	-	-	-

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qsat1a Page 122

Duke Non-Residential Prescriptive

SAT1a. how would you rate your satisfaction with... The application process?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	127 100.0%	94 100.0%	113 100.0%	14 100.0%	82 100.0%	12 100.0%
Total Valid Responses	113	88	100	13	76	12
Total Responses (Unweighted)	127	94	71	56	72	22
Total Valid Responses (Unweighted)	118	90	65	53	68	22
Net 0-4	2 1.7%	0 0.2%	0 0.2%	2 12.9% C	0 0.3%	-
0 - Extremely dissatisfied	0 0.3%	0 0.2%	-	0 2.3%	0 0.3%	-
1	-	-	-	-	-	-
2	0 0.3%	-	-	0 2.3%	-	-
3	1 0.5%	-	0 0.1%	0 3.6%	-	-
4	1 0.6%	-	0 0.1%	1 4.6%	-	-
Net 5-7	18 16.2%	16 17.6%	15 15.3%	3 23.2%	13 17.2%	2 19.9%
5	5 4.6%	5 5.6%	4 4.5%	1 5.9%	4 4.9%	1 10.0%

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qsat1a Page 123
(Continued)
Duke Non-Residential Prescriptive

SAT1a. how would you rate your satisfaction with... The application process?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
6	6 5.5%	2 2.1%	6 5.9%	0 2.3%	2 2.5%	-
7	7 6.1%	9 9.8%	5 4.9%	2 15.0%	7 9.8%	1 9.9%
Net 8-10	93 82.1%	73 82.2%	84 84.5% D	9 63.9%	63 82.5%	10 80.1%
8	24 21.3%	24 26.8%	21 21.2%	3 22.0%	20 26.2%	4 30.6%
9	24 21.1%	11 12.0%	22 21.8%	2 16.1%	10 12.9%	1 5.9%
10 - Extremely Satisfied	45 39.7%	38 43.5%	41 41.6%	3 25.8%	33 43.5%	5 43.6%
(Don't know)	10 7.9%	4 3.9%	9 8.0%	1 6.5%	4 4.5%	-
(Refused)	4 3.1%	2 2.0%	4 3.5%	-	2 2.3%	-
Mean	8.6	8.7	8.7 D	7.6	8.7	8.5 d

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qsat1b Page 124

Duke Non-Residential Prescriptive

SAT1b. how would you rate your satisfaction with... The measures that are eligible for incentives through the <program>?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	127 100.0%	94 100.0%	113 100.0%	14 100.0%	82 100.0%	12 100.0%
Total Valid Responses	115	86	101	14	75	11
Total Responses (Unweighted)	127	94	71	56	72	22
Total Valid Responses (Unweighted)	118	87	64	54	66	21
Net 0-4	3 2.3%	2 2.4%	1 1.1%	1 10.8% c	2 2.8%	-
0 - Extremely dissatisfied	0 0.3%	0 0.3%	-	0 2.2%	0 0.3%	-
1	-	-	-	-	-	-
2	1 0.6%	-	0 0.1%	1 4.5%	-	-
3	1 0.9%	-	1 0.9%	0 1.2%	-	-
4	0 0.4%	2 2.2%	0 0.1%	0 2.8%	2 2.5%	-
Net 5-7	12 10.6%	16 18.6%	10 9.8%	2 16.2%	12 16.5%	4 32.2%
5	2 1.5%	2 2.9%	0 0.3%	1 10.5% c	2 2.5%	1 5.3%

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qsat1b Page 125
(Continued)
Duke Non-Residential Prescriptive

SAT1b. how would you rate your satisfaction with... The measures that are eligible for incentives through the <program>?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
6	0 0.4%	5 5.4%	0 0.2%	0 2.2%	5 6.2%	-
7	10 8.6%	9 10.3%	9 9.3%	0 3.4%	6 7.7%	3 27.0% De
Net 8-10	100 87.2%	68 79.0%	90 89.1%	10 73.0%	61 80.7%	8 67.8%
8	23 20.4%	24 27.5%	20 19.7%	4 25.5%	21 27.4%	3 28.2%
9	20 17.6%	10 11.5%	18 17.4%	3 19.5%	9 11.6%	1 10.5%
10 - Extremely Satisfied	56 49.2%	35 40.0%	53 52.1% D	4 28.0%	31 41.6%	3 29.0%
(Don't know)	10 8.2%	8 8.1%	10 8.8%	0 3.4%	7 8.5%	1 5.0%
(Refused)	2 1.4%	-	2 1.6%	-	-	-
Mean	8.9	8.5	9.1 D	7.7	8.5	8.3

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qsat1c Page 126

Duke Non-Residential Prescriptive

SAT1c. how would you rate your satisfaction with... The incentive levels?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	127 100.0%	94 100.0%	113 100.0%	14 100.0%	82 100.0%	12 100.0%
Total Valid Responses	123	88	109	14	76	12
Total Responses (Unweighted)	127	94	71	56	72	22
Total Valid Responses (Unweighted)	125	88	70	55	67	21
Net 0-4	2 1.9%	4 5.0%	1 0.8%	1 10.3% c	4 5.0%	1 5.1%
0 - Extremely dissatisfied	0 0.3%	2 2.8%	-	0 2.2%	2 2.5%	1 5.1%
1	-	-	-	-	-	-
2	0 0.1%	-	-	0 1.2%	-	-
3	0 0.1%	-	-	0 1.2%	-	-
4	2 1.4%	2 2.1%	1 0.8%	1 5.7%	2 2.5%	-
Net 5-7	19 15.8%	14 15.5%	15 14.1%	4 28.6%	10 12.5%	4 34.9% E

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qsat1c Page 127
(Continued)
Duke Non-Residential Prescriptive

SAT1c. how would you rate your satisfaction with... The incentive levels?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
5	2 1.2%	3 3.3%	0 0.2%	1 9.5% c	1 1.5%	2 15.0% e
6	9 7.4%	5 5.2%	8 7.4%	1 7.2%	5 6.0%	-
7	9 7.1%	6 7.0%	7 6.5%	2 11.9%	4 5.0%	2 19.9% e
Net 8-10	101 82.3%	70 79.5%	92 85.1% D	9 61.0%	63 82.6% f	7 60.0%
8	32 25.7%	19 22.0%	28 25.9%	3 23.7%	16 21.2%	3 27.0%
9	15 12.4%	17 18.7%	13 11.8%	2 17.0%	15 20.1%	1 10.1%
10 - Extremely Satisfied	54 44.3%	34 38.8%	51 47.3% D	3 20.4%	31 41.2%	3 22.9%
(Don't know)	4 3.1%	4 4.3%	4 3.5%	-	4 4.8%	0 0.9%
(Refused)	0 0.2%	2 2.0%	-	0 2.2%	2 2.3%	-
Mean	8.7	8.4	8.8 D	7.5	8.5	7.5

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qsat1d Page 128

Duke Non-Residential Prescriptive

SAT1d. how would you rate your satisfaction with... The contractor who helped you install the equipment?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	92 100.0%	69 100.0%	80 100.0%	12 100.0%	59 100.0%	10 100.0%
Total Valid Responses	92	69	80	12	59	10
Total Responses (Unweighted)	104	72	56	48	55	17
Total Valid Responses (Unweighted)	102	71	56	46	54	17
Net 0-4	1 0.7%	4 5.5%	-	1 5.3%	4 6.4%	-
0 - Extremely dissatisfied	0 0.3%	-	-	0 2.6%	-	-
1	-	-	-	-	-	-
2	0 0.3%	2 2.7%	-	0 2.6%	2 3.2%	-
3	-	-	-	-	-	-
4	-	2 2.7%	-	-	2 3.2%	-
Net 5-7	5 5.7%	9 13.2%	4 5.3%	1 8.2%	8 13.4%	1 12.0%
5	-	1 1.2%	-	-	0 0.4%	1 6.0%

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qsat1d Page 129
(Continued)
Duke Non-Residential Prescriptive

SAT1d. how would you rate your satisfaction with... The contractor who helped you install the equipment?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
6	1 0.7%	-	0 0.2%	0 4.1%	-	-
7	5 5.0%	8 12.0%	4 5.1%	0 4.1%	8 13.1%	1 6.0%
Net 8-10	86 93.6% b	56 81.3%	76 94.7% e	10 86.5%	47 80.2%	9 88.0%
8	9 10.3%	10 14.5%	8 10.1%	1 11.8%	10 16.7% f	0 1.1%
9	9 9.4%	15 22.4%	6 7.8%	2 19.9%	12 21.0%	3 30.8%
10 - Extremely Satisfied	68 73.9% B	31 44.4%	61 76.7% Ed	6 54.8%	25 42.4%	6 56.1%
(Don't know)	0 0.2%	0 0.3%	-	0 1.4%	0 0.4%	-
(Refused)	0 0.3%	-	-	0 2.5%	-	-
Mean	9.5 B	8.7	9.6 Ed	8.8	8.6	9.2

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qsat1e Page 130

Duke Non-Residential Prescriptive

SAT1e. how would you rate your satisfaction with... Your interactions with <program> staff?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	127 100.0%	94 100.0%	113 100.0%	14 100.0%	82 100.0%	12 100.0%
Total Valid Responses	95	67	84	11	57	11
Total Responses (Unweighted)	127	94	71	56	72	22
Total Valid Responses (Unweighted)	103	71	56	47	50	21
Net 0-4	1 1.6%	4 5.9%	1 1.2%	0 4.2%	4 7.1%	-
0 - Extremely dissatisfied	1 1.3%	2 3.1%	1 1.1%	0 2.7%	2 3.7%	-
1	-	-	-	-	-	-
2	0 0.3%	-	0 0.1%	0 1.5%	-	-
3	-	-	-	-	-	-
4	-	2 2.8%	-	-	2 3.3%	-
Net 5-7	7 7.6%	12 18.2%	5 6.2%	2 18.0%	10 18.5%	2 16.7%
5	1 1.1%	2 2.8%	0 0.1%	1 8.4% c	2 3.3%	-

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qsat1e Page 131
(Continued)
Duke Non-Residential Prescriptive

SAT1e. how would you rate your satisfaction with... Your interactions with <program> staff?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
6	0 0.2%	1 1.7%	0 0.2%	-	1 2.0%	-
7	6 6.3%	9 13.7%	5 5.8%	1 9.6%	7 13.2%	2 16.7%
Net 8-10	87 90.8% b	51 75.9%	78 92.6% e	9 77.8%	42 74.4%	9 83.3%
8	18 19.3%	14 20.3%	17 20.5%	1 9.9%	14 24.0% F	0 1.0%
9	15 16.0%	9 13.3%	14 16.4%	2 13.8%	6 10.5%	3 28.4%
10 - Extremely Satisfied	53 55.5%	28 42.2%	47 55.7%	6 54.2%	23 40.0%	6 53.9%
(Not applicable)	23 17.9%	23 24.9%	21 18.5%	2 13.0%	23 28.6%	-
(Don't know)	4 3.4%	3 3.3%	4 3.5%	0 2.2%	2 2.3%	1 9.9%
(Refused)	5 3.6%	-	4 3.5%	1 4.3%	-	-
Mean	9.1	8.4	9.1 e	8.6	8.2	9.2 E

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qsat1f Page 132

Duke Non-Residential Prescriptive

SAT1f. how would you rate your satisfaction with... The <program> overall?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	127 100.0%	94 100.0%	113 100.0%	14 100.0%	82 100.0%	12 100.0%
Total Valid Responses	127	94	113	14	82	12
Total Responses (Unweighted)	127	94	71	56	72	22
Total Valid Responses (Unweighted)	127	93	71	56	71	22
Net 0-4	1 1.0%	1 1.0%	-	1 8.7%	1 1.1%	-
0 - Extremely dissatisfied	0 0.2%	-	-	0 2.2%	-	-
1	1 0.5%	-	-	1 4.3%	-	-
2	-	-	-	-	-	-
3	-	-	-	-	-	-
4	0 0.2%	1 1.0%	-	0 2.2%	1 1.1%	-
Net 5-7	8 6.6%	13 14.3%	6 5.7%	2 13.4%	13 15.7%	1 5.0%
5	1 0.7%	1 1.2%	0 0.1%	1 5.8%	1 1.4%	-

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qsat1f Page 133
(Continued)
Duke Non-Residential Prescriptive

SAT1f. how would you rate your satisfaction with... The <program> overall?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
6	0 0.4%	0 0.2%	0 0.1%	0 2.7%	0 0.3%	-
7	7 5.5%	12 12.9%	6 5.6%	1 4.9%	11 14.0%	1 5.0%
Net 8-10	117 92.4%	79 84.7%	106 94.3% d	11 77.9%	68 83.2%	11 95.0% D
8	16 12.5%	23 24.0%	13 11.8%	3 17.6%	18 21.6%	5 40.6% d
9	33 26.3%	15 16.1%	30 26.2%	4 27.3%	13 15.5%	2 20.8%
10 - Extremely Satisfied	68 53.6%	42 44.6%	63 56.3% D	5 33.0%	38 46.2%	4 33.6%
(Don't know)	-	0 0.2%	-	-	0 0.3%	-
(Refused)	-	-	-	-	-	-
Mean	9.2	8.8	9.3 eD	8.1	8.8	8.8 d

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qrec_sat2am Page 134

Duke Non-Residential Prescriptive

SAT2a. Your response suggests that you are not fully satisfied with the application process?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	2 100.0%	0 100.0%	0 100.0%	2 100.0%	0 100.0%	-
Total Responses (Unweighted)	8 100.0%	1 100.0%	2 100.0%	6 100.0%	1 100.0%	-
Difficult to understand	1 53.6%	-	0 50.0%	1 54.0%	-	-
Difficult to compile information	1 46.4%	0 100.0%	0 50.0%	1 46.0%	0 100.0%	-
Open ended response	-	-	-	-	-	-
Don't Know	-	-	-	-	-	-
Refused	-	-	-	-	-	-

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qsat2bm1 Page 135

Duke Non-Residential Prescriptive

SAT2b. Your response suggests that you are not fully satisfied with the measures that are eligible for incentives through the <program>?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	3 100.0%	2 100.0%	1 100.0%	1 100.0%	2 100.0%	-
Total Responses (Unweighted)	9 100.0%	2 100.0%	3 100.0%	6 100.0%	2 100.0%	-
Open ended response	3 100.0% B	0 10.3%	1 100.0% E	1 100.0%	0 10.3%	-
(Don't know)	-	2 89.7%	-	-	2 89.7%	-
(Refused)	-	-	-	-	-	-

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qsat2cm1 Page 136

Duke Non-Residential Prescriptive

SAT2c. Your response suggests that you are not fully satisfied with the incentive levels?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	2 100.0%	4 100.0%	1 100.0%	1 100.0%	4 100.0%	1 100.0%
Total Responses (Unweighted)	7 100.0%	3 100.0%	1 100.0%	6 100.0%	2 100.0%	1 100.0%
Open ended response	2 79.6%	2 56.8%	1 100.0%	1 66.7%	2 50.0%	1 100.0%
(Don't know)	0 20.4%	2 43.2%	-	0 33.3%	2 50.0%	-
(Refused)	-	-	-	-	-	-

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qsat2dm1 Page 137

Duke Non-Residential Prescriptive

SAT2d. Your response suggests that you are not fully satisfied with the contractor who helped you install the equipment?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	1 100.0%	4 100.0%	-	1 100.0%	4 100.0%	-
Total Responses (Unweighted)	2 100.0%	2 100.0%	-	2 100.0%	2 100.0%	-
Open ended response	1 100.0%	4 100.0%	-	1 100.0%	4 100.0%	-
(Don't know)	-	-	-	-	-	-
(Refused)	-	-	-	-	-	-

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qsat2em1 Page 138

Duke Non-Residential Prescriptive

SAT2e. Your response suggests that you are not fully satisfied with your interactions with <program> staff?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	1 100.0%	4 100.0%	1 100.0%	0 100.0%	4 100.0%	-
Total Responses (Unweighted)	4 100.0%	3 100.0%	2 100.0%	2 100.0%	3 100.0%	-
Open ended response	1 100.0% b	2 47.3%	1 100.0% e	0 100.0%	2 47.3%	-
(Don't know)	-	2 52.7%	-	-	2 52.7%	-
(Refused)	-	-	-	-	-	-

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qsat2fm1 Page 139

Duke Non-Residential Prescriptive

SAT2f. Your response suggests that you are not fully satisfied with the <program> overall?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	1 100.0%	1 100.0%	-	1 100.0%	1 100.0%	-
Total Responses (Unweighted)	4 100.0%	1 100.0%	-	4 100.0%	1 100.0%	-
Open ended response	1 75.0%	1 100.0%	-	1 75.0%	1 100.0%	-
(Don't know)	0 25.0%	-	-	0 25.0%	-	-
(Refused)	-	-	-	-	-	-

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qsat3a Page 140

Duke Non-Residential Prescriptive

SAT3a. How likely are you to participate in the <program> again, within the next year? Would you say...

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	127 100.0%	94 100.0%	113 100.0%	14 100.0%	82 100.0%	12 100.0%
Total Responses (Unweighted)	127 100.0%	94 100.0%	71 100.0%	56 100.0%	72 100.0%	22 100.0%
Very likely	55 43.0%	43 46.1%	46 41.0%	8 59.1% c	37 44.6%	7 56.7%
Somewhat likely	40 31.3%	32 34.2%	37 32.6%	3 21.0%	30 36.1%	3 21.7%
Not very likely	22 17.6% B	6 6.8%	22 19.4% eD	1 3.9%	6 7.1%	1 5.0%
Not at all likely	9 6.9%	7 8.0%	7 6.2%	2 12.6%	7 8.9%	0 1.8%
(Don't know)	0 0.4%	3 2.9%	-	0 3.4%	1 1.1%	2 14.9% e
(Refused)	1 0.7%	2 2.0%	1 0.8%	-	2 2.3%	-

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qrec_sat3b Page 141

Duke Non-Residential Prescriptive

SAT3b. Why are you not likely to participate in the program again?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	31 100.0%	14 100.0%	29 100.0%	2 100.0%	13 100.0%	1 100.0%
Total Responses (Unweighted)	26 100.0%	18 100.0%	15 100.0%	11 100.0%	15 100.0%	3 100.0%
Was Not Satisfied with the Program	1 2.0%	-	-	1 26.3%	-	-
Don't Need Any New Equipment	27 88.0%	10 73.4%	27 92.7% D	1 30.8%	9 71.7%	1 100.0%
Equipment I Need is Not Available	1 2.9%	-	1 3.2%	-	-	-
Incentives Aren't High Enough	0 1.3%	3 20.1%	0 0.3%	0 13.1%	3 21.4%	-
Moving	-	-	-	-	-	-
Funding	-	-	-	-	-	-
Other Specify	1 4.8%	-	1 3.8%	0 16.6%	-	-
Don't Know	-	1 6.5%	-	-	1 6.9%	-
Refused	0 1.0%	-	-	0 13.1%	-	-

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qsat4a Page 142

Duke Non-Residential Prescriptive

SAT4a. How likely are you to recommend the <program> to other businesses like yours? Would you say...

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	127 100.0%	94 100.0%	113 100.0%	14 100.0%	82 100.0%	12 100.0%
Total Responses (Unweighted)	127 100.0%	94 100.0%	71 100.0%	56 100.0%	72 100.0%	22 100.0%
Very likely	118 93.1% B	73 78.0%	107 94.5% Ed	12 81.8%	64 78.4%	9 75.3%
Somewhat likely	6 5.0%	16 16.8% A	5 4.5%	1 8.9%	14 17.1% C	2 14.9%
Not very likely	0 0.3%	-	0 0.1%	0 2.2%	-	-
Not at all likely	1 0.9%	1 1.0%	0 0.1%	1 7.1% c	1 1.1%	-
(Don't know)	-	1 1.3%	-	-	-	1 9.9%
(Refused)	1 0.7%	3 3.0%	1 0.8%	-	3 3.4%	-

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qrec_sat4b Page 143

Duke Non-Residential Prescriptive

SAT4b. Why are you not likely to recommend the program to other businesses?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	2 100.0%	1 100.0%	0 100.0%	1 100.0%	1 100.0%	-
Total Responses (Unweighted)	7 100.0%	1 100.0%	2 100.0%	5 100.0%	1 100.0%	-
Was Not Satisfied with the Program	1 67.9%	-	0 50.0%	1 70.3%	-	-
Selection of Eligible Equipment	-	-	-	-	-	-
Incentives Levels	-	1 100.0%	-	-	1 100.0%	-
Paperwork/Application Process	-	-	-	-	-	-
Not in communication with other businesses	0 26.7%	-	0 50.0%	0 23.4%	-	-
Other Specify	0 5.4%	-	-	0 6.2%	-	-
Don't Know	-	-	-	-	-	-
Refused	-	-	-	-	-	-

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qrec_br1am1 Page 144

Duke Non-Residential Prescriptive

BR1a. What do you view as the main barriers, if any, to participating in the program?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	127 100.0%	94 100.0%	113 100.0%	14 100.0%	82 100.0%	12 100.0%
Total Responses (Unweighted)	127 100.0%	94 100.0%	71 100.0%	56 100.0%	72 100.0%	22 100.0%
Paperwork/Application Process/Time Required to Complete Application	25 19.6%	8 8.8%	22 19.7% e	3 18.7%	6 7.1%	2 20.8%
Selection of Equipment Available Through the	3 2.2%	3 3.4%	2 1.8%	1 5.2%	2 2.3%	1 10.9%
Incentive Levels	11 8.4%	7 7.9%	10 8.9%	1 4.3%	7 9.1%	-
Knowledge of Incentives and Eligible Products	12 9.6%	8 8.1%	10 9.0%	2 13.8%	7 8.5%	1 5.0%
Financial considerations besides incentive levels	12 9.8%	8 8.2%	11 9.8%	1 9.5%	8 9.3%	0 0.9%
Availability/Selection of Trade Allies	-	-	-	-	-	-
Timeline for submission/ eligibility	0 0.1%	2 2.0%	0 0.1%	-	-	2 15.8%
No need for equipment	1 0.5%	1 1.0%	-	1 4.3%	1 1.1%	-
Lack of awareness of program	2 1.4%	2 2.6%	2 1.6%	-	2 2.3%	1 5.0%
Other, Specify	9 7.4%	9 9.4%	9 8.0%	0 3.4%	9 10.8%	-
None - Don't See Any Barriers	47 36.8%	43 45.2%	41 36.0%	6 42.9%	38 45.9%	5 40.8%

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qrec_br1am1 Page 145
(Continued)
Duke Non-Residential Prescriptive

BR1a. What do you view as the main barriers, if any, to participating in the program?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Same as Just Mentioned	-	-	-	-	-	-
Don't Know	4	3	4	0	3	0
	3.4%	3.1%	3.5%	2.2%	3.4%	0.9%
Refused	3	0	3	-	0	-
	2.2%	0.2%	2.4%		0.3%	

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Appendix F. Participant Telephone Survey Cross-Tabulations

Table qrec_br1bm1 Page 146

Duke Non-Residential Prescriptive

BR1b. What could Duke Energy do to reduce these barriers to participation in the program?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	73 100.0%	48 100.0%	65 100.0%	8 100.0%	41 100.0%	7 100.0%
Total Responses (Unweighted)	78 100.0%	50 100.0%	45 100.0%	33 100.0%	37 100.0%	13 100.0%
Increase incentives	7 9.6%	7 14.8%	7 10.4%	0 3.2%	7 17.3%	-
Simplify applications/ paperwork requirements/ time commitment to participate	6 8.2%	2 4.8%	5 7.6%	1 13.3%	0 1.1%	2 27.0% e
Provide more guidance and assistance/increased program contact during process	16 22.3% b	5 9.7%	16 24.4% D	0 5.4%	5 11.3%	-
Provide program training and information more readily to participants	9 12.1%	3 6.2%	8 12.6%	1 7.9%	3 7.3%	-
Market the program more extensively/effectively	4 6.1%	9 19.2%	4 5.6%	1 10.1%	9 21.0%	1 8.6%
Improve selection of measures	6 8.7%	2 3.9%	5 7.6%	1 18.0%	2 4.6%	-
Improve processing times	1 1.4%	-	1 1.5%	-	-	-
Adjust the participation timeframe	0 0.3%	0 0.2%	0 0.3%	-	-	0 1.5%
Open ended response	6 8.7%	3 6.6%	5 7.9%	1 15.1%	2 4.6%	1 18.7%

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qrec_br1bm1 Page 147
(Continued)
Duke Non-Residential Prescriptive

BR1b. What could Duke Energy do to reduce these barriers to participation in the program?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Don't Know	17 22.6%	12 24.5%	14 22.0%	2 26.9%	10 24.0%	2 27.3%
Refused	-	3 5.8%	-	-	3 6.8%	-

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qrec_br2m11 Page 148

Duke Non-Residential Prescriptive

BR2. And more generally, what do you view as the main barriers, if any, to making energy efficient improvements at your facility?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	127 100.0%	94 100.0%	113 100.0%	14 100.0%	82 100.0%	12 100.0%
Total Responses (Unweighted)	127 100.0%	94 100.0%	71 100.0%	56 100.0%	72 100.0%	22 100.0%
Higher Cost of Energy Efficient Equipment	65 51.4% B	28 30.3%	59 52.5% E	6 43.3%	20 25.0%	8 66.6% dE
Access to Financing or Capital for Energy Improvements	6 4.8%	9 10.0%	5 4.5%	1 6.7%	9 11.3%	0 0.9%
Difficulty Finding Information on How to Improve Energy	0 0.3%	2 2.2%	0 0.1%	0 2.2%	2 2.6%	-
Uncertainty About the Savings From Energy Efficiency Improvements	6 4.9%	4 4.7%	6 5.3%	0 1.2%	3 3.9%	1 9.9%
Lease Structure / We are Renters	6 4.6%	1 1.0%	6 5.2%	-	1 1.1%	-
Difficult to Find Contractors	-	-	-	-	-	-
Lack of knowledge/ information	1 0.9%	5 5.3%	1 0.8%	0 1.2%	4 4.6%	1 10.0%
No need for new equipment	0 0.2%	1 1.0%	-	0 2.2%	1 1.1%	-
Corporate approval process	-	-	-	-	-	-

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qrec_br2m11 Page 149
(Continued)
Duke Non-Residential Prescriptive

BR2. And more generally, what do you view as the main barriers, if any, to making energy efficient improvements at your facility?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Keeping up with technological changes	-	-	-	-	-	-
Other, Specify	7 5.4%	9 9.3%	6 5.2%	1 7.1%	9 10.5%	0 0.9%
None - Don't See Any Barriers	29 23.0%	31 32.8%	24 21.3%	5 36.2%	28 34.5%	3 21.7%
Don't Know	5 4.1%	4 3.9%	5 4.3%	0 2.2%	4 4.5%	-
Refused	2 1.4%	2 2.0%	2 1.6%	-	2 2.3%	-

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qrec_f1 Page 150

Duke Non-Residential Prescriptive

F1. What is the business type of the facility located at <ADDRESSS>?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	127 100.0%	94 100.0%	113 100.0%	14 100.0%	82 100.0%	12 100.0%
Total Responses (Unweighted)	127 100.0%	94 100.0%	71 100.0%	56 100.0%	72 100.0%	22 100.0%
K-12 School	1 0.8%	3 3.2%	0 0.3%	1 4.6%	3 3.7%	-
College/University	-	1 1.4%	-	-	-	1 10.9%
Grocery	0 0.1%	2 1.9%	0 0.1%	-	2 2.2%	-
Medical	1 0.4%	2 1.6%	0 0.2%	0 2.4%	1 1.1%	1 5.0%
Hotel/Motel	8 6.5%	12 12.4%	7 6.1%	1 9.5%	11 13.1%	1 7.7%
Light Industry	8 6.2%	2 2.5%	7 6.1%	1 6.5%	2 2.8%	-
Heavy Industry	4 3.5%	-	4 3.6%	0 2.2%	-	-
Office	16 12.7%	6 6.3%	14 12.3%	2 15.4%	5 5.7%	1 10.0%
Restaurant	2 1.6%	6 6.9%	-	2 14.2%	5 5.7%	2 14.9%
Retail/Service	43 33.5%	24 25.0%	41 36.0% D	2 13.8%	20 24.2%	4 30.8%
Government	2 1.3%	2 2.0%	1 1.0%	1 3.9%	2 2.3%	-

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qrec_f1 Page 151
(Continued)
Duke Non-Residential Prescriptive

F1. What is the business type of the facility located at <ADDRESSS>?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Manufacturing	5 4.1%	3 2.7%	5 4.4%	0 1.8%	3 3.1%	-
Church/Religious Building	10 8.0%	4 4.6%	9 7.9%	1 8.7%	4 4.5%	1 5.0%
Agriculture	0 0.2%	2 2.0%	-	0 2.2%	2 2.3%	-
Automotive Service/Gas Station	6 5.0%	5 5.0%	6 5.2%	1 3.9%	5 5.7%	-
Non-profit	4 3.5%	3 3.0%	4 3.6%	0 2.2%	2 2.7%	1 5.0%
Storage/Warehouse	9 7.0%	4 4.0%	9 7.9%	-	4 4.6%	-
Garage	1 0.7%	-	1 0.8%	-	-	-
Hospitality/Hotel	0 0.3%	0 0.3%	0 0.1%	0 2.2%	0 0.3%	0 0.9%
Residential community	0 0.2%	3 3.0%	-	0 2.2%	3 3.4%	-
K-12 Education	0 0.3%	-	0 0.1%	0 2.2%	-	-
Contractor/Construction	5 3.9%	3 3.0%	5 4.3%	-	3 3.4%	-
Other Specify	0 0.2%	5 5.0% a	-	0 2.2%	5 5.7%	-
Don't Know	-	1 1.3%	-	-	-	1 9.9%

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qrec_f1 Page 152
(Continued)
Duke Non-Residential Prescriptive

F1. What is the business type of the facility located at <ADDRESSS>?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Refused	-	3 3.0%	-	-	3 3.4%	-

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qf2 Page 153

Duke Non-Residential Prescriptive

F2. Which of the following best describes the ownership of this facility?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	127 100.0%	94 100.0%	113 100.0%	14 100.0%	82 100.0%	12 100.0%
Total Responses (Unweighted)	127 100.0%	94 100.0%	71 100.0%	56 100.0%	72 100.0%	22 100.0%
My company owns and occupies this facility	60 47.1%	59 62.6% a	48 43.0%	11 80.0% C	50 61.5% c	8 70.3%
My company owns this facility but it is rented to someone else	33 26.2% B	6 6.9%	32 28.1% ED	2 11.1%	6 7.9%	-
My company rents this facility	33 25.6%	22 23.3%	32 28.2% D	1 5.5%	20 23.8%	2 19.9%
(Don't know)	0 0.4%	1 1.0%	-	0 3.4%	1 1.1%	-
(Refused)	1 0.7%	6 6.2% a	1 0.8%	-	5 5.7%	1 9.9%

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Appendix F. Participant Telephone Survey Cross-Tabulations

Table qf3a Page 154

Duke Non-Residential Prescriptive

F3a. How many employees, full plus part-time, are employed at this facility?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	127 100.0%	94 100.0%	113 100.0%	14 100.0%	82 100.0%	12 100.0%
Total Responses (Unweighted)	127 100.0%	94 100.0%	71 100.0%	56 100.0%	72 100.0%	22 100.0%
0-29	79 62.2%	64 68.5%	72 64.1%	7 47.2%	57 69.3%	8 63.5%
30-69	23 18.4%	7 7.7%	20 17.7%	3 23.7% f	6 7.3%	1 9.9%
70-99	5 3.8%	1 0.7%	4 3.6%	1 5.5%	1 0.8%	-
100-249	10 8.0%	7 7.3%	8 7.0%	2 15.6%	7 8.3%	-
250-700	2 1.7%	5 5.3%	2 1.4%	1 3.9%	4 4.6%	1 10.0%
(Don't know)	7 5.5%	5 5.4%	7 6.0%	0 1.2%	3 3.9%	2 15.8% d
(Refused)	0 0.3%	5 5.0%	0 0.1%	0 2.2%	5 5.7% c	-

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qf3b Page 155

Duke Non-Residential Prescriptive

F3b. Do you know the approximate number of employees? Would you say it is...?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	7 100.0%	5 100.0%	7 100.0%	0 100.0%	3 100.0%	2 100.0%
Total Responses (Unweighted)	6 100.0%	7 100.0%	5 100.0%	1 100.0%	4 100.0%	3 100.0%
Less than 10	4 57.1%	-	4 58.5%	-	-	-
10-49	0 2.5%	1 19.8%	-	0 100.0%	1 28.0%	0 5.6%
50-99	0 1.3%	0 4.3%	0 1.3%	-	0 6.7%	-
100-249	2 26.1%	-	2 26.8%	-	-	-
250-499	-	-	-	-	-	-
500 or more	1 13.1%	-	1 13.4%	-	-	-
(Don't know)	-	3 52.9%	-	-	2 65.3%	1 31.8%
(Refused)	-	1 23.1%	-	-	-	1 62.6%

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Appendix F. Participant Telephone Survey Cross-Tabulations

Table qemp_ct Page 156

Duke Non-Residential Prescriptive

Employee Count: Categorized

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total	127 100.0%	94 100.0%	113 100.0%	14 100.0%	82 100.0%	12 100.0%
Less Than 10	53 41.6%	39 41.1%	49 43.8% D	3 24.1%	36 43.3%	3 25.9%
10-49	47 37.1%	30 32.2%	42 36.9%	6 39.1%	25 29.9%	6 48.3%
50-99	11 9.0%	5 4.9%	9 8.3%	2 14.5%	5 5.6%	-
100-249	12 9.4%	7 7.3%	10 8.6%	2 15.6%	7 8.3%	-
250-499	2 1.8%	5 5.4%	2 1.5%	1 4.5%	4 4.6%	1 10.9%
500 or More	1 0.7%	-	1 0.8%	-	-	-
Don't Know	-	3 2.9%	-	-	2 2.6%	1 5.0%
Refused	0 0.3%	6 6.2% a	0 0.1%	0 2.2%	5 5.7% c	1 9.9%

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qrec_f4 Page 157

Duke Non-Residential Prescriptive

rec_f4. What is the primary heating fuel for your facility?

	Jurisdiction		DEC Technology		DEP Technology	
	DEC	DEP	Lighting	Non-Lighting	Lighting	Non-Lighting
	(A)	(B)	(C)	(D)	(E)	(F)
Total Responses	127 100.0%	94 100.0%	113 100.0%	14 100.0%	82 100.0%	12 100.0%
Total Responses (Unweighted)	127 100.0%	94 100.0%	71 100.0%	56 100.0%	72 100.0%	22 100.0%
Electricity	56 44.2%	38 40.4%	52 45.8%	4 31.4%	34 41.4%	4 33.6%
Gas	54 42.7%	37 38.8%	48 42.7%	6 42.7%	32 38.7%	5 39.8%
Electric and Gas	9 7.4%	5 4.8%	7 6.4%	2 15.4%	3 3.9%	1 10.9%
Heating oil	0 0.2%	-	-	0 2.2%	-	-
No heat	1 1.0%	5 5.0%	1 0.8%	0 2.2%	5 5.7%	-
Other, Please Specify	-	-	-	-	-	-
Don't Know	6 4.5%	3 3.7%	5 4.3%	1 6.1%	3 3.4%	1 5.9%
Refused	-	7 7.2%	-	-	6 6.8%	1 9.9%

Comparison Groups: AB/CD/EF/CE/DF
Independent T-Test for Means (unequal variances), Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Appendix G. Trade Ally Online Survey Cross-Tabulations

This Appendix contains detailed results from the trade ally online survey. We provide results in the form of Wincross tables with a breakdown of survey results by jurisdiction.

Survey Summary

Program	Non-Residential Prescriptive Smart $aver Energy Efficiency for Business
Jurisdiction	DEC & DEP
Survey Type	Internet
Target Population	Participating Trade Allies
Dates Fielded	June 1 - June 21, 2017
Number of Completes[5]	143
Response Rate	18.2%
Average Survey Time for Completes	21 min
Number of Reminders (web)	2

[5] A total of 143 trade allies completed the entire survey; however, an additional five trade allies completed all of the questions in the spillover section and were included in the trade ally spillover analysis. As a result, the responses of these five trade allies are included in the cross-tabulations for the spillover questions, increasing the total number of responses to those questions to 148.

Duke Trade Ally Tables

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Table qsc0a_rec Page 1

Duke Trade Ally Tables

Which of the following best describes your business?

	Jurisdiction	
	DEC	DEP
	(A)	(B)
Total	111 100.0%	32 100.0%
Contractor	48 43.2%	13 40.6%
Equipment Vendor/ Distributor	46 41.4% B	7 21.9%
Energy Service Company (ESCO)	4 3.6%	6 18.8% A
Equipment Manufacturer	4 3.6%	2 6.2%
Engineering Firm	2 1.8%	1 3.1%
Rebate administrator/ processor	2 1.8%	1 3.1%
Building owner/property manager	1 0.9%	1 3.1%
Other	4 3.6%	1 3.1%

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qsc0bm1_re1 Page 2

Duke Trade Ally Tables

What type of equipment, if any, is your company's area of expertise? Please select all that apply.

	Jurisdiction	
	DEC	DEP
	(A)	(B)
Total	111 100.0%	32 100.0%
Lighting	95 85.6%	25 78.1%
HVAC	23 20.7%	11 34.4%
Process equipment	8 7.2%	5 15.6%
Motors, pumps, VFDs	25 22.5%	8 25.0%
Food service products	8 7.2%	2 6.2%
Information technology	6 5.4%	1 3.1%
Compressed air equipment	12 10.8%	2 6.2%
Roofing	1 0.9%	-
Solar	2 1.8%	-
Window treatment	-	1 3.1%
Water heating	1 0.9%	-
Wiring (commerical or industrial)	1 0.9%	-

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qsc0bm1_re1 Page 3
(Continued)
Duke Trade Ally Tables

What type of equipment, if any, is your company's area of expertise? Please select all that apply.

	Jurisdiction	
	DEC	DEP
	(A)	(B)
Air purification	1 0.9%	-
Water purification	1 0.9%	-
Other	4 3.6%	1 3.1%

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qsc0c Page 4

Duke Trade Ally Tables

For how many years has <TRADEALLY_NAME> participated in Duke Energy's <program>?

	Jurisdiction	
	DEC	DEP
	(A)	(B)
Total	111 100.0%	32 100.0%
Less Than a Year	4 3.6%	1 3.1%
One Year	16 14.4%	4 12.5%
Two Years	18 16.2%	6 18.8%
Three Years	18 16.2%	7 21.9%
Four Years	17 15.3% b	2 6.2%
Five Years or More	28 25.2%	11 34.4%
Don't Know	10 9.0%	1 3.1%

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qpi1_a Page 5

Duke Trade Ally Tables

Since <tradeally_name> became a <program> trade ally, have any of the following aspects changed and if so, by how much?
Your knowledge of high efficiency options...

	Jurisdiction	
	DEC	DEP
	(A)	(B)
Total	116 100.0%	32 100.0%
Did Not Increase	14 12.1%	6 18.8%
Increased Somewhat	62 53.4%	14 43.8%
Increased Greatly	40 34.5%	12 37.5%

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qpi1_b Page 6

Duke Trade Ally Tables

Since <tradeally_name> became a <program> trade ally, have any of the following aspects changed and if so, by how much?
Your comfort level in discussing the benefits of high efficiency equipment with your customers...

	Jurisdiction	
	DEC	DEP
	(A)	(B)
Total	116 100.0%	32 100.0%
Did Not Increase	14 12.1%	5 15.6%
Increased Somewhat	50 43.1%	17 53.1%
Increased Greatly	52 44.8%	10 31.2%

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qpi1_c Page 7

Duke Trade Ally Tables

Since <tradeally_name> became a <program> trade ally, have any of the following aspects changed and if so, by how much?
The percentage of sales situations in which you recommend high efficiency equipment...

	Jurisdiction	
	DEC	DEP
	(A)	(B)
Total	116 100.0%	32 100.0%
Did Not Increase	14 12.1%	5 15.6%
Increased Somewhat	43 37.1%	14 43.8%
Increased Greatly	59 50.9%	13 40.6%

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qpi1_d Page 8

Duke Trade Ally Tables

Since <tradeally_name> became a <program> trade ally, have any of the following aspects changed and if so, by how much?
The percentage of jobs in which <tradeally_name> installs high efficiency equipment in Duke Energy's <jurisdiction> service territory...

	Jurisdiction	
	DEC	DEP
	(A)	(B)
Total	116 100.0%	32 100.0%
Did Not Increase	18 15.5%	8 25.0%
Increased Somewhat	57 49.1%	15 46.9%
Increased Greatly	41 35.3%	9 28.1%

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qpi1_e Page 9

Duke Trade Ally Tables

Since <tradeally_name> became a <program> trade ally, have any of the following aspects changed and if so, by how much?
The total volume of high efficiency equipment <tradeally_name> installs in Duke Energy's <jurisdiction> service territory...

	Jurisdiction	
	DEC	DEP
	(A)	(B)
Total	116 100.0%	32 100.0%
Did Not Increase	22 19.0%	7 21.9%
Increased Somewhat	53 45.7%	15 46.9%
Increased Greatly	41 35.3%	10 31.2%

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qpi2 Page 10

Duke Trade Ally Tables

Did the <program> (including the program incentive and any training, information, or other support that the program provided) contribute at all to these increases?

	Jurisdiction	
	DEC	DEP
	(A)	(B)
Total	112 100.0%	31 100.0%
Yes	93 83.0% B	18 58.1%
No	8 7.1%	3 9.7%
Don't Know	11 9.8%	10 32.3% A

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qpi3_a Page 11

Duke Trade Ally Tables

On a scale of 0 to 10, where 0 is "not at all influential" and 10 is "extremely influential," please rate the influence of the <program> on the increase in… Your knowledge of high efficiency options.

	Jurisdiction	
	DEC	DEP
	(A)	(B)
Total	85 100.0%	16 100.0%
Net 0-4	14 16.5%	4 25.0%
0 - Not at All Influential	1 1.2%	1 6.2%
1	1 1.2%	-
2	2 2.4%	-
3	5 5.9%	3 18.8%
4	5 5.9%	-
Net 5-7	39 45.9%	6 37.5%
5	18 21.2% B	1 6.2%
6	12 14.1%	1 6.2%
7	9 10.6%	4 25.0%
Net 8-10	32 37.6%	6 37.5%

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qpi3_a Page 12
(Continued)
Duke Trade Ally Tables

On a scale of 0 to 10, where 0 is "not at all influential" and 10 is "extremely influential," please rate the influence of the <program> on the increase in… Your knowledge of high efficiency options.

	Jurisdiction	
	DEC (A)	DEP (B)
8	11 12.9%	3 18.8%
9	6 7.1%	-
10 - Extremely Influential	15 17.6%	3 18.8%
Mean	6.6	6.4

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qpi3_b Page 13

Duke Trade Ally Tables

On a scale of 0 to 10, where 0 is "not at all influential" and 10 is "extremely influential," please rate the influence of the <program> on the increase in… Your comfort level in discussing the benefits of high efficiency with your customers.

	Jurisdiction	
	DEC	DEP
	(A)	(B)
Total	86 100.0%	17 100.0%
Net 0-4	9 10.5%	3 17.6%
0 - Not at All Influential	1 1.2%	1 5.9%
1	1 1.2%	-
2	2 2.3%	-
3	4 4.7%	-
4	1 1.2%	2 11.8%
Net 5-7	37 43.0%	8 47.1%
5	14 16.3%	3 17.6%
6	8 9.3%	1 5.9%
7	15 17.4%	4 23.5%
Net 8-10	40 46.5%	6 35.3%

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qpi3_b Page 14
(Continued)
Duke Trade Ally Tables

On a scale of 0 to 10, where 0 is "not at all influential" and 10 is "extremely influential," please rate the influence of the <program> on the increase in… Your comfort level in discussing the benefits of high efficiency with your customers.

	Jurisdiction	
	DEC	DEP
	(A)	(B)
8	12 14.0%	3 17.6%
9	8 9.3%	1 5.9%
10 - Extremely Influential	20 23.3%	2 11.8%
Mean	7.1	6.5

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qpi3_c Page 15

Duke Trade Ally Tables

On a scale of 0 to 10, where 0 is "not at all influential" and 10 is "extremely influential," please rate the influence of the <program> on the increase in… The percentage of sales situations in which you recommend high efficiency equipment.

	Jurisdiction	
	DEC	DEP
	(A)	(B)
Total	85 100.0%	17 100.0%
Net 0-4	8 9.4%	2 11.8%
0 - Not at All Influential	1 1.2%	1 5.9%
2	1 1.2%	-
3	2 2.4%	-
4	4 4.7%	1 5.9%
Net 5-7	28 32.9%	5 29.4%
5	9 10.6%	3 17.6%
6	8 9.4%	-
7	11 12.9%	2 11.8%
Net 8-10	49 57.6%	10 58.8%
8	14 16.5%	4 23.5%

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qpi3_c Page 16
(Continued)
Duke Trade Ally Tables

On a scale of 0 to 10, where 0 is "not at all influential" and 10 is "extremely influential," please rate the influence of the <program> on the increase in… The percentage of sales situations in which you recommend high efficiency equipment.

	Jurisdiction	
	DEC	DEP
	(A)	(B)
9	10	4
	11.8%	23.5%
10 - Extremely Influential	25	2
	29.4%	11.8%
	b	
Mean	7.6	7.1

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qpi3_d Page 17

Duke Trade Ally Tables

On a scale of 0 to 10, where 0 is "not at all influential" and 10 is "extremely influential," please rate the influence of the <program> on the increase in… The percentage of jobs in which <tradeally_name> installs high efficiency equipment in Duke Energy's <jurisdiction> service territory.

	Jurisdiction	
	DEC	DEP
	(A)	(B)
Total	84 100.0%	16 100.0%
Net 0-4	11 13.1%	2 12.5%
0 - Not at All Influential	1 1.2%	-
1	1 1.2%	1 6.2%
2	4 4.8%	-
3	3 3.6%	-
4	2 2.4%	1 6.2%
Net 5-7	31 36.9%	5 31.2%
5	14 16.7%	1 6.2%
6	5 6.0%	2 12.5%
7	12 14.3%	2 12.5%
Net 8-10	42 50.0%	9 56.2%

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qpi3_d Page 18
(Continued)
Duke Trade Ally Tables

On a scale of 0 to 10, where 0 is "not at all influential" and 10 is "extremely influential," please rate the influence of the <program> on the increase in… The percentage of jobs in which <tradeally_name> installs high efficiency equipment in Duke Energy's <jurisdiction> service territory.

	Jurisdiction	
	DEC	DEP
	(A)	(B)
8	11 13.1%	3 18.8%
9	9 10.7%	1 6.2%
10 - Extremely Influential	22 26.2%	5 31.2%
Mean	7.1	7.4

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qpi3_e Page 19

Duke Trade Ally Tables

On a scale of 0 to 10, where 0 is "not at all influential" and 10 is "extremely influential," please rate the influence of the <program> on the increase in… The total volume of high efficiency equipment <tradeally_name> installs in Duke Energy's <jurisdiction> service territory.

	Jurisdiction	
	DEC	DEP
	(A)	(B)
Total	82 100.0%	16 100.0%
Net 0-4	9 11.0%	2 12.5%
1	-	1 6.2%
2	3 3.7%	-
3	1 1.2%	-
4	5 6.1%	1 6.2%
Net 5-7	36 43.9%	4 25.0%
5	13 15.9%	2 12.5%
6	10 12.2%	1 6.2%
7	13 15.9%	1 6.2%
Net 8-10	37 45.1%	10 62.5%
8	8 9.8%	1 6.2%

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qpi3_e Page 20
(Continued)
Duke Trade Ally Tables

On a scale of 0 to 10, where 0 is "not at all influential" and 10 is "extremely influential," please rate the influence of the <program> on the increase in… The total volume of high efficiency equipment <tradeally_name> installs in Duke Energy's <jurisdiction> service territory.

	Jurisdiction	
	DEC	DEP
	(A)	(B)
9	8	2
	9.8%	12.5%
10 - Extremely Influential	21	7
	25.6%	43.8%
Mean	7.2	7.8

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qpi4_a1_re1 Page 21

Duke Trade Ally Tables

How was the <program> influential in increasing… the percentage of jobs in which <tradeally_name> installs high efficiency equipment in Duke Energy's <jurisdiction> service territory?

	Jurisdiction	
	DEC	DEP
	(A)	(B)
Total	41 100.0%	8 100.0%
Rebate offer helps to close the sale with the customer	8 19.5%	2 25.0%
The incentive saves the customer money	7 17.1%	2 25.0%
Enabled the installation of higher efficiency equipment	4 9.8%	3 37.5%
We are able to offer the customer higher energy savings	1 2.4%	-
Mentioned the incentive or rebate (non-specific)	8 19.5%	-
We are able to recommend reliable vendors	1 2.4%	-
Other	14 34.1%	1 12.5%

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qpi4_b1_re1 Page 22

Duke Trade Ally Tables

How was the <program> influential in increasing… the total volume of high efficiency equipment <tradeally_name> installs in Duke Energy's <jurisdiction> service territory?

	Jurisdiction	
	DEC	DEP
	(A)	(B)
Total	92 100.0%	28 100.0%
.	1 1.1%	-
0	34 37.0%	16 57.1% a
1	8 8.7%	1 3.6%
1,000,000	42 45.7%	17 60.7%
2	2 2.2%	3 10.7%
2m	1 1.1%	-
4	5 5.4%	-
5	7 7.6%	1 3.6%
5%	1 1.1%	-
6	1 1.1%	-
10	-	1 3.6%

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qpi4_b1_re1 Page 23
(Continued)
Duke Trade Ally Tables

How was the <program> influential in increasing… the total volume of high efficiency equipment <tradeally_name> installs in Duke Energy's <jurisdiction> service territory?

	Jurisdiction	
	DEC	DEP
	(A)	(B)
25%	-	1 3.6%
35	1 1.1%	-
40-50%	8 8.7%	1 3.6%
48	1 1.1%	-
50	2 2.2%	-
50%	1 1.1%	-
60	1 1.1%	-
64 plus	-	1 3.6%
70	1 1.1%	-
97	19 20.7%	3 10.7%
100	3 3.3%	1 3.6%
500000	1 1.1%	-

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qpi4_b1_re1 Page 24
(Continued)
Duke Trade Ally Tables

How was the <program> influential in increasing… the total volume of high efficiency equipment <tradeally_name> installs in Duke Energy's <jurisdiction> service territory?

	Jurisdiction	
	DEC	DEP
	(A)	(B)
?	1 1.1%	-
all	1 1.1%	-

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qpi5 Page 25

Duke Trade Ally Tables

Did any factors, other than the <program>, contribute to the increases you mentioned?

	Jurisdiction	
	DEC	DEP
	(A)	(B)
Total	93 100.0%	18 100.0%
Yes	49 52.7%	12 66.7%
No	26 28.0%	3 16.7%
Don't Know	18 19.4%	3 16.7%

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qpi5am1_re1 Page 26

Duke Trade Ally Tables

What were those factors?

	Jurisdiction	
	DEC	DEP
	(A)	(B)
Total	23 100.0%	4 100.0%
Increased knowledge or training of energy efficient products	11 47.8%	1 25.0%
Mentioned the incentive or rebate (non-specific)	3 13.0%	1 25.0%
Price decreases for energy efficient products	7 30.4%	-
Increased quality of energy efficient products	6 26.1%	1 25.0%
Improvements to the process of upgrading for the customer	1 4.3%	-
New regulations were enacted	1 4.3%	1 25.0%

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table QPI6A Page 27

Duke Trade Ally Tables

Has your participation in the <program> affected your business practices in any other ways?

	Jurisdiction	
	DEC	DEP
	(A)	(B)
Total	93 100.0%	18 100.0%
Yes	41 44.1%	8 44.4%
No	41 44.1%	9 50.0%
Don't know	11 11.8%	1 5.6%

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qpi6bm1_re1 Page 28

Duke Trade Ally Tables

Has your participation in the <PROGRAM2> affected your business practices in any other ways?

	Jurisdiction	
	DEC	DEP
	(A)	(B)
Total	41 100.0%	8 100.0%
Provided more options for customers	5 12.2%	-
Allowed me to provide more information to customers	8 19.5%	-
Improved the purchasing process for customers	1 2.4%	-
Allowed me to make more sales	8 19.5%	3 37.5%
Increased outreach	11 26.8%	-
Participation in the program takes up more of my time	1 2.4%	-
Other	10 24.4%	5 62.5% A

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qta1_a_1 Page 29

Duke Trade Ally Tables

Approximately what percentage of your total equipment installations (in terms of dollars) was… Standard Efficiency?

	Jurisdiction	
	DEC	DEP
	(A)	(B)
Total	76 100.0%	17 100.0%
0	14 18.4%	4 23.5%
5	1 1.3%	-
10	5 6.6%	2 11.8%
15	1 1.3%	-
20	3 3.9%	1 5.9%
25	3 3.9%	1 5.9%
30	4 5.3%	-
40	5 6.6%	-
50	4 5.3%	-
60	2 2.6%	1 5.9%
70	-	1 5.9%
80	1 1.3%	1 5.9%

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qta1_a_1 Page 30
(Continued)
Duke Trade Ally Tables

Approximately what percentage of your total equipment installations (in terms of dollars) was… Standard Efficiency?

	Jurisdiction	
	DEC	DEP
	(A)	(B)
Don't Know	33 43.4%	6 35.3%

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qta1_b_1 Page 31

Duke Trade Ally Tables

Approximately what percentage of your total equipment installations (in terms of dollars) was… High Efficiency - that DID RECEIVE an incentive from Duke Energy?

	Jurisdiction	
	DEC	DEP
	(A)	(B)
Total	87 100.0%	16 100.0%
2	1 1.1%	-
5	1 1.1%	1 6.2%
10	3 3.4%	1 6.2%
20	3 3.4%	1 6.2%
30	3 3.4%	-
40	2 2.3%	-
50	8 9.2%	-
60	2 2.3%	-
65	1 1.1%	-
70	4 4.6%	2 12.5%
75	3 3.4%	2 12.5%

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qta1_b_1 Page 32
(Continued)
Duke Trade Ally Tables

Approximately what percentage of your total equipment installations (in terms of dollars) was… High Efficiency - that DID RECEIVE an incentive from Duke Energy?

	Jurisdiction	
	DEC	DEP
	(A)	(B)
80	6 6.9%	2 12.5%
90	5 5.7%	-
95	1 1.1%	-
100	17 19.5%	2 12.5%
Don't Know	27 31.0%	5 31.2%

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qta1_c_1 Page 33

Duke Trade Ally Tables

Approximately what percentage of your total equipment installations (in terms of dollars) was… High Efficiency - that DID NOT RECEIVE an incentive from Duke Energy?

	Jurisdiction	
	DEC	DEP
	(A)	(B)
Total	73 100.0%	17 100.0%
0	5 6.8%	1 5.9%
1	1 1.4%	1 5.9%
5	1 1.4%	1 5.9%
10	9 12.3%	2 11.8%
20	10 13.7%	3 17.6%
25	6 8.2%	2 11.8%
30	2 2.7%	1 5.9%
40	3 4.1%	-
50	4 5.5%	1 5.9%
70	2 2.7%	-
90	1 1.4%	-

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qta1_c_1 Page 34
(Continued)
Duke Trade Ally Tables

Approximately what percentage of your total equipment installations (in terms of dollars) was… High Efficiency - that DID NOT RECEIVE an incentive from Duke Energy?

	Jurisdiction	
	DEC	DEP
	(A)	(B)
Don't Know	29 39.7%	5 29.4%

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qta2a Page 35

Duke Trade Ally Tables

Between <evalperiod>, did any of your customers in Duke Energy’s <jurisdiction> service territory install equipment that was eligible for a <program> incentive but that did not receive an incentive?

	Jurisdiction	
	DEC	DEP
	(A)	(B)
Total	29 100.0%	5 100.0%
Yes	13 44.8%	2 40.0%
No	9 31.0%	-
Don't Know	7 24.1%	3 60.0%

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qta2b Page 36

Duke Trade Ally Tables

Approximately, how many of your projects in Duke Energy’s <jurisdiction> service territory between <evalperiod> used high efficiency equipment but did not receive a <program>?

	Jurisdiction	
	DEC	DEP
	(A)	(B)
Total	11 100.0%	2 100.0%
1	1 9.1%	1 50.0%
10	1 9.1%	-
Don't Know	9 81.8%	1 50.0%

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qso1a Page 37

Duke Trade Ally Tables

How influential was your recommendation on your customers' choice of high efficiency equipment over standard efficiency equipment?

	Jurisdiction	
	DEC	DEP
	(A)	(B)
Total	55 100.0%	13 100.0%
Net 0-4	4 7.3%	3 23.1%
0 - Not at All Influential	1 1.8%	-
2	1 1.8%	1 7.7%
3	1 1.8%	2 15.4%
4	1 1.8%	-
Net 5-7	21 38.2%	5 38.5%
5	8 14.5%	3 23.1%
6	10 18.2%	1 7.7%
7	3 5.5%	1 7.7%
Net 8-10	30 54.5%	5 38.5%
8	10 18.2%	-

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qso1a Page 38
(Continued)
Duke Trade Ally Tables

How influential was your recommendation on your customers' choice of high efficiency equipment over standard efficiency equipment?

	Jurisdiction	
	DEC	DEP
	(A)	(B)
9	6 10.9%	1 7.7%
10 - Extremely Influential	14 25.5%	4 30.8%
Mean	7.3	6.5

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qso1bm1_rec Page 39

Duke Trade Ally Tables

What type of high efficiency equipment did your customers install without an incentive from Duke Energy?

	Jurisdiction	
	DEC	DEP
	(A)	(B)
Total	41 100.0%	10 100.0%
Lack of Awareness or Knowledge	36 87.8%	9 90.0%
Products Not Eligible	2 4.9%	1 10.0%
Time or Effort Required	1 2.4%	-
Project Costs	1 2.4%	-
Didn't Qualify	1 2.4%	-

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qrs1a Page 40

Duke Trade Ally Tables

In terms of cost, how large were the projects that installed high efficiency equipment but did NOT receive an incentive?

	Jurisdiction	
	DEC	DEP
	(A)	(B)
Total	38 100.0%	10 100.0%
Smaller Than Projects That Received an Incentive	21 55.3%	5 50.0%
About the Same Size as Projects That Received	11 28.9%	5 50.0%
Larger Than Projects That Received an Incentive	1 2.6%	-
Don't Know	5 13.2%	-

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qrs1b Page 41

Duke Trade Ally Tables

Approximately, how much smaller would you say were high efficiency projects that DID NOT receive a Duke Energy incentive compared to projects that DID receive an incentive?

	Jurisdiction	
	DEC	DEP
	(A)	(B)
Total	18 100.0%	5 100.0%
Three Quarters of the Size	3 16.7%	1 20.0%
Half the Size	3 16.7%	-
A Quarter of the Size	7 38.9%	1 20.0%
Less Than a Quarter of the Size	5 27.8%	3 60.0%

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qrs1c Page 42

Duke Trade Ally Tables

Approximately, how much larger would you say were high efficiency projects that DID NOT receive a Duke Energy incentive compared to projects that DID receive an incentive?

	Jurisdiction	
	DEC	DEP
	(A)	(B)
Total	1 100.0%	-
More Than Twice the Size	1 100.0%	-

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qaw1 Page 43

Duke Trade Ally Tables

How many of your customers are aware of options for energy efficiency upgrades at their facilities?

	Jurisdiction	
	DEC	DEP
	(A)	(B)
Total	111 100.0%	32 100.0%
All of My Customers 100%	16 14.4%	9 28.1%
Most of My Customers 75% or More	43 38.7%	10 31.2%
Some of My Customers 20% - 74%	48 43.2%	11 34.4%
Less Than 20% of My Customers	4 3.6%	2 6.2%

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qaw2 Page 44

Duke Trade Ally Tables

How many of your customers already know about the <program> before you discuss it with them?

	Jurisdiction	
	DEC	DEP
	(A)	(B)
Total	111 100.0%	32 100.0%
All of My Customers 100%	4 3.6%	-
Most of My Customers 75% or More	19 17.1%	7 21.9%
Some of My Customers 20% - 74%	58 52.3%	18 56.2%
Less Than 20% of My Customers	27 24.3%	6 18.8%
None of My Customers	3 2.7%	1 3.1%

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qaw3a Page 45

Duke Trade Ally Tables

How often do you promote the <program> to your customers? Would you say you promote it to…

	Jurisdiction	
	DEC	DEP
	(A)	(B)
Total	111 100.0%	32 100.0%
All of My Customers 100%	59 53.2%	15 46.9%
Most of My Customers 75% or More	32 28.8%	8 25.0%
Some of My Customers 20% - 74%	16 14.4%	9 28.1%
Less Than 20% of My Customers	4 3.6%	-

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qaw3bm1_re1 Page 46

Duke Trade Ally Tables

When you do not promote the <program> to your customers, what are the reasons?

	Jurisdiction	
	DEC	DEP
	(A)	(B)
Total	52 100.0%	17 100.0%
The customer is not interested in the program or high efficiency equipment	4 7.7%	1 5.9%
I do promote to all customers	2 3.8%	3 17.6%
When a project needs to be done quickly	2 3.8%	2 11.8%
Not big enough financial savings for the customer	2 3.8%	2 11.8%
The customer is not in Duke territory or not a Duke customer	3 5.8%	-
Equipment does not qualify for the program	2 3.8%	1 5.9%
The customer is not a home owner	2 3.8%	-
The customer already has high efficiency equipment installed	1 1.9%	-
Other	34 65.4%	9 52.9%

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qaw4m1_rec2 Page 47

Duke Trade Ally Tables

What do you view as the main barriers that prevent your customers from installing energy efficient equipment?

	Jurisdiction	
	DEC	DEP
	(A)	(B)
Total	111 100.0%	32 100.0%
Higher Cost of Energy Efficient Equipment	62 55.9%	17 53.1%
Access to Financing or Capital for Energy Improvements	22 19.8%	8 25.0%
Time or logistics of application	5 4.5%	2 6.2%
Lack of Knowledge of Energy Efficient Options	3 2.7%	1 3.1%
Time or logistics of installation	3 2.7%	1 3.1%
Uncertainty about quality of energy efficienct products	3 2.7%	1 3.1%
Rebate amount too low	1 0.9%	3 9.4%
Uncertainty About the Savings From Energy Efficiency Improvements	2 1.8%	1 3.1%
Equipment Doesn't Qualify	2 1.8%	1 3.1%
Lack of Interest in Energy Efficient Equipment	1 0.9%	-

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qaw4m1_rec2 Page 48
(Continued)
Duke Trade Ally Tables

What do you view as the main barriers that prevent your customers from installing energy efficient equipment?

	Jurisdiction	
	DEC	DEP
	(A)	(B)
Other	16	3
	14.4%	9.4%

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qaw5am1_re2 Page 49

Duke Trade Ally Tables

What do you view as the main barriers that prevent your customers from participating in the <PROGRAM1>?

	Jurisdiction	
	DEC	DEP
	(A)	(B)
Total	110 100.0%	32 100.0%
Higher cost of energy efficient equipment	15 13.6%	6 18.8%
Access to financing or capital for energy improvements	3 2.7%	3 9.4%
Lack of knowledge of energy efficient options	2 1.8%	1 3.1%
Uncertainty about the savings from energy efficiency improvements	2 1.8%	-
Paperwork/Application process	9 8.2%	2 6.2%
Lack of awareness of the Smart $aver program	3 2.7%	-
Selection of equipment available through the Smart $aver program	2 1.8%	1 3.1%
Incentive levels	3 2.7%	3 9.4%
Time to Participate	4 3.6%	2 6.2%
Problems with vendors	-	1 3.1%
Not Duke Energy customers	2 1.8%	-

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qaw5am1_re2 Page 50
(Continued)
Duke Trade Ally Tables

What do you view as the main barriers that prevent your customers from participating in the <PROGRAM1>?

	Jurisdiction	
	DEC	DEP
	(A)	(B)
No barriers to participation	59 53.6% B	11 34.4%
Other	10 9.1%	6 18.8%

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qaw5bm1_re1 Page 51

Duke Trade Ally Tables

What could Duke Energy do to reduce these barriers to customer participation in the <program>?

	Jurisdiction	
	DEC	DEP
	(A)	(B)
Total	52 100.0%	22 100.0%
Loosen Equipment Requirements	1 1.9%	-
Increase Incentives	12 23.1% b	2 9.1%
Simplify Application Process	5 9.6%	3 13.6%
Reduce Application Timeline	2 3.8%	-
Program is Performing Well, No Suggestion	6 11.5%	1 4.5%
Improve and Increase Program Marketing/ Communications	2 3.8%	7 31.8% A
Include More Product Categories	4 7.7%	2 9.1%
Offer training	1 1.9%	-
Other	23 44.2%	8 36.4%

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qtr1 Page 52

Duke Trade Ally Tables

Have you participated in any training provided by Duke Energy’s <program>?

	Jurisdiction	
	DEC	DEP
	(A)	(B)
Total	111 100.0%	32 100.0%
Yes	48 43.2%	14 43.8%
No	63 56.8%	18 56.2%

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qtr2m1_rec1 Page 53

Duke Trade Ally Tables

Which of the following trainings have you participated in?

	Jurisdiction	
	DEC	DEP
	(A)	(B)
Total	48 100.0%	14 100.0%
Program Training	26 54.2%	11 78.6% a
Sales Training	13 27.1%	2 14.3%
Online Application Portal Training	23 47.9%	7 50.0%
Other, Please Specify	9 18.8%	-

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qtr3a_1 Page 54

Duke Trade Ally Tables

When did you receive the program training from Duke Energy?

	Jurisdiction	
	DEC	DEP
	(A)	(B)
Total	26 100.0%	11 100.0%
2014	8 30.8%	5 45.5%
2015	7 26.9%	1 9.1%
2016	8 30.8%	4 36.4%
Don't Know	3 11.5%	1 9.1%

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qtr3b_1 Page 55

Duke Trade Ally Tables

How useful was the program training?

	Jurisdiction	
	DEC	DEP
	(A)	(B)
Total	26 100.0%	11 100.0%
Net 0-4	2 7.7%	-
1	2 7.7%	-
Net 5-7	12 46.2%	8 72.7%
5	4 15.4%	5 45.5% a
6	2 7.7%	1 9.1%
7	6 23.1%	2 18.2%
Net 8-10	12 46.2%	3 27.3%
8	5 19.2%	-
9	1 3.8%	1 9.1%
10 - Extremely useful	6 23.1%	2 18.2%
Mean	7.1	6.7

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qtr3c_1m1 Page 56

Duke Trade Ally Tables

What would have made the program training more useful?

	Jurisdiction	
	DEC	DEP
	(A)	(B)
Total	2 100.0%	-
Other	2 100.0%	-

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qtr3d_1m1_1 Page 57

Duke Trade Ally Tables

What was the most useful about the program training?

	Jurisdiction	
	DEC	DEP
	(A)	(B)
Total	20 100.0%	6 100.0%
Online Portal Explanation and Examples	1 5.0%	-
Application Questions Answered	1 5.0%	-
Increased Program-Related Knowledge Generally	5 25.0%	1 16.7%
Increased Knowledge of Program-Eligible Measures	1 5.0%	-
Increased Knowledge of Incentives	2 10.0%	2 33.3%
One-on-one Instruction	-	2 33.3%
Updates on changes to the program	4 20.0%	-
Program marketing strategies	4 20.0%	-
Program materials	1 5.0%	1 16.7%
Other	2 10.0%	1 16.7%

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qtr3a_2 Page 58

Duke Trade Ally Tables

When did you receive the sales training from Duke Energy?

	Jurisdiction	
	DEC	DEP
	(A)	(B)
Total	13 100.0%	2 100.0%
2014	2 15.4%	1 50.0%
2015	7 53.8%	1 50.0%
2016	3 23.1%	-
Don't Know	1 7.7%	-

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qtr3b_2 Page 59

Duke Trade Ally Tables

How useful was the sales training?

	Jurisdiction	
	DEC	DEP
	(A)	(B)
Total	13 100.0%	2 100.0%
Net 0-4	1 7.7%	-
1	1 7.7%	-
Net 5-7	4 30.8%	1 50.0%
5	2 15.4%	1 50.0%
7	2 15.4%	-
Net 8-10	8 61.5%	1 50.0%
8	4 30.8%	-
9	1 7.7%	-
10 - Extremely useful	3 23.1%	1 50.0%
Mean	7.4	7.5

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qtr3c_2m1 Page 60

Duke Trade Ally Tables

What would have made the sales training more useful?

	Jurisdiction	
	DEC	DEP
	(A)	(B)
Total	1 100.0%	-
Other	1 100.0%	-

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qtr3d_2m1_1 Page 61

Duke Trade Ally Tables

What was the most useful about the sales training?

	Jurisdiction	
	DEC	DEP
	(A)	(B)
Total	10 100.0%	1 100.0%
Rebate Calculation	1 10.0%	-
Online Portal Explanation and Examples	1 10.0%	-
Increased Program-Related Knowledge Generally	4 40.0%	-
Increased Knowledge of Program-Eligible Measures	1 10.0%	-
Increased Knowledge of Incentives	2 20.0%	-
Program marketing strategies	3 30.0%	1 100.0%
Other	1 10.0%	-

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qtr3a_3 Page 62

Duke Trade Ally Tables

When did you receive the online application portal training from Duke Energy?

	Jurisdiction	
	DEC	DEP
	(A)	(B)
Total	23 100.0%	8 100.0%
2014	1 4.3%	1 12.5%
2015	5 21.7%	1 12.5%
2016	11 47.8%	3 37.5%
2017	2 8.7%	1 12.5%
Don't Know	4 17.4%	2 25.0%

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qtr3b_3 Page 63

Duke Trade Ally Tables

How useful was the online application portal training?

	Jurisdiction	
	DEC	DEP
	(A)	(B)
Total	23 100.0%	8 100.0%
Net 0-4	2 8.7%	1 12.5%
0 - Not at all useful	1 4.3%	-
3	1 4.3%	1 12.5%
Net 5-7	6 26.1%	3 37.5%
5	1 4.3%	1 12.5%
6	4 17.4%	1 12.5%
7	1 4.3%	1 12.5%
Net 8-10	15 65.2%	4 50.0%
8	9 39.1%	-
9	2 8.7%	1 12.5%
10 - Extremely useful	4 17.4%	3 37.5%

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qtr3b_3 Page 64
(Continued)
Duke Trade Ally Tables

How useful was the online application portal training?

	Jurisdiction	
	DEC	DEP
	(A)	(B)
Mean	7.3	7.5

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qtr3c_3m1_r Page 65

Duke Trade Ally Tables

What would have made the online application portal training more useful?

	Jurisdiction	
	DEC	DEP
	(A)	(B)
Total	2 100.0%	1 100.0%
Other	2 100.0%	1 100.0%

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qtr3d_3m1_1 Page 66

Duke Trade Ally Tables

What was the most useful about the online application portal training?

	Jurisdiction	
	DEC	DEP
	(A)	(B)
Total	20 100.0%	6 100.0%
Online Portal Explanation and Examples	3 15.0%	-
Question and Answer Opportunity	1 5.0%	-
Application Questions Answered	3 15.0%	2 33.3%
Increased Program-Related Knowledge Generally	8 40.0%	-
Other	6 30.0%	4 66.7% a

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qtr3a_4 Page 67

Duke Trade Ally Tables

When did you receive the [TRAINING TYPE] from Duke Energy?

	Jurisdiction	
	DEC	DEP
	(A)	(B)
Total	9 100.0%	-
2014	2 22.2%	-
2015	1 11.1%	-
2016	5 55.6%	-
Don't Know	1 11.1%	-

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qtr3b_4 Page 68

Duke Trade Ally Tables

How useful was the [TRAINING TYPE]?

	Jurisdiction	
	DEC	DEP
	(A)	(B)
Total	9 100.0%	-
Net 8-10	9 100.0%	-
8	4 44.4%	-
10 - Extremely useful	5 55.6%	-

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qtr3d_4m1_1 Page 69

Duke Trade Ally Tables

What was the most useful about the [TRAINING TYPE]?

	Jurisdiction	
	DEC (A)	DEP (B)
Total	9 100.0%	-
Online Portal Explanation and Examples	1 11.1%	-
Question and Answer Opportunity	2 22.2%	-
Application Questions Answered	1 11.1%	-
Increased Program-Related Knowledge Generally	1 11.1%	-
One-on-one Instruction	2 22.2%	-
Other	4 44.4%	-

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qtr4m1_rec Page 70

Duke Trade Ally Tables

Why have you not participated in a <program> training?

	Jurisdiction	
	DEC	DEP
	(A)	(B)
Total	63 100.0%	18 100.0%
Was Not Aware	33 52.4%	11 61.1%
Did Not Have Time	11 17.5% b	1 5.6%
Training Wasn't Needed	8 12.7%	2 11.1%
Location	3 4.8%	2 11.1%
Duke Energy Representative Answers Questions	2 3.2%	-
Other	8 12.7%	2 11.1%

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

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Appendix G. Trade Ally Online Survey Cross-Tabulations

Table qtr5a Page 71

Duke Trade Ally Tables

Is there any other type of training that Duke Energy could provide that would help you promote the <program>?

	Jurisdiction	
	DEC	DEP
	(A)	(B)
Total	48 100.0%	14 100.0%
Yes	11 22.9%	4 28.6%
No	37 77.1%	10 71.4%

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qtr5bm1_rec Page 72

Duke Trade Ally Tables

What type of training would be helpful to you?

	Jurisdiction	
	DEC	DEP
	(A)	(B)
Total	11 100.0%	4 100.0%
End User Training	4 36.4%	-
Custom Program Training	2 18.2%	-
Marketing/Sales	1 9.1%	1 25.0%
Prescriptive	-	1 25.0%
Other	4 36.4%	2 50.0%

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table QOP1 Page 73

Duke Trade Ally Tables

Are you aware that Duke Energy has an online portal where trade allies can submit applications for energy efficiency projects, track the status of their applications, and access program information?

	Jurisdiction	
	DEC	DEP
	(A)	(B)
Total	111 100.0%	32 100.0%
Yes	84 75.7%	23 71.9%
No	27 24.3%	9 28.1%

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table QOP2 Page 74

Duke Trade Ally Tables

Have you ever used the online portal?

	Jurisdiction	
	DEC	DEP
	(A)	(B)
Total	84 100.0%	24 100.0%
Yes	60 71.4%	14 58.3%
No	24 28.6%	10 41.7%

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table QOP3M1_1 Page 75

Duke Trade Ally Tables

How have you used the online portal? Have you used it to… Please select all that apply.

	Jurisdiction	
	DEC	DEP
	(A)	(B)
Total	60 100.0%	13 100.0%
Submit applications	55 91.7%	11 84.6%
Track the status of applications	42 70.0%	8 61.5%
Access program materials	26 43.3%	5 38.5%
Other, please specify:	1 1.7%	1 7.7%

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table QOP4 Page 76

Duke Trade Ally Tables

Approximately, what percentage of applications for the [PROGRAM1] do you submit through the online portal?

	Jurisdiction	
	DEC	DEP
	(A)	(B)
Total	55 100.0%	11 100.0%
0	3 5.5%	1 9.1%
10	1 1.8%	-
20	1 1.8%	1 9.1%
50	1 1.8%	1 9.1%
75	4 7.3%	-
90	1 1.8%	1 9.1%
95	1 1.8%	-
98	1 1.8%	-
100	36 65.5% b	4 36.4%
Don't know	6 10.9%	3 27.3%

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qop5m1_rec1 Page 77

Duke Trade Ally Tables

Table: qop5m1_rec

	Jurisdiction	
	DEC	DEP
	(A)	(B)
Total	111 100.0%	32 100.0%
Prefer to use paper application	2 1.8%	2 6.2%
Customer filled out application and submitted themselves	2 1.8%	-
Submitted application by email	1 0.9%	1 3.1%
Haven't needed to	2 1.8%	1 3.1%
Don't know how to use the portal	2 1.8%	2 6.2%
Someone else at my company submits the applications	2 1.8%	-
Supplier completes and submits applications	1 0.9%	2 6.2%
Other	12 10.8%	2 6.2%
0	111 100.0%	32 100.0%

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qsat1_a Page 78

Duke Trade Ally Tables

How would you rate your satisfaction with the following components of the <program>? The application process...

	Jurisdiction	
	DEC	DEP
	(A)	(B)
Total	104 100.0%	31 100.0%
Net 0-4	13 12.5%	5 16.1%
1	2 1.9%	-
2	1 1.0%	2 6.5%
3	5 4.8%	2 6.5%
4	5 4.8%	1 3.2%
Net 5-7	31 29.8%	12 38.7%
5	13 12.5%	4 12.9%
6	7 6.7%	2 6.5%
7	11 10.6%	6 19.4%
Net 8-10	60 57.7%	14 45.2%
8	18 17.3%	4 12.9%
9	23 22.1% B	2 6.5%

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qsat1_a Page 79
(Continued)
Duke Trade Ally Tables

How would you rate your satisfaction with the following components of the <program>? The application process...

	Jurisdiction	
	DEC	DEP
	(A)	(B)
10 - Extremely Satisfied	19	8
	18.3%	25.8%
Mean	7.3	7.0

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qsat1_b Page 80

Duke Trade Ally Tables

How would you rate your satisfaction with the following components of the <program>? The measures that are eligible for incentives through the <program>...

	Jurisdiction	
	DEC	DEP
	(A)	(B)
Total	105 100.0%	31 100.0%
Net 0-4	17 16.2%	4 12.9%
0 - Extremely Dissatisfied	1 1.0%	-
2	4 3.8%	-
3	7 6.7%	2 6.5%
4	5 4.8%	2 6.5%
Net 5-7	34 32.4%	9 29.0%
5	8 7.6%	2 6.5%
6	5 4.8%	2 6.5%
7	21 20.0%	5 16.1%
Net 8-10	54 51.4%	18 58.1%
8	16 15.2%	5 16.1%

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qsat1_b Page 81
(Continued)
Duke Trade Ally Tables

How would you rate your satisfaction with the following components of the <program>? The measures that are eligible for incentives through the <program>...

	Jurisdiction	
	DEC	DEP
	(A)	(B)
9	19	5
	18.1%	16.1%
10 - Extremely Satisfied	19	8
	18.1%	25.8%
Mean	7.2	7.6

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qsat1_c Page 82

Duke Trade Ally Tables

How would you rate your satisfaction with the following components of the <program>? The incentive levels...

	Jurisdiction	
	DEC (A)	DEP (B)
Total	107 100.0%	32 100.0%
Net 0-4	15 14.0%	3 9.4%
0 - Extremely Dissatisfied	2 1.9%	-
1	1 0.9%	-
2	2 1.9%	-
3	8 7.5%	1 3.1%
4	2 1.9%	2 6.2%
Net 5-7	44 41.1%	12 37.5%
5	9 8.4%	6 18.8%
6	16 15.0%	2 6.2%
7	19 17.8%	4 12.5%
Net 8-10	48 44.9%	17 53.1%
8	15 14.0%	6 18.8%

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qsat1_c Page 83
(Continued)
Duke Trade Ally Tables

How would you rate your satisfaction with the following components of the <program>? The incentive levels...

	Jurisdiction	
	DEC	DEP
	(A)	(B)
9	16	6
	15.0%	18.8%
10 - Extremely Satisfied	17	5
	15.9%	15.6%
Mean	7.0	7.3

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qsat1_d Page 84

Duke Trade Ally Tables

How would you rate your satisfaction with the following components of the <program>? The <program> Trade Ally Online Portal...

	Jurisdiction	
	DEC	DEP
	(A)	(B)
Total	84 100.0%	22 100.0%
Net 0-4	11 13.1%	3 13.6%
0 - Extremely Dissatisfied	-	2 9.1%
1	2 2.4%	-
3	5 6.0%	1 4.5%
4	4 4.8%	-
Net 5-7	32 38.1%	10 45.5%
5	17 20.2%	5 22.7%
6	8 9.5%	3 13.6%
7	7 8.3%	2 9.1%
Net 8-10	41 48.8%	9 40.9%
8	11 13.1%	3 13.6%

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qsat1_d Page 85
(Continued)
Duke Trade Ally Tables

How would you rate your satisfaction with the following components of the <program>? The <program> Trade Ally Online Portal...

	Jurisdiction	
	DEC	DEP
	(A)	(B)
9	15	2
	17.9%	9.1%
10 - Extremely Satisfied	15	4
	17.9%	18.2%
Mean	7.0	6.5

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qsat1_e Page 86

Duke Trade Ally Tables

How would you rate your satisfaction with the following components of the <program>? Your interactions with <program> staff...

	Jurisdiction	
	DEC	DEP
	(A)	(B)
Total	100 100.0%	32 100.0%
Net 0-4	8 8.0%	3 9.4%
0 - Extremely Dissatisfied	1 1.0%	-
2	-	1 3.1%
3	3 3.0%	2 6.2%
4	4 4.0%	-
Net 5-7	19 19.0%	7 21.9%
5	6 6.0%	1 3.1%
6	3 3.0%	3 9.4%
7	10 10.0%	3 9.4%
Net 8-10	73 73.0%	22 68.8%
8	9 9.0%	10 31.2% A

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qsat1_e Page 87
(Continued)
Duke Trade Ally Tables

How would you rate your satisfaction with the following components of the <program>? Your interactions with <program> staff...

	Jurisdiction	
	DEC	DEP
	(A)	(B)
9	22 22.0% b	3 9.4%
10 - Extremely Satisfied	42 42.0%	9 28.1%
Mean	8.3	7.8

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qsat1_f Page 88

Duke Trade Ally Tables

How would you rate your satisfaction with the following components of the <program>? The <program> overall...

	Jurisdiction	
	DEC	DEP
	(A)	(B)
Total	107 100.0%	32 100.0%
Net 0-4	5 4.7%	2 6.2%
1	1 0.9%	-
3	1 0.9%	1 3.1%
4	3 2.8%	1 3.1%
Net 5-7	34 31.8%	13 40.6%
5	12 11.2%	2 6.2%
6	8 7.5%	4 12.5%
7	14 13.1%	7 21.9%
Net 8-10	68 63.6%	17 53.1%
8	22 20.6%	6 18.8%
9	27 25.2% b	4 12.5%

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qsat1_f Page 89
(Continued)
Duke Trade Ally Tables

How would you rate your satisfaction with the following components of the <program>? The <program> overall...

	Jurisdiction	
	DEC	DEP
	(A)	(B)
10 - Extremely Satisfied	19	7
	17.8%	21.9%
Mean	7.8	7.6

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qsat2am1_re Page 90

Duke Trade Ally Tables

Your response suggests that you are not fully satisfied with the application process. Why did you give this rating?

	Jurisdiction	
	DEC (A)	DEP (B)
Total	47 100.0%	17 100.0%
Too complicated / cumbersome	11 23.4%	4 23.5%
Specific issues with setup	5 10.6%	3 17.6%
Processing time	5 10.6%	2 11.8%
Dissatisfied with rebates / incentives	4 8.5%	3 17.6%
Application length/Too much effort required	5 10.6%	-
Would like training / more information	4 8.5%	1 5.9%
Unfamiliar with online option	2 4.3%	2 11.8%
Generally satisfied	2 4.3%	1 5.9%
Not streamlined	2 4.3%	-
Don't see a need to use it	1 2.1%	-
No reason	2 4.3%	-
Other	2 4.3%	1 5.9%

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qsat2am1_re Page 91
(Continued)
Duke Trade Ally Tables

Your response suggests that you are not fully satisfied with the application process. Why did you give this rating?

	Jurisdiction	
	DEC	DEP
	(A)	(B)
Refusal	2 4.3%	-

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qsat2bm1_re Page 92

Duke Trade Ally Tables

Your response suggests that you are not fully satisfied with the measures eligible for incentives. Why did you give this rating?

	Jurisdiction	
	DEC	DEP
	(A)	(B)
Total	53 100.0%	13 100.0%
Some measures are not eligible, when they should	19 35.8%	3 23.1%
Measure incentives are insufficient	7 13.2%	1 7.7%
Easier process	4 7.5%	2 15.4%
Reduction in eligible measures	4 7.5%	1 7.7%
Unfamiliar / Need training or help	3 5.7%	2 15.4%
Other	3 5.7%	1 7.7%
No reason	6 11.3%	2 15.4%
Don't know	6 11.3%	1 7.7%
Refusal	1 1.9%	-

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qsat2cm1_re Page 93

Duke Trade Ally Tables

Your response suggests that you are not fully satisfied with the incentive levels. Which measures do you think should have different incentive levels?

	Jurisdiction	
	DEC	DEP
	(A)	(B)
Total	60 100.0%	15 100.0%
Lighting	28 46.7%	6 40.0%
Other	23 38.3%	7 46.7%
No reason	3 5.0%	2 13.3%
Don't know	4 6.7%	-
Refusal	2 3.3%	-

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qsat2dm1_re Page 94

Duke Trade Ally Tables

Your response suggests that you are not fully satisfied with the <PROGRAM2> Trade Ally Online Portal. Why did you give this rating?

	Jurisdiction	
	DEC	DEP
	(A)	(B)
Total	43 100.0%	13 100.0%
Used infrequently	12 27.9%	3 23.1%
It is cumbersome/Not user friendly	10 23.3%	2 15.4%
Specific IT issues	4 9.3%	-
It is good, no issues	3 7.0%	1 7.7%
Unaware of portal	2 4.7%	1 7.7%
Data re-entry required	3 7.0%	-
Would like more information / training	2 4.7%	1 7.7%
Can't go back and make edits	-	1 7.7%
Other	4 9.3%	3 23.1%
No reason	1 2.3%	1 7.7%
Don't Know	2 4.7%	-

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qsat2e_rec_ Page 95

Duke Trade Ally Tables

Your response suggests that you are not fully satisfied with your interactions with <PROGRAM2> staff. Why did you give this rating?

	Jurisdiction	
	DEC	DEP
	(A)	(B)
Total	29 100.0%	10 100.0%
Limited interaction	7 24.1%	1 10.0%
Generally dissatisfied / needed more	5 17.2%	2 20.0%
Generally satisfied	6 20.7%	-
Difficult to contact	2 6.9%	4 40.0% A
Better communication	3 10.3%	2 20.0%
Directed to online portal	1 3.4%	-
No reason	2 6.9%	-
Don't Know	2 6.9%	-
Refusal	1 3.4%	1 10.0%

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qsat2fm1_re Page 96

Duke Trade Ally Tables

Your response suggests that you are not fully satisfied with the <PROGRAM1> overall. Why did you give this rating?

	Jurisdiction	
	DEC	DEP
	(A)	(B)
Total	39 100.0%	15 100.0%
General improvements	8 20.5%	4 26.7%
Application Too Lengthy/ Complicated	7 17.9%	2 13.3%
Increase rebates and incentives	8 20.5%	-
Generally satisfied	2 5.1%	4 26.7% a
Processing time	2 5.1%	2 13.3%
Would like more information / training	4 10.3%	-
Other	3 7.7%	2 13.3%
No reason	3 7.7%	1 6.7%
Don't Know	1 2.6%	-
Refusal	1 2.6%	-

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table QF1 Page 97

Duke Trade Ally Tables

Approximately how many TOTAL COMMERCIAL OR INDUSTRIAL PROJECTS does your company implement in a typical year in Duke Energy's <jurisdiction> service territory? If unsure, please provide your best estimate.

	Jurisdiction	
	DEC	DEP
	(A)	(B)
Total	111 100.0%	32 100.0%
1	2 1.8%	-
2	5 4.5%	4 12.5%
3	1 0.9%	-
5	4 3.6%	1 3.1%
6	-	1 3.1%
10	4 3.6%	-
12	3 2.7%	-
15	8 7.2%	1 3.1%
20	6 5.4%	3 9.4%
24	-	1 3.1%
25	2 1.8%	-

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table QF1 Page 98
(Continued)
Duke Trade Ally Tables

Approximately how many TOTAL COMMERCIAL OR INDUSTRIAL PROJECTS does your company implement in a typical year in Duke Energy’s <jurisdiction> service territory? If unsure, please provide your best estimate.

	Jurisdiction	
	DEC	DEP
	(A)	(B)
30	2 1.8%	1 3.1%
40	1 0.9%	-
50	11 9.9%	3 9.4%
60	1 0.9%	1 3.1%
65	1 0.9%	-
70	1 0.9%	-
75	4 3.6%	1 3.1%
80	1 0.9%	-
100	10 9.0%	-
110	1 0.9%	-
120	1 0.9%	-
125	1 0.9%	-

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table QF1 Page 99
(Continued)
Duke Trade Ally Tables

Approximately how many TOTAL COMMERCIAL OR INDUSTRIAL PROJECTS does your company implement in a typical year in Duke Energy’s <jurisdiction> service territory? If unsure, please provide your best estimate.

	Jurisdiction	
	DEC	DEP
	(A)	(B)
140	1 0.9%	-
150	2 1.8%	3 9.4%
200	2 1.8%	1 3.1%
250	1 0.9%	-
300	2 1.8%	-
400	3 2.7%	-
500	1 0.9%	-
1000	2 1.8%	-
5000	-	1 3.1%
Don't know	27 24.3%	10 31.2%

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table QF2 Page 100

Duke Trade Ally Tables

How many employees does your company have?

	Jurisdiction	
	DEC	DEP
	(A)	(B)
Total	111 100.0%	32 100.0%
1	9 8.1%	4 12.5%
2	6 5.4%	-
3	7 6.3%	-
4	10 9.0%	4 12.5%
5	3 2.7%	4 12.5%
6	5 4.5%	2 6.2%
7	3 2.7%	-
8	-	1 3.1%
9	3 2.7%	2 6.2%
10	5 4.5%	-
11	-	1 3.1%
13	1 0.9%	-

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table QF2 Page 101
(Continued)
Duke Trade Ally Tables

How many employees does your company have?

	Jurisdiction	
	DEC	DEP
	(A)	(B)
14	1 0.9%	-
15	6 5.4%	-
18	2 1.8%	-
20	7 6.3%	-
21	-	1 3.1%
24	1 0.9%	-
25	4 3.6%	1 3.1%
26	1 0.9%	-
28	1 0.9%	-
34	-	1 3.1%
40	1 0.9%	-
45	1 0.9%	-
50	3 2.7%	-

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table QF2 Page 102
(Continued)
Duke Trade Ally Tables

How many employees does your company have?

	Jurisdiction	
	DEC	DEP
	(A)	(B)
55	1 0.9%	-
58	1 0.9%	-
65	1 0.9%	-
70	1 0.9%	-
75	1 0.9%	-
76	1 0.9%	-
85	-	1 3.1%
100	1 0.9%	2 6.2%
122	1 0.9%	-
155	1 0.9%	-
200	1 0.9%	-
220	1 0.9%	-
300	3 2.7%	-

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table QF2 Page 103
(Continued)
Duke Trade Ally Tables

How many employees does your company have?

	Jurisdiction	
	DEC	DEP
	(A)	(B)
400	-	1 3.1%
425	-	1 3.1%
450	-	1 3.1%
500	2 1.8%	1 3.1%
750	1 0.9%	-
800	1 0.9%	-
8000	1 0.9%	-
9000	-	1 3.1%
Don't know	12 10.8%	3 9.4%

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table QF3 Page 104

Duke Trade Ally Tables

Would you consider your company to be local, regional, national, or international in size?

	Jurisdiction	
	DEC	DEP
	(A)	(B)
Total	111 100.0%	32 100.0%
Local	37 33.3%	15 46.9%
Regional	44 39.6% B	5 15.6%
National	21 18.9%	10 31.2%
International	9 8.1%	2 6.2%

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qf4m1_rec_1 Page 105

Duke Trade Ally Tables

What are the key business sectors your company serves? Please select all that apply.

	Jurisdiction	
	DEC	DEP
	(A)	(B)
Total	111 100.0%	32 100.0%
K-12 School	45 40.5% B	6 18.8%
College/University	42 37.8%	12 37.5%
Grocery	31 27.9%	8 25.0%
Medical	46 41.4%	12 37.5%
Hotel/Motel	45 40.5%	15 46.9%
Light Industry	82 73.9% B	15 46.9%
Heavy Industry	49 44.1%	10 31.2%
Office	74 66.7%	23 71.9%
Restaurant	44 39.6%	14 43.8%
Retail/Service	59 53.2%	18 56.2%
Government	25 22.5%	9 28.1%

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table qf4m1_rec_1 Page 106
(Continued)
Duke Trade Ally Tables

What are the key business sectors your company serves? Please select all that apply.

	Jurisdiction	
	DEC	DEP
	(A)	(B)
Convenience Store	2 1.8%	-
Gas Station	2 1.8%	-
Warehouse	1 0.9%	-
Residential/Condominiums/ Multifamily	3 2.7%	2 6.2%
Other (Specify)	2 1.8%	2 6.2%

Comparison Groups: AB
T-Test for Means, Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.

Lowercase letters indicate significance at the 90% level.

Appendix H. Impact Calculation Tables

Deemed Savings Review

The Word document containing the deemed savings review memorandum is provided as a separate file.

Gross Impact Analysis

The Excel spreadsheet containing the gross impact analysis is provided as a separate file.

For more information, please contact:

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Memorandum

To: Jean Williams, Rose Stoeckle, and Monica Redman (Duke Energy)
From: Matt Drury, Mallorie Gattie-Garza, Antje Flanders (Opinion Dynamics)
Date: December 6, 2017
Re: Deemed Savings Review for the Duke Energy Carolina (DEC) Smart $aver® Incentive Program and the Duke Energy Progress (DEP) Energy Efficiency for Business Incentive Program – Final

Introduction

Opinion Dynamics conducted a review of ex ante per unit savings ("deemed savings") for the Duke Energy Carolina (DEC) Smart $aver® Incentive Program and the Duke Energy Progress (DEP) Energy Efficiency for Business (EEB) Incentive Program. This review covers measures incented through the Smart $aver/EEB programs for the following periods:[1]

- DEC Smart $aver: August 1, 2015 – July 31, 2016
- DEP EEB: March 1, 2016 – July 31, 2016

Opinion Dynamics originally submitted this deemed savings review on October 31, 2016 and a revised version on December 21, 2016, after receipt of additional supporting documentation from Duke. In March 2017, Opinion Dynamics received revised ex ante values for some of the reviewed measures. In October 2017, Opinion Dynamics again received revised ex ante values for several DEC lighting measures. This final deemed savings review incorporates all of these updates. The exception is the measure selection process (discussed below), which was based on program data through July 31, 2016 and the original ex ante savings values.

Measure Selection

Due to the large number of different types of measures (N=204) incented during the review period, Opinion Dynamics prioritized and reviewed the measures that individually accounted for at least 0.5% of total ex ante

[1] The evaluation period for DEC is August 1, 2015 to February 28, 2017; the evaluation period for DEP is March 1, 2016 to February 28, 2017. This review includes program tracking data available as of the time of the data pull for this task, i.e., through July 31, 2016.

program savings.[2] In total, we reviewed 66 individual measures, which accounted for 93% of the total program energy savings.

Table 1 summarizes, by technology, the program measures incented through July 31, 2016 and their savings, as well as the number of measures included in the deemed savings review and the share of total savings they account for.

Table 1. Summary of Measures Reviewed

Technology	Total Measures	Total Ex Ante Savings	Reviewed Measures	Percent of Ex Ante Technology Savings Reviewed
Lighting	83	120,429,112	54	98%
Food Service Products	43	9,892,610	2	80%
Motors, Pumps & VFDs	8	5,868,817	3	99%
HVAC	63	5,775,575	5	29%
Information Technology	4	3,318,558	2	88%
Process Equipment	3	1,122,447	0	0%
Total	204	146,407,119	66	93%

Note: When selecting measures for review, we set aside two EEB "measures" that were tracked at the technology level only: "Lighting - EEB" and "HVAC - EEB". They account for 9,365 MWh and 29 MWh, respectively.

Deemed Savings Review

To complete the deemed savings review, Opinion Dynamics first reviewed all documentation supplied by Duke Energy, including databases, previous evaluation reports, and input assumption files. Where available, we reviewed ex ante savings inputs and algorithms to determine whether any updates were required. In addition, we leveraged engineering algorithms from several Technical Reference Manuals (listed in Key References section below), and applied DEC/DEP-specific inputs to those algorithms from program tracking data whenever possible.

The following sections provide a summary of the reviewed measures, by technology, and compare the ex ante and ex post deemed savings values. We provide an explanation (if applicable) where the values differ. We provide the full database with all algorithms and assumptions in the Supporting Documentation section below.

Lighting Measures

Our review included 54 lighting measures, accounting for 98% of ex ante lighting savings. Table 2 summarizes the results of our review for these 54 measures. Where available, we reviewed ex ante assumptions and algorithms and confirmed whether the assumptions appeared reasonable for the given

[2] A total of 31 measures individually accounted for 0.5% or more of total ex ante program savings. Combined, these 31 measures account for over 87% of total ex ante program savings. In addition to these 31 measures, our review included closely related measures. For example, there are three different “LED Canopy” measures with different wattage ranges. Of these, one accounts for at least 0.5% of savings; the other two do not. Our review included all three measures since the incremental effort of reviewing such related measures is small. We included 32 additional measures that met these criterial for a total of 63 reviewed measures.

measure. In cases where ex ante wattage assumptions were missing, such as for LED Downlights and Exterior HIDs, we developed reasonable estimates based on other references such as Smart $aver® documentation for Duke Energy Indiana (DEI) projects and technical reference manuals (TRM).

One overarching update we made to the majority of lighting calculations was to use annual operating hours from the program tracking database to estimate the average hours of use for each measure type. This caused slight revisions to the ex ante assumed hours of use, resulting in an increase or decrease across the various measures. The complete analysis and assumptions for all lighting measures are provided in the Supporting Documentation file below.

Table 2. Lighting Measure Summary

Measure	Unit	Ex Ante Deemed Savings			Ex Post Savings			Reasons for Differences
		kWh	Summer kW	Winter kW	kWh	Summer kW	Winter kW	
LED Lamps (DEC)	per fixture	141	0.029	0.029	147	0.029	0.029	We used the DEC ex ante assumptions, but adjusted DEC ex ante hours of use to reflect hours of use in participant database (N=800).
LED Lamps (DEP)	per fixture	114	0.031	0.031	147	0.029	0.029	We used the DEP ex ante assumptions, but adjusted DEP ex ante hours of use to reflect hours of use in participant database (N=800). Additionally, DEP ex ante did not incorporate waste heat factors.
LED Downlight (DEC)	per fixture	234	0.050	0.049	343	0.050	0.050	We used the DEC ex ante assumptions, but adjusted DEC ex ante hours of use to reflect hours of use in participant database (N=800).
LED Downlight (DEP)	Per fixture	195	0.048	0.048	343	0.050	0.050	We used the DEP ex ante assumptions, but adjusted DEP ex ante hours of use to reflect hours of use in participant database (N=800). Additionally, DEP ex ante did not incorporate waste heat factors.
LED Case lighting	per door	460	0.039	0.039	463	0.064	0.064	There are no wattage assumptions listed in source document for baseline or efficient wattage. We performed a separate analysis consistent with the analysis we did for DEI, but arrived at slightly higher kWh savings and higher kW

Measure	Unit	Ex Ante Deemed Savings			Ex Post Savings			Reasons for Differences
		kWh	Summer kW	Winter kW	kWh	Summer kW	Winter kW	
								savings. We adjusted hours of use to be specific to DEC/DEP participant data (N=204).
LED Highbay replacing 251-400W HID	per fixture	1,028	0.210	0.000	1,263	0.233	0.233	We used the DEC-DEP ex ante file, but adjusted hours of use to reflect hours of use in participant database (N=367). Ex post also uses updated waste heat factors to be consistent with other lighting measures and rely on the weighted values from the TechMarket Works 2013 Evaluation Report.
LED Highbay replacing greater than 400W HID	per fixture	1,889	0.386	0.000	2,320	0.428	0.428	
LED Canopy replacing 176-250W HID	per fixture	697	0.000	0.000	708	0.000	0.000	We used the DEC-DEP ex ante file, but adjusted hours of use to reflect hours of use in participant database (N=265).
LED Canopy replacing 251-400W HID	per fixture	1,024	0.000	0.000	1,040	0.000	0.000	
LED Canopy replacing up to 175W HID	per fixture	440	0.000	0.000	446	0.000	0.000	
Exterior HID replacement above 400W HID retrofit	per fixture	1,276	0.000	0.000	1,403	0.000	0.000	We used the DEC-DEP ex ante file, but adjusted hours of use to reflect hours of use in participant database (N=888).
Exterior HID replcmnt 250W to 400W HID retrofit	per fixture	706	0.000	0.000	780	0.000	0.000	
Exterior HID replacement to 175W HID retrofit	per fixture	268	0.000	0.000	308	0.000	0.000	
Exterior HID replcmnt 175W to 250W HID retrofit	per fixture	409	0.000	0.000	454	0.000	0.000	
Garage HID replcmnt 175W to 250W HID retrofit	per fixture	936	0.102	0.102	744	0.108	0.108	We used the DEC-DEP ex ante file, but adjusted hours of use to reflect hours of use in participant database (N=25).
Garage HID replacement to 175W HID retrofit	per fixture	611	0.067	0.067	504	0.073	0.073	

Measure	Unit	Ex Ante Deemed Savings			Ex Post Savings			Reasons for Differences
		kWh	Summer kW	Winter kW	kWh	Summer kW	Winter kW	
Garage HID replcmnt 250W to 400W HID retrofit	per fixture	1,614	0.175	0.175	1,278	0.185	0.185	
Garage HID replacement above 400W HID retrofit	Per fixture	2,803	0.304	0.304	2,300	0.333	0.333	
LW HPT8 4ft 4 lamp, Replace T12	per fixture	222	0.038	0.038	167	0.050	0.050	We used the DEC-DEP ex ante file, but adjusted hours of use to reflect values in participant database (N=177). Additionally, we made some adjustments to pre- and post-wattage assumptions. Ex post also uses updated waste heat factors to be consistent with other lighting measures and rely on the weighted values from the TechMarket Works 2013 Evaluation Report.
LW HPT8 4ft 2 lamp, Replace T12	per fixture	112	0.019	0.016	84	0.025	0.025	
LW HPT8 4ft 3 lamp, T8-LWT8	per fixture	108	0.021	0.021	33	0.010	0.010	
LW HPT8 4ft 2 Lamp, T8-LWT8	per fixture	83	0.016	0.016	22	0.007	0.007	
LW HPT8 4ft 3 lamp, Replace T12	per fixture	184	0.032	0.027	165	0.050	0.050	
LW HPT8 4ft 4 Lamp, T8-LWT8	per fixture	160	0.031	0.031	44	0.013	0.013	
LW HPT8 4ft 1 lamp, Replace T12	per fixture	78	0.013	0.011	63	0.019	0.019	
LW HPT8 4ft 1 lamp, T8-LWT8	per fixture	50	0.010	0.010	11	0.003	0.003	
Occupancy Sensors under 500 Watts	per sensor	513	0.082	0.048	513	0.082	0.082	No adjustments to energy or summer demand, but we are unable to confirm ex ante winter peak savings based on the source document. We give the same ex post demand savings to summer and winter peak.
Occupancy Sensors over 500 Watts	per sensor	1,276	0.197	0.115	1,276	0.197	0.197	
Compact Fluorescent Screw in	per fixture	125	0.034	0.034	109	0.028	0.028	There are no wattage assumptions listed in source document for baseline or efficient wattage. Savings appear reasonable based on separate ex post calculations. We also adjusted hours of use to reflect hours of use in participant database (N=24) and added waste heat factors and adjusted the coincidence

Measure	Unit	Ex Ante Deemed Savings kWh	Ex Ante Deemed Savings Summer kW	Ex Ante Deemed Savings Winter kW	Ex Post Savings kWh	Ex Post Savings Summer kW	Ex Post Savings Winter kW	Reasons for Differences
								factor to align with other lighting measures.
High Bay Fluorescent 6L F32 T-8	per fixture	1,263	0.268	0.000	466	0.119	0.119	Ex ante savings based on previous work paper methodology. For ex post, we updated the ex ante assumptions with hours of use from the participant database (N=41). Ex post also uses updated waste heat factors to be consistent with other lighting measures and rely on the weighted values from the TechMarket Works 2013 Evaluation Report. We also updated pre and post wattages based on the Illinois TRM and/or Arkansas TRM.
High Bay Fluorescent 4L F32 T-8	per fixture	809	0.172	0.000	285	0.073	0.073	
High Bay Fluorescent 8L F32 T-8	per fixture	853	0.181	0.000	744	0.190	0.190	
High Bay 6L T-5 High Output	per fixture	835	0.134	0.000	491	0.119	0.119	Ex ante savings based on previous work paper methodology. For ex post, we updated the ex ante assumptions with hours of use from the participant database (N=74). Ex post also uses updated waste heat factors to be consistent with other lighting measures and rely on the weighted values from the TechMarket Works 2013 Evaluation Report. We also updated pre and post wattages based on the Illinois TRM and/or Arkansas TRM.
High Bay 4L T-5 HO	per fixture	1,159	0.246	0.000	256	0.062	0.062	
High Bay 8L T-5 HO	per fixture	1,990	0.422	0.000	621	0.150	0.150	
2 High Bay 6L T-5 High Output	per fixture	1,914	0.406	0.399	1,730	0.418	0.418	
LED FLD rplcng or ILO GRT 100W HAL, INCD, or HID	per fixture	542	0.000	0.000	603	0.000	0.000	We used the DEC-DEP ex ante file, but adjusted hours of use to reflect hours of use in participant database (N=198).
LED FLD rplcng or ILO up to 100W HAL, INCD, or HID	per fixture	159	0.000	0.000	178	0.000	0.000	
LED Panel 2x4 replacing or in lieu of T8 FL	per fixture	192	0.039	0.000	196	0.043	0.043	We used the DEC-DEP ex ante file, but adjusted hours of use to reflect hours of use in participant database (N=1,135). Ex post also uses updated waste heat factors to
LED Panel 2x2 replacing or in lieu of T8 FL	per fixture	52	0.011	0.000	53	0.012	0.011	

Measure	Unit	Ex Ante Deemed Savings			Ex Post Savings			Reasons for Differences
		kWh	Summer kW	Winter kW	kWh	Summer kW	Winter kW	
LED Panel 1x4 replacing or in lieu of T8 FL	per fixture	82	0.017	0.000	84	0.019	0.017	be consistent with other lighting measures and rely on the weighted values from the TechMarket Works 2013 Evaluation Report.
LED 4ft Tube 3-LED, replacing T8 fluorescent	per fixture	118	0.021	0.000	133	0.026	0.026	We used the DEC-DEP ex ante file, but adjusted hours of use to reflect hours of use in participant database (N=983). Ex post also uses updated waste heat factors to be consistent with other lighting measures and rely on the weighted values from the TechMarket Works 2013 Evaluation Report.
LED 4ft Tube 2-LED, replacing T8 fluorescent	per fixture	84	0.015	0.000	95	0.019	0.019	
LED 4 ft Tube 1-LED, replacing T8 fluorescent	per fixture	51	0.009	0.000	57	0.011	0.011	
LED 2ft Tube 2-LED, replacing T8 fluorescent	per fixture	55	0.010	0.000	62	0.012	0.012	
LED 2ft Tube 1-LED, replacing T8 fluorescent	per fixture	34	0.006	0.000	38	0.008	0.008	
LED 2ft Tube 4 lamps replacing or in lieu of T12 or T8 fluorescent 4 lamps	per fixture	80	0.014	0.000	90	0.018	0.018	
LED 2ft Tube 3 lamps replacing or in lieu of T12 or T8 fluorescent 3 lamps	per fixture	72	0.013	0.000	81	0.016	0.016	
LED Tube 1x4 replacing T8 fluorescent_ 2-LED Tubes	per fixture	84	0.015	0.000	95	0.019	0.019	
LED Tube 1x4 replacing T8 fluorescent_ 1-LED Tubes	per fixture	51	0.009	0.000	57	0.011	0.011	
LED Tube 2x4 replacing T8 fluorescent_ 2-LED Tubes	per fixture	55	0.010	0.000	95	0.019	0.019	
LED Tube 2x4 replacing T8	per fixture	34	0.006	0.000	57	0.011	0.011	

Measure	Unit	Ex Ante Deemed Savings			Ex Post Savings			Reasons for Differences
		kWh	Summer kW	Winter kW	kWh	Summer kW	Winter kW	
fluorescent_ 1-LED Tubes								
LED Tube 2x4 replacing T8 fluorescent_ 3-LED Tubes	per fixture	72	0.013	0.000	133	0.026	0.026	
LED Tube 2x4 replacing T8 fluorescent_ 4-LED Tubes	per fixture	80	0.014	0.000	190	0.038	0.038	

Food Service Products

Our review included two food service measures, accounting for 80% of ex ante food service products savings. Table 3 summarizes the results of our review for these measures. The ex ante source documentation is based on a study by the Food Service Technology Center from 2004. We estimated savings using the latest ENERGY STAR Calculator which uses more recent assumptions from 2011. The complete analysis and assumptions for the food service measures are provided in the Supporting Documentation file below.

Table 3. Food Service Equipment Measure Summary

Measure	Unit	Ex Ante Deemed Savings			Ex Post Savings			Reasons for Differences
		kWh	Summer kW	Winter kW	kWh	Summer kW	Winter kW	
Holding Cabinet Full Size Insulated	per cabinet	5,256	0.960	0.960	2,770	0.506	0.506	Ex post uses the latest ENERGY STAR Calculator assumptions. Ex ante savings are based on an older (2004) study.
Holding Cabinet Half Size Insulated	per cabinet	1,796	0.328	0.328	810	0.148	0.148	

Motors, Pumps and VFDs

Our review included three motors, pumps, and VFDs measures, accounting for 99% of ex ante savings for this technology. Table 4 summarizes the results of our review for these three measures. The complete analysis and assumptions for the reviewed motors, pumps, and VFDs measures are provided in the Supporting Documentation file below.

Table 4. Motors, Pumps, and VFD Equipment Measure Summary

		Ex Ante Deemed Savings			Ex Post Savings			
Measure	Unit	kWh	Summer kW	Winter kW	kWh	Summer kW	Winter kW	Reasons for Differences
VFD HVAC Fan	Per hp	1,911	0.291	0.299	1,911	0.291	0.299	No adjustments
VFD HVAC Pump	Per hp	1,914	0.169	0.241	1,914	0.169	0.241	
VFD Process Pump 1-50 HP	Per hp	1,012	0.209	0.209	1,012	0.209	0.209	

HVAC Measures

Our review included five chiller measures, accounting for 29% of ex ante HVAC savings. Table 5 summarizes the results of our review for these five measures. The ex ante source documentation did not include specific ex ante assumptions, only the total claimed savings per measure. For ex post, we relied on standard engineering algorithms to estimate savings. The complete analysis and assumptions for all chiller measures are provided in the Supporting Documentation file below.

Table 5. HVAC Measure Summary

		Ex Ante Deemed Savings			Ex Post Savings			
Measure	Unit	kWh	Summer kW	Winter kW	kWh	Summer kW	Winter kW	Reasons for Differences
AirCoolScrewChill COP = 2.86, IPLV = 4.33 pt	Per ton	439	0.164	0.000	493	0.021	0.000	Not all ex ante inputs and assumptions were available so we calculated ex post separately using standard algorithms for chillers. Since these are chillers, we feel it is unlikely that there would be winter demand savings.
Air-Cooled Screw Chiller COP = 2.86, IPLV = 3.97 per ton	Per ton	257	0.096	0.000	387	0.021	0.000	
AirCoolScrewChill COP = 3.08, IPLV = 4.00 pt	Per ton	388	0.133	0.093	396	0.091	0.000	
AirCoolScrewChill COP = 3.08, IPLV = 5.22 pt	Per ton	540	0.146	0.132	694	0.091	0.000	
AirCoolScrewChill COP = 3.36, IPLV = 5.69 pt	Per ton	696	0.232	0.161	775	0.167	0.000	

Information Technology

Our review included two information technology (IT) measures, accounting for 88% of ex ante IT savings. Table 6 summarizes the results of our review for these measures. For server virtualization, the ex ante source documentation did not include specific ex ante assumptions, only the total claimed savings per measure. We therefore performed a separate ex post analysis to estimate savings. For variable frequency drives on computer room air conditioners, we reviewed the ex ante savings assumptions and did not make any modifications. The complete analysis and assumptions for the IT equipment are provided in the Supporting Documentation file below.

Table 6. Information Technology Measure Summary

		Ex Ante Deemed Savings			Ex Post Savings			
Measure	Unit	kWh	Summer kW	Winter kW	kWh	Summer kW	Winter kW	Reasons for Differences
Server Virtualization	Per 10 servers virtualized to one	20,781	2.370	0.000	20,950	2.392	2.392	Ex ante source documentation did not include specific assumptions. Calculated ex post separately using three separate methods and taking an average. Savings occur 24/7 so we give ex post savings to both summer and winter demand.
VFDs on CRAC CRAH AHU fans 5HP	Per fan	10,990	0.000	0.000	10,985	0.000	0.000	Tracking data use ex ante value of 10,990 kWh but assumptions in documentation yield 10,985 kWh. No other adjustments.

Supporting Documentation

Below we provide the full database of our deemed savings assumptions.

Duke Energy_Deemed Sav

Key References

Table 7 lists the references used in this deemed savings review, including (1) documentation supplied by Duke Energy that documents ex ante values and (2) other references used to develop ex post values.

Table 7. Key References

Reference	Source
Duke-Supplied Documentation	
• Carolina Non Res Smart $aver Prescriptive 6-16-11 • Carolinas - Final Non-Res Smart $aver Process and Impact Evaluation Report - April 5 2013.pdf • CLEAResults_Measures_Master (Final 05.31.15) • DEC SmartSaver Prescriptive Program Evaluation_FINAL07162016 • Draft Duke Database Master ver5 • DSMore Input Template New Measures May 2010 Chillers – NC • Duke Carolinas Master 09182012 - Revised 12-27-12.xlsx • Duke Database Master (ccj rev 040412) • FES-L1a High Performance T8 Lighting Duke 070110 • FES-L3 High Bay Fluorescents Duke 070110 • FES-L13 Exterior Lighting HiEff LED Induction Duke Midwest 070110 • FES-M2 Variable Frequency Drives Duke 070110 • FES-M3 High Efficiency Pumps Duke 070110 • ITEE_DC_Virtualization_FINAL_rev_MeasureWorkbook_09-20-12 • NC IT Measures 03 27 15 • NC LED Canopy Measure 08 26 14 • NC LED Floodlighting Measure 08 26 14 • NC LED Highbay Measure 08 26 14 • NC LED Panel Measure 08 26 14	
Other References	
Arkansas TRM	Arkansas Technical Reference Manual. Version 4.0. August 29, 2014.
ASHRAE	90.1-2007. Table 6.8.1C.
Energycode.gov	North and South Carolina code requirement: https://www.energycodes.gov/adoption/states/
ENERGY STAR	ENERGY STAR Hot Food Holding Cabinet Calculations for Commercial Kitchen Equipment Calculator. http://energy.gov/eere/femp/energy-and-cost-savings-calculators-energy-efficient-products
Green Grid White Paper #37.	An Analysis of Server Virtualization Utility Incentives. http://www.thegreengrid.org/~/media/WhitePapers/Server%20Virtualization%20for%20Utilities_final.ashx?lang=en
Illinois TRM	Illinois Technical Reference Manual. Version 5.0. February 11, 2016. Illinois Technical Reference Manual. Version 3.0. February 24, 2014
Indiana TRM	Indiana Technical Reference Manual. Version 2.2. July 28, 2015.
Mid-Atlantic TRM	Mid-Atlantic Technical Reference Manual. Version 4.0. June 2014.
Wisconsin TRM	Wisconsin Technical Reference Manual. October 22, 2015.
Tennessee Valley Authority TRM	Tennessee Valley Authority Technical Resource Manual. Version 3.0. January 2015.
Texas TRM	Texas Technical Reference Manual. Version 2.0. Volume 3. April 18, 2014.
US EPA Backgrounder on EISA 2007.	http://www.energystar.gov/ia/products/lighting/cfls/downloads/EISA_Backgrounder_FINAL_4-11_EPA.pdf

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Duke Energy Carolinas and Progress

EnergyWise for Business Programs Evaluation Report – Final

June 12, 2017

Opinion Dynamics

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Opinion Dynamics

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1. Evaluation Summary

1.1 Program Summary

The Duke Energy Carolinas (DEC) and Duke Energy Progress (DEP) EnergyWise for Business Program is a demand response (DR) and energy efficiency (EE) program that provides small businesses with the opportunity to participate in DR events, earn incentives, and realize additional energy efficiency (EE) benefits. The program was introduced in 2016 and offers participants either a programmable, two-way WiFi Smart Thermostat or a Load Control Switch. Participants can select one of three levels of DR participation—30% cycling, 50% cycling, and 75% cycling—with varying levels of earned incentives based on the selected cycling strategy. Smart thermostat participants who have a heat pump with electric resistance heat strips are also offered the option of participating in winter DR events and can earn additional incentives per season. Customers who opt for the smart thermostat have the ability to manage their thermostat remotely with presets that help them potentially realize energy savings. Duke Energy contracted with Comverge to implement this program.

The program targets small businesses with a qualifying central air conditioning system and a minimum usage of 1,000 kWh per month during the billing months of May through September. By the end of 2016, the program had enrolled a total of 606 customers and 1,202 devices. The program called three summer but no winter DR events in 2016.

1.2 Evaluation Objectives

The 2016 evaluation included a deemed savings review and an engineering-based gross impact analysis to answer the following key research questions:

1. What were the estimated gross demand response impacts from the program in 2016?
2. What were the estimated gross energy efficiency impacts from the program in 2016?

It should be noted that this evaluation did not include a regression-based modeling approach, which is the industry-standard approach to estimating impacts from DR events. As such, the results of this evaluation should be interpreted as directional. The upcoming evaluation of the 2017 EnergyWise for Business Program will include a regression-based model approach to estimating both DR and EE impacts.

1.3 High-Level Findings

Based on our engineering-based impact analysis, the EnergyWise for Business Program fell short of planned savings in 2016, realizing between one-quarter (DEP) and one-third (DEC) of planned DR savings and just above 40% of planned EE savings.

Table 1-1 presents the results of our DR and EE analyses, including ex ante and ex post values for the number of devices, per device savings, and overall impacts, by jurisdiction. The table also presents the resulting realization rates.

Table 1-1.Summary of Gross Impact Analysis

Estimate	DEC			DEP		
	Ex Ante	Ex Post	Realization Rate	Ex Ante	Ex Post	Realization Rate
Demand Response Impacts						
Average # of Participating Devices[A]	625	442	71%	355	262	74%
Average Per Device kW Savings	3.59	1.54	43%	3.59	1.25	35%
Total Demand Response Savings	**2,244**	**682**	**30%**	**1,274**	**329**	**26%**
Energy Efficiency Impacts						
Number of Enrolled Thermostats[B]	750	692	92%	426	447	105%
Average Per Thermostat kWh Savings	1,450	641	44%	1,450	562	39%
Total Energy Efficiency Savings	**1,087,500**	**443,344**	**41%**	**617,700**	**251,433**	**41%**

[A] Ex post values represent the average number of devices (across the three 2016 DR events) that were enrolled during the event and did not opt out. These are the devices that achieved demand reductions during the 2016 events.
[B] Ex ante and ex post values represent thermostats enrolled at the end of 2016.

Two factors contributed to the shortfall in savings:

1. **Per-unit savings assumptions:** Our deemed savings review found that ex ante per-unit savings were too high, mostly due to an overestimate of the size (tonnage) of the controlled air conditioning units. Since equipment size is directly correlated with savings, the smaller than expected controlled units significantly affected realized EE and DR savings. On the DR side, other contributors to lower than expected per unit savings were a higher than planned adoption of thermostats (which in 2016 were estimated to achieve lower DR savings than switches) and a slight under-enrollment in the more aggressive cycling strategies for DEP.

2. **Enrollment:** By the end of 2016, the program had almost met its planned number of enrolled devices: Enrollment for DEC was 92% of projections while enrollment for DEP exceeded projections (105%). As a result, enrollment assumptions did not significantly contribute to the shortfall in EE savings. Device enrollment did affect DR impacts, however, as some of the devices were not installed until after the summer DR events. As a result, participation levels in the DR events were just short of three-quarters of planned participation.

1.4 Evaluation Recommendations

Because this evaluation was limited to an engineering-based analysis, there is uncertainty about the program impacts achieved in 2016. However, based on our comparison of planning and verified assumptions, we provide the following recommendations for future program planning.

Adopt More Conservative HVAC Average Tonnage Values

The tonnage values tracked in the program participation database suggest that Duke Energy's current planning values are too high. Pending results from the 2017 evaluation, the program may wish to lower its planning values as smaller units, everything else being equal, will achieve lower savings compared to larger units. As a result, an erroneous tonnage assumption might result in the program not achieving its savings goals.

Increase Promotion of Higher Cycling Strategies among Program Enrollees

Participants in DEP seemed to shy away from enrolling in the 75% cycling strategy and opted for strategies that result in lower savings. As such, we encourage Duke Energy to put additional emphasis on 75% cycling when recruiting participants, as it will lead to greater savings. Another alternative would be for Duke Energy to adjust its ex ante assumptions regarding cycling strategies. While this would not increase savings, it would provide more realistic planning assumptions and improve realization rates.

2. Program Description

2.1 Program Design

The Duke Energy Carolinas (DEC) and Duke Energy Progress (DEP) EnergyWise for Business program is a demand response (DR) and energy efficiency (EE) program that provides small businesses with the opportunity to participate in DR events, earn incentives, and realize additional EE benefits. The program was introduced in 2016 and offers participants either a programmable, two-way WiFi Smart Thermostat or a Load Control Switch. Participants can select one of three levels of DR participation—30% cycling, 50% cycling, and 75% cycling—with varying levels of earned incentives based on the selected cycling strategy. Smart Thermostat participants who have a heat pump with electric resistance heat strips are also offered the option of participating in winter DR events and can earn additional incentives per season. Customers who opt for the smart thermostat have the ability to manage their thermostat remotely with presets that help them potentially realize energy savings. Duke Energy contracted with Comverge to implement this program.

The program targets small businesses with a qualifying central air conditioning system and a minimum usage of 1,000 kWh per month during the billing months of May through September.

The program was first implemented by Comverge in the DEC and DEP territories in 2016. The evaluation period considered in this report is January 1, 2016 to December 31, 2016.

2.2 Program Implementation

Duke Energy contracted with Comverge in 2016 to implement the EnergyWise for Business program. Once a customer enrolls in the program, a representative visits the site to install the devices and to show participants how to program their devices and access the web portal. Events are called on weekdays when average temperature criteria are met and a high system peak is projected. Each time an event is scheduled, participants are notified via email and through the web portal. During the event, the devices display a message that an event is in progress. Participants are able to opt out of events at any time before or during the event.

2.3 Program Participation

Based on the program-tracking database, the program distributed 1,202 devices in 2016, associated with 606 unique customer accounts. Customers overwhelmingly opted for Smart Thermostats (95%) over Load Control Switches (5%). The 30% cycling strategy was the most popular among customers, with 63% of devices enrolled into that cycling level. Only 23% of devices were enrolled in the 50% cycling strategy and 14% in the 75% cycling strategy. Table 2-1 provides the distribution of device types and cycling strategies.

Table 2-1. Counts of Enrolled Devices, Device Jurisdiction, Type, and Cycling Strategy

Jurisdiction and Cycling Strategy	Number of Devices			Percentage of Total Devices in Jurisdiction		
	Thermostat	Switch	Total	Thermostat	Switch	Total
DEC						
30%	393	12	405	54%	2%	56%
50%	169	16	185	23%	2%	25%
75%	130	9	139	18%	1%	19%
Jurisdiction Total	692	37	729	95%	5%	100%
DEP						
30%	289	19	308	61%	4%	65%
50%	113	5	118	24%	1%	25%
75%	45	2	47	10%	<1%	10%
Jurisdiction Total	447	26	473	95%	5%	100%
Overall Total	1,139	63	1,202	95%	5%	100%

3. Overview of Evaluation Activities

To address the research objectives for this evaluation, Opinion Dynamics performed a range of data collection and analytic activities. These activities are summarized in this section.

3.1 Program Staff Interviews

We conducted an in-depth interview with the Duke Energy EnergyWise for Business program manager. This interview took place in January 2016. The purpose of this interview was to understand the program's current design and implementation, and to determine the priorities for the impact evaluation.

3.2 Program Materials Review

To inform the subsequent analyses, Opinion Dynamics reviewed program materials, including program design and implementation materials, relevant research reports, and most notably the program-tracking database.

3.3 Engineering-Based Impact Analysis to Determine Ex-Post Savings and Realization Rate

To determine program impacts, the evaluation team used a three-step process: (1) we conducted a deemed savings review; (2) we performed an analysis of the program participation database; and (3) we estimated ex post savings and calculated realization rates.

Step 1: Deemed Savings Review. Opinion Dynamics reviewed inputs and algorithms provided by Duke Energy to document existing (ex ante) assumptions and claimed EE and DR savings. We then performed an engineering analysis using various Technical Reference Manuals (TRMs) and secondary sources to develop verified (ex post) per-unit savings estimates for Smart Thermostats and Load Control Switches. As part of this analysis, we looked up cooling equipment characteristics, based on model numbers, for a sample of 54 participants to update program assumptions about equipment efficiency. We then updated the ex ante savings values based on our engineering analysis and the customer data we received. The deemed savings review, including references to all sources used, is presented in Appendix A.

Step 2: Participation Analysis. The evaluation team reviewed program-tracking data to assess program participation during the evaluation period. This effort included:

- A review of the program participation database to determine the total number of devices and participants, the type of devices installed, and the cycling strategies employed, as well as device installation dates.
- A review of thermostat and switch reports to identify opt-outs.

Step 3: Estimation of Ex Post Savings and Realization Rates. To estimate ex post savings, we applied the ex post per-unit savings values from the deemed savings review (Step 1) with participation counts from the participation analysis (Step 2). We then calculated realization rates for both energy and demand impacts by dividing ex post (evaluated) savings by ex ante (claimed) savings.

4. Gross Impact Evaluation

Our gross impact evaluation included three main analytic steps: (1) a deemed savings review, (2) a participation analysis, and (3) estimation of ex post savings analysis and realization rates for the demand response and energy efficiency components of the program. Figure 4-1 depicts this process.

Figure 4-1. Gross Impact Evaluation Approach

The following subsections describe our approach and the results for each of the three steps.

4.1 Deemed Savings Review

The goal of the deemed savings review was to examine existing program savings values and assumptions and to develop new estimates that the program can use going forward. Our review consisted of several activities:

- We reviewed inputs and algorithms provided by Duke Energy. We also reviewed source documents and program filings to determine existing assumptions about per-device DR and EE savings.
- We reviewed the TRMs for Arkansas, Illinois, Indiana, and the Mid-Atlantic, as well as secondary sources to establish an algorithm for EE savings and to inform assumptions for new per-unit savings estimates for Smart Thermostats and Load Control Switches.
- We used tonnage information from the program-tracking database to update default program assumptions.
- We conducted a look-up of 54 equipment model numbers to develop an estimate of the average efficiency (expressed as the Seasonal Energy Efficiency Ratio [SEER]) of participants' cooling equipment.

Based on the results of these activities, we developed new per-device savings values.

Below, we summarize the inputs for estimating both DR and EE impacts and present the results of the analysis. The full deemed savings review is included in Appendix A.

4.1.1 Demand Response Load Impacts

Our evaluation of the 2016 EnergyWise for Business Program did not include a model-based analysis of DR events.[1] However, one of the key determinants of summer DR event savings is the size (tonnage) of the

[1] Note that a full, model-based DR impact analysis will be performed as part of our 2017 program evaluation.

controlled cooling equipment. Our comparison of program tonnage assumptions with actual tonnage information in the program-tracking database found that the size of participants' cooling equipment is substantially smaller than the program assumption. Everything else being equal, smaller equipment size would lead to smaller per-device DR event savings. To provide updated per device-DR savings, we therefore developed a ratio of actual to assumed equipment size (i.e., average ex post tonnage/average ex ante tonnage). We applied this ratio to the program's ex ante per-device savings assumptions (by device type and cycling strategy), using the following formula:

*Per-Device kW Event Savings = Ex Ante kW * Ex Post Tons/Ex Ante Tons*

Table 4-1 provides the ex ante and ex post tonnage assumptions, by device type and jurisdiction, and the resulting tonnage ratios. Tonnage ratios range from 0.36 for equipment controlled by DEP load control switches to 0.46 for equipment controlled by DEC smart thermostats.

Table 4-1. Tonnage Assumptions for Estimating DR Event Impacts

	Smart Thermostat			Load Control Switch		
		Ex Post			Ex Post	
Parameter	Ex Ante	DEC	DEP	Ex Ante	DEC	DEP
Tonnage	9.62	4.41	4.08	9.62	4.02	3.48
Tonnage Ratio		0.46	0.42		0.42	0.36

[A] In instances where tonnage values were missing from the program participation database (n = 65 devices), the average tonnage for that device and jurisdiction value was imputed.

Table 4-2 shows the program's ex ante per-device savings assumptions for thermostats and switches, by cycling strategy, and the ex post values that result from applying the tonnage ratios to the ex ante values. Given the relatively low tonnage ratios, estimated ex post kW savings are less than half of ex ante savings, across both jurisdictions and device types.

Table 4-2. Assumptions for Estimating Per Device DR Event Savings (kW)

	Smart Thermostat			Load Control Switch		
		Ex Post kW			Ex Post kW	
Cycling Strategy	Ex Ante kW	DEC	DEP	Ex Ante	DEC	DEP
30% Cycling	2.02	0.93	0.86	2.50	1.04	0.90
50% Cycling	3.77	1.73	1.60	4.25	1.78	1.54
75% Cycling	6.27	2.88	2.66	6.75	2.82	2.44

4.1.2 Energy Efficiency Impacts

The program's energy efficiency impacts are associated with smart thermostats only. Duke Energy provided tonnage assumptions as well as per device ex ante savings, but did not provide the algorithm used to develop these savings. We compared the ex ante tonnage assumption with actual tonnages from the program tracking databases and calculated per thermostat ex post savings using the following equation, which is common to most TRMs for thermostat measures:

*kWh savings per thermostat = Tonnage * 12/SEER * EFLHcool * ESF*

Table 4-3 summarizes the ex ante tonnage and per device savings assumptions (provided by Duke Energy) and provides the ex post inputs into the EE savings formula. These inputs include the average equipment tonnage, the average equipment efficiency (SEER), Equivalent Full Load Cooling Hours (EFLHcool), and the Energy Savings Factor (ESF). The deemed savings review memo (Appendix A) provides more detail about these inputs, including the sources of information.

Table 4-3. Assumptions for Estimating EE kWh Impacts

Parameter	Ex Ante Value		Ex Post Value	
	DEC	DEP	DEC	DEP
Tonnage	9.62	9.62	4.41	4.08
SEER	Unknown		11.2	11.8
EFLHcool	Unknown		1,355	1,355
ESF	Unknown		10%	10%
Savings per Thermostat (kWh)	1,450	1,450	641	563

Similar to the per device DR impacts, the greater ex ante tonnage assumption was largely responsible for the difference between ex ante and ex post per-thermostat EE savings. While we do not have ex ante values for SEER, EFLHcool, and ESF, nor the algorithm used, we calculate per-thermostat EE savings of 1,397 kWh (DEC) and 1,326 kWh (DEP) when using the ex post energy savings equation and assumptions but substituting in the ex ante tonnage assumptions. These values are very close to the ex ante EE savings value of 1,450 kWh, so differences in assumptions other than tonnage would be minor.

4.2 Participation Analysis

The second step in the gross impact analysis consisted of an analysis of program enrollment and event participation, based on program tracking data and customer opt out reports. Both are described in this section.

4.2.1 Program Enrollment

According to information provided by Duke Energy, anticipated participation in the program was 1,250 devices for DEC and 710 devices for DEP. The program further assumed that 60% of devices would be thermostats and 40% would be load control switches.

Review of the program tracking data showed a total 2016 enrollment of 729 thermostats and switches in the DEC service territory and 473 thermostats and switches in the DEP service territory, just over half of what was anticipated in the program filings. It should be noted that approximately 34% of these devices were installed after the 2016 summer event season, and therefore were not able to participate in these events. The tracking data also showed a different mix of thermostats and switches from what was anticipated, with fewer customers choosing to install switches than projected.

Table 4-4 provides ex ante and ex post enrollment numbers, by device type and jurisdictionTable 4-4. Projected and Actual Program Enrollment.

Table 4-4. Projected and Actual Program Enrollment (Number of Devices)

Jurisdiction	Device Type	Demand Response			Energy Efficiency		
		# Projected	# Achieved	% Achieved	# Projected	# Achieved	% Achieved
DEC	Thermostat	750	692	92%	750	692	92%
	Switch	500	37	7%	0	0	n/a
	Overall	**1,250**	**729**	**58%**	**750**	**692**	**92%**
DEP	Thermostat	426	447	105%	426	447	105%
	Switch	284	26	9%	0	0	n/a
	Overall	**710**	**473**	**67%**	**426**	**447**	**105%**

To develop expected savings from DR events, the program also projected the share of customers that would select the different cycling strategies. The program projected 50% of enrollment in the 30% cycling strategy, 30% of enrollment in the 50% cycling strategy, and 20% of enrollment in the 75% cycling strategy. These projections were fairly accurate for DEC customers, but DEP customers showed a stronger preference for the 30% cycling strategy at the expense of the 75% cycling strategy. Everything else being equal, a lower cycling percentage will generate lower DR savings. To realize expected savings, the program may therefore need to more strongly promote the higher cycling strategies, particularly among DEP customers.

Table 4-5 provides the projected and actual distributions of enrollment in the three cycling strategies.

Table 4-5. Ex Ante and Ex Post Distribution of Cycling Strategies by Jurisdiction

Jurisdiction	Projected[A]	Actual
30% Cycling Strategy		
DEC	50%	55.6%
DEP		65.1%
50% Cycling Strategy		
DEC	30%	25.4%
DEP		24.9%
75% Cycling Strategy		
DEC	20%	19.1%
DEP		9.9%

[A]Based on 9/19/2014 PowerPoint presentation, entitled "Small Business Demand Response – Evaluation Gate Presentation"

4.2.2 Participation in Demand Response Events

In 2016, the program called three summer DR events, on July 8th, July 14th, and July 27th. The average peak temperature on these three event days was 96 °F.[2] There were no winter events called in 2016.

To assess participation in the three summer DR events, Opinion Dynamics reviewed override reports to assess the number of event opt-outs. These data were then merged with the program tracking data to determine opt-out rates by jurisdiction. As shown in Table 4-6, opt-out rates for events were low, and review of the data does not suggest that opt-outs vary as a function of cycling strategy. It is worth noting that as of the third event on July 28th, only 797 devices had been installed (66% of the total enrolled devices in 2016).

[2] Average peak temperature is based on weather information for Charlotte and Raleigh, NC.

Thus, about a third of 2016 participants were not able to participate in any of the 2016 DR events as they had not yet had their devices installed.

Table 4-6. Device Participation by Event and Jurisdiction

Event Date & Jurisdiction	Enrolled Devices	Device Opt-Outs	Part. Devices	Device Part. Rate
7/8/2016				
DEC	424	1	423	99.8%
DEP	235	1	234	99.6%
Total	659	2	657	99.7%
7/14/2016				
DEC	443	16	427	96.4%
DEP	258	8	250	96.9%
Total	701	24	677	96.6%
7/27/2016				
DEC	495	20	475	96.0%
DEP	302	1	301	99.7%
Total	797	21	776	97.4%

4.3 Estimation of Ex Post Savings

The third step in our gross impact evaluation was to estimate program DR and EE savings using the ex post deemed savings values and information from the program participation database developed in the previous steps. Below, we describe the inputs and algorithms used for the DR and EE ex post savings analyses and present the results.

4.3.1 Demand Response Impacts

For each summer DR event, we estimated kW impacts by multiplying the per-device ex post savings (shown in Table 4-2) by the number of participating devices. Since per unit ex post savings estimates vary by jurisdiction, device type, and cycling strategy, we developed 6 different ex post savings values for each jurisdiction and each event (2 device types x 3 cycling strategies). We then summed over these values to estimate the total event savings by jurisdiction.

Table 4-7 provides the number of participating devices per event, average per device savings (i.e., the weighted average across the three cycling strategies), and overall kW savings. Across both DEC and DEP, both participating devices and savings increased with each event, as a result of the program enrolling new customers as the event season progressed. On average, in DEC savings were 682 kW per event and in DEP savings were 329 kW per event, including savings from both thermostats and switches.

Table 4-7. DR kW Savings by Event

Event Date	DEC		DEP	
	Therm.	Switch	Therm.	Switch
7/8/2016				
Number of Participating Devices	401	22	226	8
Average Per-Device kW Savings	1.52	1.86	1.28	1.18
Total Event kW Savings	**609**	**41**	**288**	**9**
7/14/2016				
Number of Participating Devices	403	24	242	8
Average Per-Device kW Savings	1.54	1.79	1.29	1.18
Total Event kW Savings	**619**	**43**	**312**	**9**
7/27/2016				
Number of Participating Devices	450	25	288	13
Average Per-Device kW Savings	1.53	1.83	1.22	1.07
Total Event kW Savings	**687**	**46**	**352**	**14**
Overall Average				
Number of Participating Devices	418	24	252	10
Weighted Average Per-Device kW Savings	1.53	1.83	1.26	1.13
Total Event kW Savings	**638**	**44**	**317**	**11**

Error! Reference source not found. shows the average ex post summer DR event impacts, by jurisdiction, relative to the ex ante values taken from program filings. Overall, the program achieved just under one-quarter of its anticipated DR savings. This shortfall is driven by two key factors: (1) the lower than projected size of participating air conditioning units and (2) the lower than expected enrollment at the time of the 2016 summer events.

The lower per-unit savings realization rate for DEP, compared to DEC, results from the relative under-enrollment in the 75% cycling strategy in that jurisdiction as well as a slightly greater tonnage adjustment compared to DEC.

Table 4-8. Program DR Impacts

Estimate	DEC			DEP		
	Ex Ante	Ex Post	Realization Rate	Ex Ante	Ex Post	Realization Rate
Average # of Participating Devices	625	442	71%	355	262	74%
Average Per Device kW Savings[A]	3.59	1.54	43%	3.59	1.25	35%
Total Program Savings	**2,244**	**682**	**30%**	**1,274**	**329**	**26%**

[A]Ex post kW values represent the weighted average of thermostats and switches.

4.3.2 Energy Efficiency Impacts

To estimate EE savings, we multiplied the per thermostat savings (shown in Table 4-3. Assumptions for Estimating EE kWh ImpactsTable 4-3), by the number of enrolled thermostats (shown in Table 2-1). Table 4-9 summarizes ex ante and ex post thermostat counts and per unit savings values and shows the resulting realization rates.

Table 4-9. Program Energy Efficiency Impacts

Estimate	DEC			DEP		
	Ex Ante	Ex Post	Realization Rate	Ex Ante	Ex Post	Realization Rate
Number of Enrolled Thermostats[A]	750	692	92%	426	447	105%
Average Per Thermostat kWh Savings	1,450	641	44%	1,450	562	39%
Total Energy Efficiency Savings	**1,087,500**	**443,344**	**41%**	**617,700**	**251,433**	**41%**

[A] Ex ante and ex post values represent thermostats enrolled at the end of 2016.

Duke Energy achieved just over 40% of its anticipated EE kWh savings. The discrepancy between the ex ante and ex post savings is mainly due to the shortfall in per thermostat savings resulting from the lower than expected size (tonnage) of the controlled air conditioning units.

5. Conclusions and Recommendations

5.1 Conclusions

Based on our engineering-based impact analysis, the EnergyWise for Business Program fell short of planned savings in 2016, realizing between one-quarter (DEP) and one-third (DEC) of planned DR savings and just above 40% of planned EE savings.

Table 5-1 presents the results of our DR and EE analyses, including ex ante and ex post values for the number of devices, per device savings, and overall impacts, by jurisdiction. The table also presents the resulting realization rates.

Table 5-1.Summary of Gross Impact Analysis

Estimate	DEC			DEP		
	Ex Ante	Ex Post	Realization Rate	Ex Ante	Ex Post	Realization Rate
Demand Response Impacts						
Average # of Participating Devices[A]	625	442	71%	355	262	74%
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Total Demand Response Savings	**2,244**	**682**	**30%**	**1,274**	**329**	**26%**
Energy Efficiency Impacts						
Number of Enrolled Thermostats[B]	750	692	92%	426	447	105%
Average Per Thermostat kWh Savings	1,450	641	44%	1,450	562	39%
Total Energy Efficiency Savings	**1,087,500**	**443,344**	**41%**	**617,700**	**251,433**	**41%**

[A] Ex post values represent the average number of devices (across the three 2016 DR events) that were enrolled during the event and did not opt out. These are the devices that achieved demand reductions during the 2016 events.
[B] Ex ante and ex post values represent thermostats enrolled at the end of 2016.

Two factors contributed to the shortfall in savings:

1. **Per-unit savings assumptions:** Our deemed savings review found that ex ante per-unit savings were too high, mostly due to an overestimate of the size (tonnage) of the controlled air conditioning units. Since equipment size is directly correlated with savings, the smaller than expected controlled units significantly affected realized EE and DR savings. On the DR side, other contributors to lower than expected per unit savings were a higher than planned adoption of thermostats (which in 2016 were estimated to achieve lower DR savings than switches) and a slight under-enrollment in the more aggressive cycling strategies for DEP.

2. **Enrollment:** By the end of 2016, the program had almost met its planned number of enrolled devices: Enrollment for DEC was 92% of projections while enrollment for DEP exceeded projections (105%). As a result, enrollment assumptions did not significantly contribute to the shortfall in EE savings. Device enrollment did affect DR impacts, however, as some of the devices were not installed until after the summer DR events. As a result, participation levels in the DR events were just short of three-quarters of planned participation.

5.2 Recommendations

Because this evaluation was limited to an engineering-based analysis, there is uncertainty about the program impacts achieved in 2016. However, based on our comparison of planning and verified assumptions, we provide the following recommendations for future program planning.

Adopt More Conservative HVAC Average Tonnage Values

The tonnage values tracked in the program participation database suggest that Duke Energy's current planning values are too high. Pending results from the 2017 evaluation, the program may wish to lower its planning values as smaller units, everything else being equal, will achieve lower savings compared to larger units. As a result, an erroneous tonnage assumption might result in the program not achieving its savings goals.

Increase Promotion of Higher Cycling Strategies among Program Enrollees

Participants in DEP seemed to shy away from enrolling in the 75% cycling strategy and opted for strategies that result in lower savings. As such, we encourage Duke Energy to put additional emphasis on 75% cycling when recruiting participants, as it will lead to greater savings. Another alternative would be for Duke Energy to adjust its ex ante assumptions regarding cycling strategies. While this would not increase savings, it would provide more realistic planning assumptions and improve realization rates.

6. Summary Form

Duke Energy Carolinas and Progress EnergyWise for Business Program

Completed EMV Fact Sheet

Duke Energy Progress' and Carolinas' EnergyWise for Business Program is a demand response program that provides small businesses with the opportunity to participate in DR events, earn incentives, and realize additional EE benefits. The program offers either a programmable, two-way WiFi Smart Thermostat or a Load Control Switch to customers. Customers can select one of three levels of DR participation: 30% cycling, 50% cycling, and 75% cycling with varying levels of earned incentives based upon the selected cycling strategy. Thermostat participants having a heat pump with electric resistance heat strips are also offered the option of participating in winter DR, and can earn additional incentives per season.

Date	June 12, 2017
Region(s)	Duke Energy Carolinas & Progress
Evaluation Period	1/1/16 through 12/31/16
Total kWh Savings	DEC: 641 kWh DEP: 563 kWh
Coincident kW Impact	DEC : 681 kW DEP : 328 kW
Measure Life	Not evaluated
Net-to-Gross Ratio	Not evaluated
Process Evaluation	No
Previous Evaluation(s)	None

To determine program impacts, the evaluation team used a three-step process: (1) we conducted a deemed savings review; (2) we performed an analysis of the program participation database; and (3) we estimated ex post savings and calculated realization rates.

Step 1: Deemed Savings Review. The evaluation team reviewed the inputs and algorithms used by Duke Energy to estimate ex ante savings. The team adjusted these values based on information from program-tracking data and secondary sources. The full deemed savings review is provided in Appendix A.

Step 2: Participation Analysis. The evaluation team reviewed program-tracking data to assess program participation during the evaluation period. This effort included:

- A review of the program participation database to determine the total number of devices and participants, the type of devices installed, and the cycling strategies employed, as well as device installation dates.
- A review of thermostat and switch log data to determine device operability rates and to identify opt-outs.

Step 3: Estimation of Ex Post Savings and Realization Rates. To estimate ex post savings, we applied the ex post per-unit savings values from the deemed savings review (Step 1) with participation counts from the participation analysis (Step 2). We then calculated realization rates for both energy and demand impacts by dividing ex post (evaluated) savings by ex ante (claimed) savings.

7. DSMore Table

The embedded Excel spreadsheets below contains measure-level inputs for Duke Energy Analytics. Per-measure savings values in the spreadsheet are based on the gross and net impact analysis reported above. Measure life estimates have not been updated as part of this evaluation since it was not part of the evaluation scope.

[DSMore Tables provided in separate files]

Appendix A. Deemed Savings Review

[Deemed Savings Review provided in a separate file]

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Duke Energy Progress & Duke Energy Carolinas

Energy Efficient Lighting & Retail LED Programs

Evaluation Report – Final

April 6, 2018

Opinion Dynamics

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1. Evaluation Summary

This report provides results of a comprehensive process and impact evaluation of two distinct programs: the Duke Energy Progress (DEP) Energy Efficient Lighting (EEL) program and the Duke Energy Carolinas (DEC) Retail LED program. The program periods under evaluation are January 1, 2016 through March 12, 2017 for the DEP EEL program and March 21, 2016 through March 12, 2017 for the DEC Retail LED program. We refer to these periods as PY2016–2017 throughout the remainder of this evaluation report.

1.1 Program Summary

1.1.1 The DEP EEL Program

DEP launched the EEL program in January 2010, with the goal of reducing electric energy consumption and peak demand through increased awareness and adoption of energy-efficient lighting technologies. DEP partners with retailers and manufacturers across North and South Carolina to provide price markdowns on customer purchases of efficient lighting. The program promotes customer awareness and purchase of program-discounted products through a range of marketing and outreach strategies, including in-store collateral and events, bill inserts, direct mail and email marketing, mass media advertising, online advertising, and community events. The program also provides training to store staff. Product mix includes standard and specialty CFLs, LEDs, and ENERGY STAR® fixtures, with a wide range of products across these technologies. Participating retailers include a variety of channel types, including Big Box, Do-It-Yourself (DIY), Club, and Discount stores.

DEP manages the EEL program and is responsible for overseeing program design, marketing, and operations. Ecova has implemented the EEL program on behalf of DEP since 2010.

The program period under evaluation includes bulb sales invoiced from January 1, 2016 through March 12, 2017. Over this period, DEP discounted more than 3.6 million lighting products, achieving 140,215 MWh in ex ante energy savings, 23.0 MW in ex ante summer peak demand savings, and 7.1 MW in ex ante winter peak demand savings. Table 1-1 provides a summary of DEP EEL program sales and savings achievements.

Table 1-1. DEP EEL Program Sales and Savings Summary

Metric	Performance
Bulbs	3,627,458
Ex ante energy savings (MWh)	140,215
Ex ante summer peak demand savings (MW)	23.0
Ex ante winter peak demand savings (MW)	7.1

Source: Opinion Dynamics analysis of program tracking data.

1.1.2 DEC Retail LED Program

DEC launched the Retail LED program in March 2016 with the goal of reducing electric energy consumption and peak demand through increased awareness and adoption of energy-efficient lighting technologies. DEC partners with retailers and manufacturers across North and South Carolina to provide price markdowns on customer purchases of efficient lighting. The program promotes customer awareness and purchase of program-discounted products through a range of marketing and outreach strategies, including in-store collateral and events, bill inserts, direct mail and email marketing, mass media advertising, online advertising, and community events. The program also provides training to store staff. Product mix includes standard, reflector, and specialty LEDs, along with ENERGY STAR LED fixtures. Participating retailers include a variety of channel types, including Big Box, DIY, Club, and Discount stores.

DEC manages the Retail LED program and is responsible for overseeing program design, marketing, and operations. Ecova implements the program on DEC's behalf.

The program period under evaluation includes bulb sales from March 21, 2016 through March 12, 2017. Over this period, DEC discounted more than 1.3 million lighting products, achieving 52,602 MWh in claimed/ex ante energy savings, 8.8 MW in ex ante summer peak demand savings, and 2.6 MW in ex ante winter peak demand savings. Table 1-2 provides a summary of DEC Retail LED program sales and savings achievements.

Table 1-2. DEC Retail LED Program Sales and Savings Summary

Metric	Performance
Bulbs	1,385,056
Ex ante energy savings (MWh)	52,602
Ex ante summer peak demand savings (MW)	8.8
Ex ante winter peak demand savings (MW)	2.6

Source: Opinion Dynamics analysis of program tracking data.

1.2 Evaluation Objectives and High-Level Findings

1.2.1 Evaluation Objectives

The 2017 evaluation of both the DEP EEL and DEC Retail LED programs included process, impact, and market assessment components and addressed several major research objectives:

- Assess program performance and estimate gross and net energy (kWh) and summer and winter peak demand (kW) savings associated with program activity
- Assess program implementation processes and marketing strategies and identify opportunities for improvement
- Better understand the quickly shifting lighting market and customer lighting use

To achieve these research objectives, the evaluation team completed a range of data collection and analytic activities, including interviews with program staff, a review of deemed savings, program tracking data analysis, a residential lighting logger study, retailer shelf audits, interviews with manufacturer and retailer staff, geographic information system (GIS) analysis to estimate leakage, sales data modeling, and an impact analysis. Table 1-3 provides an overview of the evaluation activities, the scope of each, the research area that each activity supported, and an overview of the activity's purpose.

Table 1-3. Overview of Evaluation Activities

#	Evaluation Activity	Scope: DEP EEL Program	Scope: DEC Retail LED Program	Impact	Process	Market	Purpose
1	Program staff interviews	n=2			X		• Provide insight into program design and delivery
2	Deemed savings review	All data provided		X			• Review completeness, accuracy, and consistency of data and ex ante savings assumptions
3	Materials review	All materials provided			X		• Provide insight into program design and delivery
4	Program tracking data analysis	All data provided		X	X	X	• Calculate gross energy and demand savings • Understand program footprint, measure mix, retailer mix, and incentive levels
5	Residential lighting logger study	n=107		X	X	X	• Estimate hours of use (HOU), coincidence factors (CFs), and in-service rates (ISRs) for LEDs installed in customer homes • Assess lighting composition and use among residential customers with LEDs
6	Retailer shelf audits	n=15	n=15	X	X	X	• Assess shelf space distribution for general service and reflector products • Estimate baseline wattage adjustments • Provide program marketing insight
7	Retailer and manufacturer interviews	n=21	n=21	X	X	X	• Estimate net-to-gross ratio (NTGR) • Provide insight into program delivery and the current and future lighting market
8	Sales data modeling	All data provided		X			• Estimate NTGR
9	Leakage analysis	All data provided		X			• Estimate leakage rate

Source: Opinion Dynamics analysis.

1.2.2 DEP EEL Program High-Level Findings and Recommendations

The DEP EEL program realized 89% of the gross energy savings, 95% of the gross summer peak demand savings, and 113% of the gross winter peak demand savings. Table 1-4 provides a summary of the program's gross impacts by savings type and sector. As can be seen in the table, the program achieved 125,001,897 kWh in ex post energy savings, 21,962 kW in summer peak demand savings, and 8,066 kW in winter peak demand savings.

Table 1-4. DEP EEL Program Gross Impact Results by Sector

Savings Type	Savings Category	Ex Ante Savings	Ex Post Gross Savings	Gross Realization Rate
Energy savings (kWh)	Residential savings	109,576,023	97,829,373	89%
	Commercial savings	30,639,454	27,172,524	89%
	Total	140,215,477	125,001,897	89%
Summer peak demand savings (kW)	Residential savings	15,796	15,503	98%
	Commercial savings	7,215	6,458	90%
	Total	23,011	21,962	95%
Winter peak demand savings (kW)	Residential savings	5,246	6,412	122%
	Commercial savings	1,880	1,654	88%
	Total	7,126	8,066	113%

Source: Opinion Dynamics analysis of program tracking data.

Opinion Dynamics used sales data modeling and interviews with program participating retailers and manufacturers to estimate program NTGR. The analysis resulted in the program-level NTGR of 0.40. Applying this NTGR to the ex post gross savings resulted in net energy savings of 50,001 MWh, net summer peak demand savings of 8.8 MW, and net winter peak demand savings of 3.2 MW.

Table 1-5. DEP EEL Program Ex Post Net Savings

Savings Type	Ex Ante Savings	Ex Post Gross Savings	NTGR	Ex Post Net Savings	Net Realization Rate*
Energy savings (MWh)	140,215	125,002	0.40	50,001	89%
Summer peak demand savings (MW)	23.0	22.0	0.40	8.8	95%
Winter peak demand savings (MW)	7.1	8.1	0.40	3.2	113%

Source: Opinion Dynamics analysis of program tracking data.
* Denominator is ex ante net savings.

Program implementation processes were smooth and effective, resulting in high levels of stakeholder and market actor satisfaction. Program staff effectively managed 744 unique products across 289 participating storefronts. Program tracking data were generally clean and well maintained. Program marketing was versatile and targeted customers both at point of purchase and through local event-based venues.

From its inception in 2010 through the end of current evaluation period (March 2017), the DEP EEL program discounted a total of 29,520,349 CFL and LED bulbs and fixtures, of which, we estimate that 24,123,345 were purchased by DEP residential customers. If the 1.2 million DEP residential customers equally purchased the 24,122,648 bulbs, each would have purchased an average of 21 bulbs. If we were to account for CFL burnout from early program years,[1] divide the adjusted number of program bulbs by the total number of residential DEP customers, and assume that a typical home has 53 sockets, we estimate that at the end of 2016, program-discounted bulbs would be installed in close to half of all residential sockets (48%). This is a large impact on efficient bulb use. The program continued efforts to reach underserved customer segments and sockets by maintaining a relatively high share of sales through the Dollar/Discount channel (which attracts lower-income shoppers) and increased its focus on specialty products (standard bulb sales decreased by 8% between PY2015 and PY2016–2017).

[1] Assuming a 5-year expected useful life (EUL) for a CFL.

The transformation of the lighting market in the DEP jurisdiction continued at an accelerated pace. Compared to the fall of 2012, when LED products accounted for just 10% of all general service products on the store shelves in the DEP jurisdiction, in 2016, LEDs accounted for 57% of the shelf space. Between 2015 and 2016, the shelf space dedicated to LEDs grew from 38% to 57%.

Additionally, LED prices have decreased dramatically over time. More specifically, based on the shelf audit research we conducted in 2014 and 2016 in DEP, standard LED prices dropped from $14.65 per bulb to $4.68, which represents a 68% drop in price. Similarly, the average per-bulb price for reflector products decreased from $23.00 in 2014 to $6.92 in 2016. These decreasing prices made LEDs more affordable and accessible to the broader population. The introduction of new ENERGY STAR 2.0 lamp specifications in 2017 rendered most CFLs ineligible for ENERGY STAR certification, while at the same time relaxing certification requirements for LEDs. These changes in standards helped further the prominence of LEDs.

These findings indicate that the key barriers to energy-efficient lighting adoption, such as product availability and price, have been largely mitigated, which may signal diminishing program effects moving forward. This finding is further substantiated by the energy-efficient lighting penetration in the DEP jurisdiction: nearly 9 in 10 DEP customers (88%) reported having CFLs or LEDs in their homes and 42% reported having LEDs in their homes.

That said, LEDs continue to be the most expensive lighting technology on store shelves, and program discounts help bring them on par with less expensive halogens and incandescents. Furthermore, customers who have LEDs in their homes do not have them in all of their sockets. Program opportunities continue to exist among certain customer segments, namely, older customers, renters, and customers with lower levels of education and lower incomes, where both penetration of energy-efficient products and the percent of sockets taken up by energy-efficient products is lower than average. Additionally, program opportunities continue to exist among a narrow set of product categories, such as specialty products, where a considerable share of shelf space and sockets is still taken by incandescent and halogen products.

New energy efficiency standards are scheduled to take effect in 2020 with the second phase of the Energy Independence and Security Act (EISA) of 2007, which will require that most of the bulbs on the market meet the 45 lumens per watt efficacy minimum, effectively making LEDs the new baseline. Under this new phase of EISA, energy-efficient lighting programs, such as the DEP EEL program, will no longer be cost-effective or needed. Until then, manufacturers have no plans to discontinue the production of incandescent and halogen products, and the program can help further market transformation to energy-efficient lighting.

Based on these findings, Opinion Dynamics recommends the following:

- Continue and if possible increase the program's focus on underserved customer segments. Such efforts include targeting stores in areas with disproportionate shares of underserved customers and targeting retailers with disproportionate numbers of shoppers from underserved segments.
- Continue and if possible increase targeting of specialty products by increasing the prominence of specialty products in the program product mix, including focusing on lower-wattage specialty products, and by adjusting program marketing and messaging to focus on underserved sockets and increase messaging relevance (such as specialty sockets in dining rooms).
- Monitor the market for retailer and manufacturer behaviors in terms of manufacturing practices and shelf stocking trends in anticipation of the second phase of EISA to identify optimal timing for program completion.

1.2.3 DEC Retail LED Program High-Level Findings and Recommendations

The DEC Retail LED program realized 110% of the gross energy savings, 121% of the gross summer peak demand savings, and 155% of the gross winter peak demand savings. Table 1-6 provides a summary of the program's gross impacts by savings type and sector. As can be seen in the table, the program achieved 57,846,855 kWh in energy savings, 10,676 kW in summer peak demand savings, and 4,045 in winter peak demand savings.

Table 1-6. DEC Retail LED Program Gross Impact Results by Sector

Savings Type	Savings Category	Ex Ante Savings	Ex Post Gross Savings	Gross Realization Rate
Energy savings (kWh)	Residential savings	41,630,988	45,761,993	110%
	Commercial savings	10,971,300	12,084,862	110%
	Total	52,602,288	57,846,855	110%
Summer peak demand savings (kW)	Residential savings	6,002	7,543	126%
	Commercial savings	2,843	3,132	110%
	Total	8,845	10,676	121%
Winter peak demand savings (kW)	Residential savings	1,993	3,359	169%
	Commercial savings	624	686	110%
	Total	2,617	4,045	155%

Source: Opinion Dynamics analysis of program tracking data.

Opinion Dynamics used sales data modeling and interviews with program participating retailers and manufacturers to estimate program NTGR. The analysis resulted in the program-level NTGR of 0.41. Applying this NTGR to the ex post gross savings resulted in net energy savings of 23,717 MWh, net summer peak demand savings of 4.4 MW, and net winter peak demand savings of 1.7 MW.

Table 1-7. DEC Retail LED Program Ex Post Net Savings

Savings Type	Ex Ante Savings	Ex Post Gross Savings	NTGR	Ex Post Net Savings	Net Realization Rate*
Energy savings (MWh)	52,602	57,847	0.41	23,717	110%
Summer peak demand savings (MW)	8.8	10.7	0.41	4.4	121%
Winter peak demand savings (MW)	2.6	4.0	0.41	1.7	155%

Source: Opinion Dynamics analysis of program tracking data.
* Denominator is ex ante net savings.

Program implementation processes were smooth and effective, resulting in high levels of stakeholder and market actor satisfaction. Program staff effectively managed 384 unique products across 300 participating storefronts. Program tracking data were generally clean and well maintained. Program marketing was versatile and targeted customers both at point of purchase and through local event-based venues.

The program made efforts to reach underserved customer segments and sockets by targeting Dollar/Discount retailers (which attract lower-income shoppers), and focusing on specialty products. In PY2016–2017, 44% of program participating storefronts were Dollar/Discount, and they accounted for 10% of program sales.

Shelf audits conducted over time in the neighboring DEP jurisdiction show that LED prices have decreased dramatically over time. More specifically, standard LED prices dropped from $14.65 per bulb in 2014 to $4.68 in 2016, which represents a 68% drop in price.[2] Similarly, the average per-bulb price for reflector products decreased from $23.00 in 2014 to $6.92 in 2016. Average LED prices in the DEC jurisdiction, based on the results of the 2016 shelf audits, mimic DEP's, with the per-bulb price for standard LEDs averaging $4.87 and the per-bulb price for reflector LEDs averaging $7.01. These decreasing prices made LEDs more affordable and accessible to a broader population. The introduction of new ENERGY STAR 2.0 lamp specifications in 2017 rendered most CFLs ineligible for ENERGY STAR certification, while at the same time relaxing certification requirements for LEDs. These changes in standards helped further the prominence of LEDs.

These findings indicate that the key barriers to energy-efficient lighting adoption, such as product availability and price, have been largely mitigated, which may signal diminishing program effects moving forward. This finding is further substantiated in the energy-efficient lighting penetration in the DEC jurisdiction: based on the data collected as part of the Residential Lighting Logger study, more than 9 in 10 DEC customers (92%) reported having CFLs or LEDs in their homes and 33% reported having LEDs in their homes.[3]

That said, LEDs continue to be the most expensive lighting technology on store shelves, and program discounts help bring them on par with less expensive halogens and incandescents. Furthermore, customers who have LEDs in their homes do not have them in all of their sockets. Program opportunities continue to exist among certain customer segments, namely, older customers, renters, and customers with lower levels of education and lower incomes, where both penetration of energy-efficient products and the percent of sockets taken up by energy-efficient products is lower than average. Additionally, program opportunities continue to exist among a narrow set of product categories, such as specialty product[4]s, where a considerable share of shelf space and sockets is still taken by incandescent and halogen products.

New energy efficiency standards are scheduled to take effect in 2020 with the second phase of EISA, which will require that most of the bulbs on the market meet the 45 lumens per watt efficacy minimum, effectively making LEDs the new baseline. Under this new phase of EISA, energy-efficient lighting programs, such as the DEC Retail LED program, will no longer be cost-effective or needed. Until then, manufacturers have no plans to discontinue the production of incandescent and halogen products, and the program can help further market transformation to energy-efficient lighting.

Based on these findings, Opinion Dynamics recommends the following:

- Continue and if possible increase focus on underserved customer segments. Such efforts include targeting stores in areas with disproportionate shares of underserved customers and targeting retailers with disproportionate numbers of shoppers from underserved segments.
- Continue and, if possible, increase targeting of specialty products by increasing the prominence of specialty products in the program product mix, including focusing on lower-wattage specialty products, and by adjusting program marketing and messaging to focus on underserved sockets and increase messaging relevance (such as specialty sockets in dining rooms).

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[2] Note that this analysis is based on the light bulbs of all wattages, including those not discounted through the DEC Retail LED program.

[3] Note that these results include LED penetration across lighting products of all wattages, and not just the wattages discounted through the program.

[4] Specialty products include lighting products designed for specialty applications, such as three-way, candelabra, globe, etc.

- Monitor the market for retailer and manufacturer behaviors in terms of manufacturing practices and shelf stocking trends in anticipation of the second phase of EISA to identify optimal timing for program completion

2. Program Descriptions

This section provides an overview of the design, implementation, and performance of the Duke Energy Progress (DEP) Energy Efficient Lighting (EEL) program and the Duke Energy Carolinas (DEC) Retail LED program. We discuss each program separately. The program periods under evaluation are January 1, 2016 through March 12, 2017 for the DEP EEL program and March 21, 2016 through March 12, 2017 for the DEC Retail LED program. We refer to these periods as PY2016–2017 throughout the remainder of this evaluation report.

2.1 The DEP EEL Program

2.1.1 Program Design

DEP launched the EEL program in January 2010, with the goal of reducing energy consumption and peak demand through increased awareness and adoption of energy-efficient lighting technologies. The program addresses two key barriers to the purchase of efficient lighting: (1) the higher prices of CFLs and LEDs compared to incandescent and halogen bulbs and (2) customer awareness and knowledge of the benefits of efficient lighting. DEP partners with retailers and manufacturers across its service territory in North and South Carolina to provide price markdowns on customer purchases of efficient lighting products. The program promotes customer awareness and purchase of program-discounted products through a range of marketing and outreach strategies, including in-store collateral and events, bill inserts, direct mail and email marketing, mass media advertising, online advertising, and community events. The program also provides training to store staff. Product mix includes standard and specialty CFLs, LEDs, and ENERGY STAR® fixtures, with a wide range of products across these technologies. Participating retailers represent a variety of retail channels, including Big Box, Do-It-Yourself (DIY), Club, and Discount stores.

2.1.2 Program Implementation

DEP manages the EEL program and is responsible for overseeing program design, marketing, and operations. Ecova has implemented the EEL program on behalf of DEP since 2010. Ecova is responsible for communicating directly with participating manufacturers and retailers, obtaining and processing program sales data, training retailer staff, and promoting program products through in-store demonstration events and point-of-purchase (POP) marketing materials.

2.1.3 Program Performance

In PY2016–2017, DEP discounted more than 3.6 million lighting products through the EEL program, achieving 140,215 MWh in claimed/ex ante energy savings, 23.0 MW in ex ante summer peak demand savings, and 7.1 MW in ex ante winter peak demand savings. Table 2-1 provides a summary of PY2016–17 achieved sales and ex ante savings.

Table 2-1. DEP EEL Program Sales and Savings Summary

Metric	Performance
Bulbs	3,627,458
Ex ante energy savings (MWh)	140,215
Ex ante summer peak demand savings (MW)	23.0
Ex ante winter peak demand savings (MW)	7.1

Source: Opinion Dynamics analysis of program tracking data.

Table 2-2 provides a summary of the product mix discounted through the program during PY2016–2017. For the first time in its history, the program sold more LEDs than CFLs (67% vs. 33%). Standard bulbs accounted for more than two-thirds of all bulbs sold (71%). Close to a third (31%) of all sales and 95% of CFL sales were standard CFL products, while 40% of all sales and 60% of all LEDs sales were standard LED products.

Table 2-2. DEP EEL Program Ex Ante Savings by Product Type

	Reported Bulbs		Ex Ante Energy Savings (kWh)		Ex Ante Summer Peak Demand Savings (kW)		Ex Ante Winter Peak Demand Savings (kW)	
Measure Type	**Bulbs**	**% of Total Sales**	**kWh Savings**	**% of Total Savings**	**kW Savings**	**% of Total Savings**	**kW Savings**	**% of Total Savings**
LEDs	2,435,583	67%	91,221,854	65%	15,342	67%	4,539	64%
LED Standard	*1,434,774*	*40%*	*52,590,526*	*38%*	*8,847*	*38%*	*2,617*	*37%*
LED Specialty	*301,077*	*8%*	*8,873,879*	*6%*	*1,493*	*6%*	*442*	*6%*
LED Reflector	*502,385*	*14%*	*23,290,579*	*17%*	*3,918*	*17%*	*1,159*	*16%*
LED Fixture	*197,347*	*5%*	*6,466,871*	*5%*	*1,084*	*5%*	*321*	*5%*
CFLs	1,191,875	33%	48,993,623	35%	7,669	33%	2,588	36%
CFL Standard	*1,133,010*	*31%*	*45,586,662*	*33%*	*7,136*	*31%*	*2,408*	*34%*
CFL Specialty	*1,572*	*0%*	*55,333*	*0%*	*9*	*0%*	*3*	*0%*
CFL Reflector	*7,684*	*0%*	*295,166*	*0%*	*46*	*0%*	*16*	*0%*
CFL Fixture	*49,609*	*1%*	*3,056,461*	*2%*	*478*	*2%*	*161*	*2%*
Total	3,627,458	100%	140,215,477	100%	23,011	100%	7,126	100%

Source: Opinion Dynamics analysis of program tracking data.

2.2 DEC Retail LED Program

2.2.1 Program Design

DEC launched the Retail LED program in March 2016 with the goal of reducing electric energy consumption and peak demand through increased awareness and adoption of energy-efficient lighting technologies. The program addresses two key barriers to the purchase of efficient lighting: (1) the higher prices of LEDs compared to less energy-efficient alternatives, such as incandescents and halogens, and (2) customer awareness and knowledge of the benefits of efficient lighting. DEC partners with retailers and manufacturers across its service territory in North and South Carolina to provide price markdowns on customer purchases of efficient lighting. The program promotes customer awareness and purchase of program-discounted products through a range of marketing and outreach strategies, including in-store collateral and events, bill inserts, direct mail and email marketing, mass media advertising, online advertising, and community events. The program also provides training to store staff. Product mix includes standard, reflector, and specialty LEDs, along with ENERGY STAR fixtures, with a wide range of products across these technologies. The program product mix did not include 60-watt and 75-watt equivalents, as those products are discounted through DEC's Free LED program. Participating retailers represent several retail channels, including Big Box, DIY, Club, and Discount stores.

2.2.2 Program Implementation

DEC manages the Retail LED program and is responsible for overseeing program design, marketing, and operations. Ecova has implemented the Retail LED program on behalf of DEC since the program's inception in early 2016. Ecova is responsible for communicating directly with participating manufacturers and retailers, obtaining and processing program sales data, training retailer staff, and promoting program products through in-store demonstration events and POP marketing materials.

2.2.3 Program Performance

In PY2016–2017, DEC discounted more than 1.3 million lighting products, achieving 52,602 MWh in claimed/ex ante energy savings, 8.8 MW in ex ante summer peak demand savings, and 2.6 MW in ex ante winter peak demand savings. Table 2-3 provides a summary of PY2016–2017 sales and savings achievements.

Table 2-3. DEC Retail LED Program Sales and Savings Summary

Metric	Performance
Bulbs	1,385,056
Ex ante energy savings (MWh)	52,602
Ex ante summer peak demand savings (MW)	8.8
Ex ante winter peak demand savings (MW)	2.6

Source: Opinion Dynamics analysis of program tracking data.

Table 2-4 provides a summary of the product mix discounted through the DEC Retail LED program during the current evaluation period. Reflector bulbs accounted for 40% of bulbs sold, making up the largest share of program sales during the period. Standard LEDs comprised 24% of all sales, specialty LEDs 21%, and LED fixtures 16%.

Table 2-4. DEC Retail LED Program Ex Ante Savings by Product Type

Measure Type	Reported Bulbs		Ex Ante Energy Savings (kWh)		Ex Ante Summer Peak Demand Savings (kW)		Ex Ante Winter Peak Demand Savings (kW)	
	Bulbs	**% of Total Sales**	**kWh Savings**	**% of Total Savings**	**kW Savings**	**% of Total Savings**	**kW Savings**	**% of Total Savings**
LED Standard	325,547	24%	11,932,672	23%	2,007	23%	594	23%
LED Specialty	290,875	21%	8,573,616	16%	1,442	16%	427	16%
LED Reflector	548,207	40%	24,872,820	47%	4,184	47%	1,238	47%
LED Fixture	220,427	16%	7,223,180	14%	1,210	14%	359	14%
Total	1,385,056	100%	52,602,288	100%	8,845	100%	2,617	100%

Source: Opinion Dynamics analysis of program tracking data.

3. Key Research Objectives

Opinion Dynamics' evaluation of the DEP EEL and DEC Retail LED programs included process, impact, and market assessment components. For each program, the key evaluation objectives were identical and consisted of the following:

- Assess program performance and estimate net energy (kWh) and summer and winter peak demand (kW) savings associated with program activity
- Assess program implementation processes and marketing strategies and identify opportunities for improvement
- Understand customer awareness, preferences, purchasing behaviors, and lighting market dynamics

We designed our evaluation tasks based on the following impact-related research objectives:

- Estimate program ex post gross energy and demand savings
- Estimate program ex post net energy and demand savings
- Develop updated leakage rate reflecting the share of program-discounted bulbs sold to other utilities' customers
- Develop updated residential LED in-service rates (ISRs), hours of use (HOU), summer peak coincidence factor (summer CF), and winter peak coincidence factor (winter CF)

Through our evaluation, we examined the following process-related questions:

- How effective are the program implementation and data tracking practices?
- How effective are the program marketing, outreach, and educational tactics?
- Are retailers and manufacturers satisfied with the programs?
- What are the strengths, weaknesses, and opportunities for program improvement?
- How, if at all, have retailer stocking and sales practices changed?
- What lighting technologies do customers have in their homes?
- How does energy-efficient lighting penetration vary by customer type?
- How does lighting usage vary by customer type and room type?
- What are current and future trends in the lighting market, including retailer stocking practices and customer preferences and purchasing decisions?

4. Overview of Evaluation Activities

To answer the research questions listed in the previous section, Opinion Dynamics performed a range of data collection and analytical activities. The activities were identical for both the DEP EEL and DEC Retail LED programs. Table 4-1 provides a summary of evaluation activities and the areas of inquiry each helped address. Following the table, we provide details on each activity's scope, sampling approach, and timing as applicable.

Table 4-1. Overview of Evaluation Activities

#	Evaluation Activity	Scope: DEP EEL Program	Scope: DEC Retail LED Program	Impact	Process	Market	Purpose
1	Program staff interviews	n=2			X		• Provide insight into program design and delivery
2	Deemed savings review	All data provided		X			• Review completeness, accuracy, and consistency of data and ex ante savings assumptions
3	Materials review	All materials provided			X		• Provide insight into program design and delivery
4	Program tracking data analysis	All data provided		X	X	X	• Calculate gross energy and demand savings • Understand program footprint, measure mix, retailer mix, and incentive levels
5	Residential lighting logger study	n=107		X	X	X	• Estimate HOU, CFs, and ISRs for LEDs installed in customer homes • Assess lighting composition and use among residential customers with LEDs
6	Retailer shelf audits	n=15	n=15	X	X	X	• Assess shelf space distribution for general service and reflector products • Estimate baseline wattage adjustments • Provide program marketing insight
7	Retailer and manufacturer interviews	n=21	n=21	X	X	X	• Estimate net-to-gross ratio (NTGR) • Provide insight into program delivery and the current and future lighting market
8	Sales data modeling	All data provided		X			• Estimate NTGR
9	Leakage analysis	All data provided		X			• Estimate leakage rate

Source: Opinion Dynamics analysis.

4.1 Program Staff Interviews

Opinion Dynamics completed two interviews with program staff at Duke Energy. We completed one interview in July 2016 and another in May 2017. Each interview covered both the DEP EEL and DEC Retail LED programs. For each program, the interviews explored, among other topics, program performance; changes in program design and implementation; participating retailer, product, and incentive mix; data-tracking and communication processes; and outlooks for future program planning.

4.2 Deemed Savings Review

In support of the impact evaluation, for each program, Opinion Dynamics completed a review of the energy savings assumptions used to estimate energy and peak demand savings. As part of this process, we also reviewed preliminary program sales data extracts and offered feedback to program staff regarding data quality and completeness. The objectives of the review were to identify and review the deemed savings values used for ex ante impacts and to check program sales data for any gaps, omissions, inconsistencies, or errors.

4.3 Materials Review

Opinion Dynamics conducted a review of program materials and data for each program, including marketing plans and materials, program planning documents, weekly field reports, and past evaluation reports and studies.

4.4 Program Tracking Data Analysis

Opinion Dynamics reviewed and assessed the sales data extracts for each program. Analyses included:

- Identifying any data gaps, omissions, inconsistencies, or errors, and correcting them as needed
- Summarizing program design and performance based on product mix, retailer mix, and incentive levels
- Analyzing sales trends over time, by geography and by retailer (specifically for the DEP EEL program)

4.5 Residential Lighting Logger Study

Opinion Dynamics completed a lighting logger study among DEP and DEC residential customers who had LED bulbs installed. The key goal of the study was to estimate HOU and CFs for LEDs. As part of the study, we also developed updated estimates of LED ISRs and collected valuable data on lighting penetration and saturation levels in each jurisdiction, which allowed us to assess and characterize lighting usage in customer homes in DEP and DEC jurisdictions.

4.5.1 Sample Design and Fielding

For purposes of this study, eligible customers were defined as DEP and DEC residential customers who have at least one LED installed in conditioned spaces. Because the data on the presence of LEDs are not readily available, data collection for the study consisted of two distinct activities:

- **Recruitment survey:** To identify and recruit eligible residential customers for the study

- **On-site visits:** To collect data on lighting products in use and to deploy and retrieve lighting logger equipment

We drew the sample for this study from the population of DEP and DEC residential customers provided by Duke Energy. We cleaned the customer data to remove duplicate records, customer records with no contact information, and customer records with a "do not contact" designator. We stratified the sample by jurisdiction and geographic region. We drew the sample in proportion to the share of customers in each jurisdiction and geographic region, with the goal of ensuring adequate representation of the customers from each jurisdiction and robust geographic coverage.

Identifying and recruiting customers with LEDs installed can be costly when administered over the phone, because it requires calling and screening a large number of ineligible customers. To achieve maximum efficiencies in the recruitment process, we recruited customers online as well as over the phone. We sent email invitations to participate to customers for whom we had email addresses, and called customers for whom we only had telephone numbers. To further increase the efficiency of the recruitment process, we oversampled customers with email addresses and administered a larger share of recruitment online. Online recruitment is less disruptive to customers than recruitment over the phone, much less costly, can be administered faster, and offers the valuable benefit of supplementing survey questions with visual aids (e.g., pictures of LED bulbs and socket types) for easier recognition and more-accurate self-reported data.

As part of the recruitment process, we screened customers for the presence of LEDs. During recruitment, we collected valuable data on LED and CFL penetration for all customers we spoke with, as well as customers' sociodemographic and household characteristics. This data allowed us to develop a robust post-stratification approach and to inform the process analysis.

We followed up with eligible customers to schedule a time for a site visit. As part of each site visit, we conducted a lighting inventory, sampled fixtures for logging, and placed lighting loggers. We kept the loggers in place for approximately 6 months. After 6 months, we scheduled return visits, during which we removed lighting loggers and collected updated information on key variables of interest. Customers who qualified and agreed to participate in the lighting logger study received a $50 gift card upon completion of the logger deployment site visit and another $50 gift card upon completion of the logger retrieval visit.

Table 4-2 provides a summary of the sampling and recruitment process. As can be seen in the table, from the sample of 5,866 of DEP and DEC customers, we identified 526 eligible customers, recruited 323 customers, and completed site visits with 107 of those customers. We retrieved loggers from all 107 homes where we deployed them.

Table 4-2. Summary of Sampling and Recruitment

Sampling Step	DEP	DEC	Total
Population	1,395,369	1,739,789	3,135,158
Sample frame	1,113,646	1,367,567	2,481,213
Sample drawn	1,757	4,109	5,866
Eligible customers	201	325	526
Recruited customers	131	192	323
Completed deployment site visits	46	61	107
Completed logger retrieval*	46	61	107

Source: Opinion Dynamics analysis.
* This includes homes where customers sent loggers back to us in prepaid packages with a brief self-administered survey. A total of 11 homes sent loggers back to us in prepaid packages.

We completed recruitment and deployment site visits between March and June 2016, and retrieval visits between October and December 2016. Table 4-3 provides the final survey dispositions for the study.

Table 4-3. Lighting Logger Recruitment Disposition Summary

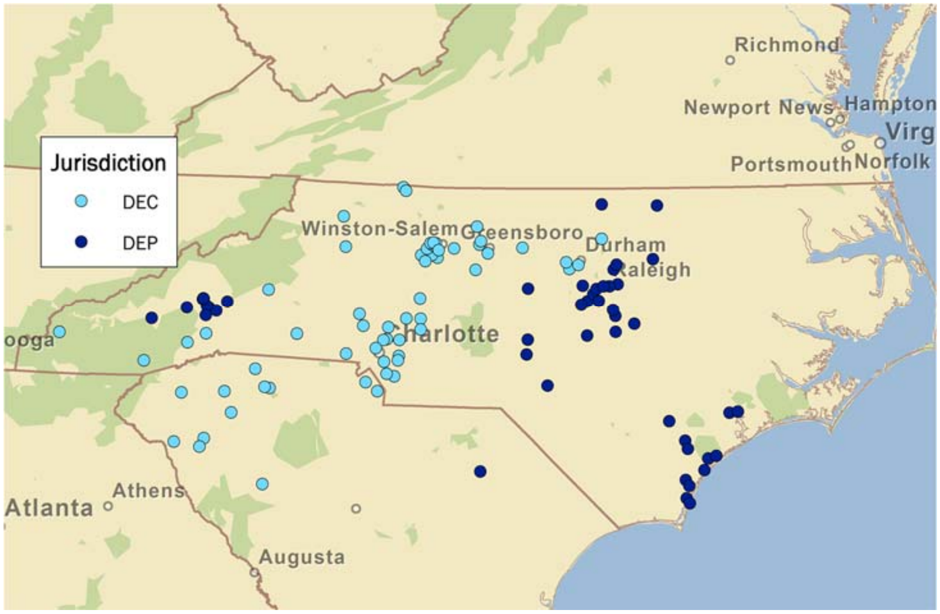
Disposition	Customers
Completed logger visit (I)	**107**
Eligible non-interviews (N)	**216**
Incomplete data	126
Recruited but site visit not completed	90
Survey ineligible household (X1)	**2,026**
Ineligible (no LEDs)	1,962
Does not live at address	55
Not a Duke Energy customer	9
Not eligible (X2)	**664**
Business number	65
Computer tone	18
Customer indicated called already	2
Disconnected phone/wrong email/phone number	579
Household with undetermined survey eligibility (U1)	**9,518**
Answering machine	863
Callback	243
Closed out of survey before completion	224
Did not open the online survey	7,034
Do not call list	31
Refusal	524
Alternative phone number	1
Language problems	57
Mid-interview terminate – do not call back	25
Not available	431
Recruited but unable to contact	85
Undetermined if eligible household (U2)	**411**
Busy tone	31
No answer	365
Privacy line/blocked number	15
Total customers in sample	*12,942*

Source: Opinion Dynamics analysis of the survey disposition data.

We calculated response rates using the Response Rate 3 (RR3) methodology specified by American Association of Public Opinion Research (AAPOR). The response rate for the lighting logger study was 6%.

Figure 4-1 illustrates the location of the 107 households that participated in the lighting logger study. As can be seen in the figure, the sample of homes adequately covered the DEP and DEC jurisdictions.

Figure 4-1. Distribution of Site Visits across DEP and DEC Jurisdictions



Source: Opinion Dynamics analysis of the site visit data.

4.5.2 Logger Deployment and Retrieval

As part of this study, we conducted an inventory of lighting products in all screw- or pin-based sockets (both medium screw-based and small screw-based sockets) located in both conditioned and unconditioned spaces (including outside).[5] We deployed loggers only on inside switches that control sockets with LEDs.

For logger deployment purposes, during the site visits, technicians classified rooms into seven following distinct room types[6]:

- Kitchen
- Living room
- Bedroom
- Bathroom
- Dining room
- Basement
- Other

For each room, technicians collected information on the total number of switches, switch controls, total number of light sockets controlled by each switch, lighting technology (CFL, LED, incandescent, halogen, empty socket), and bulb shape (twist, reflector, globe) in each socket. As part of the site visit, we also interviewed

[5] We excluded linear lighting from the inventory.

[6] Note that the list of room types for lighting inventory is more detailed and includes 16 unique room types.

homeowners and collected detailed data on their sociodemographic and household characteristics and lighting preferences.

To capture lighting usage, we used DENT loggers. We deployed up to seven loggers per home, one in each distinct room type. For homes with fewer than seven rooms with LEDs, we deployed more than one logger per room (but no more than three loggers per room) to increase the overall precision, as well as to use them as a backup loggers in case the need arose. Within each room and room type, we randomly selected the light switch to log in cases the room had multiple switches controlling LEDs. We placed lighting loggers only on switches that controlled at least one LED installed in a conditioned space. For each logger, we recorded the switch it was placed on and the count of light bulbs, by technology, it controlled. We also recorded a detailed description of the logger placement to aid in subsequent retrieval visits (e.g., light above master bathroom mirror).

To accurately capture lighting usage, we placed lighting loggers as close to the light source as possible, without compromising the aesthetics of the lighting. We recorded any instances when lighting loggers could not be placed on the desired fixture and the reasons why (e.g., accessibility, homeowner objections). In these cases, we selected alternative light fixtures for logger placement.

As part of the logger deployment process, we calibrated each logger's sensitivity setting to make sure it only captured lighting from the dedicated fixture and did not accidentally capture ambient sources of lighting, such as daylight.

Upon completion of the study, we removed the loggers using standard procedures for logger testing prior to removal, including state of light testing, and battery check prior to retrieval. We also conducted a closing interview with the homeowner about any changes in lighting usage over the course of the logging period.

4.5.3 Logger Data Preparation and Cleaning

We deployed a total of 314 loggers across 107 households. We were unable to retrieve a total of 7 loggers. To prepare the logger data for analysis, we performed a series of data-cleaning steps to ensure proper and reasonable logging. Those steps included:

- Identification and removal of corrupted/failed loggers: Initial review of the logger files identified loggers that were corrupted or failed to log the data properly. Corrupted/failed loggers consisted of those that: (1) did not contain any logs falling within the valid logging time frame (indicative of issues with logger clock calibration); (2) did not collect any data (indicative of the loggers not working properly); (3) contained logged data in stark contrast to self-reported socket usage, namely, loggers with no "on" time or very sporadically low "on" periods, while the homeowner reported the fixtures being always on or on most of the time. We identified 44 loggers that were corrupted/failed and therefore needed to be removed from further analysis.
- Logger date "trimming": This step was necessary to ensure that extraneous observations (i.e., logs) associated with logger placement, testing, and calibration were not a part of the analysis. Logger data were "trimmed" to remove all logs recorded "on" before the logger installation date, as well as on or after the logger retrieval day. To determine and validate deployment and retrieval dates, we used data recorded by the field staff as part of the deployment and retrieval process. For each logger, we trimmed the start date to be the first full day of logging and the end date to be the last full day of logging. For loggers received in the mail and therefore missing a clear indicator of the logging end period,[7] we carefully reviewed each individual logger's log patterns to determine an appropriate end date.

[7] Those loggers were removed and mailed to us by residents; thus, the retrieval process did not follow standard retrieval procedures.

Comparing the selected end date to the ship date of the package validated this assumption. We did not drop any loggers as a result of this step.

- Identification of loggers with short logging periods: Once "trimmed," we calculated logging periods for each logger. Some loggers may have failed or been removed by the residents during the early part of the logging period and therefore only contained logging data for a small fraction of the period. To increase the reliability of the HOU estimates, loggers logging for less than 1 month were excluded from the analysis. We identified one logger with a short logging period that needed to be removed from the analysis.

- Analysis of unexpected/suspicious usage patterns: To ensure proper operation of the loggers throughout the logging period, we performed an extensive analysis of logger usage patterns and flagged loggers with unusual or unexpected patterns for further review and validation. We explored a variety of patterns, including long "on" periods, long "off" periods and usage gaps, no "on" periods, and high variance in usage and usage changes over time. We did not identify any loggers with unexpected patterns and therefore did not drop any loggers from our analysis as a result of this step.

- Analysis of logger flickering: We thoroughly explored logger flickering and its impact on the HOU estimates. Logger flickering is caused by an external stimulus, such as sunlight or moisture interference. Flickering commonly manifests itself in short "flicks" or "on" and "off" periods. Flickering is generally difficult to identify and correct for because it is hard to determine whether the short-interval "on/off" periods are false positives or false negatives. We explored the impact logger flickering could have on average daily HOU by calculating, for each logger, the total number of logs that each logger recorded and normalizing the total number of logs to the days that the logger was in the field, thus arriving at an average number of logs per day. A high count of logs per day is usually indicative of loggers flickering. We then estimated the impact that potential logger flickering could have on the HOU estimates by summing for each logger every 1–10 second "on/off" period[8] and dividing them by the total number of days that the logger was deployed. The resulting number presents an upper bound of the impact that flickering has on the HOU estimates. The results of the analysis revealed that the impacts of the flickering issue on the estimation of the average daily HOU are negligible. As such, we did not make any adjustments to the logger data.

In the end, we deployed 314 loggers, of which 262 were used for the analysis (83%). Table 4-4 provides a summary of logger attrition.

Table 4-4. Logger Attrition Summary

	Loggers Affected		Sites Affected	
Cut or Drop Decision	#	%	#	%
Total deployed	314	100%	107	100%
Unusable loggers	52	17%	42	39%
Unable to retrieve	7	2%	5	5%
Corrupted/failed loggers	44	14%	36	34%
Less than 30 days of logging	1	<1%	1	1%
Total used in analysis	262	83%	107	100%

Source: Opinion Dynamics analysis of the logger data.

[8] 1–10 second "on" and "off" periods were determined as the most common "flicker" periods. This is a very conservative range because the 10-second "on/off" pattern is a very conceivable usage pattern for people to exhibit.

4.5.4 Post-Stratification

Lighting metering studies are involved and require time and effort on behalf of the customer. Certain customer types may be less likely to participate in such a study (e.g., those with higher incomes or those employed full-time). If the customers that are under- or overrepresented in our sample have different lighting usage patterns, the study results, namely HOU and CFs, will suffer from non-response error and will not be representative of the broader population.

As part of our analysis, Opinion Dynamics explored the presence of non-response bias in the site visit sample by comparing the study's site visit participants to the broader population on a range of observable characteristics associated with the lighting usage. Those include home type, homeownership status, age, income, education, household size, and employment status.

Only customers with LEDs were eligible for the lighting logger study, and the data on the sociodemographic and household characteristics of that population segment do not exist. To assess non-response bias, therefore, we made two comparisons:

- **Recruitment survey respondents to the general population of DEP and DEC customers.** As part of the recruitment survey, we collected sociodemographic and household information from both qualifying and non-qualifying customers. We compared the composition of the customers who responded to the recruitment survey to a broader population of DEP and DEC customers. We used the U.S. Census Bureau's 2010–2015 American Community Survey (ACS) data to obtain information on DEP and DEC customers. This comparison allowed us to assess the presence of the non-response bias in our recruitment effort. Aside from DEP customers being slightly underrepresented, the sample was well aligned with the population across a range of sociodemographic and household characteristics.

- **Sample of site visits to the eligible population of customers.** We compared the sociodemographic and household characteristics of the households that participated in the logger study with those of all customers eligible for the study, as determined through the recruitment survey. This comparison allowed us to assess whether customers who agreed to participate in the study were different from those who qualified but chose not to participate. We found that our site visit sample was skewed in terms of homeownership and home type, with renters and residents of multifamily properties being underrepresented. We also found that DEP customers were slightly underrepresented. As expected, HOU and other key variables of interest differed considerably across those groups.

Based on this analysis, we developed and applied post-stratification weights based on homeownership and jurisdiction to align the sample with the population. We did not weight the data by home type because home type is highly correlated with homeownership, and weighting the data by the latter automatically aligned the sample by the former. Table 4-5 summarizes the post-stratification weights that we applied.

Table 4-5. Lighting Logger Study Post-Stratification Weights

Jurisdiction	Homeownership	n	Weight
DEP	Own	41	1.0383
DEP	Rent	5	1.5645
DEC	Own	49	0.8439
DEC	Rent	12	1.2715

Source: Opinion Dynamics analysis of the site visit and logger data.

4.5.5 Hours of Use Annualization Process

Lighting logger studies that do not log usage during the entire year must employ an annualization process to adjust for changes in daylight hours that likely affect HOU. While this study did not cover the whole year, loggers were in place for most of the year, capturing data on usage during the spring, summer, and part of the fall. Such a considerable fielding period is likely to result in observed HOU estimates mimicking the annual values. In this case, using observed estimates will be appropriate, and even preferable, given the modeling uncertainty that the annualization process might introduce.

Before defaulting to the observed HOU estimates, however, we annualized the lighting usage data using an individual ordinary least squares (OLS) regression model. The model specification is provided in Equation 4-1.

Equation 4-1. Hours of Use Model Specification

$$Hd = \alpha + \beta \sin(\theta d) + \varepsilon d$$

Where:

Hd = HOU on day d, starting with d=1 on January 1.

α = The intercept representing HOU when sin(θd)=0. Since average sin(θd) for the year is equal to zero by design, evaluating the model at the average declination angle leaves only the constant to estimate HOU; therefore, the intercept term is equal to average annualized HOU for each bulb.

β = Sine coefficient, or the difference between the HOU on the solstice and days with the average annual declination angle.

$Sin(\theta d)$ = Sine of the solar declination angle or day d converted to follow the change in the HOU and adjusted to fit the −1 to +1 interval with an average of zero for the year (for ease of analysis). The solar declination angle represents the latitude at which the sun is directly overhead at midday. We used the following formula to calculate the sine of the solar declination angle for each day of the year:

$$\sin(-\pi*2*(284+d)/365)$$

εd = Residual error

We fit sinusoid regression models separately for weekends and weekdays for each individual logger and then combined the results in proportion to the percent of weekends versus weekdays in a year. We analyzed each regression model for goodness of fit to determine if the individual bulb was sufficiently daylight-sensitive to justify regression-based annualization and to determine if the sinusoid model could provide a reliable estimate (i.e., the sinusoid model accurately represented trends in lighting use over time). Specifically, we looked at:

- Significance of the sine coefficient t-statistic. Loggers with a t-statistic lower than 1.282 or higher than −1.282 were flagged as "poor fit" (meaning that the solar declination angle is not significantly different from 0 at a 90% confidence level).
- Magnitude of the sine coefficient. Models that resulted in extremely high sine coefficients (absolute magnitude of seven or more) were flagged as "poor fit."[9]

[9] In many of those cases, use changed dramatically during different periods of the study, and it was not possible to determine typical use. For example, lights may have stayed continuously on for a portion of the study, and then used intermittently.

- The value of the intercept. Models with the negative intercept were flagged as "poor fit."

If any of the parameters described above were true, we replaced the modeled HOU with non-annualized observed daily average HOU. As part of this exercise, we replaced 76% of modeled results with observed HOU estimates.

4.5.6 Coincidence Factor Estimation

CFs represent the fraction of time during the peak period that the light is on. We used the following definitions of peak periods in the CF calculations:

- Summer peak period: non-holiday weekday, during the months of June–August, between the hours of 3pm and 5pm
- Winter peak period: non-holiday weekday, during the months of December–February, between the hours of 7am and 9am

Because loggers were in the field for the entire duration of the summer peak period, annualization of the lighting usage was not necessary. Therefore, we relied on the observed usage data to estimate summer peak CFs. We calculated the summer peak CF by summing, for each logger, the time the light was on during the summer peak period and dividing the result by 2 (3pm–5pm).

Conversely, we did not log lighting usage during the winter peak period. To determine winter peak CFs, we annualized lighting usage. We performed similar goodness of fit calculations as with the HOU annualization described in the section above. We calculated the winter peak CF by summing, for each logger, the time the light was on during the winter peak period and dividing the result by 2 (7am–9am).

4.5.7 Hours of Use and Coincidence Factor Aggregation Process

Consistent with the three-stage cluster or multi-stage sampling approach to deploying loggers, wherein we first select households, then rooms, then switches to place loggers on, we aggregated the individual logger results first to the room level within each household, then to the room level across households, and finally across room levels to the overall household-level estimate. To arrive at the room-level HOU and CF estimates within a household, we aggregated the results from the individual loggers, weighting down loggers that were installed in the same room type in a single household so that room-level estimates' contribution to the overall estimate is consistent across households. This weighting process ensured that a household where multiple loggers were installed within the same room type did not contribute to the room-level estimate more heavily than a household where only one logger was installed in a given room type. We then developed across-household room-level estimates by weighting individual estimates by the number of light bulbs logged as part of the process. Finally, we weighted room-level estimates by the share of LEDs in each room type to arrive at the overall HOU and CF estimates.

4.5.8 In-Service Rate Calculation

We calculated ISRs for LEDs by summing all of the LEDs in storage and dividing the result by the sum of LEDs installed inside and outside of customers' homes, as well as in storage. We developed ISRs for each household and then weighted the results to the overall ISR for each jurisdiction by the share of LEDs in each household. This ensured that homes with more LEDs contributed more heavily to the program ISR. We also applied homeownership weights as described in the section above to ensure representativeness of the results.

Table 4-7 summarizes achieved relative precision across all metrics.

Table 4-6. Precision and Margins of Error at 90% Confidence

Metric of Interest	Relative Precision (at 90% Confidence)
DEP ISR	4%
DEC ISR	5%

Source: Opinion Dynamics analysis of the site visit data.

4.5.9 Targeted Confidence and Precision

The evaluation targeted 10% precision at the 90% confidence level (90/10) for the HOU estimates across the DEP and DEC jurisdictions combined. Opinion Dynamics achieved the desired precision for HOU estimates. Precision around the CF estimates is slightly worse than 90/10. With ISR estimates, we were able to meet 90/10 at the jurisdiction level. Table 4-7 summarizes achieved relative precision across all metrics.

Table 4-7. Precision and Margins of Error at 90% Confidence

Metric of Interest	Relative Precision (at 90% Confidence)
HOU	9%
Summer CF	12%
Winter CF	12%

Source: Opinion Dynamics analysis of the logger data.

4.6 Retailer Shelf Audits

Opinion Dynamics completed retail shelf audits across a range of retail channels in DEP and DEC jurisdictions in September 2016. We completed shelf audits at both participating and non-participating retailers. We selected a purposeful sample of retailers and storefronts to provide good geographic and retailer channel coverage, while capturing a meaningful percentage of program bulb sales. Table 4-8 summarizes the shelf audit sample by retail channel and jurisdiction. As can be seen in the table, we completed 15 retailer shelf audits per jurisdiction. Of the 15 DEP retailers, 12 were participating in the DEP EEL program and 3 were not. Of the 15 DEC retailers, 10 were participating in the program and 5 were not. The 12 participating retailers that we visited in the DEP jurisdiction accounted for 21% of program sales, and the 10 participating retailers that we visited in the DEC jurisdiction accounted for 25% of program sales.

Table 4-8. Shelf Audit Data Collection Overview

Retail Channel	DEP			DEC		
	Participating Retailers	% of Program Sales	Non-Participating Retailers	Participating Retailers	% of Program Sales	Non-Participating Retailers
Big Box	1	1%	1	2	<1%	1
DIY	3	5%	2	4	4%	2
Club	4	13%	0	4	21%	2
Discount*	1	<1%	0	0	<1%	0
Hardware	3	2%	0	0	<1%	0
Total	12	21%	3	10	25%	5

Source: Opinion Dynamics analysis of the shelf audit data.
* Discount channel includes Dollar Tree, Goodwill, and Habitat ReStore stores.

As part of each shelf audit, the evaluation team recorded the number and price ranges of different lighting products in key wattage categories. We recorded data separately for general service products and reflector products. The evaluation team also recorded the presence of program-sponsored POP marketing and promotional materials. We used results from the study to adjust baseline wattage assumptions and to provide insight into the shelf space devoted to different lighting products.

As described above, the selection of retailers for shelf audits made use of a purposeful sampling approach. As a non-probability sampling method, the concept of sampling error does not apply, so there is no estimate of precision for the resulting estimates.[10]

4.7 Retailer and Manufacturer Interviews

Opinion Dynamics completed a total of 33 interviews with store-level retailer staff and manufacturer contacts. The sample frame for retailer interviews included all participating retailer locations. We drew a purposeful sample with consideration of geographic and retail channel coverage, and attempted to maximize representation of total program sales.

The sample frame for manufacturers and corporate-level retailers was supplied to us by the program manager and included a total of 15 contacts from 14 companies. We reached out to nearly all manufacturer contacts, with a purposeful focus on the retailers and manufacturers representing the most program sales. All the manufacturers we contacted sold products discounted by both programs during the evaluation period.

Table 4-9 provides a summary of the retailer and manufacturer interviews by jurisdiction and stakeholder type. The table also provides the percent of sales accounted for by each group of interviewed respondents.

[10] There may be other sources of uncertainty, such as measurement error, that are associated with these interviews and all the NTGR methods. It is not possible to quantify these errors like we can sampling error. We discuss these other research limitations throughout this report.

Table 4-9. Retailer and Manufacturer Interview Data Collection Overview

Interview Type	DEP			DEC		
	Planned Interviews	Completed Interviews	% of Bulb Sales	Planned Interviews	Completed Interviews	% of Bulb Sales
Store-level retailer staff	10	10	20%	10	12	28%
Manufacturer contacts*	7	11	84%	7	9	84%
Total	17	21	83%	17	21	90%

Source: Opinion Dynamics analysis of retailer and manufacturer interview data.
* We spoke to 11 manufacturer contacts, 9 of whom provided feedback for both programs and 2 of whom participated in only the DEP EEL program.

As described above, retailer and manufacturer interviews made use of a purposeful sampling approach. As a non-probability sampling method, the concept of sampling error does not apply, so there is no estimate of precision for the resulting estimates, including NTGR.[11]

4.8 Sales Data Modeling

The goal of the sales data modeling was to develop a NTGR estimate. As part of this research activity, we estimated, for each program, lighting price elasticities using regression modeling of PY2016–2017 program sales and pricing data. We calculated a NTGR estimate from the price elasticities. A detailed description of the sales data modeling methodology can be found in Section 6.1 of this report.

Sales data modeling uses sales data from the entire period under evaluation rather than a sample of the program sales records. Because no sampling was used, the concept of sampling error does not apply, so there is no estimate of precision for the resulting NTGR estimate.

4.9 Leakage Analysis

Leakage occurs when non-Duke Energy customers purchase program-discounted products and install them in homes or businesses located outside of a utility's service territory. The program leakage rate reflects the percentage of program bulbs purchased by non-Duke Energy electric customers. Duke Energy cannot claim savings from those products, and the savings associated with them need to be subtracted from the overall program impacts.

DEP and DEC share a border. With both jurisdictions running upstream lighting programs, program bulbs are "leaking" from one jurisdiction into the other. As part of the leakage analysis, it is therefore important to estimate not only leakage "out" (percent of program bulbs purchased by non-utility customers) but also leakage "in" (percent of other program's bulbs purchased by utility customers). The final leakage rate, as a result, is the net of the two leakage estimates (see Equation 4-2 below).

Equation 4-2. Leakage Rate Formula

$$Leakage\ Rate = Leakage\ Out - Leakage\ In$$

[11] There may be other sources of uncertainty, such as measurement error, that are associated with these interviews and all the NTGR methods. It is not possible to quantify these errors like we can sampling error. We discuss these other research limitations throughout this report.

The key factor affecting leakage for an upstream residential lighting program is the location of the participating stores in relation to the DEP and DEC jurisdiction borders. Opinion Dynamics relied on geographic information system (GIS) analysis to estimate both leakage "out" and "in" rates for each jurisdiction. We leveraged three data sources to perform the analysis:

- Participating store location and bulb sales data
- U.S. Census 2015 ACS data at the census block group level
- Customer data

To calculate leakage rates, we performed the following steps:

- Mapped respective store locations participating in the DEP EEL and DEC Retail LED programs.
- Defined a store's territory as the area lying within a certain radius from participating stores. We customized radius designators depending on whether the stores were located in urban or rural areas. We relied on the U.S. Census definitions of urban area, urbanized cluster, and rural area,[12] and assigned a 5-mile radius to the stores located in urban areas, a 7-mile radius to the stores located in urbanized clusters, and a 10-mile radius to the stores located in rural areas. The customized radius assignments assume that customers will need to travel further in rural compared to urban areas to have access to the types of retailers that participate in the program.
- Calculated the number of households living within each participating store's territory by summing the total number of households across all census block groups lying within the store-assigned radius (5, 7, or 10 miles). In cases where a portion of a census block group fell within the designated radius, we apportioned the population of shoppers based on the percentage of land mass falling within the designated radius of the store.
- Calculated the total number of the DEP and DEC customers, respectively, living within each participating store's territory by mapping DEP and DEC customer data to the census block groups lying within each store's designated radius and summing the customers across the census block groups. Similar to calculating the total number of households within a store's territory, in cases where a part of a census block group fell within a designated radius, we apportioned the population of DEP and DEC customers based on the percentage of land mass falling within that radius.
- Calculated leakage "out" for each participating store by dividing the total number of DEP and DEC customers, respectively, by the total population falling within each store's territory and subtracting it from 1 (see Equation 4-3 below). We calculated a program-level leakage "out" by weighting the individual store rates by the program sales volume, so stores that sold more bulbs through the program had more weight.

Equation 4-3. Leakage Out Formula

$$Leakage\ Out\ (DEP) = 1 - \left(\frac{DEP\ Customer\ Total}{Population\ Total\ within\ Designated\ Radius\ of\ DEP\ Participating\ Stores}\right)$$

[12] The U.S. Census defines urban area as an area with the population of 50,000 or more, an urbanized cluster as an area with population between 2,500 and 50,000, and a rural area as areas that are not urban areas or urbanized clusters. It should be noted that a store's territory and the shopping patterns are likely to be influenced by a number of factors, including the type of store, the road network, and the population density of the area. It was not possible to consider all of these factors for this analysis.

$$Leakage\ Out\ (DEC) = 1 - \left(\frac{DEC\ Customer\ Total}{Population\ Total\ within\ Designated\ Radius\ of\ DEC\ Participating\ Stores}\right)$$

- Calculated leakage “in” for each participating store by diving the total number of the opposite jurisdiction’s customers living within a store’s territory by the total population within each store’s territory. Similar to the leakage “out” calculation, we developed initial program-level leakage “in” by weighting the individual store rates by the program sales volume, so stores that sold more bulbs through the program had more weight.

Equation 4-4. Initial Leakage In Formula

$$Initial\ Leakage\ In\ (DEP) = \left(\frac{DEC\ Customer\ Total}{Population\ Total\ within\ Designated\ Radius\ of\ DEP\ Participating\ Stores}\right)$$

$$Initial\ Leakage\ In\ (DEC) = \left(\frac{DEP\ Customer\ Total}{Population\ Total\ within\ Designated\ Radius\ of\ DEC\ Participating\ Stores}\right)$$

We applied the resulting rates to the energy savings to estimate the total savings “leaking into” the DEP jurisdiction from the DEC Retail LED program and vice versa. We adjusted the savings to reflect the ISRs associated with the jurisdiction in which bulbs would being installed. We then divided the resulting leakage “in” savings by the program’s overall ex post gross savings to arrive at the normalized final leakage “in” rate for each program.

Equation 4-5. Final Leakage In Formula

$$Leakage\ In\ (DEP) = \left(\frac{Leakage\ In\ Savings\ from\ DEC}{DEP\ Ex\ Post\ Gross\ Savings}\right)$$

$$Leakage\ In\ (DEC) = \left(\frac{Leakage\ In\ Savings\ from\ DEP}{DEC\ Ex\ Post\ Gross\ Savings}\right)$$

Leakage data analysis relied on sales data from the entire period under evaluation rather than a sample of the program sales records. Because no sampling was used, the concept of sampling error does not apply, so there is no estimate of precision for the resulting leakage rate estimates.

5. Gross Impact Evaluation

This section describes the methodology the evaluation team used to conduct the gross impact analysis and the results of the analysis. Due to the similarities in the savings assumptions and analytical approaches across the DEP EEL and DEC Retail LED programs, we present the methodology and the results of the gross impact evaluation together for the two programs.

The evaluation team completed the following activities as part of the gross impact analysis:

- Reviewed program tracking data and ex ante savings values for accuracy, completeness, and consistency
- Reviewed and compiled appropriate ex post assumptions based on recent Carolinas-specific research
- Conducted engineering analysis to develop estimates of ex post gross energy and demand savings

5.1 Methodology

Neither North Carolina nor South Carolina has a Technical Reference Manual (TRM) that provides a recommended savings estimation approach and savings assumptions. Therefore, all savings assumptions are based on the most recent available Carolinas-specific research.

Duke Energy changed its approach to estimating ex ante savings during the current evaluation period, relying on per-unit savings by product category and applying a single set of values across all products within each category. Per-unit values are based on results of the previous evaluation (DEP EEL PY2015), and categories are defined by bulb technology, shape, and subtype (e.g., general purpose CFLs, outdoor reflector LEDs, 3-way LEDs). We applied the per-unit savings specified by the program based on product categories recorded in the program tracking data.

We estimated gross savings using the recommended approach in the Uniform Methods Project (UMP) protocols. Per the UMP protocols, savings calculations account for baseline wattages, actual bulb wattages, ISR, lighting operation (HOU and CFs), and interactive effects. These equations and all recommended savings parameters are detailed below. We reviewed program sales data and corrected any inconsistencies in product categorization or bulb specifications prior to calculating gross savings.

5.1.1 Review of Program Tracking Data for Completeness and Consistency

Opinion Dynamics analyzed the program sales data for any gaps and inconsistencies. As part of the analysis, we performed the following steps:

- Checked the core data fields for missing values
- Checked the data for temporal gaps (due to missing invoices, transactions, etc.) by reviewing variation in monthly invoiced sales
- Verified consistency of product categorization for each product, cross-checked these categories with detailed measure descriptions, and corrected any inconsistent product categories based on available information from the ENERGY STAR or retailer websites

- Cross-checked wattages, lumen outputs, incandescent equivalent wattages, and detailed measure description data fields for consistency and accuracy and corrected inconsistent values
- Checked pack size and rebate information for outliers or unreasonable values

Opinion Dynamics identified and corrected slight inconsistencies in bulb categorizations, bulb wattage, and lumen assignments. None of those inconsistencies was widespread; each adjustment affected a fraction of a percent of total sales, and the effect on program savings was negligible.

5.1.2 Recommended Savings Assumptions

In this section, we provide an overview of the savings assumptions applied to estimate ex post gross savings for each program. We chose the savings assumptions with consideration of the following factors:

- Assumptions are based on Carolinas-specific research
- Assumptions are based on the most recent available research and analysis
- LED savings assumptions are specific to LEDs as much as possible

We relied on a standard equation to estimate program savings and estimated savings attributable to the residential vs. commercial installations separately. The equation incorporates baseline wattages, actual bulb wattages, ISR, lighting operation (HOU and CFs), and interactive effects. Equation 5-1 provides the formula that we used to estimate energy savings, while Equation 5-2 provides the formula for demand savings. These formulas are standard and are routinely used to estimate savings for lighting programs.

Equation 5-1. Annual Energy Savings

$$Res\ kWh_{saved} = NUMUNIT * ResShare\left[\left(\frac{\Delta W}{1{,}000}\right) * HOU_{Res} * ISR_{Res} * INT_{Res}\right]$$

$$Com\ kWh_{saved} = NUMUNIT * ComShare\left[\left(\frac{\Delta W}{1{,}000}\right) * HOU_{Com} * ISR_{Com} * INT_{Com}\right]$$

Equation 5-2. Annual Demand Savings

$$Res\ kW_{saved} = NUMUNIT * ResShare\left[\left(\frac{\Delta W}{1{,}000}\right) * CF_{Res} * ISR_{Res} * INT_{Res}\right]$$

$$Com\ kW_{saved} = NUMUNIT * ComShare\left[\left(\frac{\Delta W}{1{,}000}\right) * CF_{Com} * ISR_{Com} * INT_{Com}\right]$$

Where:

kWh_{saved} = First-year electric energy savings

kW_{saved} = Summer peak electric demand savings

$NUMUNIT$ = Number of bulbs

$ResShare$ = Percentage of light bulbs installed in residential applications (accounts for leakage)

$ComShare$ = Percentage of light bulbs installed in commercial applications (accounts for leakage)

ΔW = Delta watts = Baseline wattage minus efficient lighting product wattage

HOU = Annual operating hours

ISR = In-service rate

INT = Cooling and heating interactive effects

CF = Summer/winter peak coincidence factor

Res = Residential values

Com = Commercial values

Table 5-1 presents the sources of savings assumptions used to calculate program ex post gross energy and demand savings.

Table 5-1. Ex Post Savings Assumption Sources

Assumption	Source of Residential Assumptions	Source of Commercial Assumptions
Sales to residential/ commercial customers	2011 and 2012 Intercept Surveys	
Leakage rate	GIS analysis	
Baseline wattage	Incandescent equivalent adjusted for Energy Independence and Security Act (EISA) based on 2016 Retailer Shelf Audit and U.S. Department of Energy's (DOE) Energy Conservation Standards for Incandescent Reflector Lamps	
Replacement wattage	Actual product wattage	
HOU	2017 DEP-DEC Residential Lighting Logger Study (LEDs) 2012 DEP Residential Metering Study (CFLs)	2016 DEP Commercial Lighting Logger Study
First-year ISR and future installation rate trajectory	2017 DEP-DEC Residential Lighting Logger Study (LEDs) 2013 DEP General Population Survey (CFLs) 2014 DEP Storage Log Study (future installations)	2016 DEP Commercial Lighting Logger Study 2014 DEP Storage Log Study (future installations)
Interactive effects	2012 DOE2 Simulation Models	No interactive effects applied
CF (summer and winter)	2017 DEP-DEC Residential Lighting Logger Study (LEDs) 2012 DEP Residential Metering Study (CFLs)	2016 DEP Commercial Lighting Logger Study

Source: Opinion Dynamics analysis and prior evaluation reports.

Table 5-2 provides the savings assumptions used to calculate ex post gross savings. Following the table, we provide greater detail on each assumption.

Appendix M contains a detailed overview of the ex ante savings assumptions and their sources.

Table 5-2. Ex Post Savings Assumption Values

Assumption	DEP EEL Program		DEC Retail LED Program	
	Residential	**Commercial**	**Residential**	**Commercial**
Sales to residential/ commercial customers*	0.817	0.099	0.880	0.107
Leakage rate	0.084	0.084	0.013	0.013
Baseline wattage	Minimum efficiency baseline adjusted for applicable federal standards			
Replacement wattage	Actual product wattage			
HOU	2.922 (CFLs) 2.881 (LEDs)	6.930 (CFLs) 5.783 (LEDs)	2.881	5.783
First-year ISR	0.795 (CFLs) 0.943 (LEDs) 1.0 (fixtures)	0.879 (CFLs) 0.979 (LEDs) 1.0 (fixtures)	0.865 (LEDs) 1.0 (fixtures)	0.979 (LEDs) 1.0 (fixtures)
Interactive effects	0.94 (Energy) 1.27 (Summer peak) 0.50 (Winter peak)	1.0	0.94 (Energy) 1.27 (Summer peak) 0.50 (Winter peak)	1.0
Summer CF	0.1138 (CFLs) 0.1283 (LEDs)	0.4966 (CFLs) 0.5471 (LEDs)	0.1283	0.5471
Winter CF	0.0960 (CFLs) 0.1451 (LEDs)	0.1737 (CFLs) 0.1199 (LEDs)	0.1451	0.1199

Source: Opinion Dynamics analysis and prior evaluation reports.
* Together with the leakage rate, these values add up to 1.

Sales to Residential/Commercial Customers and Leakage Rate

Because the DEP EEL and DEC Retail LED programs rely on retail channels to reach customers, both residential and commercial customers end up purchasing and installing program-discounted lighting products. Due to longer operating hours, savings from the discounted lighting products installed in commercial settings are greater than residential savings. Furthermore, not all program bulbs are installed in homes where Duke Energy provides electric service (leakage). The nature of the upstream program design makes it difficult to limit the purchase of program-discounted products to Duke Energy customers only.

As part of the previous DEP EEL program evaluations (namely, 2011 and 2012 in-store intercept survey efforts), Navigant Consulting estimated the percentage of program sales to commercial versus residential customers (Table 5-3). We relied on these estimates to apportion program savings across residential and commercial customers for the current evaluation. We leveraged the results of the GIS analysis to estimate program leakage and adjusted program savings based on the results.

Table 5-3. Residential versus Commercial Installations

Metric	Percent of Sales
Share of sales to residential customers	89%
Share of sales to commercial customers	11%
Total	100%

Source: Navigant Consulting. EM&V Report for the 2013 Energy Efficient Lighting Program.

For leakage rates, we relied on the GIS analysis. As part of the analysis, we estimated both leakage in and leakage out, as well as leakage in for each program. Table 5-4 provides the results of the leakage rate analysis. As can be seen in the table, the overall leakage rate is 8.4% for the DEP EEL program and 1.3% for the DEC Retail LED program.

Table 5-4. Program Leakage Rates

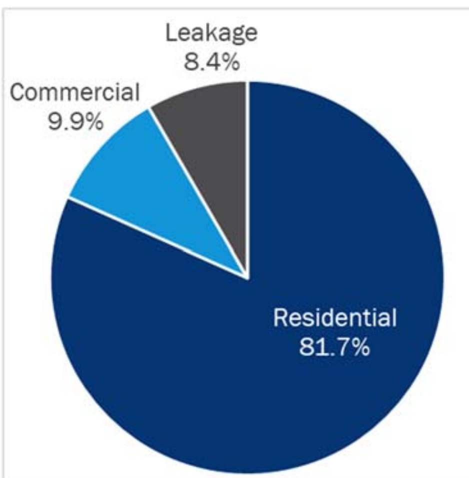
Program	Leakage Out Rate	Leakage In Rate	Total Leakage Rate
DEP EEL	8.7%	0.3%	8.4%
DEC Retail LED	3.4%	2.1%	1.3%

Source: Opinion Dynamics GIS analysis.

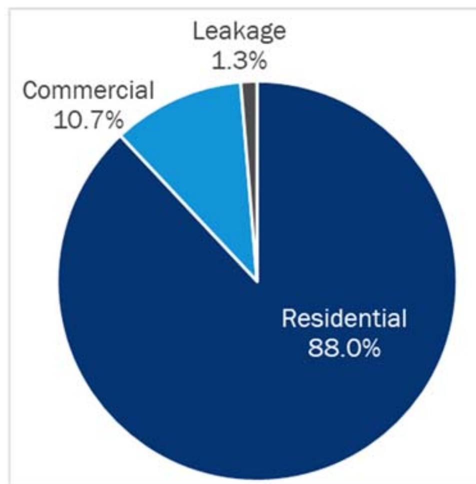
Figure 5-1 provides the distribution of program sales for each program across sectors and outside of each program's respective jurisdiction.

Figure 5-1. Sales to Residential/Commercial Customers and Leakage Rate Assumptions

DEP EEL Program



DEC Retail LED Program



Source: Opinion Dynamics GIS analysis.

Baseline Wattages

We used the minimum efficiency baseline approach to determine baseline wattages for program-discounted products for both programs (in both residential and commercial settings). Minimum efficiency standards in the market vary by product type based on the federal standards. Below we detail the methods we used to calculate baseline wattages for each product type.

General Service Products

Incandescent products have historically been the lowest efficiency product on the market. The 2007 EISA gradually phased out general service incandescent products, replacing them with halogens and thus making them the new baseline. The EISA regulations affected 100-watt incandescent products in January 2012, 75-watt incandescent products in January 2013, and 60-watt and 40-watt incandescent products in January 2014. However, products did not immediately disappear from the market, as manufacturers and retailers were allowed to sell through their existing inventory of incandescents. Because some incandescent products may still have been available for purchase in 2016, assuming a halogen baseline may not reflect the actual market and be too punitive to program savings.

To assess incandescent product availability and determine if any upward adjustments to the baseline wattage are warranted, Opinion Dynamics relied on the shelf audit research.

Of the 15 stores in DEP jurisdiction, none carried 100-watt or 75-watt incandescents. One retailer (a participating hardware store) carried one 60-watt incandescent product. The incandescent product was one of twenty 60-watt equivalent products available to the customers at that store. Two stores (both participating hardware stores) carried 40-watt incandescent products. In both stores, incandescent products represented a small portion of 40-watt equivalent products (2 out of 14 products in one store, and 3 out of 22 products at the other). The three stores that carried incandescent products accounted for a small percent of program sales (10%).

Of the 15 stores that we visited in the DEC jurisdiction, none carried incandescent products, and all but Club stores carried halogen products.

Given that we did not find any incandescent products in the DEC jurisdiction and the very limited availability of these products in the DEP service territory, we used halogen baseline wattages to estimate savings for general service CFLs and LEDs discounted through both the DEP EEL and DEC Retail LED program (see Table 5-5).

Table 5-5. Recommended Baseline Wattages for General Service Products

Equivalent Incandescent Wattage	EISA Baseline Wattage
100-watt equivalents	72
75-watt equivalents	53
60-watt equivalents	43
40-watt equivalents	29

Source: Opinion Dynamics analysis.

Reflector Products

To determine baseline wattages for flood lights and reflector bulbs and fixtures, we relied on the approach established by the Navigant Consulting team during its PY2013 evaluation of the DEP EEL program. Baselines were assigned based on a combination of maximum allowable wattage and the available information for replacement bulbs regarding wattage and lumen output. We accounted for higher efficiency standards introduced by the DOE Energy Conservation Standards for some incandescent reflector lamps that went into effect in July 2012. We deemed this approach reasonable given the complexities associated with assigning baseline wattages to reflector products, which include a non-linear lumen-to-watt ratio, a variety of bulb shapes and sizes of varying efficacies, and the discrepancy between maximum allowable wattages and product availability on store shelves.

Table 5-6. Baseline Wattage Assumptions for Reflector and Flood Light Products

Bulb Type	Lumen Range		Baseline Watts	Exemption Status
	Lower End	Upper End		
R, PAR, ER, BR, BPAR, or similar bulb shapes with medium screw bases with diameter > 2.5" (*see exceptions below)	600	739	50	
	740	849	50	
	850	999	55	
	1,000	1,300	65	
*ER30, BR30, BR40, ER40	400	449	40	Exempt
	450	499	45	Exempt
	500	1,419	65	Exempt
*R20	400	449	40	Exempt
	450	719	45	Exempt
*All reflector lamps below the lumen ranges specified above	200	299	30	
	300	399	40	

Source: Opinion Dynamics analysis and prior evaluation reports.

Specialty Products

Neither EISA nor DOE Energy Conservation standards for incandescent reflector lamps affect other specialty products, such as three-way bulbs, candelabra bulbs, and globe bulbs. As such, we used incandescent equivalent wattage as the baseline for these specialty products.

Replacement Wattage

For the replacement wattage, we used the actual bulb wattage associated with each discounted lighting product. We compared the listed wattage to lumen outputs and measure descriptions where possible to ensure that the most accurate wattage was applied.

Hours of Use and Coincidence Factors

A light metering study is the industry standard to estimate HOU and CFs. Depending on the technology and customer type, we relied on several metering studies for HOU and CF for the two programs.

On the residential side, HOU and CF assumptions for CFLs (for the DEP EEL program only) were drawn from the 2012 DEP Residential Metering study. Table 5-7 provides a summary of the HOU and CF values for CFLs.

Table 5-7. Residential HOU and CF Assumptions for CFLs

Statistic	CFL Value
HOU	2.922
Summer CF	0.1138
Winter CF	0.0960

Source: Prior evaluation reports.

Residential HOU and CF assumptions for LEDs for both programs are based on the results from the 2016 DEP-DEC Residential Lighting Logger study. As part of the study, we metered LED usage across a representative sample of 107 homes across DEP and DEC jurisdictions, including 46 homes in the DEP jurisdiction and 61 homes in the DEC jurisdiction. The study yielded updated LED- and Carolinas-specific residential HOU and CF estimates. Table 5-8 provides LED HOU and CF estimates from the study.

Table 5-8. Residential HOU and CF Assumptions for LEDs

Statistic	LED Value
HOU	2.881
Summer CF	0.1283
Winter CF	0.1451

Source: Opinion Dynamics lighting logger analysis.

Appendix N provides additional results from the study.

On the commercial side, we applied commercial HOU and CF estimates from the 2015–2016 DEP Commercial Lighting Logger study completed by Opinion Dynamics as part of the PY2015 DEP EEL program evaluation. As part of the study, Opinion Dynamics logged CFL and LED lighting in 79 commercial facilities across the DEP service territory over an 8-month period.[13] Table 5-9 provides recommended HOU and CF assumptions for commercial installation.

Table 5-9. Commercial HOU and CF Assumptions

Statistic	CFL	LED
HOU	6.930	5.783
Summer CF	0.4966	0.5471
Winter CF	0.1737	0.1199

Source: Opinion Dynamics lighting logger analysis.

First-Year In-Service Rate and Future Savings

First-year ISR varies by technology, customer type (residential vs. commercial), and jurisdiction. For residential CFL installations (for the DEP EEL program only), we relied on the results from the general population survey completed by Navigant Consulting as part of the DEP EEL PY2013 evaluation. For residential LED installations, we relied on results from the 2016 Residential Lighting Logger study completed as part of this evaluation. As

[13] Opinion Dynamics placed loggers in 88 facilities, but excluded logger data from 9 facilities during the data-cleaning process.

part of the study, we collected information on the number of LEDs installed and in storage. We estimated the first-year ISR by dividing the total number of LEDs installed by the total number of LEDs installed and in storage. We estimated independent ISRs for DEP and DEC. For commercial savings, we relied on the results of the 2015–2016 DEP Commercial Lighting Logger Study that Opinion Dynamics completed as part of the PY2015 DEP EEL program evaluation. As part of that study, we completed a full inventory of all medium screw-based sockets within each business facility, including bulbs that were in storage. The ISR for a given bulb type is defined as the number of installed bulbs divided by the total number of bulbs found within the facility. For lighting fixtures, we used a first-year ISR of 100% for both residential and commercial sectors and across both programs. It is highly unlikely that customers who purchase lighting fixtures do not install them right away. Table 5-10 summarizes the first-year ISRs that we used in the impact analysis.

Table 5-10. First-Year In-Service Rates

Year	DEP			DEC		
	LEDs	**CFLs**	**Fixtures**	**LEDs**	**CFLs**	**Fixtures**
Residential	94.3%	79.5%	100.0%	86.5%	N/A	100.0%
Commercial	97.9%	87.9%	100.0%	97.9%	N/A	100.0%

Source: Opinion Dynamics lighting logger analysis and prior evaluation reports.

Although the first-year ISR is less than 100% for both CFLs and LEDs, research studies across the country have found that customers eventually install nearly all bulbs received through a program. The two main approaches to claiming savings from these later installations are: (1) staggering the savings over time and claiming some in later program years and (2) claiming the savings from the expected installation in the program year the product was sold but discounting the saving by a societal or utility discount rate. While the "staggered" approach allows program administrators to more accurately capture the timing of the realized savings, the "discounted savings" approach allows for the simplicity of claiming all costs and benefits during the program year and eliminates the need to keep track of and claim savings from future installations.

Opinion Dynamics used the discounted savings approach to claim savings from future installations.

To allocate installations over time, we relied on the installation trajectory from the lighting storage log study conducted by Navigant Consulting as part of the PY2013 DEP EEL program evaluation. The study estimates that participants install 97% of bulbs within 4 years of purchase. Table 5-11 presents the approach to developing installation rates over the 4 years following purchase, based on the study.

Table 5-11. Installation Rate Trajectory Formulas

Year	Installation Rate Trajectory	Incremental Installation Trajectory
Year 1	First-Year ISR	First-Year ISR
Year 2	((1 – First-Year ISR) * 41%) + First-Year ISR	(1 – First-Year ISR) * 41%
Year 3	((1 – First-Year ISR) * 69%) + First-Year ISR	(1 – First-Year ISR) * 28%
Year 4	97%	97% – ((1 – First-Year ISR) * 69%) + First-Year ISR

Source: Uniform Methods Project (UMP) Lighting Evaluation Protocols.

To claim savings from future installations of PY2015 sales, we discounted all future savings by the utility-specified discount rate using the net present value (NPV) formula (Equation 5-3). Program staff provided discount rates for each utility.

Equation 5-3. Net Present Value Formula

$$NPV = \frac{R_t}{(1+i)^t}$$

Where:

R = savings

t = number of years in the future savings take place

i = discount rate

Table 5-12 provides NPV-adjusted ISRs by program, sector, and bulb type.

Table 5-12. Final NPV-Adjusted In-Service Rates

	DEP			DEC		
Year	**LEDs**	**CFLs**	**Fixtures**	**LEDs**	**CFLs**	**Fixtures**
Residential	95.8%	95.2%	100.0%	95.9%	N/A	100.0%
Commercial	97.9%	96.1%	100.0%	97.9%	N/A	100.0%

Source: Opinion Dynamics analysis.

Interactive Effects

CFLs and LEDs emit less heat than incandescents, resulting in increased heating loads as more energy is needed to supplement heat emitted by incandescent light bulbs. Efficient bulbs also decrease cooling loads as less energy is needed to compensate for heat given off by incandescents. Application of interactive effects accounts for the changes in heating and cooling loads in the estimation of savings.

Consistent with the most recent evaluation, we used residential HVAC system interaction factors of 0.94 for energy savings, 1.27 for summer peak demand savings, and 0.50 for winter peak demand savings. These interactive effects estimates are based on the simulation analysis performed as part of the 2012 DEP EEL program evaluation by Navigant. Our review of the estimates determined that these factors were reasonable, relatively recent, and based on Carolinas-specific research.

Due to differences in technologies, interactive effects caused by CFLs and LEDs are likely different. The difference in these effects is unclear, especially as it pertains to the DEP and DEC jurisdictions. We are unaware of any existing modeling or simulation efforts to estimate LED-specific interactive effects. In our professional judgment, the difference between CFL and LED interactive effects is likely to have only a marginal impact on energy and peak demand savings. Given the small anticipated change in energy and peak demand savings estimates due to LED-specific interactive effects and the relatively high cost of conducting the modeling and simulation needed to estimate those interactive effects, Opinion Dynamics used previously established interactive effect estimates for CFLs from the study cited above.

For both DEP EEL and DEC Retail LED programs, we set commercial interactive effects to 1.0. In the absence of a reliable interactive effects estimate and a projected small impact of the lighting products on heat loss or gain given the nature of commercial-scale HVAC systems in place in commercial settings; not applying interactive effects is both reasonable and appropriate.

5.2 Gross Impact Results

This section presents the results of the gross impact analysis for the DEP EEL and DEC Retail LED programs.

5.2.1 Review of Program Tracking Data and Ex Ante Savings

As a first step in the gross impact analysis, the evaluation team analyzed the program sales data for any gaps, inconsistencies, and inaccuracies. We found that data fields were generally clean and fully populated, with very minor exceptions, and we did not identify any observable gaps between invoice dates and found the data to be complete and reasonable. Opinion Dynamics identified and corrected slight inconsistencies in bulb categorizations, bulb wattage, and lumen assignments. None of those inconsistencies was considerable nor resulted in a significant difference in savings.

As mentioned in the earlier section of this report, Duke Energy changed its approach to estimating ex ante savings during the current evaluation period. Duke Energy relied on per-bulb savings by product category, using categories defined by bulb technology, shape, and application (e.g., general purpose CFLs, outdoor reflector LEDs, 3-way LEDs), and applying a single set of values across all products within a category based on evaluation-recommended savings from the PY2015 DEP EEL program evaluation. We compared these ex ante per-bulb savings values to those provided by PY2015 DEP EEL program evaluation and found that all values matched perfectly. Table 5-13 provides the ex ante per-bulb savings values associated with each product category that program staff used to generate ex ante savings for both the DEP EEL and DEC Retail LED programs.

Table 5-13. Applied Ex Ante Per-Bulb Savings

	Residential Per-Bulb Savings			Commercial Per-Bulb Savings		
Product Category	Energy (kWh)	Summer Peak (kW)	Winter Peak (kW)	Energy (kWh)	Summer Peak (kW)	Winter Peak (kW)
Reflector track lighting LED	28.88	4.16	1.38	62.94	16.31	3.58
Reflector recessed LED	37.95	5.47	1.82	82.70	21.43	4.70
Reflector outdoor LED	50.88	7.33	2.44	110.87	28.73	6.30
Globe LED	22.32	3.22	1.07	48.64	12.61	2.77
General purpose LED	32.50	4.69	1.56	70.83	18.35	4.03
Fixture LED	29.26	4.22	1.40	61.61	15.97	3.50
Candelabra LED	25.86	3.73	1.24	56.35	14.60	3.20
3-way LED	71.77	10.35	3.44	156.40	40.53	8.89
Reflector recessed CFL	32.89	4.74	1.57	83.83	16.47	5.77
Globe CFL	29.25	4.22	1.40	74.54	14.65	5.13
General purpose CFL	34.45	4.97	1.65	87.81	17.25	6.04
Fixture CFL	52.88	7.62	2.53	133.43	26.22	9.18
Candelabra CFL	30.33	4.37	1.45	77.31	15.19	5.32

Source: Opinion Dynamics analysis of program tracking data.

5.2.2 DEP EEL Program Ex Post Gross Savings

Review of product category fields in the program tracking data extract revealed inconsistent bulb categorization for six unique products (identified by unique model number), which resulted in miscategorization of a small number of total bulb sales (0.1%). As such, total ex ante energy savings would have been very slightly higher (<0.1%) if the program had used the corrected product categories. One unique product was also recorded with inconsistent pack sizes. Correcting the discrepant pack size increased total bulb sales by 0.2% and would have increased ex ante savings by the same percentage.

Following program tracking data review, we calculated ex post gross energy and peak demand savings achieved by the DEP EEL program during PY2016–2017.

The program achieved 125,002 MWh in ex post gross energy savings, 22.0 MW in ex post gross summer peak demand savings, and 8.1 MW in ex post gross winter peak demand savings. The respective gross realization rates are 89% for energy savings, 95% for summer peak demand savings, and 113% for winter peak demand savings.Table 5-14 presents the results of the analysis.

Table 5-14. DEP EEL Program Gross Impact Results by Sector

Savings Type	Savings Category	Ex Ante Savings	Ex Post Gross Savings	Gross Realization Rate
Energy savings (kWh)	Residential savings	109,576,023	97,829,373	89%
	Commercial savings	30,639,454	27,172,524	89%
	Total	140,215,477	125,001,897	89%
Summer peak demand savings (kW)	Residential savings	15,796	15,503	98%
	Commercial savings	7,215	6,458	90%
	Total	23,011	21,962	95%
Winter peak demand savings (kW)	Residential savings	5,246	6,412	122%
	Commercial savings	1,880	1,654	88%
	Total	7,126	8,066	113%

Source: Opinion Dynamics analysis of program tracking data.

5.2.3 DEC Retail LED Program Ex Post Gross Savings

Review of product category fields revealed inconsistent bulb categorization for 13 unique products (identified by unique model number), which resulted in miscategorization of a small number of total bulb sales (1.6%). As such, total ex ante energy savings would have been slightly higher (0.5%) if the program had used the corrected product categories.

Following program tracking data review, we calculated ex post gross energy and peak demand savings achieved by the DEC Retail LED program during PY2016–2017.

The program achieved 57,847 MWh in ex post gross energy savings, 10.7 MW in ex post gross summer peak demand savings, and 4.0 MW in ex post gross in winter peak demand savings. The respective gross realization rates are 110% for energy savings, 121% for summer peak demand savings, and 155% for winter peak demand savings. Table 5-15 presents the results of the analysis.

Table 5-15. DEC Retail LED Program Gross Impact Results by Sector

Savings Type	Savings Category	Ex Ante Savings	Ex Post Gross Savings	Gross Realization Rate
Energy savings (kWh)	Residential savings	41,630,988	45,761,993	110%
	Commercial savings	10,971,300	12,084,862	110%
	Total	52,602,288	57,846,855	110%
Summer peak demand savings (kW)	Residential savings	6,002	7,543	126%
	Commercial savings	2,843	3,132	110%
	Total	8,845	10,676	121%
Winter peak demand savings (kW)	Residential savings	1,993	3,359	169%
	Commercial savings	624	686	110%
	Total	2,617	4,045	155%

Source: Opinion Dynamics analysis of program tracking data.

5.3 References

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6. Net-to-Gross Analysis

This section describes our approach for estimating the NTGR for each program and presents the resulting NTGRs and program net impacts.

6.1 Methodology

The NTGR represents the portion of the gross energy savings associated with a program-supported measure or behavior change that would not have been realized in the absence of the program. In other words, the NTGR represents the share of gross savings that are attributable to the program. The NTGR consists of free-ridership (FR) and spillover (SO) and is calculated as $(1 - FR + SO)$. FR is the proportion of the program-achieved verified gross savings that would have been realized absent the program. SO is additional energy-saving actions that are influenced by program interventions but did not receive program support. Sales data modeling only produces an estimate of FR.

The assessment of NTGR for upstream residential lighting programs is especially challenging for the following reasons:

- Because customers purchase discounted bulbs in a retail setting where they do not need to provide contact information, there is no list of participants with whom we can conduct a follow-up self-report NTGR survey (i.e., customers who purchased discounted bulbs through the program). Because light bulbs are a low-cost commodity product, most customers do not put extensive thought into or have reliable recall of their purchase decision. Customers may not even be aware that they purchased discounted bulbs. Therefore, we cannot conduct a general population survey in which we ask customers about their past light bulb purchases and the influence of program discounts on those purchases.
- Although we have detailed data regarding sales for the bulbs associated with the program, we lack any information about sales of other bulbs sold at the same retailers (including less-efficient and non-discounted products). Thus, while we can successfully model the relationship between bulb price and sales for the products associated with the program, we cannot take into consideration how other factors (e.g., discounts of non-program bulbs) may have affected our results.
- Program interventions may affect manufacturer distribution and retailer stocking practices, resulting in shelf space changes. Those changes are not visible to participants and therefore call for research with a range of market actors and, ultimately, triangulation of NTGR estimates from multiple sources.

To understand customers' counterfactual behaviors and to develop the most accurate possible estimates of the programs' NTGRs, Opinion Dynamics relied on two distinct methods:

- Sales data modeling
- Retailer and manufacturer interviews

Our assessment of NTGRs for the two programs was identical in approach. Below we discussed the methodology associated with each NTGR approach.

6.1.1 Sales Data Modeling

The sales data modeling approach to estimating NTGRs is based on the simple economic principle that a change in price causes a change in product sales. This assumption is the foundation of upstream program theory, so measuring the effect of program discounts on bulb sales serves as a good indicator of a program's net impact. The sales data modeling method models this relationship between product price and sales volume using the program sales data. The model produces price elasticity curves, allowing for predictions of sales at various prices, namely, program-discounted and non-discounted price levels.

For the modeling effort to succeed, there must be sufficient price variation for identical products during the evaluation period. The program implementer supported this analysis by facilitating price variation via changes in program discounts throughout the year across the two programs. As the first step in our analysis, we reviewed the data to confirm sufficient variation in product pricing. Our analysis confirmed sufficient price variation to support data modeling. In fact, price variation achieved in PY2016–2017 for the DEP EEL program exceeded that observed in the previous program years, namely, PY2014 and PY2015.

The program tracking data for both programs contained transaction-level sales summaries. Depending on the retailer and manufacturer, transaction periods ranged from 1 week to 1 month, though the majority were weekly. To ensure time series consistency and to maximize the potential for capturing the effect of in-store events on bulb sales, we normalized transaction periods to a weekly level. In instances where transactions were available only at the monthly level, the sales were split evenly across weeks of the month.

To reach our final price elasticity estimates, we fit a series of theoretically driven models predicting sales volume from product price. These models all fell into two categories: (1) models that included bulb characteristics (e.g., lumens) and interactions between bulb characteristics and (2) models that included unique product identifiers. For each model, we examined several diagnostics to assess the model's performance in terms of efficiency, omitted variables, and heteroscedasticity of residuals.[14] We also considered model fit indices, favoring models with larger R-squared values[15] and lower Akaike's Information Criterion (AIC) values[16] relative to other models based on comparable bulb quantities or sales transactions.

The simplest model, which used only unique product identifiers (inherently representative of all bulb characteristics), emerged as the best performing for both the DEP EEL and DEC Retail LED programs. Although the methodology and model design were the same for both programs, we present separate results for each.

Equation 6-1 contains the final sales data model specification. As is common in this type of analysis, we used the log of both price and sales quantity, which greatly improves the distributions of those variables, and allows for the interpretation of the price coefficient as the percent increase in sales given a one percent decrease in price, simplifying the process of analyzing price elasticity and NTGR.

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[14] Heteroscedasticity is a statistical term that describes errors in prediction that vary in size across different values of a predictor. One of the assumptions of the OLS regression is that the errors are homoscedastic (that the variance around the regression line is the same for all values of a predictor variable), so when they are heteroscedastic, an assumption of the method is violated.

[15] R-squared value is a summary statistic for many regression techniques. It shows the proportion of the total variance in the outcome variable that is correctly predicted by the model's predictor variables.

[16] AIC is a summary statistic that is based on how well the outcome variable is predicted given the number of predictor variables in the regression model. The AIC value has no inherent meaning except in comparison to the values on the same statistic produced by alternative models under consideration. Modelers seek to minimize the AIC value, along with other ways of judging the models.

Equation 6-1. Final Sales Data Model Specification

$$ln(Q_m) = \alpha + \beta_1 ln(P_m) + \sum_{\mu}(\beta_\mu model\ dummy_m)$$

Where:

m = model

ln = natural log

Q = quantity of bulbs sold

P = price per bulb[17]

model dummy = a vector of dummy variables equaling 1 for each unique model number, and 0 for all others

β_1 = coefficient representing average price elasticity

β_μ = a vector of coefficients representing each unique model number (*m*)

α = constant

Using the modeled results, the evaluation team estimated sales at non-discounted prices using Equation 6-2. We used MSRP data supplied as part of the program sales data extract for estimates of non-discounted prices.

Equation 6-2. Estimating Sales at Non-Discounted Prices

$$\widehat{Sales}_{wo} = Sales_w * \left(\frac{Price_{wo}}{Price_w}\right)^{PC}$$

Where:

$\widehat{Sales}_{wo}$ = Estimated sales without discount (MSRP)

$Sales_w$ = Sales with discount (actual sales)

$Price_{wo}$ = Price without discount (MSRP)

$Price_w$ = Price with discount (actual price)

PC = Price coefficient

We excluded bulbs sold through the Dollar/Discount retailer channel from the sales data modeling based on feedback from retailer and manufacturer staff due to lack of price variation. We developed NTGRs by comparing the predicted sales at non-discounted prices to the actual sales at program-discounted prices using Equation 6-3 below.

Equation 6-3. Sales Data Modeling NTGR Estimation Formula

$$NTGR = \frac{\widehat{Sales}_{wo} - Sales_w}{Sales_w} = \frac{NetSales}{DiscountedSales}$$

[17] We received two discounted prices in the data set, one that reflects program discounts and one that reflects other retailer or manufacturer discounts. We included the other retailer or manufacturer discounts in all projections.

Where:

$NTGR$ = NTGR (excluding any SO)

$\widehat{Sales}_{wo}$= Estimated sales without discount (MSRP)

$Sales_w$= Sales with discount

6.1.2 Retailer and Manufacturer Interviews

Opinion Dynamics completed a total of 33 interviews across a range of participating manufacturers and retailers in DEP and DEC jurisdictions to support the NTGR assessment. Of the 33 interviews, 21 informed the NTGR assessment for the DEP EEL program and 21 for the DEC Retail LED program. The interviews yielded feedback from retailers and manufacturers that accounted for 83% of DEP EEL program sales and 90% of DEC Retail LED program sales. We asked each interviewee to estimate the percentage by which the sales of efficient bulbs would be different in the absence of the program for each bulb category (i.e., standard and specialty; CFLs and LEDs). Respondents who said that sales of energy-efficient products would have decreased received a follow-up question asking to estimate the percent that would have shifted to other energy-efficient products (e.g., a percentage of LEDs that would have been CFLs or percent of ENERGY STAR LEDs that would have been non-ENERGY STAR LEDs), to account for the efficient product substitution effect. The percentage of energy-efficient bulb sales expected to move to non-energy-efficient products in the program's absence represents the NTGR for the respondent.

To the degree possible, we asked the NTGR questions for each major program-discounted product type, namely, standard and specialty LEDs, standard and specialty CFLs (only for DEP EEL program), and fixtures. As part of the interview guide, we embedded a range of validation questions to check responses for consistency. We asked respondents to provide their rationale for the reported percent change in sales in the absence of the program. Other questions included exploratory questions asking retailers to rank the importance of the program rebates as compared to the other factors, such as EISA, the need to stay ahead of the competition in terms of technological advancements, and manufacturing practices.

As part of the NTGR analysis, we estimated a NTGR for each respondent we interviewed, which we aggregated to the retail chain level and sales-weighted to the program level. As part of the analysis and aggregation process, a single manufacturer could contribute to the NTGRs across several retail channels, as long as that manufacturer was supplying its product to those retail channels.

6.2 NTGR Results

This section contains NTGR results for each program.

6.2.1 DEP EEL Program NTGR Results

Below we first present the NTGR results from sales data modeling and retailer and manufacturer interviews separately, then provide an overview of the triangulation approach, and finally present the final program-level NTGR for the DEP EEL program.

Sales Data Modeling

Using the results from the sales data model, Opinion Dynamics estimated total sales at program-discounted and non-discounted prices separately for CFLs and LEDs. For LEDs, price variation within product categories was sufficient to model outputs separately for each product category (standard LEDs, specialty LEDs, reflector LEDs, and LED fixtures). Because 95% of program-discounted CFLs were standard bulbs, this breakout was not possible or practical for CFLs. We averaged product-level NTGRs to an overall sales data modeling-based NTGR, weighting the contribution of each estimate in proportion to product sales in the program. Because sales records across the entire evaluation period were used and there was no sampling needed, the concept of sampling error does not apply, so there is no estimate of precision for the resulting NTGR estimate.

According to the results of the sales data modeling, customers would have purchased slightly fewer LEDs and considerably fewer CFLs in the absence of program discounts. We found that 90% of all LED program sales would have occurred regardless of the program discounts, and slightly more than half of program CFL sales (54%) would have occurred in the absence of the program discounts. In other words, the NTGR is 0.10 for LEDs and 0.46 for CFLs. When weighted by program sales, this reflects a program-wide NTGR of 0.20. Within LEDs, fixtures and standard bulbs showed the lowest price elasticity and therefore NTGRs (0.03 and 0.06, respectively), while reflector and specialty bulbs were more price-elastic, resulting in higher NTGRs (0.14 and 0.20, respectively). Table 6-1 summarizes NTGR results from sales data modeling. Note that the 0.20 NTGR established through the sales data modeling methods excludes the Dollar/Discount retailer channel.

Table 6-1. DEP EEL Program NTGRs from Sales Data Modeling

Bulb Type	NTGR	% of Total Sales
All LEDs	0.10	67%
LED standard	*0.06*	*40%*
LED specialty	*0.20*	*8%*
LED reflector	*0.14*	*14%*
LED fixture	*0.03*	*5%*
All CFLs	0.46	33%
Total	0.20	100%

Source: Opinion Dynamics sales data modeling analysis.

We used the modeling results to estimate price elasticities for both CFLs and LEDs. The elasticity curves show minimal to moderate sensitivity to changes in price. CFLs exhibited greater sensitivity to price changes than LEDs. As can be seen in Figure 6-1, LED price elasticity is only 0.09 and CFL elasticity is 0.37. A price elasticity of 0.09 for LEDs means that for every 100% increase in price, there is a 9% decrease in sales. Similarly, a price elasticity of 0.37 for CFLs means that for every 100% increase in price there is a 37% decrease in sales.

Figure 6-1. Modeled Price Elasticity Based on DEP EEL Program Sales Data

Source: Opinion Dynamics sales data modeling analysis.

The higher NTGR for CFLs than LEDs likely reflects consumer preferences shifting away from CFLs as superior-quality LEDs continue to drop in price and grow in popularity. It requires a greater discount for customers to purchase CFLs because of their preference for LEDs.

Retailer and Manufacturer Interviews

Using the results from the retailer and manufacturer interviews, we estimated NTGRs by retailer channel. Dollar and Discount stores received the highest NTGR of 1.00, while NTGRs for other retail channels range from 0.32 for DIY and grocery stores to 0.38 for Big Box stores. The NTGR of 1.00 for the Dollar/Discount channel reflects feedback from corporate retailer and manufacturer contacts that availability of energy-efficient lighting products at these stores is solely dependent on the DEP EEL program. In the program's absence, energy-efficient lighting products would not be stocked at these locations. Customers who shop at these stores, in turn, are likely to be highly price sensitive and, in the absence of the energy-efficient products offered through the program, would have defaulted to the lowest-cost alternative present on the market, which is currently a halogen bulb. Table 6-2 provides NTGRs for each retail channel included in the DEP EEL program.

Table 6-2. DEP EEL Program NTGRs from Retailer and Manufacturer Interviews

Retailer Channel	NTGR	% of Program Sales
DIY	0.32	30%
Club	0.33	19%
Dollar/Discount	1.00	18%
Big Box	0.38	17%
Hardware	0.37	15%
Grocery	0.32	<1%
Other	0.34	<1%
Total	0.46	100%

Source: Retailer and manufacturer interviews.

Final NTGR Estimation

Opinion Dynamics combined the NTGRs derived through the two methods described above using the following triangulation approach to arrive at a final program-wide NTGR, summarized in Table 6-3:

- Given the complete dependence of lighting product availability on program operations within the Discount/Dollar retailer channel and the likely price sensitivity of the customers shopping at those stores, we assigned a NTGR of 1.00 to all sales made through this retail channel.
- We based the NTGRs for all other retail channels on an average of the bulb-weighted average derived from each of the two approaches. By averaging the NTGR of 0.20 from the sales data modeling analysis and 0.34 from retailer and manufacturer interviews,[18] we arrive at a NTGR of 0.27 for bulbs sold through all retail channels except Dollar and Discount stores.
- The bulb-weighted average of the Dollar/Discount NTGR estimate of 1.00 and the NTGR estimate for all other retail channels of 0.27 produces the final program-wide NTGR of 0.40.

Table 6-3. Final DEP EEL Program-Wide NTGR Triangulation

Retail Channel	NTGR Source	NTGR	% of Program Sales
Dollar/Discount	Retailer/manufacturer interviews	1.00	18%
All other channels	Combined	0.27	82%
	Sales data modeling*	*0.20*	
	Retailer/manufacturer interviews*	*0.34*	
Overall		0.40	100%

Source: Opinion Dynamics analysis.
* Excludes the Dollar/Discount channel.

6.2.2 DEC Retail LED Program NTGR Results

Below we first present the NTGR results from sales data modeling and retailer and manufacturer interviews separately, then provide an overview of the triangulation approach, and finally present the final program-level NTGR for the DEC Retail LED program.

Sales Data Modeling

Using the results from the sales data model, Opinion Dynamics estimated total sales at program-discounted and non-discounted prices separately for each LED product category (standard LEDs, specialty LEDs, reflector LEDs, and LED fixtures). To arrive at the program-wide NTGR, we weighted the bulb category-specific NTGR estimates by program sales. Because sales records across the entire evaluation period were used and there was no sampling needed, the concept of sampling error does not apply, so there is no estimate of precision for the resulting NTGR estimate.

According to the results of the sales data modeling, customers would have purchased fewer LEDs in the absence of program discounts. We found that 73% of all LED program sales would have occurred regardless of the program discounts, i.e., a NTGR of 0.27. The NTGR is the highest for specialty LEDs (0.39) and lowest for standard LEDs and LED fixtures (0.21 and 0.16, respectively). Table 6-4 summarizes NTGR results from

[18] This NTGR excludes the Dollar/Discount retailer channel.

sales data modeling. Note that the 0.27 NTGR established through the sales data modeling methods excludes the Dollar/Discount retailer channel.

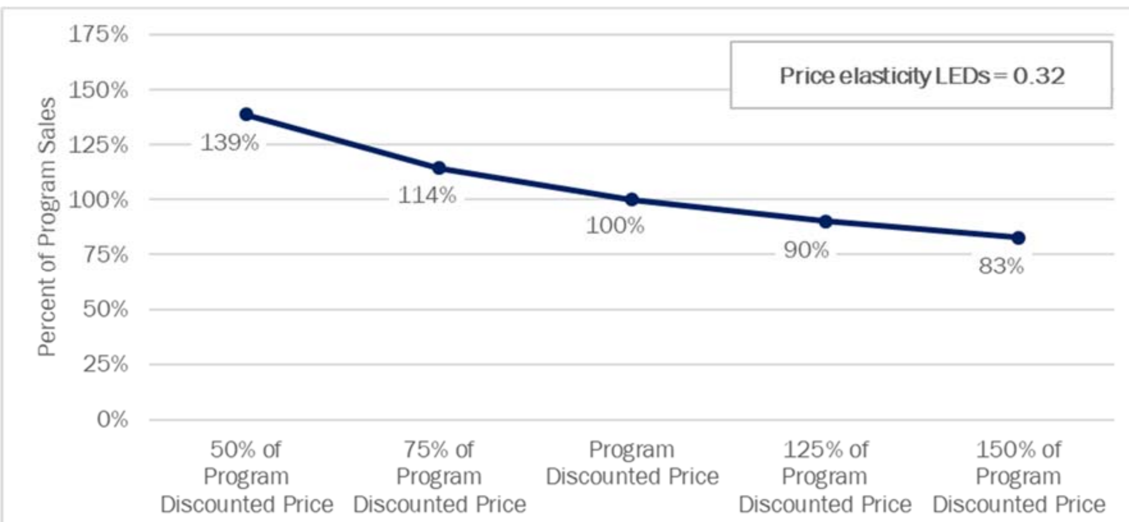
Table 6-4. DEC Retail LED Program NTGRs from Sales Data Modeling

Bulb Type	NTGR	% of Total Sales
LED standard	0.25	22%
LED specialty	0.39	21%
LED reflector	0.24	40%
LED fixture	0.23	16%
Total	0.27	100%

Source: Opinion Dynamics sales data modeling analysis.

We used the modeling results to estimate price elasticity for program bulbs. The elasticity curve shows moderate sensitivity to changes in price. As shown in Figure 6-2, LED price elasticity is 0.32, meaning that for every 100% increase in price, there is a 32% decrease in sales.

Figure 6-2. Modeled Price Elasticity Based on DEC Retail LED Program Sales Data



Source: Opinion Dynamics sales data modeling analysis.

Retailer and Manufacturer Interviews

Using the results from the retailer and manufacturer interviews, we estimated NTGRs by retail channel. The Dollar/Discount channel received a NTGR of 1.00, reflecting the feedback from corporate retailer and manufacturer contacts who said that availability of energy-efficient lighting products at these participating stores is solely dependent on the DEC Retail LED program. In the program's absence, energy-efficient lighting products would not be stocked at these locations. Customers who shop at these stores, in turn, are likely to be highly price sensitive and, in the absence of the energy-efficient products offered through the program, would have defaulted to the lowest-cost alternative present on the market, which is a halogen bulb. NTGRs for other retailer channels range from the low of 0.33 for Club stores to 0.51 for DIY stores. Table 6-2 provides NTGRs for each retail channel included in the DEC Retail LED program. As can be seen in the table, the overall NTGR for the program is 0.47.

Table 6-5. DEC Retail LED Program NTGRs from Retailer and Manufacturer Interviews

Retailer Channel	NTGR	% of Program Sales
Club	0.33	47%
DIY	0.51	36%
Dollar/Discount	1.00	10%
Big Box	0.46	7%
Total	0.47	100%

Source: Retailer and manufacturer interviews.

Final NTGR Estimation

Opinion Dynamics combined the NTGRs derived through the two methods described above using the following triangulation approach to arrive at a final program-wide NTGR, summarized in Table 6-6:

- Given the complete dependence of lighting product availability on program operations within the Discount/Dollar retail channel and the likely price sensitivity of the customers shopping at those stores, we assigned a NTGR of 1.00 to all sales made through this retail channel.
- We based the NTGRs for all other retail channels on an average of the bulb-weighted average derived from each of the two approaches. By averaging the NTGR of 0.27 from the sales data modeling analysis and 0.42 from retailer and manufacturer interviews,[19] we arrive at a NTGR of 0.34 for bulbs sold through all retail channels except Dollar and Discount stores.
- The bulb-weighted average of the Dollar/Discount NTGR estimate of 1.00 and the NTGR estimate for all other retail channels of 0.34 produces the final program-wide NTGR of 0.41.

Table 6-6. Final DEC Retail LED Program-Wide NTGR Triangulation

Retail Channel	NTGR Source	NTGR	% of Program Sales
Dollar/Discount	Retailer/manufacturer interviews	1.00	10%
All other channels	Combined	0.34	90%
	*Sales data modeling**	*0.27*	
	*Retailer/manufacturer interviews**	*0.42*	
Overall		0.41	100%

Source: Opinion Dynamics analysis.
* Excludes the Dollar/Discount channel.

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[19] This NTGR excludes the Dollar/Discount retailer channel.

6.3 Net Impact Results

The sections below provide net impact results for each program.

6.3.1 DEP EEL Program

We applied the program-level NTGR to ex post gross energy and peak demand savings to arrive at ex post net savings (Table 6-8). Program net energy savings for the DEP EEL program in PY2016–2017 were 50,001 MWh, net summer peak demand savings were 8.8 MW, and net winter peak demand savings were 3.2 MW.

Table 6-7. DEP EEL Program Ex Post Net Savings Summary

Savings Type	Ex Ante Savings	Ex Post Gross Savings	NTGR	Ex Post Net Savings	Net Realization Rate*
Energy savings (MWh)	140,215	125,002	0.40	50,001	89%
Summer peak demand savings (MW)	23.0	22.0	0.40	8.8	95%
Winter peak demand savings (MW)	7.1	8.1	0.40	3.2	113%

Source: Opinion Dynamics analysis of program tracking data.
* Denominator is ex ante net savings.

6.3.2 DEC Retail LED Program

We applied the program-level NTGR to ex post gross energy and peak demand savings to arrive at ex post net savings (Table 6-8). Program net energy savings in PY2016–2017 were 23,717 MWh, net summer peak demand savings were 4.4 MW, and net winter peak demand savings were 1.7 MW.

Table 6-8. DEC Retail LED Program Ex Post Net Savings Summary

Savings Type	Ex Ante Savings	Ex Post Gross Savings	NTGR	Ex Post Net Savings	Net Realization Rate*
Energy savings (MWh)	52,602	57,847	0.41	23,717	110%
Summer peak demand savings (MW)	8.8	10.7	0.41	4.4	121%
Winter peak demand savings (MW)	2.6	4.0	0.41	1.7	155%

Source: Opinion Dynamics analysis of program tracking data.
* Denominator is ex ante net savings.

7. Process Evaluation and Market Assessment

Opinion Dynamics relied on the following data collection and analytic activities to support evaluation of program processes and characterization of the lighting market in the DEP and DEC service territories.

- Program staff interviews
- Materials review
- Program tracking data analysis
- Retailer and manufacturer interviews
- Retailer shelf audits
- Residential lighting logger study

Section 4 provided a detailed overview of each data collection method, as well as targeted and achieved confidence and precision levels.

As part of the process evaluation specifically, Opinion Dynamics examined the following key program performance indicators:

- Retailer satisfaction with the programs
- Presence of program marketing in participating stores
- Retailer satisfaction with program marketing and training
- Knowledge of the programs and their benefits among sales staff at participating retailers

7.1 Researchable Questions

Process evaluation activities aimed at answering the following researchable questions for each program:

- How effective are the program implementation and data-tracking practices?
- How effective are the program marketing, outreach, and educational tactics?
- Are retailers and manufacturers satisfied with the programs?
- What are the strengths, weaknesses, and opportunities for program improvement?
- How have retailer stocking and sales practices changed?
- What lighting technologies do customers have in their homes?
- How does energy-efficient lighting penetration vary by customer type?
- How does lighting usage vary by customer type and room type?
- What are current and future trends in the lighting market, including retailer stocking practices and customer preferences and purchasing decisions?

7.2 Key Findings

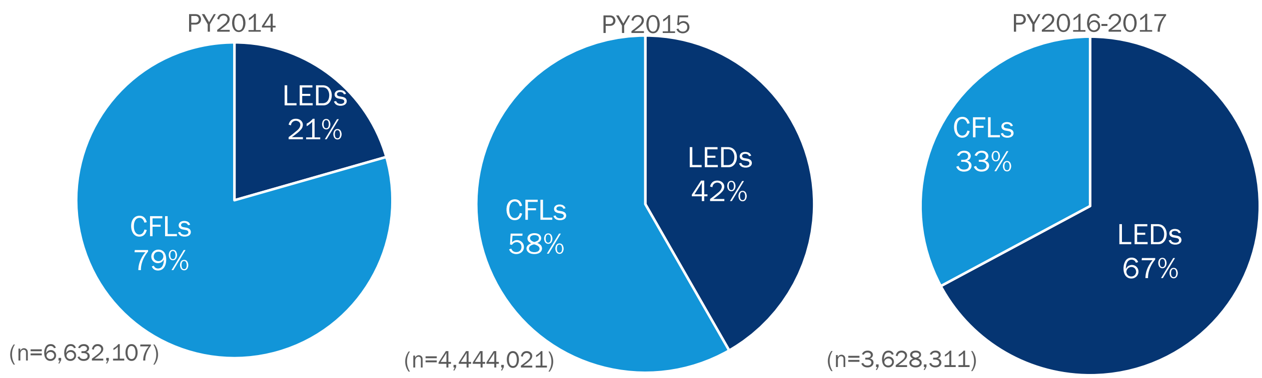
We present process findings results separately for the DEP EEL and DEC Retail LED programs. Sections below contain detailed key process and market findings.

7.2.1 DEP EEL Program

Program Participating Product Mix

The DEP EEL program sold 3,628,311 bulbs and fixtures in PY2016–2017, which included 2,436,436 LED bulbs and fixtures (67% of all sales) and 1,191,875 CFL bulbs and fixtures (33% of all sales). Overall program sales decreased by 18% compared to PY2015, when the program discounted 4,444,021 light bulbs and fixtures. Over time, the program has shifted its focus from CFLs to LEDs. In PY2016–2017, LED sales accounted for more than three times the portion of program sales that they did in PY2014 (67% compared to 21%), as shown in Figure 7-1.

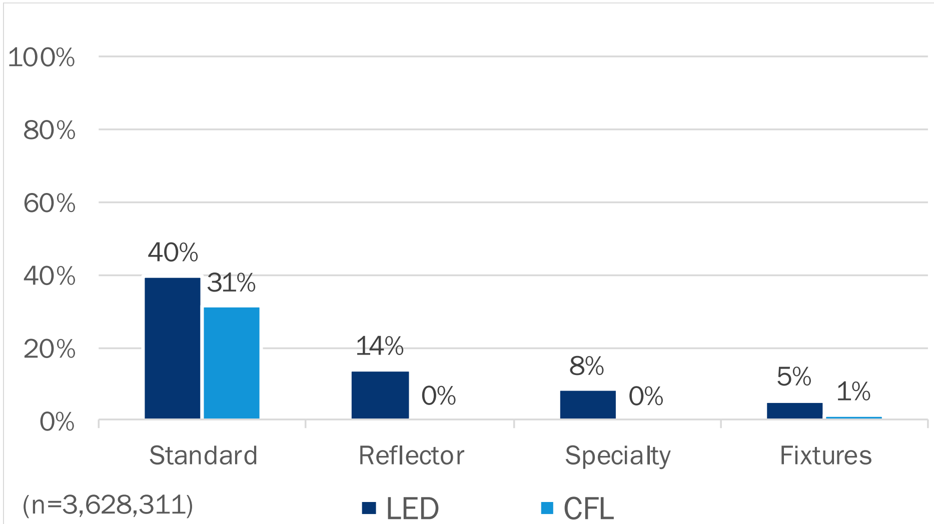
Figure 7-1. DEP EEL Program Changes in Bulb Technology Shares



Source: Opinion Dynamics analysis of program tracking data.

Standard products accounted for more than two-thirds of total bulb sales in PY2016–2017 (71%), followed by reflectors (14%) and specialty products (8%). Fixtures accounted for just 6% of all PY2016–2017 sales. CFLs were largely limited to the standard product category: 95% of PY2015–2016 CFL sales share were standard CFLs. LED products dominated specialty and reflector sales (Figure 7-2).

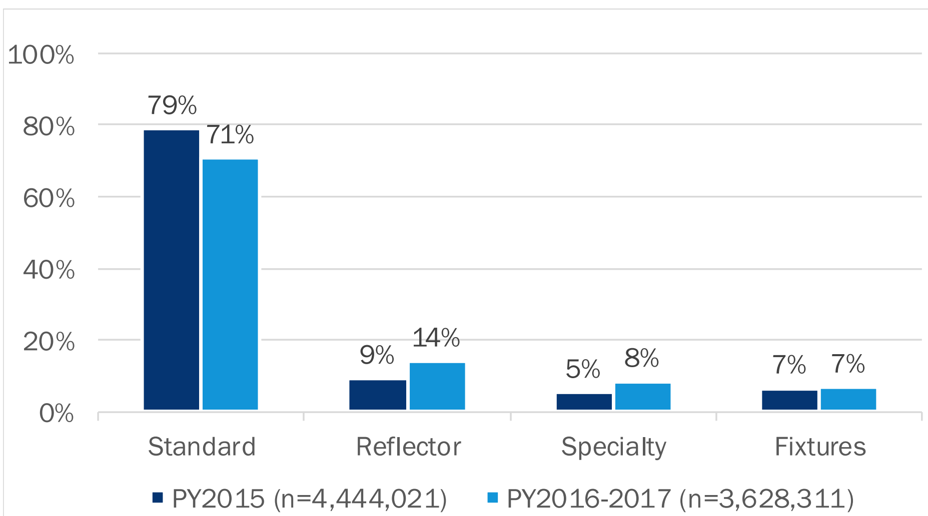
Figure 7-2. DEP EEL Program Technology Shares by Product Type



Source: Opinion Dynamics analysis of program tracking data.

Compared to PY2015, the share of specialty products increased slightly. As can be seen in Figure 7-3, program sales increased from 9% to 14% for reflector products and from 5% to 8% for specialty products and subsequently decreased from 79% to 71% for standard products.

Figure 7-3. DEP EEL Program Changes in Product Type Shares



Source: Opinion Dynamics analysis of program tracking data.

Over the course of PY2016–2017, the DEP EEL program discounted 744 unique products across a range of bulb types and wattages, which represents a 21% increase from PY2016, when the program managed 614 unique products. Such a large number of products can present implementation challenges in terms of managing the discounts and accurately tracking the sales data and calculating savings. Program staff effectively managed this large number of products, which is evidenced in clean and accurate program sales records (discussed in greater detail in Section 5.2 of this report) and high levels of retailer and manufacturer satisfaction described later in this section.

The DEP EEL program discounted a range of pack sizes over the course of PY2016–2017. Figure 7-4 provides a breakdown of program sales by pack size. As can be seen in the figure, standard CFLs were sold in larger packs, whereas LEDs of all types were sold predominantly in single packs. For standard CFLs, four-packs were most common, accounting for 62% of all packages sold. Conversely, 69% of LED packages were single packs. The reflector and specialty CFL product categories were dominated by two-packs, which comprised 59% of all packs sold in PY2016–2017. The number of large multipacks (six-pack and larger) decreased compared to PY2016, primarily due to a decrease in sales by club retailers, which tend to sell bulbs in large packages.

Figure 7-4. DEP EEL Program Sales by Package Type

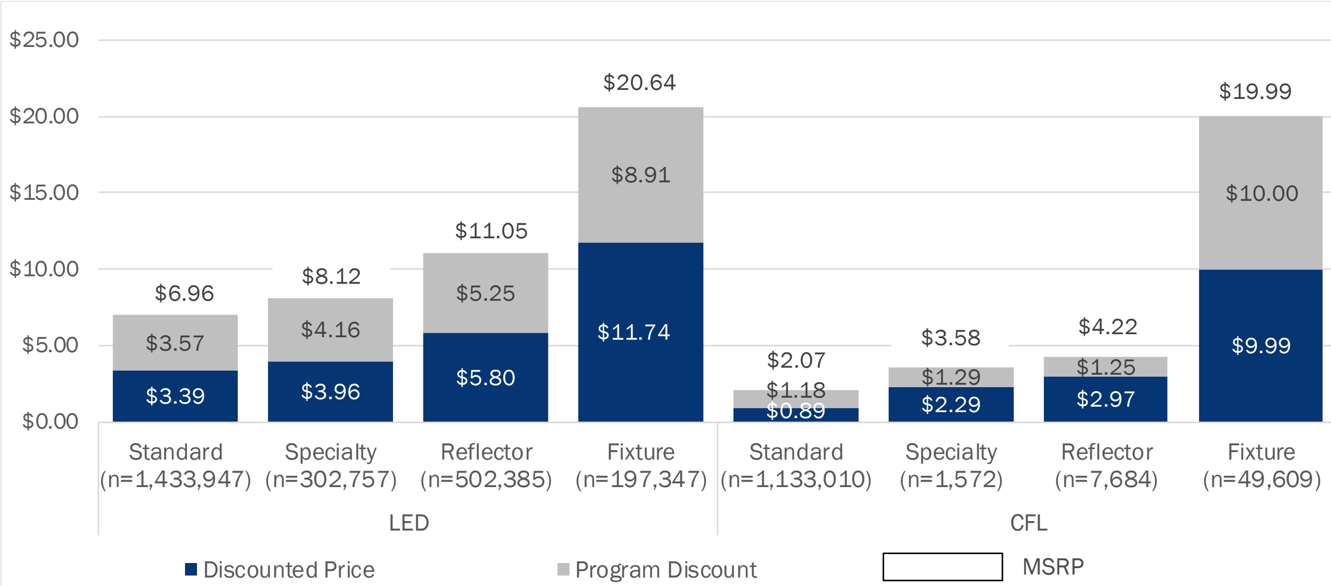
Distribution of Program Sales Across Pack Sizes by Technology

							Total
Standard CFLs (n=285,926)	14%	5%	2%	62%	8%	8%	100%
Standard LEDs (n=823,718)	69%	9%	2%	21%	0%	0%	100%
Reflector and Specialty CFLs (n=2,820)	0%	59%	12%	0%	29%	0%	100%
Reflector and Specialty LEDs (n=516,165)	69%	13%	12%	5%	1%	0%	100%

Source: Opinion Dynamics analysis of program tracking data.

Average program discounts ranged from $1.18 for standard CFLs to $10.00 for CFL fixtures. Depending on the product category, the average discount as a percentage of MSRP ranged from 30% for reflector CFLs to 57% for standard CFL products. The average program discount across all product categories was $3.48, which represents on average 50% of MSRP. Figure 7-5 provides a detailed overview of the program discounts by product type in PY2016–2017. As can be seen in the figure, discounts on LED products were higher than on CFL products as a result of the technology being generally more expensive. Average LED discounts ranged from $3.57 for standard LEDs to $8.91 for LED fixtures.

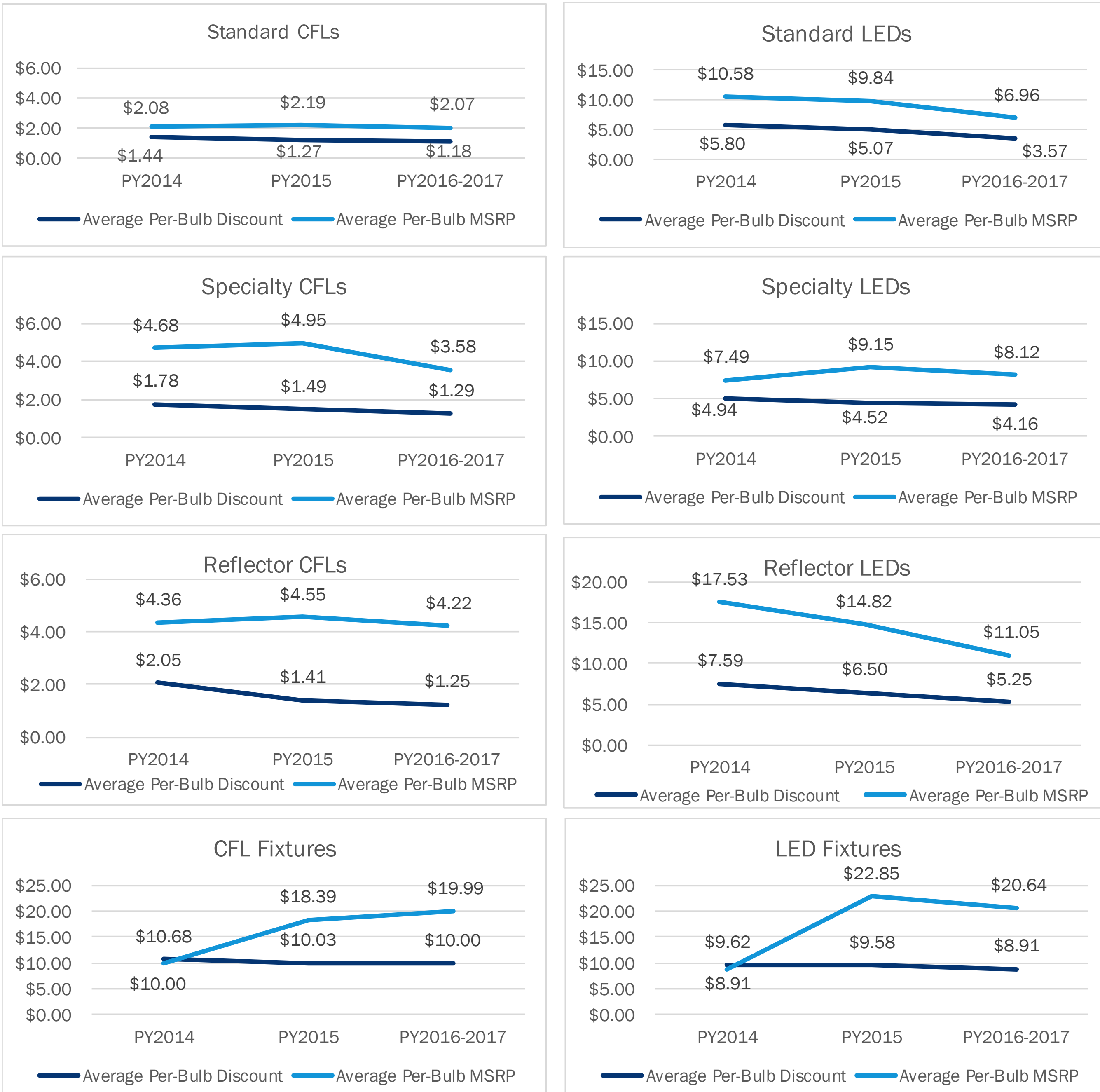
Figure 7-5. DEP EEL Program Pricing



Source: Opinion Dynamics analysis of program tracking data.

Compared to PY2014, MSRP for program-discounted products decreased across nearly all product categories. CFL fixtures is the only exception. Program discounts kept pace, indicating that program discounts were aligned with the changing retail pricing of the lighting products. Figure 7-6 shows changes in program-discounted prices and MSRP by product category over time. Program LED products decreased in price quite considerably over time, especially standard LEDs, where the MSRP dropped by 34% from $10.58 to $6.96, as well as reflector LEDs, where the MSRP dropped by 37% from $17.53 to $11.05.

Figure 7-6. DEP EEL Program Changes in Discounts and MSRP Over Time



Source: Opinion Dynamics analysis of program tracking data.

Program Retailer Mix

Similar to previous program years, the retailer mix in PY2016–2017 included a range of retailer channels. The program engaged 17 unique retailers across 289 storefronts in PY2016–2017. This represents a 7% increase from 269 storefronts in PY2015. Through the participating retailer mix, the program maintained good coverage of the DEP service territory, thus ensuring equitable customer access to program-discounted lighting products.

Table 7-1 shows a breakdown of participating storefronts and program sales across retailer channels, as well as changes in this breakdown over time. Club stores and DIY stores cumulatively captured nearly half of program sales (49%). Program sales decreased from 31% in PY2015 to 19% in PY2016–2017 for the Club retailer channel and doubled for the Hardware channel (from 7% to 15%). The program continued to discount a considerable share of sales (18%) through the Dollar/Discount channel. This focus on the Dollar/Discount channel and a shift to the Hardware channel illustrates the program's continued effort to target underserved customer segments, such as low-income customers.

Table 7-1. DEP EEL Program Changes in Participating Retailer Mix

	PY2015		PY2016–2017	
Retailer Channel	% of Storefronts (n=269)	% of Sales (n=4,444,021)	% of Storefronts (n=289)	% of Sales (n=3,628,311)
DIY	14%	26%	13%	30%
Club	4%	31%	4%	19%
Dollar/Discount	36%	18%	35%	18%
Big Box	21%	17%	14%	17%
Hardware	17%	7%	20%	15%
Grocery/Authentic	6%	<1%	11%	<1%
Other	1%	1%	1%	<1%
Total	100%	100%	100%	100%

Source: Opinion Dynamics analysis of program tracking data.

Program Marketing and Outreach

Over the course of PY2016–2017, the DEP EEL program relied on a range of marketing and outreach tactics:

- **In-store events and special promotions.** In conjunction with DEP marketing, Ecova performed a total of 246 in-store events and demonstrations in PY2016–2017 across 54 unique storefronts, with an average of 21 events per month. Ecova held the events at storefronts that were top-sellers for the program. The 54 unique storefronts where events were held accounted for a total of 48% of program sales in PY2016–2017. During these events, Ecova field staff promoted program products and discounts and educated customers about the benefits of energy-efficient lighting products.
- **Store visits and POP marketing material placement.** Over the course of the year, Ecova completed a total of 3,393 store visits, during which field staff checked for the presence and proper placement of program POP materials, updated materials as necessary, and checked for sufficient levels of inventory of program-discounted lighting products. The frequency of store visits varied by retailer based on sales volumes. This enabled team members to concentrate their visits on stores that had higher sales volumes and also tended to discount more products.

- **Community events.** Over the course of the program year, Ecova completed a total of 17 community events in which the program field representatives visited community centers to provide educational materials.
- **Direct mail, mass media, and other marketing.** Other sources of program marketing in PY2016–2017 included targeted bill inserts, direct mailers, email blasts, web promos, radio spots, and billboards.
- **POP marketing material presence.** Evaluators verified the presence of POP marketing materials as part of their visits to 12 participating retailers. POP marketing materials were present at all participating locations.

Program Implementation Processes and Program Satisfaction

Program implementation processes were smooth and consistent, resulting in high levels of retailer and manufacturer satisfaction. Program staff whom we interviewed as part of the evaluation did not identify any implementation issues or bottlenecks. The average satisfaction rating of participating manufacturers and retailers was 9.4 on a scale of 0 to 10, where 0 is "extremely dissatisfied" and 10 is "extremely satisfied." The average satisfaction rating for the product mix included in the program was 8.9, and average satisfaction with the discount size was 9.4 on the same scale. In fact, corporate-level retailers and manufacturers praised the DEP EEL program for being above average compared to similar programs across the country in terms of both incentive amounts and product mix.

"They are a top utility program across the country."

Corporate-level manufacturers were also highly satisfied with the program data-tracking and invoicing processes. The average satisfaction rating was 9.0. Several manufacturer contacts did point to challenges associated with formatting data for submission, but still expressed satisfaction with the support they received around these issues.

"The support we get from Ecova makes it much easier. They're great at communicating…as far as implementers, the best in the country."

"We struggle with some upload issues, but we tend to get those resolved very quickly."

"It might take an extra hour to format data to be able to upload, but it means that it's accurate and easy to read and understand."

Most store-level retailer contacts expressed high levels of satisfaction with marketing materials and training provided by Ecova, but some suggested that sturdier or larger signage could be helpful, and they provided an average satisfaction ratings of 7.8 Those familiar with program representatives or demonstrations expressed praise for their effectiveness and professionalism.

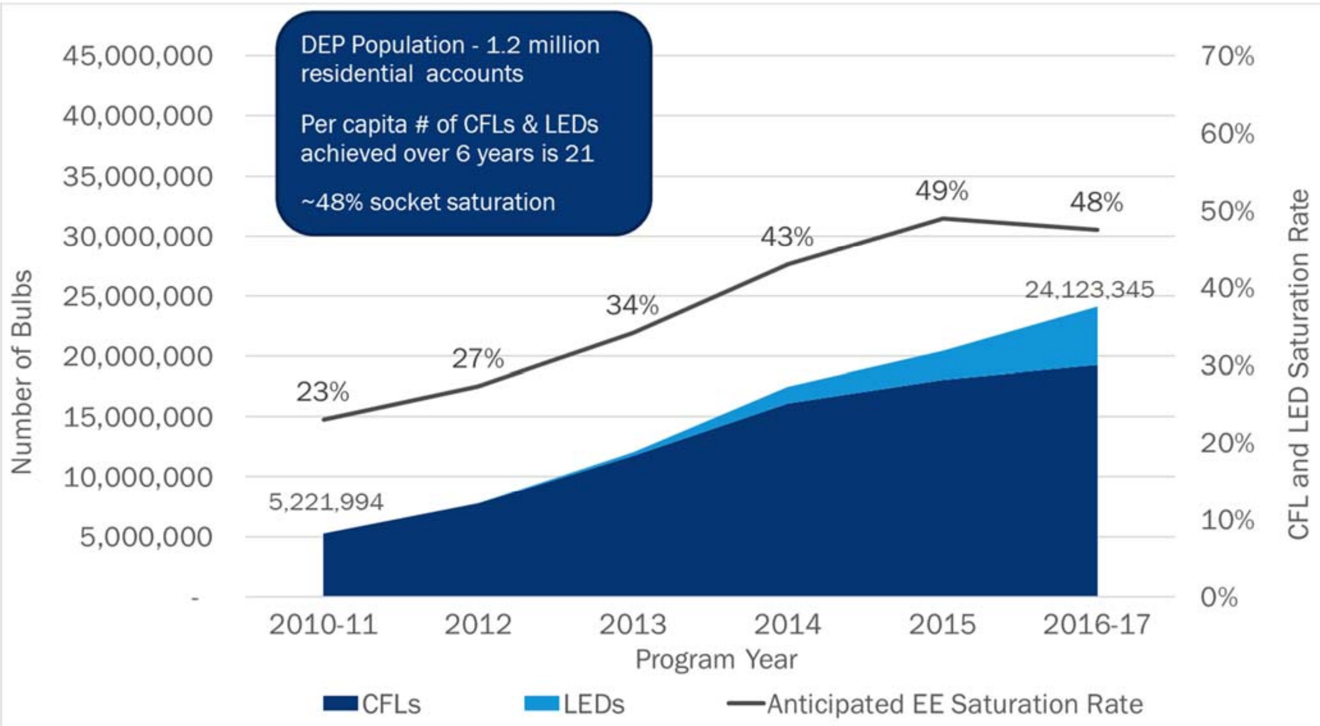
Program Impact in the DEP Service Territory and Market Trends

From its inception in 2010 through the end of current evaluation period (March 2017), the DEP EEL program discounted a total of 29,520,349 CFL and LED bulbs and fixtures, of which, we estimate that 24,123,345 were purchased by DEP residential customers. If the 1.2 million DEP residential customers equally purchased the 24,122,648 bulbs, each would have purchased an average of 21 bulbs. If we were to account for CFL burnout from early program years,[20] divide the adjusted number of program bulbs by the total number of

[20] Assuming a 5-year expected useful life (EUL) for a CFL.

residential DEP customers, and assume that a typical home has 53 sockets, we estimate that at the end of 2016, program-discounted bulbs would be installed in close to half of all residential sockets (48%). This is a large impact on efficient bulb use.

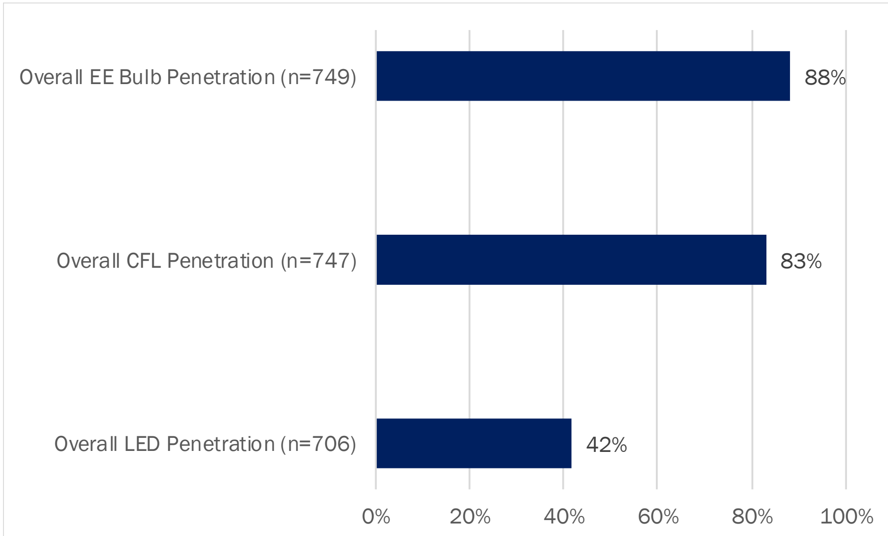
Figure 7-7. DEP EEL Program Impact on Efficient Bulb Saturation



Source: Opinion Dynamics analysis of program tracking data.
Note that 24,123,345 bulbs is not adjusted for CFL burnout, while the estimated saturation rate of 48% is adjusted for CFL burnout from the early program years.

Most customers in DEP jurisdiction have energy efficient products in their homes. As can be seen in Figure 7-8, nearly 9 in 10 customers reported having either CFLs or LEDs in their homes (88%), 83% reported having CFLs, and 42% reported having LEDs.

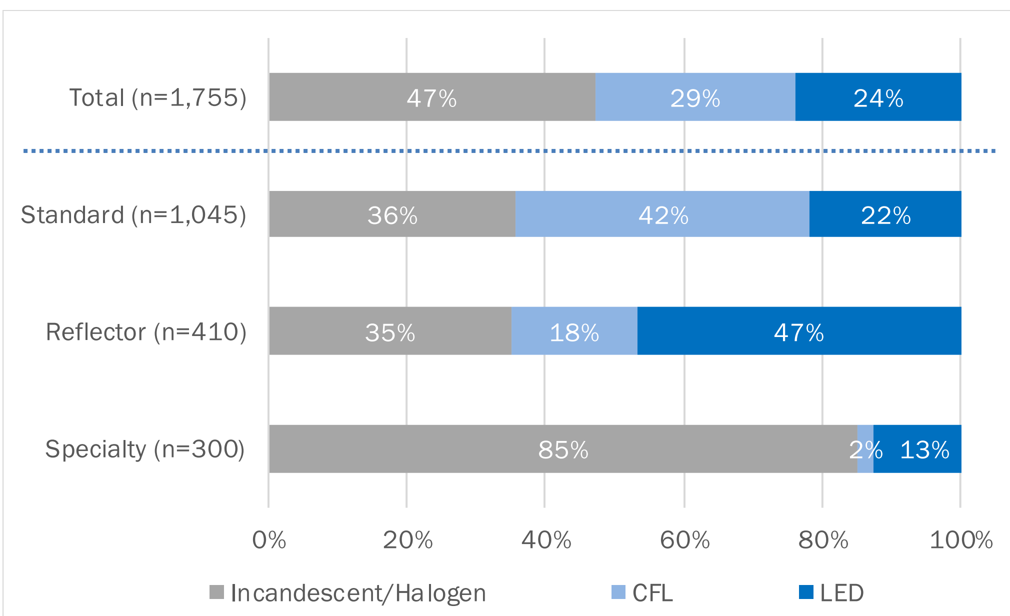
Figure 7-8. DEP EEL Program Energy-Efficient Product Penetration



Source: Opinion Dynamics analysis of site visit data.

As part of the lighting logger study, we collected detailed information on the lighting inventory in homes with LEDs. We found that even in homes with LEDs, a considerable number of sockets, especially specialty ones, contain less efficient bulbs. Figure 7-9 details the results. As can be seen in the figure, 24% of all sockets in homes with LEDs contain LEDs and 29% contain CFLs. LEDs are much more prominent among reflector products, accounting for 47% of all sockets, than in standard and specialty sockets, of which 22% and 13%, respectively, contain LEDs. Overall, 47% of all sockets and 83% of specialty sockets still have less-efficient light bulbs.

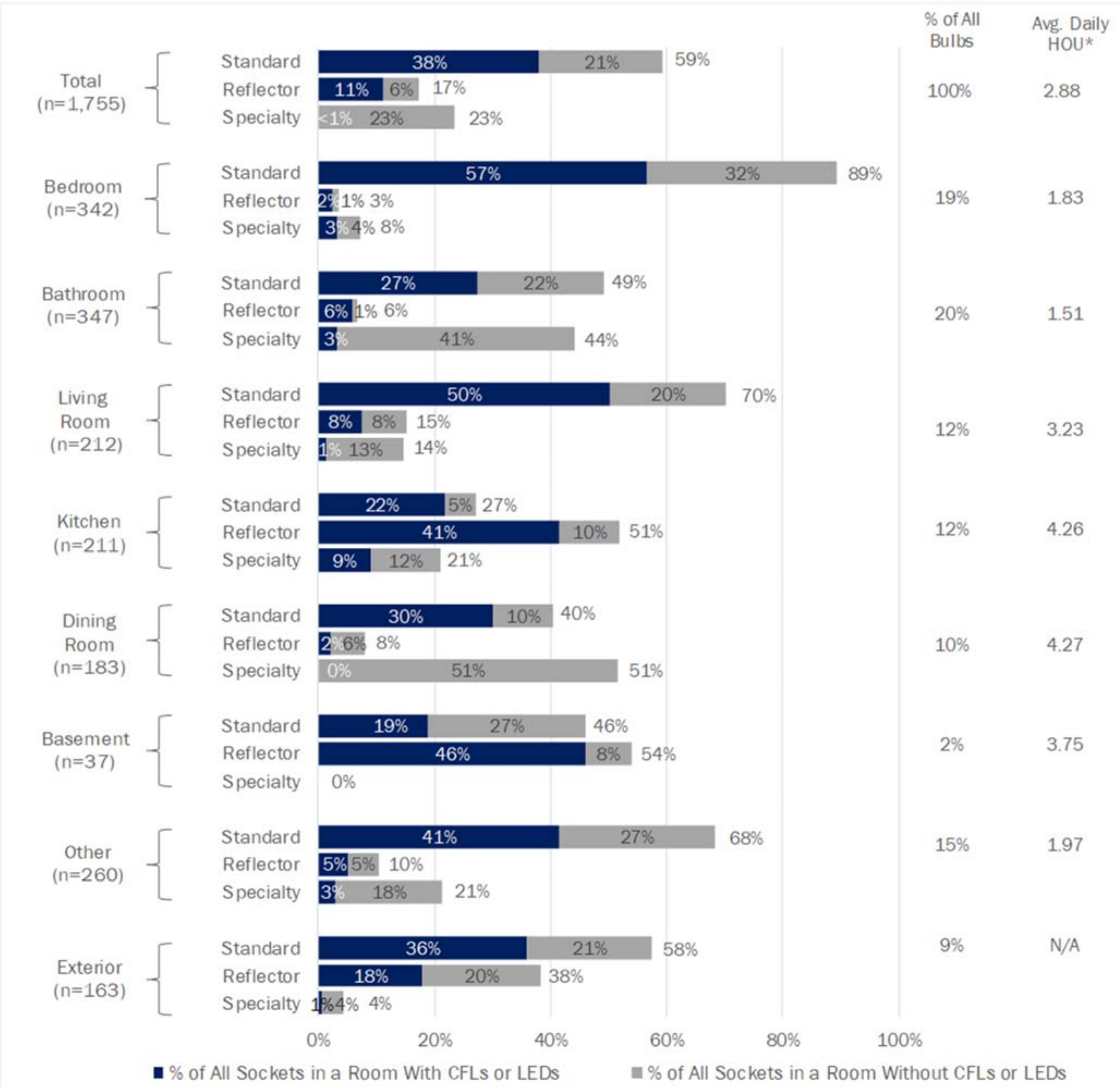
Figure 7-9. DEP EEL Program Bulb Mix in Homes with LEDs



Source: Opinion Dynamics analysis of site visit data.

An analysis of product mix by room in homes with LEDs shows pockets of opportunity. Figure 7-10 provides a breakdown of lighting products by technology and type in homes with LEDs. The figure also provides a percent distribution of all bulbs by room type, as well as average daily hours of use by room type. As can be seen in the figure, across room types, energy efficient bulbs are used more frequently in standard sockets than in specialty sockets. Energy-efficient product shares vary by room type, with kitchens having the highest share of energy-efficient products (72%) and dining rooms having the lowest (32%). More than half of light sockets in dining rooms (51%) are specialty sockets, and none of them have energy-efficient bulbs in them, which explains the low energy-efficient bulb share in this room type. Yet at the same time, dining rooms feature high average HOU (4.27 hours a day on average). Focusing program messaging on specialty products in dining rooms may help increase the marketing relevance and help the program reach these underserved sockets.

Figure 7-10. DEP EEL Program Product Mix by Room Type



Source: Opinion Dynamics analysis of site visit data.

* Average daily HOU values are for the DEP and DEC jurisdictions combined.
Note that percentages may not add up due to rounding.

A detailed analysis of the reported CFL and LED penetration among DEP customers, as well as an analysis of lighting composition in homes with LEDs, shows that there remain underserved customer segments. Table 7-2 provides a comparative analysis of the reported CFL and LED penetration rates among DEP customers, as well as the percent of sockets with LEDs among a subset of DEP customers with LEDs. As can be seen in the table, customers residing in multifamily and mobile homes, customers who rent their homes, older customers (ages

65+), customers with lower education levels, and customers with lower income levels (<$50,000) are less likely to have CFLs or LEDs in their homes. Furthermore, customers in these segments who have LEDs generally tend to have fewer LEDs. The program's continued focus on these underserved segments will ensure further transformation of the lighting market.

Table 7-2. DEP EEL Program CFL and LED Penetration by Customer Segment

Customer Segment	Energy-Efficient Light Bulb Penetration	CFL Penetration	LED Penetration	% of Sockets with LEDs*
Home Type				
Single-family	89%	84%	46%	24%
Multifamily	86%	82%	25%	26%
Mobile home	84%	75%	25%	7%
Homeownership				
Own	89%	84%	46%	24%
Rent	87%	82%	28%	26%
Age				
<35	90%	83%	31%	25%
35–64	91%	86%	45%	26%
65+	79%	73%	40%	15%
Education				
Less than college degree	85%	79%	35%	22%
College degree +	92%	87%	48%	25%
Income				
<$50,000	84%	77%	32%	27%
$50,000+	93%	88%	49%	22%

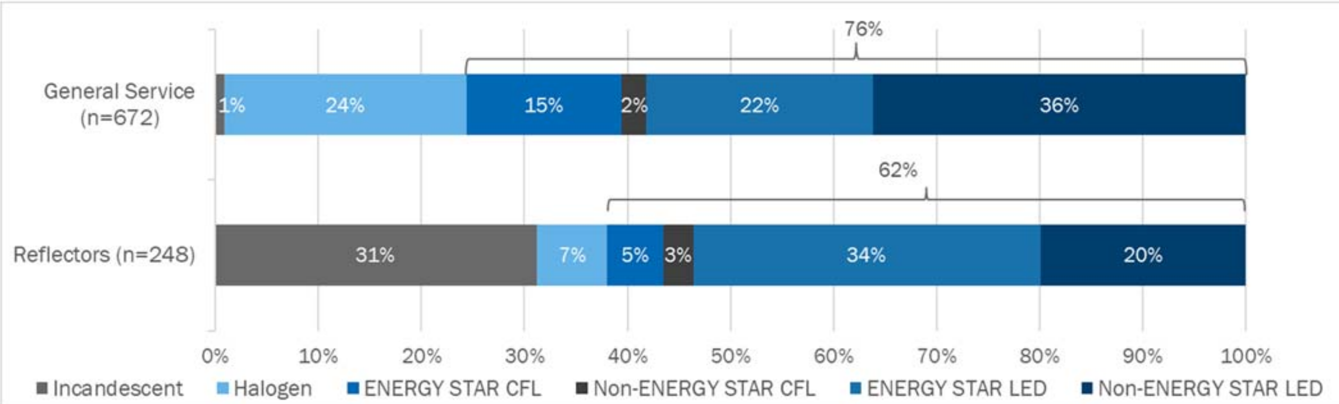
Source: Opinion Dynamics analysis of site visit data.

* Among customers who have LEDs.

shelves. As part of the shelf audits, we collected data on the general service and reflector lighting products present on the participating and non-participating store shelves. Figure 7-11 provides a breakdown of the shelf space across lighting technologies. As can be seen in the figure, more than three-quarters of the general service products on the retailer shelves (76%) are CFLs and LEDs, and 58% are LEDs. Incandescent products are virtually not available and halogen products represent just under a quarter (24%) of all products. General service ENERGY STAR LEDs are more prominent than non-ENERGY STAR LEDs (36% vs. 22% of all general service products).

In the reflector product category, incandescent products are much more prominent than in the general service category, CFLs are a lot less prominent, and ENERGY STAR LEDs are more common than non-ENERGY STAR LEDs. Incandescent products account for almost a third of all products (31%), while CFLs and LEDs account for 62%, and LEDs account for 54%. ENERGY STAR LEDs account for a larger share of all reflector products than non-ENERGY STAR LEDs (34% vs. 20%). The reflector category may present a program opportunity due to a higher share of incandescent and halogen products.

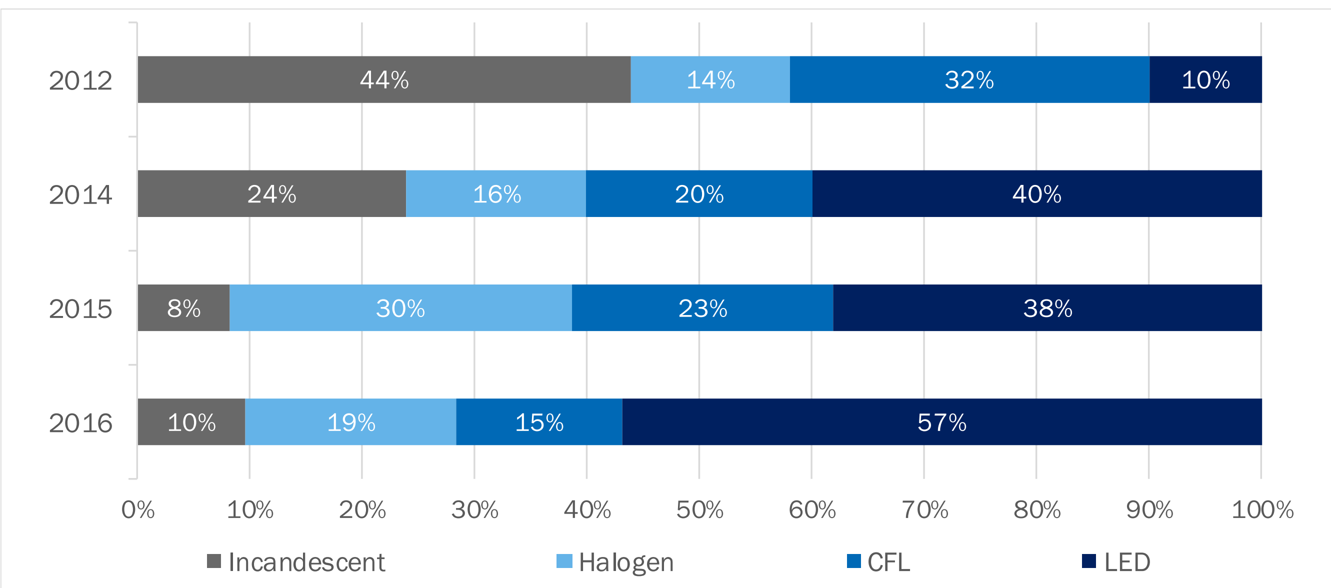
Figure 7-11. DEP EEL Program Shelf Composition of General Service and Reflector Products



Source: Opinion Dynamics analysis of shelf audit data.

The lighting products that retailers stock has changed rapidly, and the rate of change especially accelerated in the last year. Compared to the fall of 2012, when LED products accounted for just 10% of all general service products on the store shelves, in 2016, LEDs accounted for 57% of the shelf space. Between 2015 and 2016, the shelf space dedicated to LEDs grew from 38% to 57% (Figure 7-12).

Figure 7-12. DEP EEL Program Changes in the Lighting Shelf Space Composition Over Time



Source: Opinion Dynamics analysis of shelf audit data and prior evaluation reports.

The mix of bulb technologies varies by retailer channel, with Club stores carrying only CFLs and LEDs, in both the general service and reflector categories.[21] DIY and Big Box stores are the retailers with the highest percentage of halogen general service products (25% and 30%, respectively), while DIY and Hardware stores

[21] Note that the Dollar/Discount store that we visited as part of the shelf audit was a participating store and was carrying only program LEDs.

are the retailers with the highest percentage of reflector incandescent and halogen products (41%). Focusing program efforts on further shifting the shelf space away from incandescent and halogen products at these retailer channels, while further reducing program presence at the Club stores, could help increase program impact on the market.

Table 7-3. DEP EEL Program Lighting Shelf Space Composition by Retailer Channel

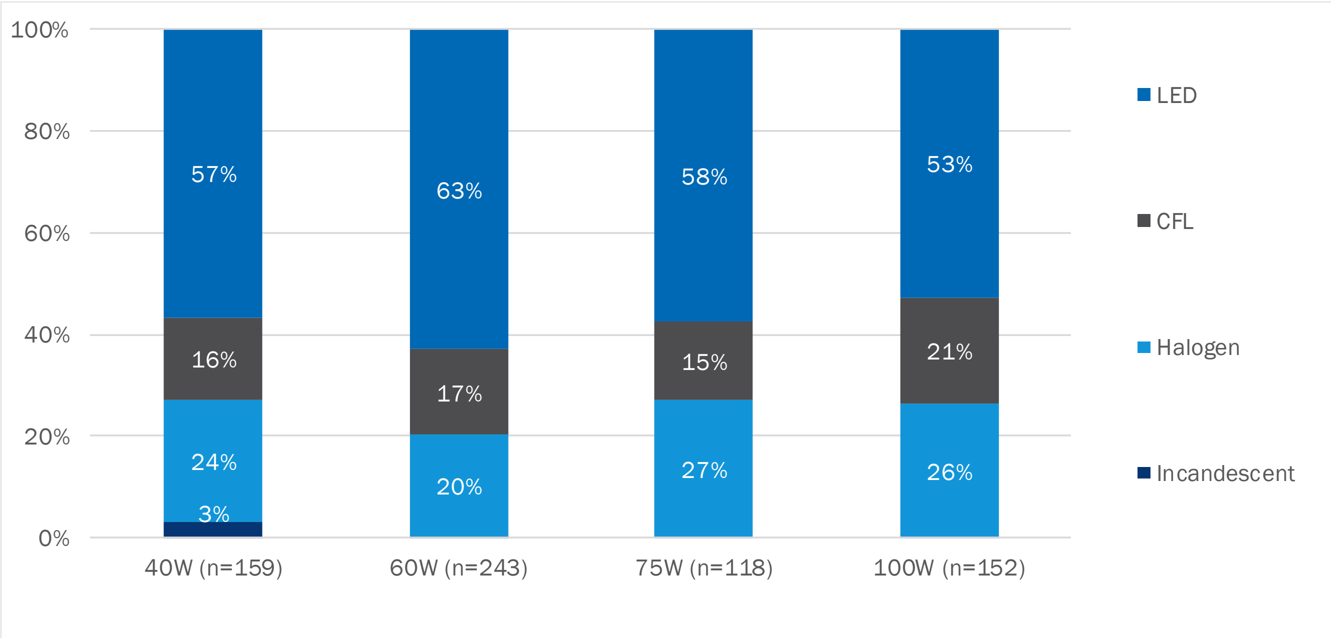
Retailer Channel	Big Box (2 stores)	Club (4 stores)	DIY (5 stores)	Dollar/ Discount (1 store)*	Hardware (3 stores)	Total (15 stores)
General Service Products						
Number of Products (n=)	*194*	*14*	*281*	*2*	*181*	*672*
Incandescent	0%	0%	0%	0%	3%	1%
Halogen	25%	0%	30%	0%	14%	24%
CFLs (Non-ENERGY STAR)	0%	0%	0%	0%	9%	2%
CFLs (ENERGY STAR)	0%	14%	16%	0%	29%	15%
LEDs (Non-ENERGY STAR)	59%	43%	31%	0%	20%	36%
LEDs (ENERGY STAR)	15%	43%	23%	100%	24%	22%
Total	100%	100%	100%	100%	100%	100%
Reflector Products						
Number of Products (n=)	*51*	*9*	*150*	*0*	*66*	*276*
Incandescent	33%	0%	29%	N/A	39%	31%
Halogen	0%	0%	12%	N/A	2%	7%
CFLs (Non-ENERGY STAR)	2%	0%	0%	N/A	11%	3%
CFLs (ENERGY STAR)	0%	22%	3%	N/A	12%	5%
LEDs (Non-ENERGY STAR)	22%	22%	23%	N/A	11%	20%
LEDs (ENERGY STAR)	43%	56%	33%	N/A	26%	34%
Total	100%	100%	100%	N/A	100%	100%

Source: Opinion Dynamics analysis of shelf audit data.

* Participating store.

An analysis of shelf space by most common bulb wattages shows that the share of energy-efficient products is relatively evenly distributed across standard bulb wattages. As can be seen in Figure 7-13, between 20% and 27% of products within a given wattage category are incandescent or halogen. LEDs, however, are slightly more prominent in the most popular 60-watt equivalent wattage.

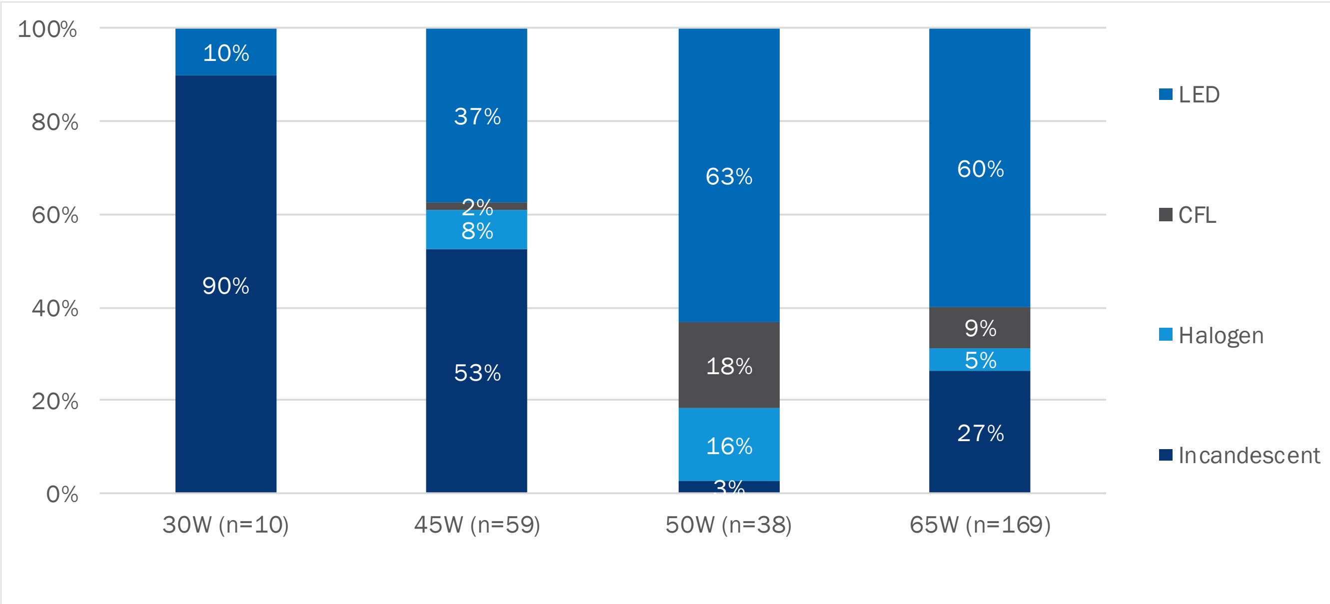
Figure 7-13. DEP EEL Program General Service Shelf Space by Equivalent Wattage



Source: Opinion Dynamics analysis of shelf audit data.

When it comes to reflectors, however, the technology mix varies considerably depending on the wattage. Lower-wattage reflectors (30-watt and 45-watt equivalents) are dominated by incandescents (90% and 53% of all products, respectively), while 50-watt and 65-watt equivalents are dominated by LEDs (63% and 60%, respectively). Across all stores, lower-wattage reflector products account for a quarter of all reflector products (25%), which represents a considerable share of products. Increasing the volume of lower-wattage reflector products discounted through the program may help further increase program impact on the lighting market transformation.

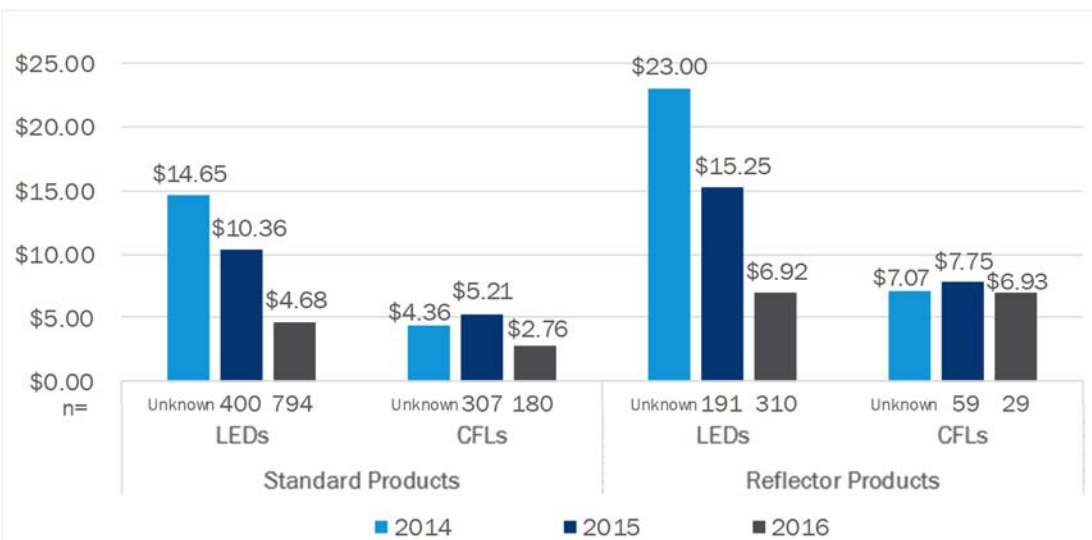
Figure 7-14. DEP EEL Program Reflector Shelf Space by Equivalent Wattage



Source: Opinion Dynamics analysis of shelf audit data.

In addition to becoming increasingly available on the store shelves, LEDs prices dropped considerably, making them more affordable. As part of the shelf audits, Opinion Dynamics collected data on product pricing for general service and reflector LEDs and CFLs. As can be seen in Figure 7-15, general service LED prices dropped from an average of $10.36 per bulb to $4.68 over the course of a year, and reflector LED prices dropped from an average of $15.25 per bulb to $6.92 over the course of a year. General service CFL prices also decreased, from an average of $5.21 per bulb to $2.76. Reflector CFL prices remained relatively stable over time.

Figure 7-15. DEP EEL Program Changes in Non-Discounted Light Bulb Prices Over Time



Source: Opinion Dynamics analysis of shelf audit data.

Despite the drops in price, CFLs and LEDs continue to be the most expensive product on the market, and halogens continue to be the least expensive lighting technology. As can be seen in Table 7-4, the average price is $1.98 for a general service halogen, $2.76 for a general service CFL, and $4.68 for a general service LED. The average price for a reflector incandescent is $4.69, for a reflector halogen is $6.24, and for a reflector CFL is $6.93. The average price for a reflector LED is $6.92. For the price-sensitive customer segments, such as lower-income residential customers, program incentives can help bring LEDs on par with halogen and incandescent pricing, thus making the technology an affordable alternative.

Table 7-4. DEP EEL Program General Service and Reflector Pricing

	Average Price (15 stores)	Min Price (15 stores)	Max Price (15 stores)
General Service Products (n=672)			
Incandescent	$0.92	$0.60	$1.25
Halogen	$1.98	$1.60	$2.36
CFLs	$2.76	$2.18	$3.33
LEDs	$4.68	$3.89	$5.48
Reflector Products (n=672)			
Incandescent	$4.69	$4.06	$5.31
Halogen	$6.24	$6.05	$6.44
CFLs	$6.93	$5.84	$8.02
LEDs	$6.92	$5.74	$8.10

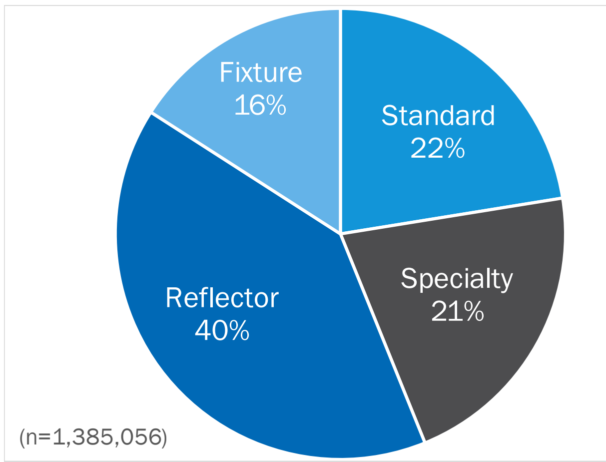
Source: Opinion Dynamics analysis of shelf audit data.

7.2.2 DEC Retail LED Program

Program Participating Product Mix

The DEC Retail LED program sold 1,385,056 LED bulbs and fixtures in PY2016–2017. As can be seen in Figure 7-16, reflector LEDs accounted for the largest share of the program sales (40%). Standard LEDs accounted for 22% of all sales, specialty LEDs for 21%, and LED fixtures for 16%.

Figure 7-16. DEC Retail LED Program Technology Shares by Product Type



Source: Opinion Dynamics analysis of program tracking data.

Over the course of PY2016–2017, the DEC Retail LED program discounted 384 unique products across a range of bulb types and wattages. Program staff effectively managed this number of products, which is evidenced in clean and accurate program sales records (discussed in greater detail in Section 5.2 of this report) and high levels of retailer and manufacturer satisfaction described later in this section.

The DEC Retail LED program discounted a range of pack sizes over the course of PY2016–2017. Figure 7-17 provides a breakdown of program sales by pack size. As can be seen in the figure, more than half of standard and specialty and reflector LEDs (59% and 57%, respectively) were sold in single packs, and 80% of LED fixtures were sold in single packs. A very small percent of reflector and specialty products (2%) were sold in six-packs, and none of the standard LEDs were sold in packages larger than four-bulb packs.

Figure 7-17. DEC Retail LED Program Sales by Package Type

Distribution of Program Sales Across Pack Sizes by Technology

						Total
Standard LEDs (n=159,896)	59%	8%	13%	20%	0%	100%
Reflector and specialty LEDs (n=453,825)	57%	15%	15%	11%	2%	100%
LED fixtures (n=186,563)	82%	18%	0%	0%	0%	100%

Source: Opinion Dynamics analysis of program tracking data.

Average program discounts ranged from $3.38 for specialty LEDs to $8.11 for fixtures. Depending on the product category, the average discount as a percentage of MSRP ranged from 45% for reflector LEDs to 55% for standard LEDs. The average program discount across all product categories was $4.49, which represents on average 46% of MSRP. Figure 7-18 provides an overview of the program discounts by product type in PY2016–2017. As can be seen in the figure, discounts for standard and specialty LEDs were generally on par, at $3.40 and $3.38, respectively. Discounts on LED fixtures were the highest, at $8.11.

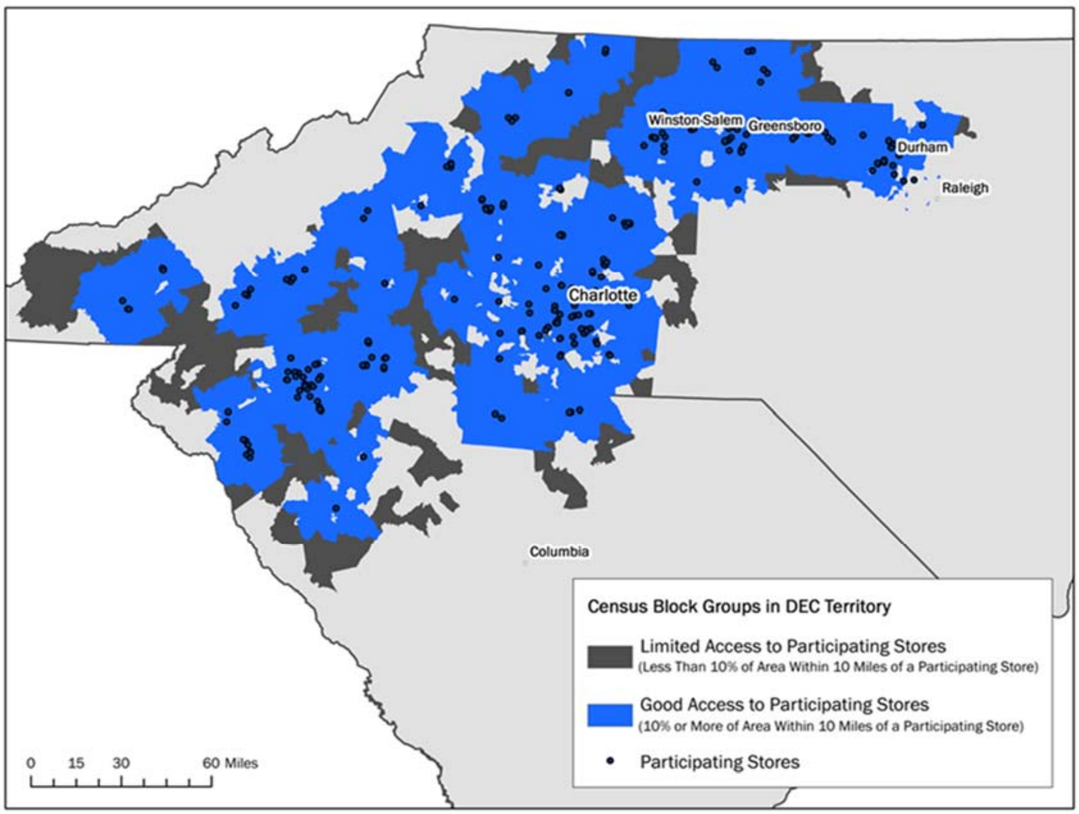
Figure 7-18. DEC Retail LED Program Pricing

Source: Opinion Dynamics analysis of program tracking data.

Program Retailer Mix

The retailer mix in PY2016–2017 included a range of retailer channels. The program engaged eight unique retailers across 300 storefronts in PY2016–2017. Through the participating retailer mix, the program maintained good coverage of the DEC jurisdiction, thus ensuring equitable customer access to program-discounted lighting products. Figure 7-19 displays the coverage of the DEC jurisdiction with participating retailers. Blue and dark gray areas on the map combined show the DEC jurisdiction boundaries. The areas of the map colored in blue show census block groups with good access to program participating storefronts, while areas in dark grey show census block group with limited access to program participating storefronts. As can be seen, most of the census block groups in the DEC jurisdiction have good access to program participating stores.

Figure 7-19. DEC Retail LED Program Participating Retailer Coverage of DEC Jurisdiction



Source: Opinion Dynamics GIS analysis.

Table 7-5 shows a breakdown of participating retailers, storefronts, and program sales across retailer channels. Club stores cumulatively captured close to half of program sales (47%), and DIY stores captured an additional 36% of sales. The program discounted 10% of products through the Dollar/Discount channel. A continued focus on the Dollar/Discount channel is important to reach underserved customer segments and also helps to maintain NTGRs.

Table 7-5. DEC Retail LED Program Participating Retailer Mix

Retail Channel	# of Retailers	% of Storefronts (n=300)	% of Sales (n=1,385,056)
Club	2	7%	47%
DIY	2	26%	36%
Dollar/Discount	3	44%	10%
Big Box	1	23%	7%
Total	8	100%	100%

Source: Opinion Dynamics analysis of program tracking data.

Program Marketing and Outreach

Over the course of PY2016–2017, the DEC Retail LED program relied on a range of marketing and outreach tactics:

- **In-store events and special promotions.** In conjunction with DEC marketing, Ecova performed a total of 236 in-store events and demonstrations in PY2016–2017 across 47 unique storefronts, with an average of 20 events per month. Ecova held the events at storefronts that were top-sellers for the program. The 47 unique storefronts where events were held accounted for a total of 62% of program sales in PY2016–2017. During these events, Ecova field staff promoted program products and discounts and educated customers about the benefits of energy-efficient lighting products.
- **Store visits and POP marketing material placement.** Over the course of the year, Ecova completed a total of 3,156 store visits, during which field staff checked for the presence and proper placement of program POP materials, updated materials as necessary, and checked for sufficient levels of inventory of program-discounted lighting products. The frequency of store visits varied by retailer based on sales volumes. This enabled team members to concentrate their visits on stores that had higher sales volumes and also tended to discount more products.
- **Community events.** Over the course of the program year, Ecova completed a total of 19 community events in which the program field representatives visited community centers to provide educational materials.
- **Direct mail, mass media, and other marketing.** Other sources of program marketing in PY2016–2017 included targeted bill inserts, direct mailers, email blasts, web promos, radio spots, and billboards.
- **POP marketing material presence.** Evaluators verified the presence of POP marketing materials as part of their visits to 10 participating retailers. POP marketing materials were present at 9 out of 10 participating locations.

Program Implementation Processes and Program Satisfaction

Program implementation processes were smooth and consistent, resulting in high levels of retailer and manufacturer satisfaction. Program staff whom we interviewed as part of the evaluation did not identify any implementation issues or bottlenecks. Corporate manufacturer contacts gave an average overall satisfaction rating of 9.3, and store employees gave an average rating of 8.9 on a scale of 0 to 10, where 0 is “extremely dissatisfied” and 10 is “extremely satisfied.”

“They’re in the top 1% of all the 50 or 60 utility programs we participate in.”

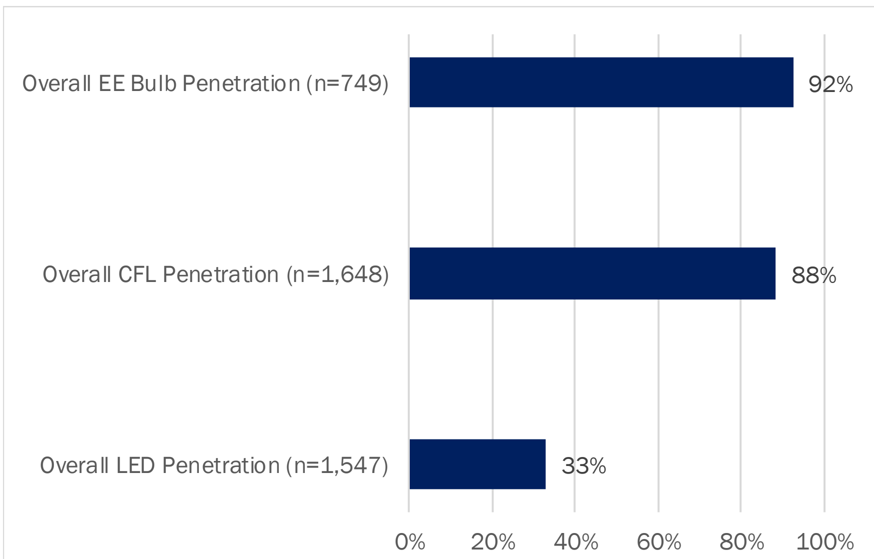
– *(Director of Sales at participating manufacturer)*

Corporate manufacturer contacts gave an average rating of 9.0 for the tracking and invoicing process, and had only positive feedback regarding interactions with Ecova. Satisfaction with the program's product mix received slightly lower ratings from both manufacturers and retailer staff (8.8 on average); some were confused by the exclusion of 60W and 75W standard bulbs. Store employees gave lower ratings to program marketing materials (7.4 on average), and suggested that sturdier signage might be helpful to avoid having it knocked down.

Program Impact in the DEC Service Territory and Market Trends

By discounting more than 1.3 million products since its inception, the program contributed to energy-efficient bulb penetration. In 2016, based on the results from the Residential Lighting Logger study, more than 9 in 10 (92%) customers had either LEDs or CFLs in their homes, 88% had CFLs, and 33% had LEDs (Figure 7-20).

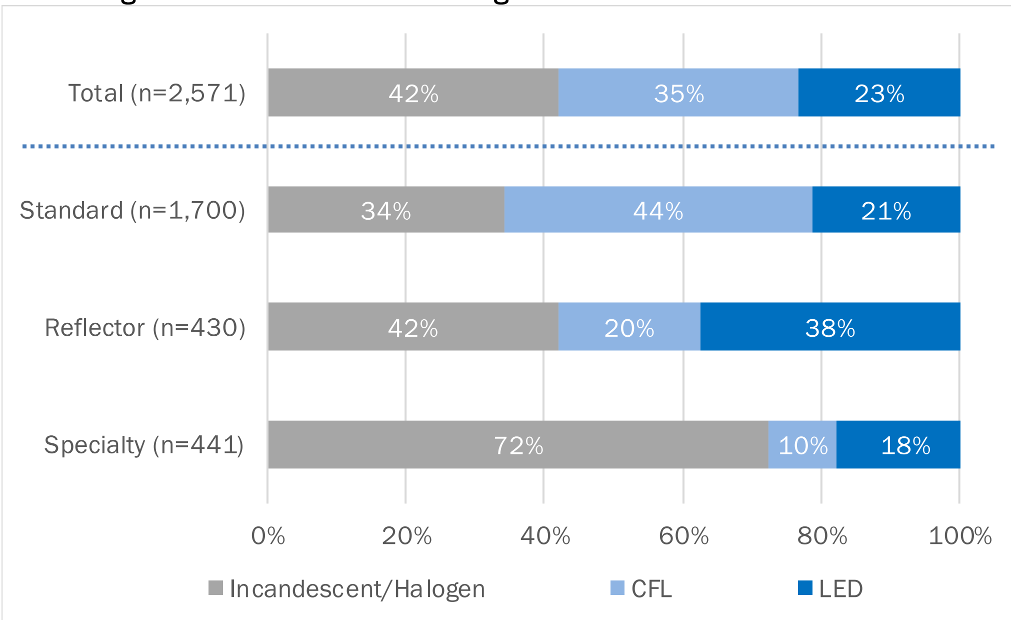
Figure 7-20. DEC Retail LED Program Energy-Efficient Product Penetration



Source: Opinion Dynamics analysis of site visit data.

As part of the lighting logger study, we collected detailed information on the lighting inventory in homes with LEDs. We found that even in home with LEDs, a considerable number of sockets, especially specialty ones, contain less-efficient technologies. Figure 7-21 details the results. As can be seen in the figure, 23% of all sockets in homes with LEDs contain LEDs and 35% contain CFLs. LEDs are much more prominent among reflector products, accounting for 38% of all sockets, than in standard and specialty sockets, where 21% and 18% of sockets, respectively, contain LEDs. Overall, 43% of all sockets and 72% of specialty sockets still have less-efficient light bulbs.

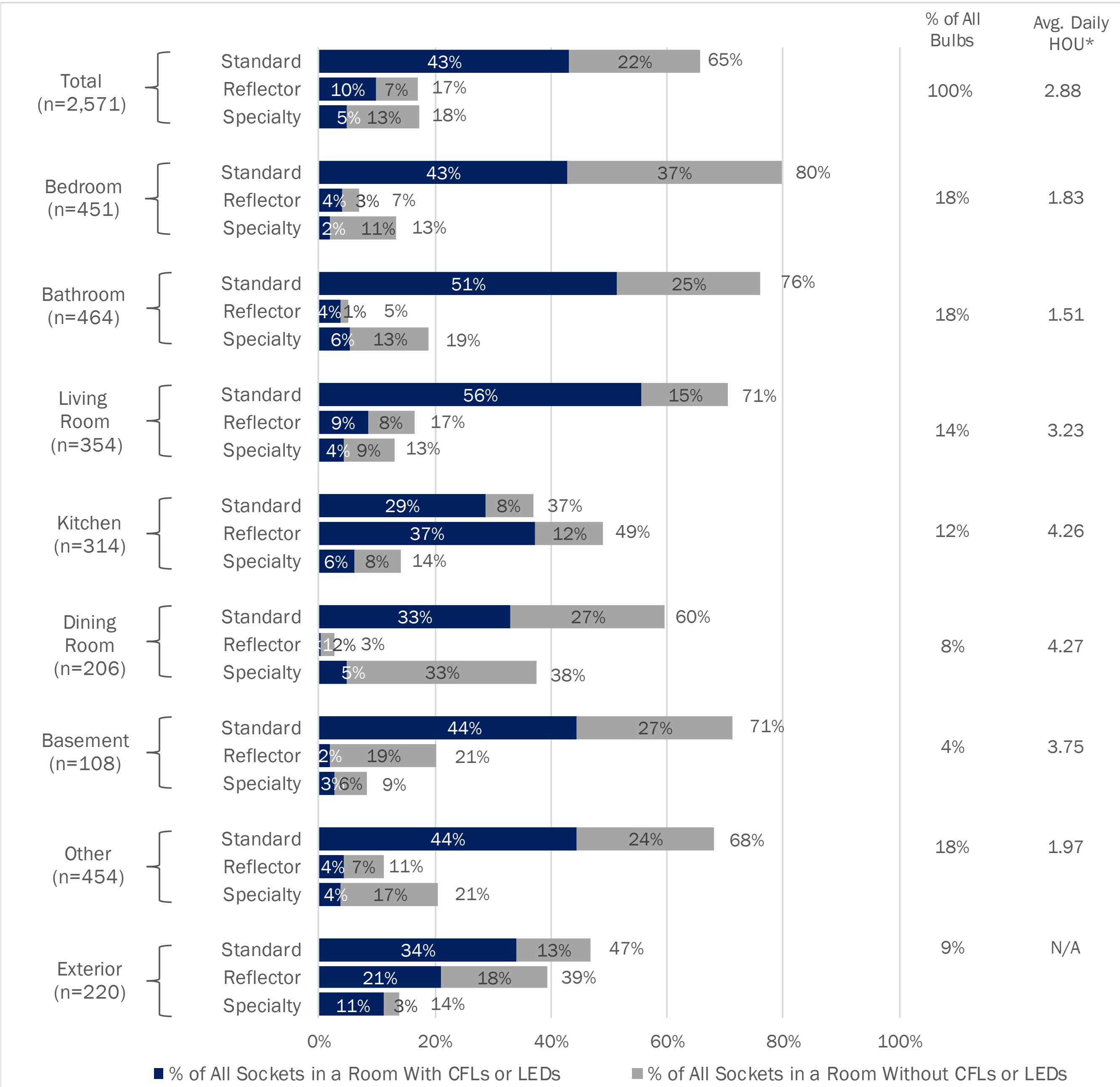
Figure 7-21. DEC Retail LED Program Bulb Mix in Homes with LEDs



Source: Opinion Dynamics analysis of site visit data.

An analysis of product mix by room in homes with LEDs shows pockets of opportunity. Figure 7-22 provides a breakdown of lighting products by technology and type in homes with LEDs. The figure also provides a percent distribution of all bulbs by room type, as well as average daily HOU by room type. As can be seen in the figure, across nearly all room types, energy efficient bulbs are used more frequently in standard sockets than in specialty sockets. Energy-efficient product shares vary by room type, with kitchens having the highest share of energy-efficient products (72%) and dining rooms having the lowest (38%). A considerable percent of light sockets in dining rooms (40%) are specialty sockets, and few of them have energy-efficient bulbs in them, which explains the low energy-efficient bulb share in this room type. Yet at the same time, dining rooms feature high average HOU (4.27 hours a day on average). Focusing program messaging on specialty products in dining rooms may help increase the marketing relevance and help the program reach these underserved sockets.

Figure 7-22. DEC Retail LED Program Product Mix by Room Type



Source: Opinion Dynamics analysis of site visit data.

* The average daily HOU values are for the DEP and DEC jurisdictions combined.
Note that percentages may not add up due to rounding.

A detailed analysis of the reported CFL and LED penetration among DEC customers, as well as an analysis of lighting composition in homes with LEDs, shows that there remain underserved customer segments. Table 7-6 provides a comparative analysis of the reported CFL and LED penetration rates among DEC customers, as well as the percent of sockets with LEDs among a subset of DEC customers with LEDs. As can be seen in the table, customers residing in multifamily and mobile homes, older customers (ages 65+), customers with lower education levels, and customers with lower income levels (<$50,000) are less likely to have CFLs or LEDs in their homes. Furthermore, customers in these segments who have LEDs generally tend to have fewer LEDs. The program's continued focus on these underserved segments will ensure further transformation of the lighting market.

Table 7-6. DEC Retail LED Program CFL and LED Penetration by Customer Segment

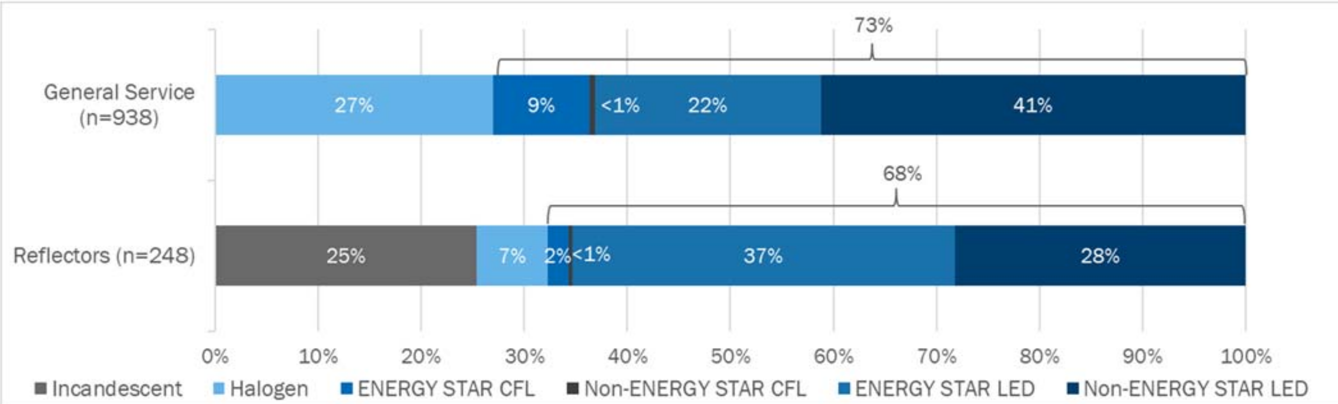
Customer Segment	Energy-Efficient Light Bulb Penetration	CFL Penetration	LED Penetration	% of Sockets with LEDs
Home Type				
Single-family	94%	90%	37%	23%
Multifamily	89%	85%	24%	32%
Mobile home	89%	85%	22%	35%
Homeownership				
Own	93%	89%	38%	23%
Rent	92%	88%	24%	32%
Age				
<35	93%	90%	27%	36%
35-64	94%	90%	36%	39%
65+	88%	81%	32%	21%
Education				
Less than college degree	91%	86%%	29%	25%
College degree +	95%	92%	39%	23%
Income				
<$50,000	90%	86%	25%	21%
$50,000+	96%	92%	96%	24%

Source: Opinion Dynamics analysis of site visit data.

Energy-efficient lighting products are not only prominent in DEC customers' homes but also on the store shelves. As part of the shelf audits, we collected data on the general service and reflector lighting products present on the participating and non-participating store shelves. Figure 7-23 provides a breakdown of the shelf space across lighting technologies. As can be seen in the figure, close to three-quarters of the general service products on the retailer shelves (73%) are CFLs and LEDs, and 63% are LEDs. Incandescent products are not available and halogen products represent just over a quarter (27%) of all general service products. General service ENERGY STAR LEDs are more prominent than non-ENERGY STAR LEDs (41% vs. 22% of all general service products).

In the reflector product category, incandescent products are much more prominent than in the general service category, CFLs are a lot less prominent, and ENERGY STAR LEDs are more common than non-ENERGY STAR LEDs. Incandescent products account for a quarter of all products (25%), while CFLs and LEDs account for 68%, and LEDs account for 65%. ENERGY STAR LEDs account for a larger share of all reflector products than non-ENERGY STAR LEDs (37% vs. 28%). The reflector category may present a program opportunity due to a higher share of incandescent and halogen products.

Figure 7-23. DEC Retail LED Program Shelf Composition of General Service and Reflector Products



Source: Opinion Dynamics analysis of shelf audit data.

The mix of bulb technologies varies by retailer channel, with Club stores carrying only CFLs and LEDs in the general service category and only LEDs in the reflector category. Both DIY and Big Box stores carried halogen general service products (26% and 29%, respectively) and halogen and incandescent reflector products (36% and 32%, respectively). Focusing program efforts on further shifting the shelf space away from incandescent and halogen products at these retailer channels, while further reducing program presence at the Club stores, can help increase program impact on the market. As presented in Section 6.2 of this report, based on the retailer and manufacturer interviews, the NTGR is the lowest for the Club retailer channel (0.33) compared to the Big Box, DIY, and Dollar/Discount channels (0.46, 0.51, and 1.00, respectively). Further decreasing focus on the Club retailer channel could help increase the program's net impacts.

Table 7-7. DEC Retail LED Program Lighting Shelf Space Composition by Retailer Channel

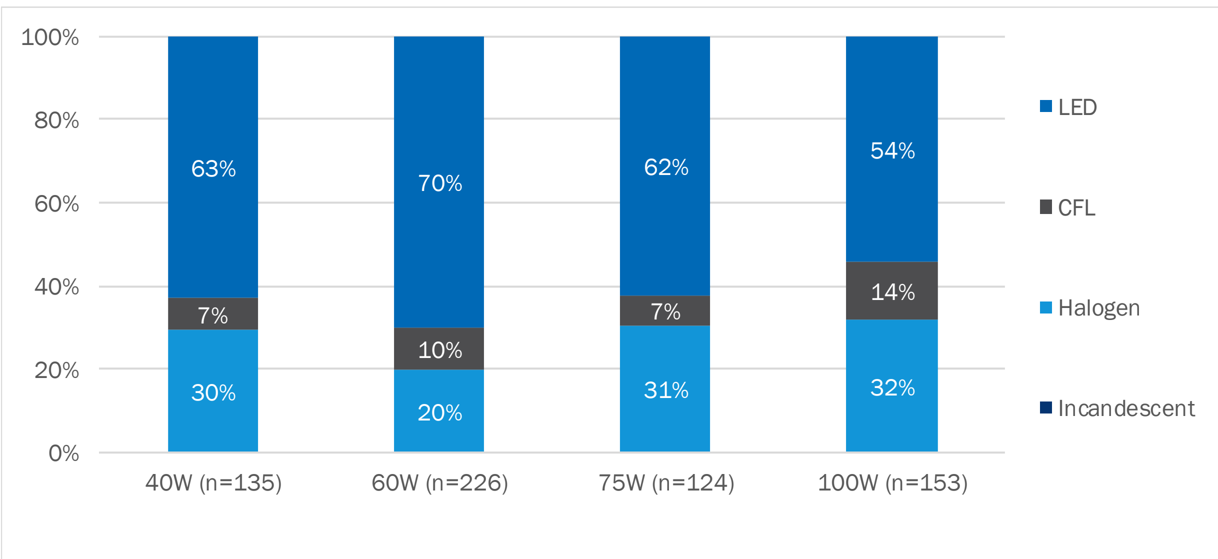
Retailer Channel	Big Box (3 stores)	Club (6 stores)	DIY (6 stores)	Total (15 stores)
Number of Products (n=)	*296*	*18*	*324*	*638*
Incandescent	–	–	–	–
Halogen	26%	0%	29%	27%
CFLs (Non-ENERGY STAR)	0%	0%	1%	0%
CFLs (ENERGY STAR)	0%	0%	19%	9%
LEDs (Non-ENERGY STAR)	56%	39%	27%	41%
LEDs (ENERGY STAR)	18%	61%	24%	22%
Total	100%	100%	100%	100%
Number of Products (n=)	*74*	*10*	*164*	*248*
Incandescent	36%	0%	22%	25%

Retailer Channel	Big Box (3 stores)	Club (6 stores)	DIY (6 stores)	Total (15 stores)
Halogen	0%	0%	10%	7%
CFLs (Non-ENERGY STAR)	0%	0%	1%	0%
CFLs (ENERGY STAR)	0%	0%	3%	2%
LEDs (Non-ENERGY STAR)	31%	0%	29%	28%
LEDs (ENERGY STAR)	32%	100%	35%	37%
Total	100%	100%	100%	100%

Source: Opinion Dynamics analysis of shelf audit data.

An analysis of shelf space by most common bulb wattage shows that the share of energy-efficient products is relatively evenly distributed across standard bulb wattages. As can be seen in Figure 7-24, between 20% and 32% of products within a given wattage category are halogen. LEDs, however, are slightly more prominent in the most popular 60-watt equivalent category, accounting for 70% of all products.

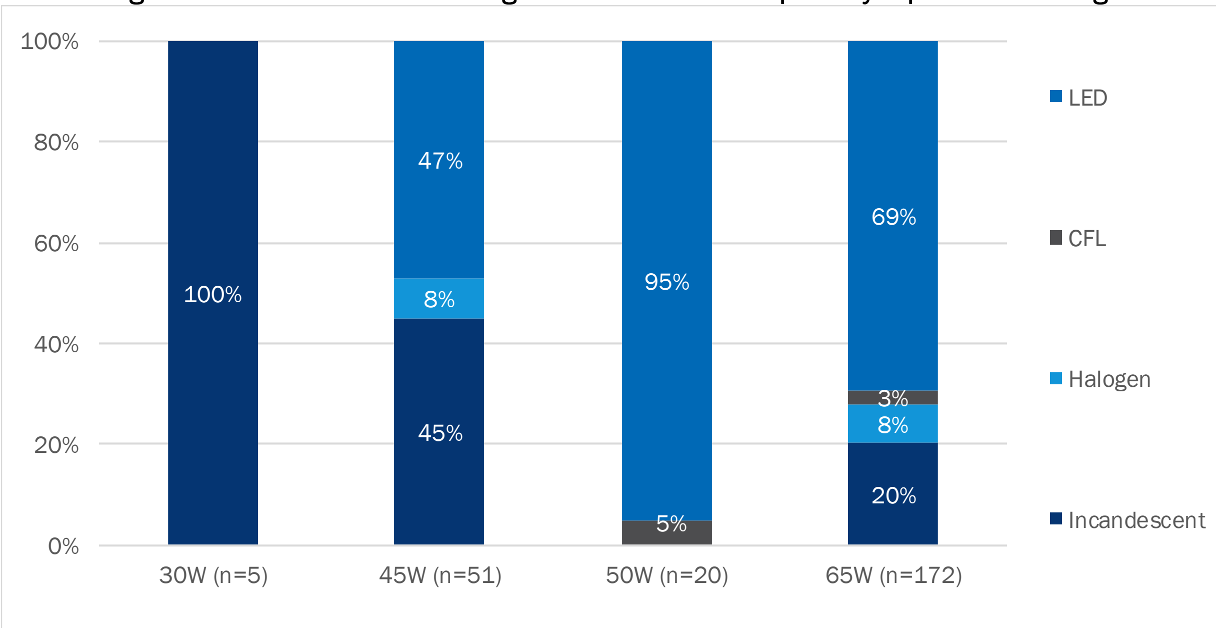
Figure 7-24. DEC Retail LED Program General Service Shelf Space by Equivalent Wattage



Source: Opinion Dynamics analysis of shelf audit data.

When it comes to reflectors, however, the technology mix varies considerably depending on the wattage. Lower-wattage reflectors (30-watt equivalent) are dominated by incandescents (100% of all products), while 50-watt and 65-watt equivalents are dominated by LEDs (95% and 69%, respectively). Across all stores, lower-wattage reflector products (30-watt and 45-watt) account for just under a quarter of all reflector products (23%). Increasing the volume of lower-wattage reflector products discounted through the program may help further increase program impact on the lighting market transformation.

Figure 7-25. DEC Retail LED Program Reflector Shelf Space by Equivalent Wattage



Source: Opinion Dynamics analysis of shelf audit data.

Despite their prominence on the store shelves, CFLs and LEDs continue to be the most expensive product on the market, and halogens continue to be the least expensive one. As can be seen in Table 7-8, the average price is $1.99 for a general service halogen, $2.87 for a general service CFL, and $4.87 for a general service LED. Average price for a reflector incandescent is $4.26, a reflector halogen is $5.33, a reflector CFL is $6.26, and reflector LED is $7.01. For the price-sensitive customer segments, such as lower-income residential customers, program incentives can help bring LEDs on par with the halogen and incandescent pricing, thus making the technology an affordable alternative.

Table 7-8. DEC Retail LED Program General Service and Reflector Pricing

	Average Price (15 stores)	Min Price (15 stores)	Max Price (15 stores)
General Service Products (n=638)			
Halogen	$1.99	$1.54	$2.44
CFLs	$2.87	$2.54	$3.21
LEDs	$4.87	$3.92	$5.81
Reflector Products (n=248)			
Incandescent	$4.26	$3.84	$4.68
Halogen	$5.33	$5.33	$5.33
CFLs	$6.26	$5.99	$6.52
LEDs	$7.01	$6.10	$7.91

Source: Opinion Dynamics analysis of shelf audit data.

7.2.3 Future Trends

We asked retailers and manufacturers about future trends in the lighting industry. Almost unanimously, respondents predicted further increase in LED shelf space and market shares at the expense of both CFL and halogen products. Many retailer and manufacturer contacts predicted that CFLs would be completely or nearly gone from shelves in the next 5 years. Some alluded to increased prominence of alternative technologies, such as smart bulbs or even some new unforeseen technology.

"I think [CFLs] are going to be done. They are slowly going to start trickling away…and the price points of LEDs are going to contribute to the demise of CFLs."

Market trends and developments support these finding. General Electric stopped manufacturing CFLs as of early 2017.[22] New ENERGY STAR standards, put into effect in January 2017, increased lumen per-watt standards for CFLs and relaxed lifetime standards for LEDs, meaning current CFLs lost their ENERGY STAR designation and many LEDs gained it.[23] As more LED products become ENERGY STAR certified, demand for those products is likely to increase further. Finally, EISA 2020 is not far off, which will further increase lighting energy efficiency standards and likely drive manufacturing and distribution practices away from halogens, leaving energy-efficient LEDs and CFLs as the only options in the market. However, when we asked manufacturers whether they had plans in place to change their manufacturing practices in anticipation of EISA 2020, none of the respondents said that they did, citing, among other reasons, general uncertainty related to the current political climate.

As part of the interviews, we also asked retailers and manufacturers about their expectations for the future lighting market both with and without the program. Opinions about the program's value in shifting the lighting market going forward were mixed. More than a third (36%) of store-level interviewees expected that the market would be unaffected by the program moving forward, while just over one-quarter (27%) thought customers would revert to less-efficient alternatives, and slightly less than one-quarter of respondents (23%) expected that the adoption of new technologies would be slowed somewhat in the absence of the program.

[22] http://pressroom.gelighting.com/news/leave-cfl-in-the-dark-and-light-up-your-love-for-led#.Vs56ksv2Zkg.

[23] https://www.energystar.gov/sites/default/files/ENERGY%20STAR%20Lamps%20V2_0%20Program%20Requirements.pdf.

8. Conclusions and Recommendations

8.1 DEP EEL Program

From its inception in 2010 through the end of current evaluation period (March 2017), the DEP EEL program discounted a total of 29,520,349 CFL and LED bulbs and fixtures, of which, we estimate that 24,123,345 were purchased by DEP residential customers. If the 1.2 million DEP residential customers equally purchased the 24,122,648 bulbs, each would have purchased an average of 21 bulbs. If we were to account for CFL burnout from early program years,[24] divide the adjusted number of program bulbs by the total number of residential DEP customers, and assume that a typical home has 53 sockets, we estimate that at the end of 2016, program-discounted bulbs would be installed in close to half of all residential sockets (48%). This is a large impact on efficient bulb use. The program continued efforts to reach underserved customer segments and sockets by maintaining a relatively high share of sales through the Dollar/Discount channel (which attracts lower-income shoppers) and increasing the focus on specialty products (standard bulb sales decreased by 8% between PY2015 and PY2016–2017).

Program implementation processes were smooth and effective, resulting in high levels of stakeholder and market actor satisfaction. Program staff effectively managed 744 unique products across 289 participating storefronts. Program tracking data were generally clean and well maintained. Program marketing was versatile and targeted customers both at point of purchase and through local event-based venues.

The transition of the lighting market in the DEP jurisdiction continued at an accelerated pace. Compared to the fall of 2012, when LED products accounted for just 10% of all general service products on the store shelves in the DEP jurisdiction, in 2016, LEDs accounted for 57% of the shelf space. Between 2015 and 2016, LEDs grew from 38% to 57% of all lighting products on store shelves.

LED prices have decreased dramatically over time. More specifically, based on the shelf audit research conducted over time, standard LED prices dropped from $14.65 per bulb in 2014 to $4.68 in 2016, which represents a 68% drop in price. Similarly, the average per-bulb price for reflector products decreased from $23.00 in 2014 to $6.92 in 2016. These decreasing prices made LEDs more affordable and accessible to the broader population. The introduction of new ENERGY STAR 2.0 lamp specifications in 2017 rendered most CFLs no longer eligible for ENERGY STAR certification, while at the same time relaxing certification requirements for LEDs. These changes in standards helped further the prominence of LEDs.

These findings indicate that the key barriers to energy-efficient lighting adoption, such as product availability and price, have been largely mitigated, which may signal diminishing program effects moving forward. This finding is further substantiated in the energy-efficient lighting penetration in the DEP jurisdiction: Nearly 9 in 10 DEP customers (88%) reported having CFLs or LEDs in their homes and 42% reported having LEDs in their homes.

That said, LEDs continue to be the most expensive lighting technology on store shelves, and program discounts help bring them on par with less expensive halogens and incandescents. Furthermore, customers who have LEDs in their homes do not have them in all of their sockets. Program opportunities continue to exist among certain customer segments, namely, older customers, renters, and customers with lower levels of education and lower incomes, where both penetration of energy-efficient products and the percent of sockets taken up by energy-efficient products is lower than average. Additionally, program opportunities continue to exist among

[24] Assuming a 5-year expected useful life (EUL) for a CFL.

a narrow set of product categories, such as specialty products, where a considerable share of shelf space and sockets is still taken by incandescent and halogen products.

New energy efficiency standards are bound to take place in 2020 with the second phase of EISA, which will require that most of the bulbs on the market meet the 45 lumens per watt efficacy minimum, effectively making LEDs the new baseline. Under this new phase of EISA, energy-efficient lighting programs, such as the DEP EEL program, will no longer be cost-effective or needed. Until then, manufacturers have no plans to discontinue the production of incandescent and halogen products, and the program can help further market transformation to energy-efficient lighting.

Based on these findings, Opinion Dynamics recommends the following:

- Continue and if possible increase underserved customer segments through the mass market program design. Such efforts include targeting stores in areas with disproportionate shares of underserved customers and targeting retailers with disproportionate numbers of shoppers from underserved segments.
- Continue and if possible increase targeting specialty products by increasing the prominence of specialty products in the program product mix, including focusing on lower-wattage products, and by adjusting program marketing and messaging to focus on underserved sockets and to increase messaging relevance (such as specialty sockets in dining rooms).
- Monitor the market for retailer and manufacturer behaviors in terms of manufacturing practices and shelf stocking trends in anticipation of the second phase of EISA to identify optimal timing for program completion.

8.2 DEC Retail LED Program

By discounting more than 1.3 million products since its inception, the DEC Retail LED program contributed to the lighting market transformation in the DEC jurisdiction. Program interventions indisputably contributed to energy-efficient bulb penetration.

Program implementation processes were smooth and effective, resulting in high levels of stakeholder and market actor satisfaction. Program staff effectively managed 384 unique products across 300 participating storefronts. Program tracking data were generally clean and well maintained. Program marketing was versatile and targeted customers both at point of purchase and through local event-base venues.

The program made efforts to reach underserved customer segments and sockets by targeting Dollar/Discount retailers (which attracts lower income shoppers), and focusing on specialty products. In PY2016–2017, 44% of program participating storefronts were Dollar/Discount, and they accounted for 10% of program sales.

Energy-efficient lighting products were prominent on the store shelves. As part of the shelf audits, we collected data on the general service and reflector lighting products present on the participating and non-participating store shelves. Close to three-quarters of the general service products on the retailer shelves (73%) were CFLs and LEDs, and 63% were LEDs. Incandescent products were not available and halogen products represented just over a quarter (27%) of all general service products.

Shelf audits conducted over time in the neighboring DEP jurisdiction show that LED prices have decreased dramatically over time. More specifically, standard LED prices dropped from $14.65 per bulb in 2014 to $4.68

in 2016, which represents a 68% drop in price.[25] Similarly, the average per-bulb price for reflector products decreased from $23.00 in 2014 to $6.92 in 2016. Average LED prices in the DEC jurisdiction, based on the results of the 2016 shelf audits, mimic DEP's, with the per-bulb price for standard LEDs averaging $4.87 and the per-bulb price for reflector LEDs averaging $7.01. These decreasing prices made LEDs more affordable and accessible to a broader population. The introduction of new ENERGY STAR 2.0 lamp specifications in 2017 rendered most CFLs no longer eligible for ENERGY STAR certification, while at the same time relaxing certification requirements for LEDs. These changes in standards helped further the prominence of LEDs.

These findings indicate that the key barriers to energy-efficient lighting adoption, such as product availability and price, have been largely mitigated, which may signal diminishing program effects moving forward. This finding is further substantiated by findings regarding overall energy-efficient lighting penetration in the DEC jurisdiction. More than 9 in 10 DEC customers (92%) reported having CFLs or LEDs in their homes and 33% reported having LEDs in their homes.[26]

That said, LEDs continue to be the most expensive lighting technology on store shelves, and program discounts help bring them on par with less expensive halogens and incandescents. Furthermore, customers who have LEDs in their homes do not have them in all of their sockets. Program opportunities continue to exist among certain customer segments, namely, older customers, renters, and customers with lower levels of education and lower incomes, where both penetration of energy-efficient products and the percent of sockets taken up by energy-efficient products is lower than average. Additionally, program opportunities continue to exist among a narrow set of product categories, such as specialty products, where a considerable share of shelf space and sockets is still taken by incandescent and halogen products.

New energy efficiency standards are bound to take place in 2020 with the second phase of EISA, which will require that most of the bulbs on the market meet the 45 lumens per watt efficacy minimum, effectively making LEDs the new baseline. Under this new phase of EISA, energy-efficient lighting programs, such as the DEC Retail LED program will no longer be cost-effective or needed. Until then, manufacturers have no plans to discontinue the production of incandescent and halogen products, and the program can help further market transformation to energy-efficient lighting.

Based on these findings, Opinion Dynamics recommends the following:

- Continue and if possible increase underserved customer segments through the mass market program design. Such efforts include targeting stores in areas with disproportionate shares of underserved customers and targeting retailers with disproportionate numbers of shoppers from underserved segments.
- Continue and if possible increase targeting specialty products by increasing the prominence of specialty products in the program product mix, including focusing on lower-wattage products, and by adjusting program marketing and messaging to focus on underserved sockets and to increase messaging relevance (such as specialty sockets in dining rooms).
- Monitor the market for retailer and manufacturer behaviors in terms of manufacturing practices and shelf stocking trends in anticipation of the second phrase of EISA to identify optimal timing for program completion.

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[25] Note that this analysis is based on the light bulbs of all wattages, including those not discounted through the DEC Retail LED program.

[26] Note that these results include LED penetration across lighting products of all wattages, and not just the wattages discounted through the program.

9. DEP EEL Program Summary Form

DEP Energy Efficient Lighting Program

Completed EMV Fact Sheet

Duke Energy Progress partners with retailers and manufacturers across North and South Carolina to provide price markdowns on efficient lighting products. The program promotes customer awareness and purchase of the program-discounted products through a range of marketing and outreach strategies and provides training to store staff. Product mix includes standard and specialty CFLs, LEDs, and ENERGY STAR fixtures, including a wide range of products in each product category. Participating retailers include a variety of retail channels including Do-It-Yourself, Club, Dollar/Discount, and Big Box stores.

Date	July 14, 2017
Region(s)	Duke Energy Progress
Evaluation Period	January 1, 2016 – March 12, 2017
Gross Annual kWh Impact	125,001,897 kWh (89% realization rate)
Gross Coincident kW Impact	21,962 Summer kW (95% realization rate) 8,066 Winter kW (113% realization rate)
Net-to-Gross Ratio	0.40
Process Evaluation	Yes
Previous Evaluation(s)	PY2014 and PY2015

Evaluation Methodology

The evaluation team reviewed ex ante per-unit savings assumptions and verified values matched those provided as part of the program's previous evaluation. The evaluation team also performed an engineering analysis of energy and demand savings to develop evaluated savings estimates, conducted a residential lighting logger study to update residential hours of use and in-service rate for LEDs, estimated leakage based on GIS analysis, and estimated a net-to-gross ratio using sales data modeling and direct feedback from retailers and manufacturers. The evaluation team also completed a process analysis based on retailer shelf audits, interviews with program staff, program tracking data analysis, review of program materials, and interviews with retailer and manufacturer staff.

Evaluation Details

- North Carolina Utilities Commission requires that evaluations of DEP's Energy Efficient Lighting program include Carolinas-specific data.
- North Carolina Utilities Commission require that evaluations of DEP's Energy Efficient Lighting program include a discussion of the impacts of LEDs, the Energy Independence and Security Act (EISA), and other innovations in lighting technology on the calculations of measure impacts and the baseline measures used in those calculations
- The evaluation team used the most recent available Carolinas-specific energy savings estimates
- The evaluation team used the Uniform Methods Project (UMP) recommended approach to estimate gross energy savings and incorporated additional adjustments as necessary
- The evaluation team developed evaluated savings assumptions using detailed product information provided as part of the program tracking data extract
- The evaluation team used a 'discounted savings approach' to claiming savings from future installations
- Assessment of program attribution relied on a combination of results from sales data modeling and interviews with participating retailers and manufacturers

10. DEC Retail LED Program Summary Form

DEC Retail LED Program

Completed EMV Fact Sheet

Duke Energy Carolinas partners with retailers and manufacturers across North and South Carolina to provide price markdowns on efficient lighting products. The program promotes customer awareness and purchase of the program-discounted products through a range of marketing and outreach strategies and provides training to store staff. Product mix includes standard, reflector, and specialty LEDs, and ENERGY STAR fixtures, including a wide range of products in each product category. Participating retailers include a variety of retail channels including Do-It-Yourself, Club, Dollar/Discount, and Big Box stores.

Date	July 14, 2017
Region(s)	Duke Energy Carolinas
Evaluation Period	March 21, 2016 – March 12, 2017
Gross Annual kWh Impact	57,846,855 kWh (110% realization rate)
Gross Coincident kW Impact	10,676 Summer kW (121% realization rate) 4,045 Winter kW (155% realization rate)
Net-to-Gross Ratio	0.41
Process Evaluation	Yes
Previous Evaluation(s)	PY2014 and PY2015

Evaluation Methodology

The evaluation team reviewed ex ante per-unit savings assumptions and verified values matched those provided as part of the previous evaluation of the DEP Energy Efficient Lighting program. The evaluation team also performed an engineering analysis of energy and demand savings to develop evaluated savings estimates, conducted a residential lighting logger study to update residential hours of use and in-service rate for LEDs, estimated leakage based on GIS analysis, and estimated a net-to-gross ratio using sales data modeling and direct feedback from retailers and manufacturers. The evaluation team also completed a process analysis based on retailer shelf audits, interviews with program staff, program tracking data analysis, review of program materials, and interviews with retailer and manufacturer staff.

Evaluation Details

- North Carolina Utilities Commission requires that evaluations of DEP's Energy Efficient Lighting program include Carolinas-specific data.
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Duke Energy Progress & Duke Energy Carolinas

Energy Efficient Lighting & Retail LED Programs Appendices

April 6, 2018

Opinion Dynamics

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Appendix A. Detailed Analysis Tables

The Excel spreadsheet is provided as a separate submission and contains detailed analysis of program gross and net impacts. The data in the file are at the invoice a unique product level measure. The file contains ex ante savings, gross savings assumptions, ex post gross savings, NTGR, and ex post net savings.

Appendix B. Chart with Measure-Level Inputs for Duke Energy Analytics

The Excel spreadsheet is provided as a separate submission and contains measure-level inputs for Duke Energy Analytics. Per-measure savings values in the spreadsheet are based on the engineering estimates presented in this report. Measure life estimates are based on previous evaluations and review of relevant TRMs. Update as necessary based on source of values.

Appendix C. Retailer and Manufacturer Interview Guide

Duke Energy Progress and Duke Energy Carolinas Retail Lighting Program

Participating Retailer and Manufacturer Interview Guide

FINAL

October 26, 2016

The main purpose of this interview guide is to measure program impact on retailer and manufacturer stocking and sales practices to estimate program net-to-gross ratio (NTGR). As part of the interviews, we will also explore retailer satisfaction with key program processes and recommendations for program improvement.

Introduction

Hello, may I speak with <NAME>?

My name is <NAME> and I am calling from Opinion Dynamics on behalf of Duke Energy. We are currently evaluating <PROGRAM> program, and I have a few questions that I would like to ask you about your experiences with the program. Do you have 15 minutes to speak with me? Your responses will be confidential, and we will not link you or your company with anything we report to Duke Energy. I do not work for Duke Energy. I am a third-party evaluator hired to help Duke Energy evaluate their <PROGRAM> program.

[OBTAIN PERMISSION TO RECORD CONVERSATION]

1. First, can you tell me your job title and major responsibilities? How long have you held this position?
2. Prior to this interview, were you aware that Duke Energy offers discounts on energy efficient light bulbs at select retailers that reduce the purchase price for customers buying bulbs?
   a. [IF YES] What is your level of involvement with the program? What has that involvement looked like?
   b. [IF NO] Are you in contact with anyone more directly involved with the program? If so, might you be able to put us in touch?
3. When did [COMPANY] begin participating in Duke Energy <PROGRAM> program?

Product Presence

[ASK STORE MANAGERS ONLY]
I would now like to ask you a few questions about the products that you have available at your store.

4. What types of CFL and LED products did your store stock in 2016? [PROBE FOR STANDARD AND SPECIALTY, CFLS AND LEDS]
   a. What product type did your store sell the most of in 2016?
5. Did you sell standard CFLs that were not ENERGY STAR certified in 2016? What about LEDs?

Market Trends and Market Effects

6. As you probably know, Duke Energy <PROGRAM> program has been around since 2009. How effective would you say the program has been in helping to increase the market (consumer demand) for high efficiency lighting products in Duke Energy's service territory? Why do you say that?
   [IF UNABLE TO COMMENT ON DUKE ENERGY SERVICE TERRITORY, PROBE FOR THE SOUTHEAST REGION OR AT THE NATIONAL LEVEL]

[ASK OF MANUFACTURERS]

7. The types of lighting products manufactured has changed quite a bit over the past ten years. The rate of changes has accelerated in the past few years in terms of the reduction in traditional incandescents and the introduction of EISA-compliant halogens and LEDs. What have been the main factors driving these changes? [PROBE FOR RELATIVE INFLUENCE OF EISA, THE DEP PROGRAM, EE LIGHTING PROGRAMS MORE GENERALLY ACROSS THE COUNTRY, NEED TO STAY AHEAD OF COMPETITORS, TECHNOLOGICAL ADVANCEMENTS IN OTHER FIELDS (E.G. CONNECTED HOMES)].
   a. How, if at all, has the program affected your manufacturing practices? What about your distribution practices? Do you vary your product distribution by existing consumer demand in a region?
   b. What is the impact of the federal legislation, namely EISA, on the changes in the manufacturing and distribution practices?
   c. Do you currently manufacture and/or distribute EISA-affected incandescent products?
   d. If EISA legislation were to be overturned tomorrow, how likely is it that [COMPANY] would start manufacturing and distributing EISA-affected incandescent products? Why do you say that?

[ASK OF STORE MANAGERS]

8. How do you determine which products to stock at your store(s)? [PROBE FOR ABILITY OF INDIVIDUAL STORES TO INFLUENCE WHAT IS STOCKED]

9. How, if at all, has the program affected CFL and LED stocking and product availability? Why do you say that? [PROBE SEPARATELY FOR ENERGY STAR VS. NON-ENERGY STAR PRODUCTS]
   a. Would the shelf space dedicated to CFLs and LEDs be different in the absence of the program? How different would it look? [PROBE FOR STANDARD AND SPECIALTY PRODUCTS]
   b. What is the impact of the federal legislation, namely EISA, on the changes in the stocking practices?

[ASK OF CORPORATE LEVEL CHAIN RETAILER CONTACTS]

10. Do your company's stocking practices vary by store or do you stock the same types of products across all stores?
    a. Do the stocking practices differ based on whether the store is participating in the program or not? [IF DIFFER] How do the practices differ? [PROBE FOR CFLS VS. LEDS VS. LESS EFFICIENT OPTIONS, ENERGY STAR VS. NON-ENERGY STAR CFLS AND LEDS]

[ASK ALL]

11. How much customer interest is there in the market in CFLs? What about LEDs? [PROBE FOR DIFFERENCES IN INTEREST BY STANDARD AND SPECIALTY PRODUCTS]

12. What influence does the ENERGY STAR label play in customer purchase decisions? How important would you say it is for customers that CFLs and LEDs are ENERGY STAR certified? [PROBE FOR DIFFERENCES BETWEEN CFLS AND LEDS]

13. How, if at all, has the program affected customer interest and lighting preferences? Why do you say that? What other factors played a role in the change in customer interest and preferences? [PROBE FOR RETAILER/MANUFACTURER GREEN PRACTICES, ENERGY STAR MARKETING AND EDUCATIONAL EFFORTS, OTHER EFFORTS]

14. Overall, what are the main barriers to increased adoption of CFLs and LEDs? How, if at all, do they differ for CFLs versus LEDs?

15. What changes do you expect to see in the lighting market in the next five years? Why do you say that? [Probe for changes in market share of incandescents, halogens, CFLs, ENERGY STAR LEDS AND NON-ENERGY STAR LEDS. Ask if this is the same for specialty bulbs as well]

16. Looking into the future, if the program incentive and other support were to be withdrawn, what would the lighting market look like? How, if at all, would the lighting market change without future program support? How likely is it that the sales of CFLs and LEDs would sustain in the absence of the program? What about the sales of ENERGY STAR CFLs and LEDs specifically?

Program Impacts on Product Availability and Sales

17. Thinking about your sales of lighting products in 2016 so far, are there any energy efficient lighting products that <COMPANY> would not carry or would sell substantially different quantities of if it did not participate in the Duke Energy <PROGRAM> program? [PROBE BY PRODUCT TYPE: STANDARD VS. SPECIALTY, CFLS VS. LEDS]
    [IF APPLICABLE, ASK SEPARATELY FOR EACH OF THE FOLLOWING TECHNOLOGIES:
    - Standard CFLs
    - Specialty CFLs
    - Standard LEDs
    - Specialty LEDs
    - CFL or LED fixtures]

[FOR MANUFACTURERS ONLY WHERE APPLICABLE, ASK BY RETAIL CHANNEL]

18. If Duke Energy discontinued its program, do you think sales of [TECHNOLOGY] would stay the same or change?
    a. [IF SALES WOULD CHANGE] What would the percent change in sales for [TECHNOLOGY]? [IF UNABLE TO PROVIDE EXACT PERCENTAGE, PROBE FOR BEST ESTIMATE]

19. Why do you think the sales would have been [INSERT RESPONSE FROM Q18A]? How did you come up with this percent change estimate?
    [ASK IF INCREASE IN EFFICIENT BULB SALES WAS REPORTED DUE TO THE PROGRAM]

20. If the DEP program did not exist and you were selling fewer ENERGY STAR [TECHNOLOGY] as a result, what type of light bulb do you think customers would have purchased instead? Would they have purchased less efficient technologies such as incandescents and halogens, would they have shifted to non-ENERGY STAR CFLs or LEDs, or would they just purchased fewer light bulbs overall?

[ASK OF MANUFACTURERS]

21. Are there any retailers or retailer categories that would not be selling energy efficient lighting products if the program had not been available?
    a. Why do you say that?
    b. What retailers are they?

Program Satisfaction

I would now like to ask you a few questions about your satisfaction with Duke Energy <PROGRAM> program.

22. Using a scale that ranges from 0 to 10 where 0 means extremely dissatisfied and 10 means extremely satisfied, overall, how satisfied are you with Duke Energy program?
    a. Why do you give it this rating?
    b. What aspects of Duke Energy program work particularly well? Why do you say that?
    c. What aspects of the program do not work well and could be improved?

23. Using that same scale that ranges from 0 to 10 where 0 means extremely dissatisfied and 10 means extremely satisfied, how satisfied are you with the variety and types of products discounted through the program?
    a. Why do you give it this rating?
    b. Are there any types of lighting you would like to see added to the program? If so, what are they? Why would you like to see these products discounted through the program?

24. Using that same scale that ranges from 0 to 10 where 0 means extremely dissatisfied and 10 means extremely satisfied, how satisfied are you with the size of discounts provided through Duke Energy program? [IF NEEDED, PROBE FOR SATISFACTION WITH DISCOUNTS BY LIGHTING TECHNOLOGY]
    a. Why do you give it this rating?
    b. Are you ever concerned that the discounts may be so large that the increased sales won't cover your loss in topline revenue due to the discount?

25. Using that same 0 to 10 scale, how satisfied are you with the program tracking and invoicing process?
    a. Why do you give it this rating?

Marketing and Education

[SKIP FOR MANUFACTURERS]

26. Using a scale that ranges from 0 to 10 where 0 means extremely dissatisfied and 10 means extremely satisfied, how satisfied are you with the program marketing materials? [IF NEEDED, PROBE FOR POP AS WELL AS OTHER PROGRAM MARKETING]
    a. Why do you give it this rating?
    b. Do you have a sense of the impact of the signage and marketing materials on bulb sales?

27. Are there additional types of marketing that you would like the program to provide or that you think would encourage the sales of energy efficient bulbs?

Suggestions for Program Improvement

28. Do you have any other suggestions about how the Duke Energy program could be improved? What suggestions do you have to make it easier for retailers/manufacturers like <RETAILER/MANUFACTURER> to participate in the program?

These are all the questions that I have for you. Thank you very much for your time and participation.

Appendix D. Shelf Audit Data Collection Instrument

Opinion Dynamics

DEP Residential Energy Efficient Lighting & DEC Retail LED Lighting Programs

Retailer Lighting Shelf Audit

DRAFT

September 7, 2016

The main purpose of this data collection instrument is to collect information on the lighting products available at a sample of participating and non-participating retailers. The results will be used to adjust baseline wattages, describe shelf space dedicated to various technologies, and describe the presence of program marketing materials.

Retailer Information

S1. Enter the following information for the store you are about to visit.
- a. Utility:
- b. Retailer ID:
- c. Store Name:
- d. Store Address:
- e. Participating Retailer: Yes, No

Lighting Inventory – General Service Products

GS1. Please indicate whether each of the following lighting products are available at the store.
- a. General service medium screw-based incandescent
- b. General service medium screw-based halogen
- c. General service medium screw-based CFL
- d. General service medium screw-based LED
  1. Yes
  2. No

General Service – Incandescent

GSI1. Please indicate which incandescent wattage(s) is (are) available at this store.

	[SHOW IF GS1A=1] Incandescent Available
a. 100-watt	1 Yes, 2 No
b. 75-watt	1 Yes, 2 No
c. 60-watt	1 Yes, 2 No
d. 40-watt	1 Yes, 2 No

GSI2. For each of the following wattages, please provide the count of SKUs available at this store. [ONLY SHOW WATTAGES WITH YES RESPONSES TO GSI1]

	a. Count of SKUs
a. 100-watt	[NUMERIC OPEN END 1-99]
b. 75-watt	[NUMERIC OPEN END 1-99]
c. 60-watt	[NUMERIC OPEN END 1-99]
d. 40-watt	[NUMERIC OPEN END 1-99]

GSI3. For each of the following wattages, please provide the LOWEST and the HIGHEST price for each of the bulb pack sizes.
[ONLY SHOW WATTAGES WITH YES RESPONSES TO GSI1]

	a. One-bulb Pack Price	b. Two-bulb Pack Price	c. Four-bulb Pack Price
a. 100-watt	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]
b. 75-watt	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]
c. 60-watt	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]
d. 40-watt	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]

General Service – Halogen

GSH1. Please indicate which equivalent halogen wattages are available at this store.

	[SHOW IF GS1B=1] Halogen Available
a. 100-watt	1 Yes, 2 No
b. 75-watt	1 Yes, 2 No
c. 60-watt	1 Yes, 2 No
d. 40-watt	1 Yes, 2 No

GSH2. For each of the following wattages, please provide the count of SKUs available at this store. [ONLY SHOW WATTAGES WITH YES RESPONSES TO GSH1]

	a. Count of SKUs
a. 100-watt	[NUMERIC OPEN END 1-99]
b. 75-watt	[NUMERIC OPEN END 1-99]
c. 60-watt	[NUMERIC OPEN END 1-99]
d. 40-watt	[NUMERIC OPEN END 1-99]

GSH3. For each of the following wattages, please provide the LOWEST and the HIGHEST price for each of the bulb pack sizes.
[ONLY SHOW WATTAGES WITH YES RESPONSES TO GSH1]

	a. One-bulb Pack Price	b. Two-bulb Pack Price	c. Four-bulb Pack Price
a. 100-watt	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]
b. 75-watt	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]
c. 60-watt	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]
d. 40-watt	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]

General Service – CFL

GSC1. Please indicate which equivalent CFL wattages are available at this store.

	[SHOW IF GS1C=1] CFL Available
a. 100-watt	1 Yes, 2 No
b. 75-watt	1 Yes, 2 No
c. 60-watt	1 Yes, 2 No
d. 40-watt	1 Yes, 2 No

GSC1aa. Are there only ENERGY STAR CFLs, a mix of ENERGY STAR and non-ENERGY STAR CFLs, or only non-ENERGY STAR CFLs available?

1. Only ENERGY STAR CFLs
2. A mix of ENERGY STAR and non-ENERGY STAR CFLs
3. Only non-ENERGY STAR CFLs

[DO NOT SHOW GSC2AA IF GSC1AA=3]
[DO NOT SHOW GSC2BB IF GSC1AA=1]
GSC2. For each of the following wattages, please provide the count of SKUs available.
[ONLY SHOW WATTAGES WITH YES RESPONSES TO GSC1]

	aa. Count of ENERGY STAR SKUs	bb. Count of NON-ENERGY STAR SKUs
a. 100-watt	[NUMERIC OPEN END 1-99]	[NUMERIC OPEN END 1-99]
b. 75-watt	[NUMERIC OPEN END 1-99]	[NUMERIC OPEN END 1-99]
c. 60-watt	[NUMERIC OPEN END 1-99]	[NUMERIC OPEN END 1-99]
d. 40-watt	[NUMERIC OPEN END 1-99]	[NUMERIC OPEN END 1-99]

[DO NOT SHOW GSC3A-C IF GSC1AA=3]
[DO NOT SHOW GSC3D-F IF GSC1AA=1]
GSC3. For each of the following wattages, please provide the LOWEST and the HIGHEST price for each of the CFL bulb pack sizes.
[ONLY SHOW WATTAGES WITH YES RESPONSES TO GSC1]

	a. ENERGY STAR One-bulb Pack Price	b. ENERGY STAR Two-bulb Pack Price	c. ENERGY STAR Four-bulb Pack Price	d. Non-ENERGY STAR One-bulb Pack Price	e. Non-ENERGY STAR Two-bulb Pack Price	f. Non-ENERGY STAR Four-bulb Pack Price
a. 100-watt	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]
b. 75-watt	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]
c. 60-watt	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]
d. 40-watt	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]

General Service – LED

GSL1. Please indicate which equivalent LED wattages are available at this store.

	[SHOW IF GS1D=1] LED Available
a. 100-watt	1 Yes, 2 No
b. 75-watt	1 Yes, 2 No
c. 60-watt	1 Yes, 2 No
d. 40-watt	1 Yes, 2 No

GSL1aa. Are there only ENERGY STAR LEDs, a mix of ENERGY STAR and non-ENERGY STAR LEDs, or only non-ENERGY STAR LEDs available?

1. Only ENERGY STAR LEDs
2. A mix of ENERGY STAR and non-ENERGY STAR LEDs
3. Only non-ENERGY STAR LEDs

[DO NOT SHOW GSL1b IF GSL1aa=1]
GSL1bb. What is the longevity of the bulb life for NON-ENERGY STAR LEDs?

1. 25 years
2. 20 years
3. 15 years
4. 10 years
5. 7 years
6. 5 years

00. (Other, please specify)

[DO NOT SHOW GSL2AA IF GSL1AA=3]
[DO NOT SHOW GSL2BB IF GSL1AA=1]
GSL2. For each of the following wattages, please provide the count of SKUs available at this store.
[ONLY SHOW WATTAGES WITH YES RESPONSES TO GSL1]

	aa. Count of ENERGY STAR SKUs	bb. Count of NON-ENERGY STAR SKUs
a. 100-watt	[NUMERIC OPEN END 1-99]	[NUMERIC OPEN END 1-99]
b. 75-watt	[NUMERIC OPEN END 1-99]	[NUMERIC OPEN END 1-99]
c. 60-watt	[NUMERIC OPEN END 1-99]	[NUMERIC OPEN END 1-99]
d. 40-watt	[NUMERIC OPEN END 1-99]	[NUMERIC OPEN END 1-99]

[DO NOT SHOW GSL3A-C IF GSL1AA=3]
[DO NOT SHOW GSL3D-F IF GSL1AA=1]
GSL3. For each of the following wattages, please provide the count of SKUs available at this store and the LOWEST and the HIGHEST price for each of the bulb pack sizes.
[ONLY SHOW WATTAGES WITH YES RESPONSES TO GSL1]

	a. ENERGY STAR One-bulb Pack Price	b. ENERGY STAR Two-bulb Pack Price	c. ENERGY STAR Four-bulb Pack Price	d. Non-ENERGY STAR One-bulb Pack Price	e. Non-ENERGY STAR Two-bulb Pack Price	f. Non-ENERGY STAR Four-bulb Pack Price
a. 100-watt	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]
b. 75-watt	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]
c. 60-watt	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]
d. 40-watt	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]

Lighting Inventory – Reflector Products

R1. Please indicate whether each of the following lighting products are available at the store.
- a. Reflector medium screw based incandescent
- b. Reflector medium screw based Halogen
- c. Reflector medium screw based CFL
- d. Reflector medium screw based LED
    1. Yes
    2. No

Reflectors – Incandescent

RI1. Please indicate which incandescent wattage(s) is (are) available at this store.

	[SHOW IF R1A=1] Incandescent Available
a. 65-watt	1 Yes, 2 No
b. 55-watt	1 Yes, 2 No
c. 50-watt	1 Yes, 2 No
d. 40-watt	1 Yes, 2 No
e. 30-watt	1 Yes, 2 No

RI2. For each of the following wattages, please provide the count of SKUs available.
[ONLY SHOW WATTAGES WITH YES RESPONSES TO RI1]

	a. Count of SKUs
a. 65-watt	[NUMERIC OPEN END 1-99]
b. 55-watt	[NUMERIC OPEN END 1-99]
c. 50-watt	[NUMERIC OPEN END 1-99]
d. 40-watt	[NUMERIC OPEN END 1-99]
e. 30-watt	[NUMERIC OPEN END 1-99]

RI3. For each of the following wattages, please provide the LOWEST and the HIGHEST price for each of the incandescent bulb pack sizes.
[ONLY SHOW WATTAGES WITH YES RESPONSES TO RI1]

	a. One-bulb Pack Price	b. Two-bulb Pack Price
a. 65-watt	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]
b. 55-watt	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]
c. 50-watt	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]
d. 40-watt	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]
e. 30-watt	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]

Reflectors – Halogen

RH1. Please indicate which equivalent halogen wattages are available at this store.

	[SHOW IF R1B=1] Halogen Available
a. 65-watt	1 Yes, 2 No
b. 55-watt	1 Yes, 2 No
c. 50-watt	1 Yes, 2 No
d. 40-watt	1 Yes, 2 No
e. 30-watt	1 Yes, 2 No

RH2. For each of the following wattages, please provide the count of SKUs available.
[ONLY SHOW WATTAGES WITH YES RESPONSES TO RH1]

	a. Count of SKUs
a. 65-watt	[NUMERIC OPEN END 1-99]
b. 55-watt	[NUMERIC OPEN END 1-99]
c. 50-watt	[NUMERIC OPEN END 1-99]
d. 40-watt	[NUMERIC OPEN END 1-99]
e. 30-watt	[NUMERIC OPEN END 1-99]

RH3. For each of the following wattages, please provide the LOWEST and the HIGHEST price for each of the halogen bulb pack sizes.
[ONLY SHOW WATTAGES WITH YES RESPONSES TO RH1]

	a. One-bulb Pack Price	b. Two-bulb Pack Price
a. 65-watt	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]
b. 55-watt	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]
c. 50-watt	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]
d. 40-watt	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]
e. 30-watt	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]

Reflectors – CFL

RC1. Please indicate which equivalent CFL wattages are available at this store.

	[SHOW IF R1C=1] CFL Available
a. 65-watt	1 Yes, 2 No
b. 55-watt	1 Yes, 2 No
c. 50-watt	1 Yes, 2 No
d. 40-watt	1 Yes, 2 No
e. 30-watt	1 Yes, 2 No

RC1aa. Are there only ENERGY STAR CFLs, a mix of ENERGY STAR and non-ENERGY STAR CFLs, or only non-ENERGY STAR CFLs available?

1. Only ENERGY STAR CFLs
2. A mix of ENERGY STAR and non-ENERGY STAR CFLs
3. Only non-ENERGY STAR CFLs

[DO NOT SHOW RC2AA IF RC1AA=3]
[DO NOT SHOW RC2BB IF RC1AA=1]
RC2. For each of the following wattages, please provide the count of SKUs available.
[ONLY SHOW WATTAGES WITH YES RESPONSES TO RC1]

	aa. Count of ENERGY STAR SKUs	bb. Count of NON-ENERGY STAR SKUs
a. 65-watt	[NUMERIC OPEN END 1-99]	[NUMERIC OPEN END 1-99]
b. 55-watt	[NUMERIC OPEN END 1-99]	[NUMERIC OPEN END 1-99]
c. 50-watt	[NUMERIC OPEN END 1-99]	[NUMERIC OPEN END 1-99]
d. 40-watt	[NUMERIC OPEN END 1-99]	[NUMERIC OPEN END 1-99]
e. 30-watt	[NUMERIC OPEN END 1-99]	[NUMERIC OPEN END 1-99]

[DO NOT SHOW RC3A-B IF RC1AA=3]
[DO NOT SHOW RC3C-D IF RC1AA=1]

RC3. For each of the following wattages, please provide the LOWEST and the HIGHEST price for each of the CFL bulb pack sizes.
[ONLY SHOW WATTAGES WITH YES RESPONSES TO RC1]

	a. ENERGY STAR One-bulb Pack Price	b. ENERGY STAR Two-bulb Pack Price	c. Non-ENERGY STAR One-bulb Pack Price	d. Non-ENERGY STAR Two-bulb Pack Price
a. 65-watt	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]
b. 55-watt	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]
c. 50-watt	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]
d. 40-watt	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]
e. 30-watt	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]

Reflectors – LED

RL1. Please indicate which equivalent LED wattages are available at this store.

	[SHOW IF R1D=1] LED Available
a. 65-watt	1 Yes, 2 No
b. 55-watt	1 Yes, 2 No
c. 50-watt	1 Yes, 2 No
d. 40-watt	1 Yes, 2 No
e. 30-watt	1 Yes, 2 No

[DO NOT SHOW RL2AA IF RL1A=3]
[DO NOT SHOW RL2BB IF RL1A=1]
RL2. For each of the following wattages, please provide the count of SKUs.
[ONLY SHOW WATTAGES WITH YES RESPONSES TO RL1]

	aa. Count of ENERGY STAR SKUs	bb. Count of NON-ENERGY STAR SKUs
a. 65-watt	[NUMERIC OPEN END 1-99]	[NUMERIC OPEN END 1-99]
b. 55-watt	[NUMERIC OPEN END 1-99]	[NUMERIC OPEN END 1-99]
c. 50-watt	[NUMERIC OPEN END 1-99]	[NUMERIC OPEN END 1-99]
d. 40-watt	[NUMERIC OPEN END 1-99]	[NUMERIC OPEN END 1-99]
e. 30-watt	[NUMERIC OPEN END 1-99]	[NUMERIC OPEN END 1-99]

[DO NOT SHOW RL3A-B IF RL1A=3]
[DO NOT SHOW RL3C-D IF RL1A=1]
RL3. For each of the following wattages, please provide the LOWEST and the HIGHEST price for each of the LED bulb pack sizes.
[ONLY SHOW WATTAGES WITH YES RESPONSES TO RL1]

	a. ENERGY STAR One-bulb Pack Price	b. ENERGY STAR Two-bulb Pack Price	c. Non-ENERGY STAR One-bulb Pack Price	d. Non-ENERGY STAR Two-bulb Pack Price
a. 65-watt	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]
b. 55-watt	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]
c. 50-watt	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]
d. 40-watt	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]
e. 30-watt	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]	Min Price [NUMERIC OPEN END 1-199] Max Price [NUMERIC OPEN END 1-199]

Photos

PH1. Please take photos of the lighting aisle and confirm once done.
1. Confirm

Program Point-of-Purchase Marketing

[COLLECT FOR PARTICIPATING RETAILERS ONLY]
M1. Are there any Duke Energy Lighting program point-of-purchase marketing materials at this store?
- 1. Yes
- 2. No

[ASK IF M1=1]
M2. What types of materials are present at the store? Select all that apply
- 01. Was…now price signs
- 02. Shelf labels
- 03. End-caps
- 04. Sponsor signs
- 05. Hand tags
- 06. Point-of-Purchase displays
- 07. Wobblers
- 08. Shelf-hanging banners
- 09. Sponsor posters
- 10. Window clings
- 11. Stickers
- 00. Other, specify

M3. Please take photos of marketing materials and select confirm once done.
- 1. Confirm

This completes the visit.

Appendix E. Residential Lighting Logger Recruitment Survey

Duke Energy Progress and Duke Energy Carolinas Retail Lighting Program

Residential Lighting Logger Study Recruitment Instrument

FINAL

March 30, 2016

Survey Background

The primary goal of this recruitment survey is to identify DEP and DEC residential customers who have at least one LED in their home and recruit them for the lighting logger study. In addition, we will use the survey to collect key sociodemographic and household information for sampling purposes and better planning of the lighting logger deployment site visits.

Introduction – Telephone

Hello, my name is _________ and I'm calling from Opinion Dynamics on behalf of Duke Energy. May I please speak with <CUSTOMER NAME> or the person responsible for paying your utility bills? [ASK TO SPEAK TO CORRECT PERSON: "Is there anyone else in your household who is knowledgeable about your electric bill?"]

Just to confirm, do you receive an electric bill from Duke Energy at <ADDRESS>? [IF NO, THANK AND TERMINATE]

Your household has been randomly selected to participate in a lighting study for Duke Energy. This study is a part of the energy efficiency programs that Duke Energy is administering in North and South Carolina. Your participation is very important and will help improve Duke Energy energy efficiency offerings moving forward. Your responses will be used for analytic purposes only and will remain strictly confidential. If you qualify and agree to participate in the study, we will give you $100 as a token of appreciation. Let me assure you that we are not selling anything.

[IF NEEDED: This survey will only take a few minutes of your time.]

[IF NEEDED: IF YOU HAVE QUESTIONS ABOUT THIS SURVEY OR WOULD LIKE TO VERIFY THE LEGITIMACY OF THIS STUDY, PLEASE CONTACT MELINDA GOINS at 704-382-3827 OR BY EMAIL AT MELINDA.GOINS@DUKE-ENERGY.COM]

C1. Are you currently talking to me on a regular landline phone or a cell phone?
- 1. Regular landline phone
- 2. Cell phone
- 8. (Don't know)
- 9. (Refused)

[ASK IF C2 = 2]

C2. Are you currently in a place where you can talk safely and answer my questions?

1. Yes
2. No [SCHEDULE CALL BACK]
8. (Don't know) [SCHEDULE CALL BACK]
9. (Refused) [SCHEDULE CALL BACK]

Introduction – Internet

DUKE ENERGY®

Welcome to the Duke Energy Progress survey! Thank you for participating in this important study. This study is a part of the energy efficiency programs that Duke Energy is administering in North and South Carolina. Your participation is will help improve Duke Energy efficiency offerings moving forward. If you qualify and agree to participate in this study, we will give you $100 as a token of appreciation.

Please have the person knowledgeable about your electric bill you receive at 935 Burkett Rd Dover NC, 28526 take this survey. That person can either take over the survey from you or you can close out of the survey and have that person start the survey again using the same five-digit pin number on the invitation letter or reminder letter.

QI1. To start, can you please confirm if you receive an electric bill from Duke Energy at <ADDRESS>?

1. Yes, correct
2. No, incorrect [THANK & TERMINATE]

Study Eligibility

Before I can confirm your participation, I need to ask you a few additional questions to ensure you are eligible for the study. The questions will take just a few minutes to complete.

S3. Do you have any CFLs installed inside or outside your home?

[FOR PHONE RECRUITER SURVEY READ THE FOLLOWING] CFLs are also known as compact fluorescent lamps. The most common type is made with a glass tube bent into a spiral shape resembling soft-serve ice cream. Some CFLs may have a plastic or glass cover over the spiral tube.
[FOR ONLINE RECRUITER SURYEY INCLUDE THE FOLLOWING]
CFLs are also known as compact fluorescent lamps. The most common type is made with a glass tube bent into a spiral shape resembling soft-serve ice cream. Some CFLs may have a plastic or glass cover over the spiral tube. Below are some examples of what CFLs look like.

1. Yes
2. No
8. [SHOW IN PHONE RECRUITER] (Don't know) [SHOW IN THE ONLINE RECRUITER] Not sure

[DO NOT SHOW OPTION 9 IN THE ONLINE RECRUITER]

9. (Refused)

[ASK IF S3=1]
S3a. Do you have CFLs installed inside your home, outside your home, or both inside and outside your home? Consider any CFLs installed in garages as installed outside your home.
1. Inside
2. Outside
3. Both inside and outside
8. [SHOW IN PHONE RECRUITER] (Don't know) [SHOW IN THE ONLINE RECRUITER] Not sure
[DO NOT SHOW OPTION 9 IN THE ONLINE RECRUITER]
9. (Refused)

[ASK IF S3=1]
S3b. About how many CFLs would you estimate you have installed both inside and outside your home in total? Your best estimate is fine. [NUMERIC OPEN END]
0000. NUMERIC OPEN END
9998. [SHOW IN PHONE RECRUITER] (Don't know) [SHOW IN THE ONLINE RECRUITER] Not sure
[DO NOT SHOW OPTION 9 IN THE ONLINE RECRUITER]
9999. (Refused)

[ASK IF S3A=1,3]
S3c. Thinking just about CFLs installed **inside** your home, do you have any of the following CFL products?
a. Standard CFLs. Standard CFLs are spiral shaped CFLs that fit into a regular light socket and can be used to replace your basic general purpose light bulbs (traditionally incandescent).
[FOR ONLINE RECRUITER SURYEY INCLUDE THE FOLLOWING]
Below are some examples of standard CFLs.

b. Reflector CFLs or CFL flood lights. These bulbs are generally used in recessed ceiling fixtures.
[FOR ONLINE RECRUITER SURYEY INCLUDE THE FOLLOWING]
Below are some examples of reflector CFLs.

c. Specialty CFLs. Specialty CFLs include bulbs with small candelabra base or pin base, three-way bulbs, and globe shaped bulbs.
[FOR ONLINE RECRUITER SURYEY INCLUDE THE FOLLOWING]
Below are some examples of specialty CFLs.

1. Yes
2. No
8. [SHOW IN PHONE RECRUITER] (Don't know) [SHOW IN THE ONLINE RECRUITER] Not sure

[DO NOT SHOW OPTION 9 IN THE ONLINE RECRUITER]
9. (Refused)

S4. Do you have any LEDs installed inside or outside your home?
[FOR PHONE RECRUITER SURVEY READ THE FOLLOWING] LEDs or light emitting diode lamps are the newest type of bulb in the market. They often have a plastic base between the screw and the glass, sometimes with ridges. LEDs typically cost more and last longer than the other types of light bulbs.
[FOR ONLINE RECRUITER SURYEY INCLUDE THE FOLLOWING]
LEDs or light emitting diode lamps are the newest type of bulb in the market. They often have a plastic base between the screw and the glass, sometimes with ridges. Below are some examples of what LEDs look like.

Please do not include LED Christmas tree lights or LED night lights.
1. Yes
2. No
8. [SHOW IN PHONE RECRUITER] (Don't know) [SHOW IN THE ONLINE RECRUITER] Not sure

[DO NOT SHOW OPTION 9 IN THE ONLINE RECRUITER]
9. (Refused)

[ASK IF S4=1]
S4a. Do you have LEDs installed inside your home, outside your home, or both inside and outside your home? Consider any LEDs installed in garages as installed outside your home.
1. Inside
2. Outside
3. Both inside and outside
8. [SHOW IN PHONE RECRUITER] (Don't know) [SHOW IN THE ONLINE RECRUITER] Not sure

[DO NOT SHOW OPTION 9 IN THE ONLINE RECRUITER]
9. (Refused)

[ASK IF S4=1]
S4b. About how many LEDs would you estimate you have installed both inside and outside your home in total? Your best estimate is fine. [NUMERIC OPEN END]
00. NUMERIC OPEN END
9998. [SHOW IN PHONE RECRUITER] (Don't know) [SHOW IN THE ONLINE RECRUITER] Not sure
[DO NOT SHOW OPTION 9 IN THE ONLINE RECRUITER]
9999. (Refused)

[ASK IF S4A=1,3]

S4c. Thinking just about LEDs installed **inside** your home, do you have any of the following LED products?

a. Standard LEDs. Standard LEDs fit into a regular light socket and can be used to replace your basic general purpose light bulbs (traditionally incandescent).

[FOR ONLINE RECRUITER SURYEY INCLUDE THE FOLLOWING]

Below are some examples of standard LEDs.

b. Reflector LEDs or LED flood lights. These bulbs are generally used in recessed ceiling fixtures.

[FOR ONLINE RECRUITER SURYEY INCLUDE THE FOLLOWING]

Below are some examples of reflector LEDs.

c. Specialty LEDs. Specialty LEDs include bulbs with small candelabra base or pin base, three-way bulbs, and globe shaped bulbs.

[FOR ONLINE RECRUITER SURYEY INCLUDE THE FOLLOWING]

Below are some examples of specialty LEDs.

1. Yes
2. No
8. [SHOW IN PHONE RECRUITER] (Don't know) [SHOW IN THE ONLINE RECRUITER] Not sure

[DO NOT SHOW OPTION 9 IN THE ONLINE RECRUITER]

9. (Refused)

I now have just a few questions about your residence and your household.

D1. Which of the following best describes your home/residence?
- 01. Single-family detached home (Not a duplex, townhome, or apartment; attached garage is OK)
- 02. Single family attached home (Row house or townhouse)
- 03. Mobile home (Single-family)
- 04. Apartment or condominium (Multifamily)
- 00. (Other, specify)
- 98. [SHOW IN PHONE RECRUITER] (Don't know) [SHOW IN THE ONLINE RECRUITER] Not sure

[DO NOT SHOW OPTION 99 IN THE ONLINE RECRUITER]
- 99. (Refused)

[ASK IF D1 = 4]
D2. How many apartments/housing units are in your building?
1. 1
2. 2-3
3. 4-9
4. 10 or more
8. [SHOW IN PHONE RECRUITER] (Don't know) [SHOW IN THE ONLINE RECRUITER] Not sure

[DO NOT SHOW OPTION 9 IN THE ONLINE RECRUITER]
9. (Refused)

D3. Do you own or rent this residence?
1. Own
2. Rent
8. [SHOW IN PHONE RECRUITER] (Don't know) [SHOW IN THE ONLINE RECRUITER] Not sure

[DO NOT SHOW OPTION 9 IN THE ONLINE RECRUITER]
9. (Refused)

D4. Including yourself, how many people currently live in your residence year-round?
- 00. [NUMERIC OPEN END]

[DO NOT SHOW OPTIONS 98 AND 99 IN THE ONLINE RECRUITER]
- 98. (Don't know)
- 99. (Refused)

D5. How many people under the age of 18 live in your residence?
- 00. [NUMERIC OPEN END]

[DO NOT SHOW OPTIONS 98 AND 99 IN THE ONLINE RECRUITER]
- 98. (Don't know)
- 99. (Refused)

D6. Approximately, how many square feet is your residence?
- 00. [NUMERIC OPEN END]
- 99998. [SHOW IN PHONE RECRUITER] (Don't know) [SHOW IN THE ONLINE RECRUITER] Not sure

[DO NOT SHOW OPTION 99999 IN THE ONLINE RECRUITER]
- 99999. (Refused)

[ASK IF D6=99998]
D7. What would you estimate the square footage of your residence to be?
1. Less than 1,000 sqft
2. Between 1,001 and 2,000 sqft
3. Between 2,001 and 3,000 sqft
4. Between 3,001 and 4,000 sqft
5. Between 4,001 and 5,000 sqft
6. Greater than 5,000 sqft
8. [SHOW IN PHONE RECRUITER] (Don't know) [SHOW IN THE ONLINE RECRUITER] Not sure
[DO NOT SHOW OPTION 9 IN THE ONLINE RECRUITER]
9. (Refused)

I have just a few final questions.

D8. In what year were you born? [RESPONSE NOT REQUIRED]
0000. [NUMERIC OPEN END 1900-2015]
[DO NOT SHOW OPTIONS 9998 AND 9999 IN THE ONLINE RECRUITER]
9998. (Don't know)
9999. (Refused)

D9. What is your highest level of education? [RESPONSE NOT REQUIRED]
1. Less than a high school degree
2. High school degree
3. Technical/trade school program
4. Associates degree or some college
5. Bachelor's degree
6. Graduate / professional degree, e.g., J.D., MBA, MD, etc.
8. [SHOW IN PHONE RECRUITER] (Don't know) [SHOW IN THE ONLINE RECRUITER] Not sure
[DO NOT SHOW OPTION 9 IN THE ONLINE RECRUITER]
9. (Refused)

D10. Which of the following best describes your current employment status? [RESPONSE NOT REQUIRED]
1. Employed full-time
2. Employed part-time
3. Retired
4. Not employed, but actively looking
5. Not employed, and not looking
8. [SHOW IN PHONE RECRUITER] (Don't know) [SHOW IN THE ONLINE RECRUITER] Not sure
[DO NOT SHOW OPTION 9 IN THE ONLINE RECRUITER]
9. (Refused)

D11. Which category best describes your annual household income in 2015? [RESPONSE NOT REQUIRED]
1. Less than $25,000
2. $25,000 to just under $50,000
3. $50,000 to just under $75,000
4. $75,000 to just under $100,000
5. $100,000 to just under $150,000
6. $150,000 or more
8. [SHOW IN PHONE RECRUITER] (Don't know) [SHOW IN THE ONLINE RECRUITER] Not sure
[DO NOT SHOW OPTION 9 IN THE ONLINE RECRUITER]
9. (Refused)

D12. [FOR PHONE RECRUITER SURVEY READ THE FOLLOWING] Record Gender. Do not ask.
[FOR ONLINE RECRUITER SURYEY INCLUDE THE FOLLOWING]
What is your gender?
1. Male
2. Female
[DO NOT SHOW OPTIONS 8 AND 9 IN THE ONLINE RECRUITER]
8. (Don't know)
9. (Refused)

[TERMINATE IF S4CA AND S4CB<>1]

Lighting Logger Study Recruitment

L1. Great, you qualify! We would like to invite you to participate in a study that will help Duke Energy Progress understand how customers like you use lighting. As a token of appreciation, we will give $100 if you participate in the study.

As part of the study, we will visit your home and install small devices called light loggers on various light fixtures in your home. These loggers simply measure lighting usage and will not interfere with how you use your lighting or affect the look or quality of your lighting. The visit will be brief and will be scheduled based on your availability. We will leave loggers in place for a few months, and will then schedule a second visit to retrieve them. Would you be willing to participate in this study?
1. Yes
2. No [THANK AND TERMINATE]
8. [SHOW IN PHONE RECRUITER] (Don't know) [SHOW IN THE ONLINE RECRUITER] Not sure
[DO NOT SHOW OPTION 9 IN THE ONLINE RECRUITER] [THANK AND TERMINATE]
9. (Refused) [THANK AND TERMINATE]

L2. A technician will be following up with you to schedule a site visit in the next couple of weeks. Do you have any general preference of days and/or times that would work for this visit? We are not scheduling your appointment at this time, but we will try to accommodate your preference as best we can. [PROBE: WOULD WEEKDAYS OR WEEKENDS WORK BETTER FOR YOU? ARE MORNINGS, AFTERNOONS OR NIGHTS BETTER?]
1. Yes – [RECORD PREFERENCES (INCLUDE AM/PM)]
2. No
8. [SHOW IN PHONE RECRUITER] (Don't know) [SHOW IN THE ONLINE RECRUITER] Not sure
[DO NOT SHOW OPTION 9 IN THE ONLINE RECRUITER]
9. (Refused)

L3. Thank you. Let me confirm your address.
<ADDRESS>
<CITY>
<ZIP>
Is that correct?
1. Correct
2. Incorrect

[ASK IF L3=2]
L4. What is the correct address?
00. Address:
01. City:
02. Zip:

L5. [SHOW FOR PHONE SURVEY] And is <PHONE> the best number to reach you at, or is there a better number we can use to reach you?
- 01. Phone number on record is the best number.
- 00. Alternative phone number provided [RECORD ALTERNATIVE PHONE NUMBER]

L5. [SHOW FOR WEB SURVEY] Is there a phone number we can use to reach you? [RESPONSE NOT REQUIRED]
- 00. [NUMERIC OPEN END]

EMAIL. [ONLY SHOW FOR PHONE SURVEY]
- 00. Would you like to provide an email address we can use to schedule the visit?
- 99. (Does not wish to provide email)

[ASK IF NAME IS AVAILABLE]
L6. When calling back to schedule an appointment, should we ask for you or is there someone else that we could also schedule the appointment with?
- 01. Just me
- 00. [RECORD THE NAME]

[ASK IF NAME IS NOT AVAILABLE]
L7. When calling back to schedule an appointment, who should we ask for?
- 00. [OPEN END]

Those are all the questions I have for you. Thank you very much for your time. If you are selected, a technician will be contacting you within the next couple of weeks to schedule an appointment for the visit.
IF NEEDED: If you have any questions about the study, please feel free to contact Dan Chen at 617-301-4636.
IF NEEDED: To verify this study, please contact Melinda Goins at Duke Energy at 704-382-3827 or by email at melinda.goins@duke-energy.com

Thank you again for your time. Duke Energy greatly appreciates your participation.

Appendix F. Residential Lighting Logger Deployment Instrument

Duke Energy Progress and Duke Energy Carolinas Retail Lighting Program

Residential Lighting Logger Study Onsite Data Collection Instrument

Final

March 30, 2016

Survey Background

The primary goal of this instrument is to support lighting inventory and logger deployment in residential homes in Duke Energy Progress (DEP) and Duke Energy Carolinas (DEC) jurisdictions.

General Information

[FIELD TECHNICIANS CAN FILL THIS SECTION PRIOR TO THE START OF THE VISIT]

I1. Please enter customer's ODCID number: [NUMERIC 10000-99999]

I2. Please enter inspector's name.

I3. Please enter the customer's name. [OPEN RESPONSE]

I4. Please enter address of the residence.

Building Information

B1. What is the residence type? [IF NEEDED, CONFIRM WITH THE CUSTOMER]
- 01. Single-family detached building
- 02. Mobile Home/Manufactured home
- 03. Condominium
- 04. Duplex/Two-family
- 05. Multi-family building (3 or more units)
- 06. Townhouse
- 00. Other, specify [OPEN END]
- 99. Can't assess

[ASK IF B1=3 OR B1 = 5]
B2. How many units are in this building? [IF NEEDED, CONFIRM WITH THE HOMEOWNER]
1. Between 3 to 5 units
2. Between 6 to 10 units
3. Greater than 10 units
8. Don't know
9. Can't assess

[ASK CUSTOMER]
B3. Approximately how many square feet is this residence? [NUMERIC OPEN END]
99998. Don't know
99999. Can't assess

[ASK IF B3=99998]
[ASK CUSTOMER]
B4. What would you estimate the square footage of your residence to be?
1. Less than 1,000 sqft
2. Between 1,001 and 2,000 sqft
3. Between 2,001 and 3,000 sqft
4. Between 3,001 and 4,000 sqft
5. Between 4,001 and 5,000 sqft
6. Greater than 5,000 sqft
8. Don't know
9. Can't assess

[ASK CUSTOMER]
B5. Does this home have central air conditioning?
1. Yes
2. No
9. Can't assess

[ASK CUSTOMER]
B6. What is the primary heating fuel used to heat this home?
01. Electric
02. Gas
03. Propane
04. Oil
00. Other, specify [OPEN END]
99. Can't assess

[ASK IF B6=1]
[ASK CUSTOMER]
B6a. Which of the following is the system used to heat the majority of your home?
01. Heat pump
02. Electric resistance heat
00. Other, specify [OPEN END]
99. Can't assess

Socket Selection for Logger Placement

B7a. Please conduct an initial walk-through of the home and record rooms that contain at least one LOGGABLE switch.

B7. Please enter the number of rooms with loggable switches (MUST CONTAIN AT LEAST ONE LED BULB). [NUMERIC 0-20; 98= Not available, 99=Can't assess]
1. Kitchen (Up to 2)
2. Living room (Up to 3)
3. Bedroom (Up to 6)
4. Bathroom (Up to 4)
5. Dining room (Up to 2)
6. Basement (Up to 2)
7. Other (Hallway/Laundry/Office/Storage/Closet) (Up to 9)

[CREATE A TABLE BASED ON <B7 RESPONSE>]

B8. Please record the LOGGABLE switches in the following LOGGABLE rooms.
[NUMERIC 0-20; 98= Not available, 99=Can't assess]
NUMBER OF SWITCHES PER ROOM (UP TO 10 EACH)

[CREATE UP TO 8 RANDOM SELECTIONS OF LOGGABLE SWITCHES FOR LOGGER INSTALLATION]

B9. Please record the randomly selected switches on the paper form and take a photo of the form.
1. Confirm
0. Other, specify [OPEN END]

Lighting in Storage

LS1. Are there any light bulbs in storage? [IF NECESSARY: ASK HOMEOWNER]
1. Yes
2. No
9. Can't assess

LS2. Please record the following information for each bulb in storage with the same base type, bulb type, and bulb shape.

[SKIP TO R1 IF LS1 = 2 OR 9]
SS1. Please select the base type of bulb in storage:
1 Medium screw-based
2. Small/Candelabra screw-based
3. Large/Mogul screw-based
4. Pin-based
0. Other, specify [OPEN END]
9. Can't assess

SS2. Please select the bulb type:
1. Incandescent
2. CFL
3. Fluorescent
4. LED
5. Halogen
0. Other, specify [OPEN END]
9. Can't assess

SS3. Please select the bulb shape:
- 1. Standard shape/A Lamp/Pear shape [HIDE IF SS2 = 3]
- 2. Twist/Spiral [ALLOW IF SS2 = 0, SS2 =2]
- 3. Globe [HIDE IF SS2 = 3]
- 4. Bullet/Torpedo/Candelabra [HIDE IF SS2 = 3]
- 5. Bug light [HIDE IF SS2 = 3]
- 6. Spot/Reflector/Flood [HIDE IF SS2 = 3]
- 0. Other, specify [OPEN END]
- 9. Can't assess

SS5. How many total bulbs in storage are exactly like this one? (SAME BASE TYPE, BULB TYPE, AND BULB SHAPE) [NUMERIC OPEN END, 0 – 100]

SS6. Is there another type of bulb in storage?
- 1. Yes
- 2. No

[GO THROUGH LOOP SS1 – SS6 IF SS6=1, IF NOT SKIP TO R1]

Interior Lighting Inventory

TR1. Please go through the house room by room recording the following information for each room.

[BEGIN ROOM BY ROOM LIGHTING INVENTORY AND LIGHTING LOGGING LOOP]
R1. Please select a room type to collect lighting inventory:
- 01. Basement (finished)
- 02. Basement (unfinished)
- 03. Foyer/Hallway
- 04. Bathroom
- 05. Laundry
- 06. Bedroom
- 07. Kitchen
- 08. Living room/Family room
- 09. Garage
- 10. Office
- 11. Dining room
- 12. Enclosed porch/Sunroom/3 season room
- 13. Storage
- 14. Closets
- 15. Attic
- 16. Crawlspace
- 00. Other, specify [OPEN END]
- 99. Can't assess

R2. Do you have access to this room to collect lighting data?
- 1. Yes
- 2. No (provide reasons)

[ASK IF R2=1, ELSE SKIP TO END OF LOOP]
R3. Is there a window in this room?
- 1. Yes
- 2. No
- 9. Can't assess

R4. How many total light switches are in this room? [NUMERIC OPEN END]

S1. Please record the following information for each switch in the room.
S2. What is the control type of this switch?
1. On/off switch
2. Dimmable
3. 3-way
4. Motion sensor
5. Timer
0. Other, specify [OPEN END]
9. Can't assess

S3. Are there any empty sockets on this switch?
1. Yes
2. No
9. Can't assess

[ASK IF S3=1]
S4. How many empty sockets are there on this switch? [NUMERIC OPEN END]

Questions S5-S9 are about each unique socket type on this switch. [EACH SOCKET TYPE SHOULD HAVE THE SAME CONTROL, SOCKET TYPE, BULB TYPE, AND BULB SHAPE]

S5. Please select the socket type on this switch: [IF MORE THAN ONE SOCKET TYPE, RESPOND FOR FIRST, THEN FOR ADDITIONAL TYPES IN QUESTION S9]
1. Medium screw-based
2. Small/Candelabra screw-based
3. Large/Mogul screw-based
4. Pin-based
0. Other, specify [OPEN END]
9. Can't assess

S6. Please select the bulb type in this socket:
1. Incandescent
2. CFL
3. Fluorescent
4. LED
5. Halogen
6. Infrared
0. Other, specify [OPEN END]
9. Can't assess

S7. Please select the bulb shape for this socket:
1. A-Lamp
2. Twist/Spiral
3. Globe
4. Bullet/Torpedo/Candelabra
5. Spot/Reflector/Flood
0. Other, specify [OPEN END]
9. Can't assess

S7a. Please select the fixture type:
- 01. Recessed ceiling fixture
- 02. Non-recessed ceiling fixture
- 03. Ceiling fan
- 04. Table/Desk lamp
- 05. Floor Lamp/Torchiere
- 06. Wall mounted
- 07. Track lighting
- 08. Garage door
- 10. Chandelier
- 11. Pendant
- 00. Other, specify [OPEN END]
- 99. Can't assess

S8. How many total sockets on this switch are exactly like this one? [NUMERIC OPEN END] [NOTE TO AUDITOR: "LIKE" SOCKETS SHOULD HAVE THE SAME CONTROLS, SOCKET TYPE, BULB TYPE, AND BULB SHAPE.]

S9. Is there another socket type on this switch?
- 1. Yes
- 2. No

[IF S9=1 REPEAT LOOP S5-S9 (UP TO 3 TIMES), ELSE GO TO S10]

[CALCULATE S8_SUM = SUM OF RESPONSES FROM S8]

S10. Please confirm that there is a total of <S8_SUM> bulbs on this switch.
- 1. Yes
- 2. No [GO BACK TO S5]
- 9. Can't assess

S11. Is this a randomly selected switch for logger installation?
- 01. Yes
- 02. Yes, but logger cannot be placed (light is too high in the ceiling, configuration does not allow for logger placement, customer prefers not to log the switch).
- 03. No, switch is not randomly selected
- 00. Other, specify [OPEN END]

[ASK IF S11=1]
P1. Record the serial number of the logger you are placing on this switch. [OPEN END]

P2. Please enter a description of the lamp/fixture that the you are placing this logger on. [OPEN END]

P3. Please calibrate the logger and confirm.
- 0. Calibration confirmed.

P4. Please take photos of the socket the logger was placed on and a close-up photo of the logger ID and confirm.
- 0. Photo confirmed.

S12. Is there lighting in this room controlled by other switches?
- 1. Yes
- 2. No

R5. Are there any more rooms?
1. Yes
2. No

[IF S12=1 REPEAT LOOP S1-S12, ELSE GO TO EL1]

Exterior Lighting Inventory

EL1. Does the home exterior have any light sockets? [DO NOT AUDIT LIGHT BULBS THE RESIDENT DOES NOT PAY FOR, SUCH AS EXTERIOR LIGHTING AT AN APARTMENT COMPLEX].
1. Yes
2. No
9. Can’t assess

EL2. What type of bulb(s) is/are in the primary exterior light fixture? [MULTIPLE RESPONSE]
1. CFL
2. Incandescent
3. Halogen
4. LED
0. Other, specify [OPEN END]
9. Can’t assess

EX1. Please select the socket type for each exterior light socket.
1. Screw-based
2. Pin-based
0. Other, specify [OPEN END]

EX2. Please select the control type for this socket:
1. On-Off
2. Dimmable
3. 3-Way
4. Motion Sensor
5. Programmable
0. Other, specify [OPEN END]
9. Can’t assess

EX3. Please select the bulb type in this socket:
1. Incandescent
2. CFL
3. Fluorescent
4. LED
5. Halogen
6. Empty [SKIP TO EX6]
0. Other, specify [OPEN END]

EX4. Please select the bulb shape for this socket:
- 01. Standard shape/ A lamp /pear shape [HIDE IF EX3 = 3]
- 02. Twist/Spiral [ALLOW IF EX3 = 2]
- 03. Globe [HIDE IF EX3 = 3]
- 04. Bullet/Torpedo/Candelabra [HIDE IF EX3 = 3]
- 05. Bug light [HIDE IF EX3 = 3]
- 06. Spot/Reflector/Flood [HIDE IF EX3 = 3]
- 00. Other, specify [OPEN END]
- 98. Not applicable
- 99. Can't assess

[ASK IF EX4 = 1]
EX4a. Please select the fixture type:
- 1. Recessed ceiling fixture
- 2. Non-recessed ceiling fixture
- 3. Wall mounted
- 4. Lamp post or other free standing light
- 0. Other, specify [OPEN END]
- 9. Can't assess

EX5. How many total exterior sockets are exactly like this one? [NUMERIC OPEN END] (NOTE TO AUDITOR THAT A SOCKET TYPE SHOULD HAVE THE SAME BULB TYPE, BULB SHAPE, AND CONTROL TYPE)

EX6. Is there another socket type on the exterior of the home?
- 1. Yes
- 2. No

[GO THROUGH LOOP EX1-EX6 IF EX6=1, IF NOT SKIP TO LR1]

LED Replacement

LR1. Approximately when did you first install LEDs in your home? [RECORD YEAR AND MONTH] [IF NEEDED: YOUR BEST ESTIMATE IS FINE]

LR1a. What prompted you to try LEDs over other bulb types? [OPEN END]

LR2. Did you install all of your LEDs at the same time or did you install them over time?
- 1. Same time
- 2. Over time
- 8. Can't recall

LR3. When was the most recent time that you installed an LED? [RECORD YEAR AND MONTH] [IF NEEDED: YOUR BEST ESTIMATE IS FINE]

LR4. I would also like to know what was in the sockets before you installed LEDs in them. Did you replace working light bulbs with LEDs, did you replace burnt out bulbs with LEDs, or did you install LEDs in empty sockets? [MULTIPLE RESPONSE]
- 1. Replaced working bulbs
- 2. Replaced burnt out bulbs
- 3. Installed in empty sockets
- 8. Can't recall

[ASK IF LR4=1]
LR5. If you were to estimate, how many sockets had working bulbs in them before you installed LEDs in them? [NUMERIC OPEN END] [IF NEEDED: YOUR BEST ESTIMATE IS FINE]

[ASK IF LR4=1 OR 2]
LR6. And what type or types of bulbs did the LEDs replace? [MULTIPLE RESPONSE]
1. Incandescents
2. Halogens
3. CFLs

[ASK IF LR6=3]
LR7. Approximately, how many LEDs were installed in sockets with CFLs in them? [NUMERIC OPEN END] [IF NEEDED: YOUR BEST ESTIMATE IS FINE] [IF NEEDED: CFLS ARE ALSO KNOWN AS COMPACT FLUORESCENT LAMPS. THE MOST COMMON TYPE IS MADE WITH A GLASS TUBE BENT INTO A SPIRAL SHAPE RESEMBLING SOFT-SERVE ICE CREAM. SOME CFLS MAY HAVE A PLASTIC OR GLASS COVER OVER THE SPIRAL TUBE.]

[ASK IF LR7=9998]
LR8. Would you say you had CFLs in most, some, or just a few of the sockets where you installed LEDs?
1. Most
2. Some
3. Just a few
4. Can't recall

Closing

Thank you very much for participating in this study. I have a $50 gift card for you, and we will be in touch in about 6 months to come and retrieve the loggers we installed today. Upon retrieval of those loggers, you will receive another $50 gift card. Thank you again for taking the time to be a part of this important study.

G1. Record gift card number [Numeric 00000000-99999999].

Appendix G. Residential Lighting Logger Retrieval Instrument

Duke Energy Progress and Duke Energy Carolinas Retail Lighting Program

Residential Lighting Logger Study On-Site Logger Retrieval Instrument

FINAL

October 25, 2016

Study Background

The residential lighting logger study is a part of the impact evaluation of the PY2017 Duke Energy Progress (DEP) Energy Efficient Lighting program and Duke Energy Carolinas (DEC) Energy Efficient Appliances and Devices program. The key goal of the study is to estimate hours of use and coincidence factors for LEDs among residential customers in DEP and DEC jurisdictions. As part of the study, we will also develop updated estimates of LED in-service rate (ISR). The results from this study will be used to estimate program energy and demand savings impacts for PY2017 and beyond.

This data collection instrument will guide the retrieval of lighting loggers deployed in the spring 2016.

General Information

[FIELD TECHNICIANS CAN FILL THIS SECTION PRIOR TO THE START OF THE VISIT]

I1. Please enter customer's ODCID number. [NUMERIC OPEN END]

I2. Please enter field technician's name. [OPEN END]

I3. Please enter the customer's name. [OPEN RESPONSE]

I4. Please enter the address of the residence. [OPEN RESPONSE]

Logger Retrieval

L0. [ASK CUSTOMER] Now, I'm going to remove all of the loggers we placed in your home. Would you please accompany me?

[PLEASE DO NOT RETRIEVE OR MOVE THE LOGGER UNTIL AFTER TESTING ITS SENSITIVITY IN ITS CURRENT POSITION]

Please select the switch of the logger you are about to retrieve.
[LIST OF SWITCH NAMES BY ROOM TYPE, SWITCH TYPE, AND LOGGER ID; 97=Switch not listed (1) 98=Switch not listed (2); 99=No more loggers to collect]

[REPEAT L1A-L10 FOR ALL SWITCHES WITH LOGGERS]

[SKIP TO L11 IF L0=99]

[ASK IF L0<>97,98]
L1a. Please confirm the room type where this logger is installed.
[READ IN ROOM TYPE]
1. Confirm that the room type is correct
2. Room type is different

[ASK IF L0=97,98 OR L1a=2]
L2a. Please select the room type from which you are retrieving this logger.
01. Basement (finished)
02. Basement (unfinished)
03. Foyer/Hallway
04. Bathroom
05. Laundry
06. Bedroom
07. Kitchen
08. Living room/Family room
09. Garage
10. Office
11. Dining room
12. Enclosed porch/Sunroom/3 season room
13. Storage
14. Closets
15. Attic
16. Crawlspace
00. Other, specify [OPEN END]

[ASK IF L0<>97, 98]
L1b. Please confirm the control type associated with this logged switch.
[READ IN SWITCH TYPE]
1. Confirm that the control type is correct
2. Control type is different

[ASK IF L0=97,98 OR L1B=2]
L2b. What is the control type on this switch?
1. On/off switch
2. Dimmable
3. 3-way
4. Motion sensor
5. Timer
0. Other, specify [OPEN END]

[ASK IF L0<>97, 98]
L1c. Please confirm that the following bulbs are associated with this logged switch.
[READ IN BULB COUNTS BY BULB TYPE]
1. Confirm that the bulb count by technology is correct
2. Bulb type by technology is different

[ASK IF L0=97,98 OR L1C=2]
L2c. Please record the current counts of bulbs on this switch by technology.

Incandescents	Halogens	CFLs	LEDs	Other	Cannot Assess	Empty Sockets
a.	b.	c.	d.	e.	f.	g.

L1d. [ASK CUSTOMER] During the time the logger was installed or since [LOGGER INSTALL DATE], how often did you turn on this switch?

1. Never
2. Occasionally
3. Every day
4. Not sure (customer response)
9. Cannot assess (customer unable to provide an answer)
0. Other, specify [OPEN END]

L1e. [ASK CUSTOMER] Is it possible that this light was turned on either ALL the time or MOST of the time since [LOGGER INSTALL DATE]?

1. Yes
2. No
3. Not sure (customer response)
9. Cannot assess (customer unable to provide an answer)

L1f. Is there a potential for light interference that the logger can be picking up on?

00. Yes – please describe [OPEN END]
02. No
99. Cannot assess

L3. Please retrieve the logger. Prior to retrieving, please test the logger's ability (in its current position) to sense whether the switch is on or off. As currently installed, does the logger correctly register whether the switch is on or off?

1. Yes
2. No, registers as ON when switch is OFF
3. No, registers as OFF when switch is ON
4. No, logger does not register ON or OFF
0. Other, specify

L4. What is the current condition of this logger?

1. Functioning normally
2. Dead battery (blank screen)
3. Melted
4. Otherwise broken/non-operational
0. Other, specify

[ASK IF L0<>97, 98]
L5. Please confirm the logger ID.
[READ IN LOGGER ID]

1. Confirm that the logger ID is accurate
2. Logger ID is different

[ASK IF L0=97,98 OR L5=2]
L6. Please enter logger ID. [OPEN END]

L7. [ASK CUSTOMER] Did you or anyone else in your household remove the logger at any point since the installation?

1. Yes
2. No
3. Not sure (customer response)
9. Cannot assess (customer unable to provide an answer)

[ASK IF L7=1]
L8. [ASK CUSTOMER] When was the logger removed? [RECORD DAY AND MONTH] [IF NECESSARY: AN APPROXIMATE DATE IS FINE]
1. [OPEN END]
2. Don't remember
9. Cannot assess (customer unable to provide an answer)

[ASK IF L7=1]
L9. [ASK CUSTOMER] When was the logger reinstalled? [RECORD DAY AND MONTH] [IF NECESSARY: AN APPROXIMATE DATE IS FINE]
1. [OPEN END]
2. Don't remember
9. Cannot assess (customer unable to provide an answer)

L10. [ASK CUSTOMER] Who reattached this logger?
01. Field representative
02. Customer/household member
00. Other; specify
98. Not sure (customer response)
99. Cannot assess (customer unable to provide an answer)

[LOOP BACK TO QL0 FOR NEXT LOGGER OR TO MARK IF DONE]

L11. [ASK CUSTOMER] Are there any loggers that were removed and not reattached?
1. Yes
2. No
3. Not sure (customer response)
9. Cannot assess (customer unable to provide an answer)

[ASK IF L11=1]
L12. List logger ID, approximate date of logger removal and any notes related to logger removal, such as the room type the logger was installed in, the switch information, if available, etc.
[REPEAT FOR UP TO 4 LOGGERS] [ALLOW TO SKIP OUT STARTING AT SECOND LOGGER IF JUST ONE]
Logger ID [OPEN END]
Date of removal [DAY AND MONTH]
Relevant notes [OPEN END]

[ASK IF NUMBER OF RETRIEVED LOGGERS (INCLUDING L12 LOGGERS) IS LESS THAN THE NUMBER OF DEPLOYED LOGGERS]
L13. Our records show that the total of [DEPLOYED LOGGER COUNT] were deployed in this home and so far, [RETRIEVED LOGGER COUNT] were retrieved. Please record the reasons for the missing loggers. [ASK HOMEOWNER IF NEEDED] [OPEN END. PROVIDE SPECIFICS FOR EACH MISSING LOGGER IF NEEDED]

Occupancy

[ASK CUSTOMER]
O1. During the time that loggers were installed or since [LOGGER INSTALL DATE] were there any people at home all or most weekdays?
1. Yes
2. No
3. Cannot remember (customer response)
9. Cannot assess (customer unable to provide an answer)

O2. Since the loggers were installed on <DEPLOYDATE>, has there been any change(s) to your schedule that kept you away from home more than usual, such as business travel, vacations, or other changes?
1. Yes
2. No
3. Cannot remember (customer response)
9. Cannot assess (customer unable to provide an answer)

[ASK IF O2=1]
O2A. When did these changes to your routine happen?
1. Period 1: [START MONTH] to [END MONTH]
2. Period 2: [START MONTH] to [END MONTH]; 98=No more periods to list
3. Period 3: [START MONTH] to [END MONTH]; 98=No more periods to list

Lighting Purchases

LP1. Since [LOGGER INSTALL DATE], did you purchase any light bulbs for use in your home?
1. Yes
2. No
8. Not sure (customer response)
9. Cannot assess (customer unable to provide an answer)

[ASK IF LP1=1]
LP2. What light bulbs did you purchase? [MULTIPLE RESPONSE. READ RESPONSE OPTIONS IF NEEDED. EXPLAIN WHAT EACH TYPE OF TECHNOLOGY IS]
1. Incandescents/halogens
2. CFLs
3. LEDs
0. Other, specify
8. Not sure (customer response)
9. Cannot assess (customer unable to provide an answer)

[ASK IF LP1=1]
LP3. Did you install all some or none of the bulbs that you purchased?
1. All
2. Some
3. None
8. Not sure (customer response)
9. Cannot assess (customer unable to provide an answer)

[ASK IF LP2=3]
LP4. Why did you purchase LEDs and not other bulb types such as incandescents or CFLs? [OPEN END, 98-Not sure (customer response), 99-Cannot assess (customer unable to provide an answer)]

[ASK IF LP2=2]
LP5. Why did you purchase CFLs and not other bulb types such as incandescents or LEDs? [OPEN END, 98-Not sure (customer response), 99-Cannot assess (customer unable to provide an answer)]

[ASK IF LP2=1]
LP6. Why did you purchase incandescent bulbs and not other bulb types such as CFLs or LEDs? [OPEN END, 98-Not sure (customer response), 99-Cannot assess (customer unable to provide an answer)]]

[ASK IF LP2=2 AND LP2=3]
LP7. Why did you purchase CFLs and LEDs and not incandescents? [OPEN END, 98-Not sure (customer response), 99-Cannot assess (customer unable to provide an answer)]

[ASK IF LP2=1 AND LP2=2 OR LP2=3]
LP8. Why did you purchase a mix of incandescents and [CFLs/LEDs] and not just [CFLs/LEDs]? [OPEN END, 98-Not sure (customer response), 99-Cannot assess (customer unable to provide an answer)]

Closing

Thank you very much for participating in this study. I have a $50 gift card for you in exchange for your participation. Thank you again for taking the time to be a part of this important study.

[REMINDER] Please collect customer's signature on the "Duke Energy Lighting Logger Study Gift Card Receipts" form.

G1. Record gift card number [Numeric 00000000-99999999].

Appendix H. Retailer and Manufacturer Interview Results

The Excel spreadsheets are provided as a separate submission and contain tabulated and anonymized responses from retailer and manufacturer interviews as well as the calculation of NTG ratios from the retailer and manufacturer interviews.

Appendix I. Shelf Audit Results

We provide the final shelf audit data package as a separate submission. As part of the package, we provide a data file in Stata and Excel accompanied by a data dictionary.

Appendix J. Residential Lighting Logger Study Results

We provide the residential lighting logger study package as a separate submission. As part of the package, we provide the following data files in Stata and Excel with associated data dictionaries:

- Hourly logger data file
- Logger-level data file

Appendix K. Sales Data Modeling Datafile

We provide the final sales data used for sales data modeling as a separate submission. As part of the package, we provide a data file in Stata and Excel accompanied by a data dictionary.

Appendix L. Leakage Rate Analysis Results

We provide the final data used for leakage rate analysis as a separate submission. As part of the package, we provide data files in Stata and Excel accompanied by a data dictionary.

Appendix M. Ex Ante Savings Assumptions and Their Sources

Table M-1 details ex ante savings assumptions and their sources for the DEP EEL and DEC Retail LED programs.

Table M-1. Ex Ante Savings Assumptions and Their Sources

Assumption	Residential Savings Assumption	Commercial Savings Assumption	Residential Assumption Source	Commercial Assumption Source
Sales to residential/ commercial customers*	0.823	0.10	• 2011 and 2012 DEP Intercept Surveys	
Leakage rate	0.077			
Delta watts	Baseline wattage – efficient wattage		• Program tracking data • 2015 Retailer Shelf Audit	
HOU	2.922	6.930 (CFLs) 5.783 (LEDs)	• 2012 DEP Residential Metering Study	• 2015–2016 DEP Commercial Lighting Logger Study
CF	Summer: 0.1138 Winter: 0.0960	Summer: 0.497 (CFLs) 0.547 (LEDs) Winter: 0.174 (CFLs) 0.120 (LEDs)		
Interactive effects	0.94 (Energy savings) 1.27 (Summer peak demand savings) 0.50 (Winter peak demand savings)	1	• 2012 DOE2 Simulation Models	• No interactive effects applied
First-year ISR and carryover savings	0.795 (CFLs) 0.744 (LEDs) 1.00 (Fixtures)	0.879 (CFLs) 0.979 (LEDs) 1.00 (Fixtures)	• 2013 General Population Survey (for CFLs and LEDs) • Assumed value (for fixtures) • 2014 Storage Log Study (for carryover savings trajectory)	

* Together with the leakage rate, these values add up to 1.

Appendix N. Residential Lighting Logger Study – Additional Results

Overall average daily HOU for LEDs from the residential lighting logger study are 2.88 hours, the average summer peak CF is 0.128, and the average winter peak CF is 0.145. Table N-1 provides HOU and CF estimates from the study, along with the standard errors and relative precision surrounding the estimates.

Table N-1. HOU and Coincidence Factor Estimates

Statistic	Result	Standard Error	Relative Precision
HOU	2.881	0.151	9%
Summer CF	0.1283	0.010	12%
Winter CF	0.1451	0.011	12%

HOU and CFs vary by room type, with living rooms, kitchens, and dining rooms generating the highest HOU and CF values and bedrooms, bathrooms, and other room types generating the lowest HOU and CF values. Table N-2 provides HOU and CF estimates by room, as well as percent of sockets with LEDs in each room.

Table N-2. HOU and Coincidence Factor Estimates by Room

Room Type	# of Loggers	% of Sockets with LEDs	HOU	Summer CF	Winter CF
Dining room	20	17%	4.27	0.235	0.198
Kitchen	35	45%	4.26	0.220	0.266
Basement	2	14%	3.75	0.335	0.230
Living room	85	32%	3.23	0.115	0.110
Bedroom	49	16%	1.83	0.055	0.095
Bathroom	27	20%	1.51	0.050	0.080
Other	44	18%	1.91	0.084	0.097
Total	262	30%	2.88	0.128	0.145

HOU vary considerably by home type, homeownership, education, and income, as can be seen in Table N-3, HOU are much higher in multifamily homes, in homes that are rented, and in homes occupied with customers with higher income levels and higher levels of education.

Table N-3. HOU Estimates by Customer Characteristics

Room Type	n	% of Sockets with LEDs	HOU	Relative Precision
Home type				
Single-family	100	24%	2.76	8%
Multi-family	7	30%	5.05	38%
Homeownership				
Own	90	23%	2.82	8%
Rent	17	31%	3.23	32%
Income				
<$50,000	32	24%	2.15	17%
$50,000–$100,000	41	22%	3.22	11%
$100,000+	32	25%	3.04	15%
Education				
Less than college	45	24%	2.68	14%

Room Type	n	% of Sockets with LEDs	HOU	Relative Precision
Bachelor's degree	33	31%	2.62	12%
Graduate degree	28	33%	3.36	17%

To place the HOU estimates derived through this study in perspective, Opinion Dynamics compiled the results from the other HOU studies from across the country. Table N-4 presents the results. As can be seen in the table, the HOU from this study are within the range of the other studies' estimates.

Table N-4. Comparison of HOU Estimates across Studies

Study Name	Study Timing	n	HOU Result	Notes
New England HOU Study	2013	848	3.0	Efficient bulbs
Pennsylvania Statewide Residential Light Metering Study	2014	206	3.0	Efficient bulbs
DEP 2012 CFL HOU Study	2012	100	2.92	CFLs only
DEP-DEC Residential Lighting Logger Study	2016	107	2.88	LEDs only
Indiana Statewide CFL HOU Study	2012-2013	67	2.47	CFLs
EmPOWER Maryland HOU Metering Study	2014	111	2.46	Efficient bulbs
ComEd PY5/PY6 Lighting Logger Study	2014	85	2.32	Standard CFLs

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REPORT

Nexant
Reimagine tomorrow.

My Home Energy Report Program Evaluation

Submitted to Duke Energy Progress
July 31, 2017

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Equations

1 Executive Summary

1.1 Program Summary

This report describes process and impact findings for the Duke Energy Progress My Home Energy Report (MyHER) offered to residential customers who live in single-metered, single family homes with thirteen months of usage history[1]. MyHER relies on principles of behavioral science to encourage customer engagement with home energy management and energy efficiency. The program accomplishes this primarily by delivering a personalized report comparing each customer's energy use to that of a peer group of similar homes.[2] MyHER motivates customers to reduce their energy consumption by:

- Showing customers a comparison of their household electricity consumption to that of similar homes.
- Suggesting tips for reducing energy use by changing customers' behavior or installing energy efficient equipment.
- Educating them about the energy savings benefits of Duke Energy's demand side management (DSM) programs.
- Encouraging active management of their home's energy consumption.

1.2 Evaluation Objectives and High Level Findings

Nexant estimated the annual energy impacts associated with MyHER delivery for the 2016 calendar year (January 2016 – December 2016). It also presents measurements of customer satisfaction and engagement for MyHER participants. This is the first evaluation for the Duke Energy Progress (DEP) MyHER Program. The MyHER program is implemented as a randomized, controlled trial. Customers are randomly assigned to either "treatment" or "control" for the purpose of measuring energy savings. Treatment customers are MyHER recipients or participants. The control group is a set of customers from whom the MyHER is intentionally withheld. The control group serves as the baseline against which MyHER impacts are measured. As Duke Energy customers become eligible for the MyHER program, Duke Energy randomly assigns them to one of these two groups.

[1] Duke Energy launched a multi-family MyHER program in December 2016. This report focuses solely on the single-family MyHER implementation.

[2] Homes are grouped by characteristics such as location, size, vintage, and heating fuel. Energy use is compared on groups of similar homes.

The energy savings generated by the DEP MyHER program are presented in Table 1-1. The evaluated energy savings for the MyHER program are net of additional energy savings achieved through increased participation by the MyHER treatment group in other Duke Energy programs. Additional information concerning the evaluation period is shown in Table 1-2.

Table 1-1: Claimed and Evaluated Energy Impacts per Participating Household

	Energy (kWh)	Demand (kW)	Confidence/Precision
Claimed Impacts	183.7	0.0389	N/A
Evaluated Impacts	147.6	0.0239	90/9

*MyHER is an opt-out program. As such, all impacts are considered net impacts; nevertheless, Nexant calculated the impacts of the MyHER program by removing savings achieved by MyHER participants via other Duke Energy Programs.

Table 1-2: Sample Period Start and End Dates

Evaluation Component	Start	End
Impact Evaluation Period*	January 2016	December 2016
Customer Survey Period	January 2017	March 2017

*The MyHER impact analysis provides census estimates for the most recent twelve months prior to the analysis.

The DEP MyHER program implementation realized 80% of its claimed impacts during this evaluation period. Duke Energy undertakes substantial planning and coordination to deliver MyHER to approximately 588,652 DEP customers in North Carolina and 68,459 DEP customers in South Carolina. Duke Energy has developed a production process with the MyHER implementation contractor (Tendril, Inc.) that allows Duke Energy to customize MyHER messages, tips, and promotions on the basis of customer information and exposure to Duke Energy's demand-side management programs. Both Duke Energy and Tendril staff described a rigorous quality control process that has been very successful in preventing lapses in report quality from reaching the customers.

1.3 Evaluation Recommendations

Areas for improvement to the program generally center around opportunities to better support the quality control process and manage risks to it. Appropriate staffing at Tendril to support the technical and data-centered ongoing quality control processes for report mailings is critical to success in this area. Additionally, increased adherence or better development of a data delivery schedule on Tendril's part to initiate the quality control process will improve Duke Energy's ability to conduct their checks in a timely and complete manner. The increased pace of report mailings represents a long chain of quality control tasks for Duke Energy; and responsibility for completing these tasks rests with a relatively small staff. Without redundant staffing, Duke Energy should contemplate and manage risks to MyHER program operations presented by turnover or outages in availability of their staff, planned or otherwise.

Nexant recommends additional quality control and monitoring actions for enhancing Duke Energy Progress' MyHER program:

- **Maintain the integrity of the randomized, controlled trial (RCT) design with consistent, simultaneous assignment of newly-eligible customers to the treatment and control groups.** Nexant recommends that Duke Energy assign customers to both treatment or control when making group assignments. Simultaneous cohort assignment to treatment and control will eliminate any potential sources of bias stemming from time-dependent factors that could lead to observable or unobservable differences between the two groups.
- **Apply the randomized, controlled trial (RCT) design when considering program enhancements or changes.** The MyHER program is an excellent tool for customer engagement and communication. Duke Energy may use the MyHER program as a platform for testing different approaches to customer engagement, but Nexant recommends leveraging the reliability and insight provided by RCT approaches when evaluating the results of such tests.
- **Continue to manage MyHER operations with an eye towards change management and prioritization of program changes**. Challenges in quality control have historically followed on the heels of program changes and enhancements. Introduce changes slowly to consistently maintain a product that meets quality control standards and results in report cycles that pass quality assurance checks the first time.
- **Prioritize appropriate project staffing.** With MyHER's long, demanding, and ongoing production process, resource availability of appropriate staff can have implications for product quality and timely delivery. Outages and risk of outages of key project resources should be closely managed.
- **Continue to monitor engagement and evaluate the impacts of the Interactive Portal:** For this evaluation period, the MyHER Interactive Portal savings estimates are too uncertain to determine whether the portal generates incremental savings above and beyond the standard MyHER paper edition.

2 Introduction and Program Description

This section presents a brief description of the My Home Energy Report (MyHER) program as it operated in the DEP service territory from January 2016 through December 2016. This description is informed by document review, in-depth interviews with staff, and Nexant's understanding of program nuance developed through regular communication during the evaluation process. Duke Energy launched the DEP MyHER program in February 2015.

2.1 Program Description

The MyHER program is a Duke Energy Progress behavioral product for demand-side management (DSM) of energy consumption and generation capacity requirements. The MyHER presents a comparison of participants' energy use to a peer group of similar homes. It is sent by direct mail eight times a year. The MyHER provides customer-specific information that allows customers to compare their energy use for the month and over the past year to the consumption of similar homes and homes considered energy-efficient. Reports include seasonal and household-appropriate energy savings tips and information on energy efficiency programs offered by DEP. Many tips include low cost suggestions such as behavioral changes. Duke contracts with Tendril Inc. for the management and delivery of its MyHER product.

In March 2015, Duke Energy launched the MyHER Interactive Portal (MyHER Interactive, or Interactive). MyHER Interactive seeks to engage customers in a responsive energy information and education dialogue. When customers enroll in the online portal they are given the opportunity to update and expand on information about their home and electricity consumption. Customers are also routinely sent energy management tips and conservation challenges via email. The general strategy of the MyHER Interactive Portal is to open communications between customers and the utility, as well as to explore new ways of engaging households in electricity consumption management.

Customers occupying single-family homes with an individual electric meter and at least thirteen months of electricity consumption history are eligible for MyHER. The program is an opt-out program: customers can notify Duke Energy if they no longer wish to receive a MyHER and will be subsequently removed from the program.

Duke Energy placed a portion of eligible customers into a control group to satisfy evaluation, measurement, and verification (EM&V) requirements. These control group customers are not eligible to participate in the MyHER program.

Duke Energy has several objectives for the MyHER program, including:

1. Generating cost effective energy savings.
2. Increasing customer awareness of household energy use, engagement with Duke Energy, and overall customer satisfaction with services provided by Duke Energy.
3. Promoting other energy efficiency program options to residential customers.

2.2 Implementation

MyHER is implemented by Tendril Inc., a behavioral science and analytics contractor that prepares and mails the MyHER reports according to a pre-determined annual calendar. Tendril also generates and disseminates the MyHER Interactive Portal reports, emails, energy savings tips, and energy savings challenges. Tendril and Duke Energy coordinate closely on the data transfer and preparation required to successfully manage the MyHER program, and they make adjustments as needed to provide custom tips and messages expected to reflect the characteristics of specific homes. A more detailed discussion of the roles and responsibilities of both organizations is provided in Section 4.

Eligibility

The single-family segment of the MyHER program targets residential customers living in single family, single meter, and non-commercial homes with at least thirteen months of electricity consumption history.[3] Approximately 649,354 DEP residential customers currently met these requirements as of December 2016. Accounts could still be excluded from the program for reasons such as the following: assignment to the control group, different mailing and service addresses, and enrollment in payment plans based on income (although Equal Payment Plan customers are eligible). Eligibility criteria for the MyHER program have changed over time, and in some cases, customers were assigned to either treatment or control but later determined to be ineligible for the program. Nexant estimates that approximately 13.7% of assigned customers have been deemed ineligible for the program after having been assigned. Nexant removed these customers from the impact analysis.

2.3 Key Research Objectives

The section describes key research objectives and associated evaluation activities.

2.3.1 Impact Evaluation Objectives

The primary objective of the impact evaluation is to describe the impact of the program on energy consumption (kWh). Savings attributable to the program are measured across an average annual and monthly time period. The following research questions guided impact evaluation activities:

1. Is the process used to select customers into treatment and control groups unbiased?
2. Are the sample sizes of control groups used by the various entities optimal and if not, how should they be modified to be brought into line with reasonable precision targets (e.g., plus or minus 1% precision with 90% confidence).
3. What is the impact of MyHER on the uptake of other Duke Energy programs (downstream and upstream) in the market?

[3] Duke Energy launched a multi-family MyHER program in December 2016. This report focuses solely on the single-family MyHER implementation.

4. What net energy savings are attributable solely to MyHER reports after removing savings already claimed by other DEP energy efficiency programs?
5. What incremental savings are achieved by customers participating in the MyHER Interactive portal?

2.3.2 Process Evaluation Objectives

The program evaluation also seeks to identify improvements to the business processes of program delivery. Process evaluation activities focused on how the program is working and opportunities to make MyHER more effective. The following questions guided process data collection and evaluation activities:

1. Are there opportunities to make the program more efficient, more effective, or to increase participant engagement?
2. What components of the program are most effective and should be replicated or expanded?
3. What additional information, services, tips or other capabilities should MyHER consider?
4. Does MyHER participation increase customer awareness of their energy use and interest in saving energy?
5. To what extent does receiving MyHER increase customer engagement?
6. Do participants hold more favorable opinions of Duke Energy as a result of receiving the reports?
7. Do they express higher levels of stated intentions to save energy?
8. Are they more likely to say they will take advantage of Duke Energy's energy efficiency programs in the future?
9. What prevents households from acting upon information or tips provide by MyHER?
10. How can the program encourage additional action?

2.4 Organization of This Report

The remainder of this report contains the results of the impact analysis (Section 3); the results of the process evaluation activities, including the customer surveys (Section 4); and Nexant's conclusions and recommendations (Section 5).

3 Impact Evaluation

3.1 Methods

The MyHER impact evaluation measures the change in electricity consumption (kWh) resulting from exposure to the normative comparisons and conservation messages presented in Duke Energy's My Home Energy Reports. The approach for estimating MyHER impacts is built into the program delivery strategy. Eligible accounts are randomly assigned to either a treatment (participant) group or a control group. The control group accounts are not exposed to MyHER in order to provide the baseline for estimating savings attributable to the Home Energy Reports. In this randomized controlled trial (RCT) design, the only explanation for the observed differences in energy consumption between the treatment and control group is exposure to MyHER.

The impact estimate is based on monthly billing data and program participation data provided by Duke Energy. The RCT delivery method of the program removes the need for a net-to-gross analysis as the billing analysis directly estimates the net impact of the program. After estimating the total change in energy consumption in treatment group homes, Nexant performed an overlap analysis to quantify the savings associated with increased participation by treatment homes in other DEP energy efficiency offerings. These savings were claimed by other programs; therefore, they are subtracted from the MyHER impact estimates to eliminate double-counting.

3.1.1 Data Sources and Management

The MyHER impact evaluation relied on a large volume of participation and billing data from Duke Energy's data warehouse. Key data elements include the following:

- **Participant List**: A table listing each of the homes assigned to the MyHER program since its inception in 2015. This table also indicated whether the account was in the treatment or control group and the date the home was assigned to either group. Duke Energy also provided a supplemental table of Experian demographic data for program participants.
- **Billing History**: A monthly consumption (kWh) history for each account in the treatment and control group. Records included all months since assignment as well as the pre-assignment usage history required for eligibility. This file also included the meter read date and the number of days in each billing cycle.
- **Participation Tracking Data for Other DEC Energy Efficiency Programs:** A table of the Duke Energy DSM program participation of MyHER control and treatment group accounts. Key fields for analysis include the measure name, quantity, participation date, and net annual kWh and peak demand impacts per unit for each MyHER recipient and control group account participating in other DSM programs offered by Duke Energy.

- **MyHER Interactive Session Data**: A dataset containing information on participants' date of enrollment, the date of each login (e.g. a single MyHER Interactive portal session), and the duration of the session.

In preparation for the impact analysis, Nexant combined and cleaned the participation and billing data provided by the MyHER program staff. The participant list dataset included an average of 802,216 distinct accounts (the actual number varies by month); on average, 704,984 accounts were assigned to the treatment group and 97,232 accounts assigned to the control group. These figures represent accounts that were at one time or another included as part of the program. Duke Energy maintains these customer records in the program data file for tracking purposes. Customer eligibility may change over time, and Nexant also applies customer filters as part of the data cleaning and analysis process.

Nexant removed the following anomalies and outliers from the analysis:

- 2,028 records with a negative value for billed kWh.
- 29 records with unrealistically high usage: any month with greater than six times the 99^{th} percentile value for daily kWh usage, or approximately 900 kWh per day.

Like most electric utilities, Duke Energy does not bill its customers for usage within a standard calendar month interval. Instead, billing cycles are a function of meter read dates that vary across accounts. Duke Energy "calendarizes" billing records in its data warehouse in a field called "bill month." A record with bill month equal to "201501," for example, corresponds to the year and number of the bill—in this case, the home's first bill for 2015. Typically this will reflect energy captured by a meter read during one of the approximately 20 weekdays in a given month. In this example, the electric usage associated with bill month 201501 would include a mix of December and January days depending on the meter read schedule of the account.

Nexant's analysis of MyHER impacts is based on the meter read date. Nexant estimates MyHER impacts by examining differences in average daily consumption in each month, and by comparing consumption of control group customers to treatment customers. Nexant therefore estimates average daily consumption by calendar month to ensure customers' billed consumption is compared on similar days under similar weather conditions. It is important to remember that monthly impact estimates presented in this report are based on calendar month, not the Duke Energy billing month.

3.1.2 Participation Tracking

Duke Energy maintains a number of eligibility requirements for continued receipt of MyHER. Not all accounts assigned to treatment remained eligible and received MyHER over the study horizon. Nexant used information provided by Duke Energy to filter customers according to program eligibility. Since customer eligibility can change over time, Duke Energy maintains customer records for accounts that were part of the program at one time or another, and Nexant removed accounts flagged as ineligible for the program. In addition, programmatic considerations can prevent a treatment group home from receiving MyHER in a given month. Common reasons for an account not being mailed include the following:

- **Mailing Address Issues:** Mailing addresses are subjected to deliverability verification by the printer. If an account fails this check due to an invalid street name, PO Box or other issue, the home will not receive the MyHER mailer.
- **Implausible Bill**: If a home's billed usage for the previous month is less than 150 kWh or greater than 10,000 kWh, Tendril does not mail the MyHER.
- **Insufficient Matching Households**: This filter is referred to as "Small Neighborhood" by Tendril and is a function of the clustering algorithm Tendril uses to produce the usage comparison. If a home can't be clustered with a sufficient number of other homes, it will not receive the MyHER mailer.
- **No Bill Received**: If Tendril does not receive usage data for an account from Duke Energy within the necessary time frame to print and mail, the home will not receive MyHER for the month.

The Nexant data cleaning steps listed in Section 3.1.1 did not impose these filters on the impact evaluation analysis dataset. Instead, we relied on Duke Energy's determination of eligibility and removed customers flagged as not currently eligible by Duke Energy. This is necessary to preserve the RCT design because eligibility filters are not applied to the control group in the same manner as the treatment group. Nexant also relied on Duke Energy data for calculating the number of participants in each month. Table 3-1 indicates the number of treatment homes analyzed according to the "currently eligible," flag and the number of homes counted in Duke Energy participant counts.

Table 3-1: DEP MyHER Participants Analyzed by Bill Month

Bill Month	Number of Treatment Homes Analyzed	DEP Participant Count
2016m1	608,912	690,461
2016m2	612,564	666,979
2016m3	612,608	666,979
2016m4	612,623	661,667
2016m5	612,646	661,667
2016m6	612,657	642,843
2016m7	612,790	646,260
2016m8	625,959	658,229
2016m9	627,975	649,009
2016m10	627,967	649,009
2016m11	627,549	642,874
2016m12	615,401	649,354

Nexant estimated monthly impacts for the participants identified in the second column of Table 3-1. Nexant multiplied the average treatment effect by the number of participating homes indicated by Duke Energy (third column of Table 3-1) to arrive at the aggregate savings impact achieved by the program.

3.1.3 Sampling Plan and Precision of Findings

The MyHER program was implemented as an RCT in which individuals were randomly assigned to a treatment (participant) group or a control group for the purpose of estimating changes in energy use attributable to the program. Nexant's analysis includes all homes in both groups so the resulting impact estimates are free of sampling error. Nevertheless, there is inherent uncertainty associated with the impact estimates because random assignment produces a statistical chance that the control group consumption would not vary in perfect harmony with the treatment group, even in the absence of MyHER exposure. The uncertainty associated with random assignment is a function of the size of the treatment and control groups, as well as the underlying properties of customers' electricity consumption patterns. As group size increases, the uncertainty introduced by randomization decreases, and the precision of the estimates improves. Nexant has conducted numerous simulations that describe the expected precision of MyHER impact estimates at various control group sizes. Duke Energy's control group sizes are large enough that we expect impacts to achieve a margin of error below 25-30 kWh; current impacts estimates are in fact more precise, as indicated below.

Nexant's MyHER impact estimates are presented with both an absolute precision and relative precision. Absolute precision estimates are expressed in units of annual energy consumption (kWh) or as a percentage of annual average consumption. The two following statements about the MyHER Progress impact analysis reflect absolute precision:

- MyHER saves an average of 147.6 kWh per home, ± 14 kWh.
- Homes in the MyHER treatment group reduced electric consumption by an average of 0.95%, ± 0.09%.

In these examples the uncertainty of the estimate, or margin of error (denoted by "±"), is presented in the same absolute terms as the impact estimate—that is, in terms of annual electricity consumption. Nexant also includes the relative precision of the findings. Relative precision expresses the margin of error as a percentage of the impact estimate itself. Consider the following example:

- The average treatment effect of MyHER is 147.6 kWh with a relative precision of ±9.1%. In this case ± 9.1% is determined by dividing the absolute margin of error by the impact estimate: 14 ÷ 147.6 = 0.091 = 9.1%.

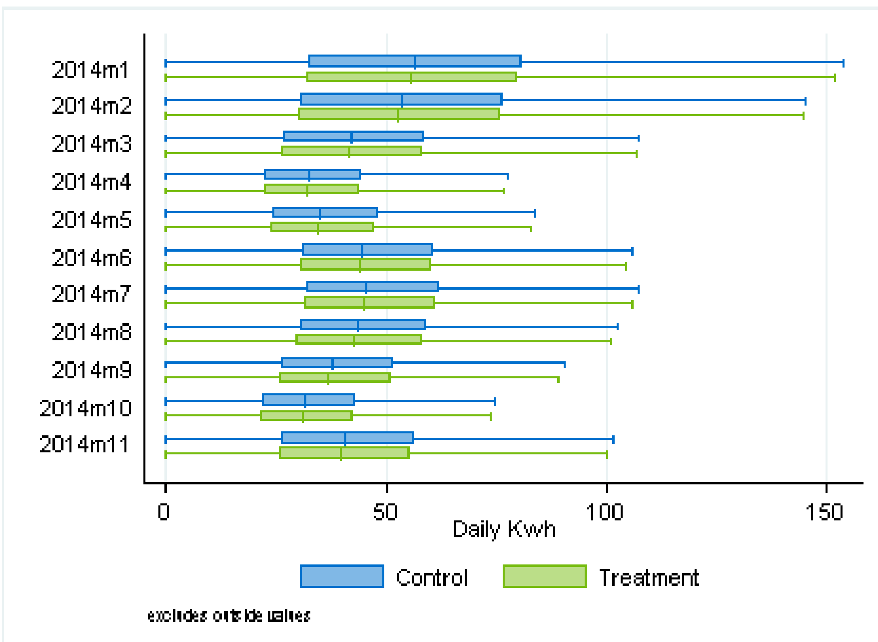
All of the precision estimates in this report are presented at the 90% confidence level and assume a two-tailed distribution.

3.1.4 Equivalence Testing

Straightforward impact estimates are a fundamental property of the RCT design. Random assignment to treatment and control produces a situation in which the treatment and control groups are statistically identical on all dimensions prior to the onset of treatment; the only difference between the treatment and control groups is exposure to MyHER. The impact is therefore the difference in average electricity consumption between the two groups. The first step to assessing the impact of an experiment involving a RCT is to determine whether or not the randomization worked as planned.

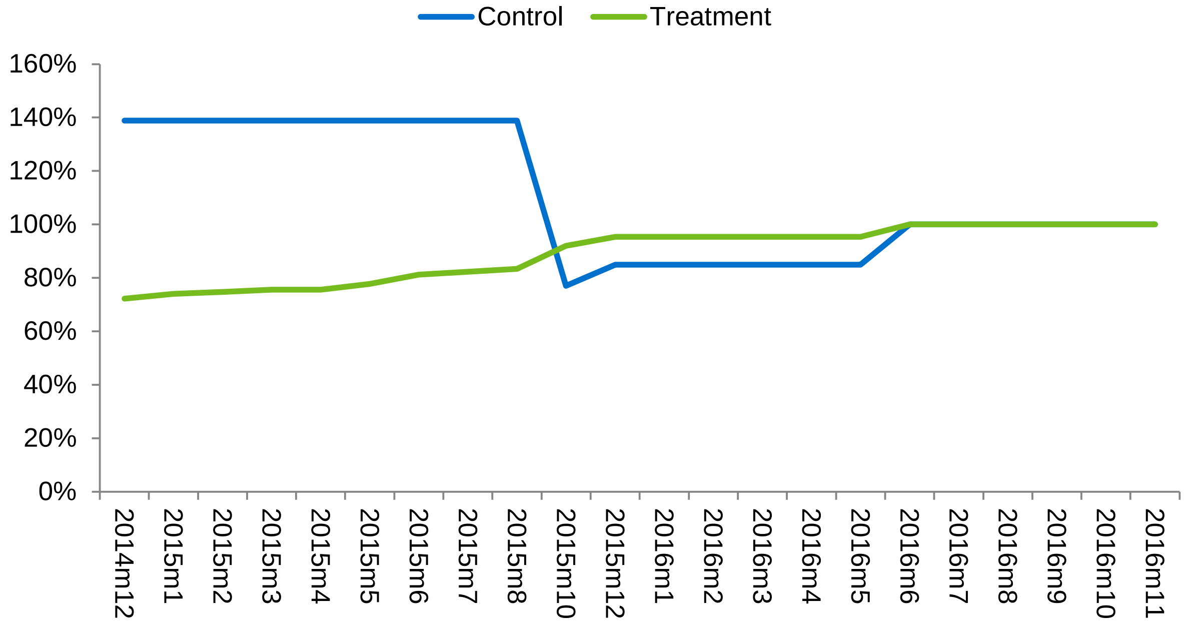
Figure 3-1 is a box-and-whisker plot of the average pre-treatment consumption for the treatment and control groups. The figure depicts the distribution of monthly average consumption in 2014, the time period prior to the full launch of the DEP MyHER program. This figure contains all accounts assigned to treatment and control in December 2014. While multiple instances of random assignment occurred over this period, Nexant aggregated DEP MyHER customers into annual or biannual cohorts because of the large number of individual assignment occasions. This figure shows some small differences in pre-treatment consumption between the treatment and control group customers. Some of these differences are due to the fact that Figure 3-1 is comprised of multiple instances of customer assignment to treatment or control; nevertheless, Nexant found differences in pre-treatment consumption across many individual occasions of random assignment within this time period. These pre-treatment differences and existence of multiple cohorts led Nexant to select the fixed-effects regression approach, which can appropriately control for such pre-treatment differences in the treatment and control groups.

Figure 3-1: Difference in Average Pre-treatment Billed Consumption for cohorts-Dec 2014



The DEP MyHER program consists of several assignment cohorts: the cohort from December 2014, and expansions throughout 2015 and 2016. Since December 2015, the program expanded as newer customers met the program's eligibility criteria. Figure 3-2 shows the timeline of program expansion since December 2014 and the assignment history of customers in the treatment and control groups; values are stated as a proportion of program composition in December 2016. In December 2015, Duke Energy released approximately 70,000 control group customers to treatment.

Figure 3-2: History of Cohort Assignments for DEP MyHER Program



This figure indicates customers were not always simultaneously assigned to treatment and control. In 2016, Nexant advised Duke Energy to maintain a simultaneous assignment protocol and to make assignment on an annual or biennial basis. Duke Energy has implemented this recommendation. Simultaneous assignment avoids any potential sources of bias that could occur due to a lack of similarity between treatment and control. The historic pattern of assignment to one group or the other is reflected by minor differences in consumption patterns between the treatment and control groups over this time period. Nexant has accounted for these differences in its impact estimation approach by applying fixed-effects regression frameworks.

Nexant estimated MyHER impacts by cohort using a fixed-effects panel regression model. A cohort is a group of accounts that are added to the program at a given time. Nexant mapped the MyHER population into five cohorts that generally follow the major periods when customers were assigned to treatment and control groups. Figure 3-3 indicates the composition of the current program by cohort.

Figure 3-3: Comparison of Treatment and Control Group Composition by Cohort

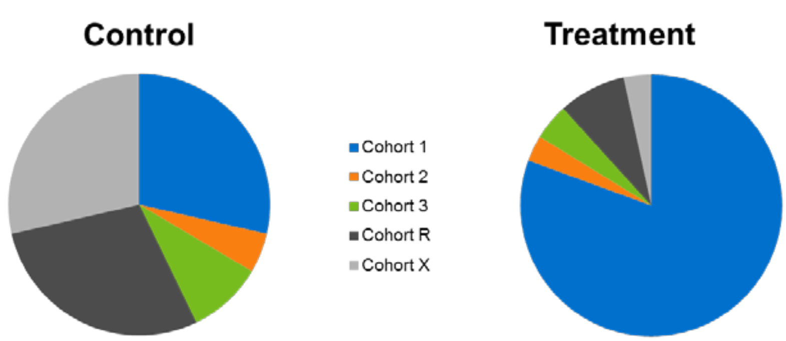


Table 3-2 provides additional summary information for each of the three cohorts. Note that the values presented in Table 3-2 are based on the year prior to each cohort's assignment; the customer counts do not match the current program composition presented in Figure 3-3 because they are measured at different points in time (prior to treatment and in April 2016, respectively). The "number of homes" columns reflect the number of active assigned customers without any filters applied for eligibility. Table 3-2 also compares the average annual kWh usage of each cohort's treatment and control group for the 12 months prior to the beginning of assignment. The pre-assignment usage is relatively balanced between groups for cohorts 1, 2, and 3.

Table 3-2: MyHER Cohort Summary Statistics

Cohort Number	Cohort Description	# Treatment Homes	# Control Homes	Annual kWh Pre-Assignment for Control Group	Annual kWh Pre-Assignment for Treatment Group	Pre-Period
1	Dec. 2014	520,971	131,157	16,461	16,790	Dec. 2013 – Nov. 2014
2	Dec. 2015	20,702	6,912	15,047	15,294	Dec. 2014 – Nov. 2015
3	Jun. 2016	5,154	2,298	16,900	16,462	Jun. 2015 – May 2016
R	Release	62,215	131,157	16,790	16,790	Dec. 2013 – Nov. 2014
X	Jun. 2015	22,865	131,157	14,934	15,089	Jun. 2014 – May 2015

3.1.5 Regression Analysis

Separating the MyHER population into cohorts accounts for cohort maturation effects and improves statistical precision relative to differences among the cohorts. Nevertheless, there are still some underlying differences between the cohort treatment and control groups that need to be netted out via a difference-in-differences approach. Nexant applied a linear fixed effects regression (LFER) model to account for these disparities.

The basic form of the LFER model is shown in Equation 3-1; the average treatment effect (ATE) is the sum of the monthly impact estimates from the LFER model. Average daily electricity consumption for treatment and control group customers is modeled using an indicator variable for the billing period of the study, a treatment indicator variable, and a customer-specific intercept term:

Equation 3-1: Fixed Effects Model Specification

$$\mathrm{kWh}_{ity} = \mathrm{customer}_i * \beta_i + \sum_{t=1}^{12}\sum_{y=2011}^{2016} \mathrm{I}_{ty} * \beta_{ty} + \sum_{t=1}^{12}\sum_{y=2011}^{2016} \mathrm{I}_{ty} * \tau_{ty} * \mathrm{treatment}_{ity} + \varepsilon_{ity}$$

Table 3-3 provides additional information about the terms and coefficients in Equation 3-1.

Table 3-3: Fixed Effects Regression Model Definition of Terms

Variable	Definition
kWh_{ity}	Customer i's average daily energy usage in billing month t of year y
$\mathrm{customer}_i$	An indicator variable that equals one for customer i and zero otherwise. This variable models each customer's average energy use separately.
β_i	The coefficient on the customer indicator variable. Equal to the mean daily energy use for each customer.
I_{ty}	An indicator variable equal to one for each monthly billing period t, year y and zero otherwise. This variable captures the effect of each billing period's deviation from the customer's average energy use over the entire time series under investigation.
β_{ty}	The coefficient on the billing period t, year y indicator variable.
$\mathrm{treatment}_{ity}$	The treatment variable. Equal to one when the treatment is in effect for the treatment group. Zero otherwise. Always zero for the control group.
τ_{ty}	The estimated treatment effect in kWh per day per customer in billing month t of year y; the main parameter of interest.
ε_{ity}	The error term.

Nexant estimated the LFER model separately for each of the five cohorts. Detailed regression output can be found in Appendix E. The model specification includes an interaction term between the treatment indicator variable and the indicator variable for the bill month term. This specification generates a separate estimate of the MyHER daily impact for each bill month. Table 3-4 illustrates the calculation of monthly impact estimates from the regression model coefficients for homes assigned to treatment in the original MyHER pilot. Each month's average treatment effect is multiplied by an assumed number of days in the month equal to 365.25/12 = 30.4.

Table 3-4: Impact Calculation Example – Cohort 3

Bill Month	Daily Treatment Coefficient (τ)	Monthly Impact (kWh)
January 2016	-0.68	-20.6
February 2016	-0.73	-22.3
March 2016	-0.47	-14.4
April 2016	-0.43	-12.9
May 2016	-0.35	-10.6
June 2016	-0.28	-8.6
July 2016	-0.09	-2.8
August 2016	-0.06	-1.8
September 2016	-0.26	-7.9
October 2016	-0.41	-12.5
November 2016	-0.58	-17.5
December 2016	-0.56	-17.1
12 Month Total Impact		**-149.4**

Impact estimates from the five cohorts were weighted and combined for each month to calculate a weighted average treatment effect. The weighting factor was the number of homes with billing data that had been assigned to the treatment group during a prior month (e.g. were in the post-treatment period).

3.1.6 Dual Participation Analysis

The regression model outputs discussed in Section 3.1.5 produce estimates of the total change in electricity consumption in homes exposed to MyHER. Some portion of the savings estimated by the regression is attributable to the propensity of MyHER treatment group homes to participate in other DEP energy efficiency offerings at a greater rate than control group homes. The primary purpose of the dual participation analysis is to quantify annual electricity savings attributable to this incremental DSM participation and subtract it from the MyHER impact estimates. This downward adjustment prevents savings from being double-counted by both the MyHER program and the program where savings were originally claimed.

A secondary objective of the dual participation analysis is to better understand the increased DSM participation, or "uplift" triggered by inclusion of marketing messages within MyHER. The ability to serve as a marketing tool for other DSM initiatives is an important part of what makes MyHER attractive as Duke Energy assumes the role of a trusted energy advisor with its customer base.

Duke Energy EM&V staff provided Nexant with a table of non-MyHER program participation records for the MyHER treatment and control group homes dating back to January 2011. This dataset included 874,790 records of efficient measure installations by the MyHER treatment and control group and formed the basis of Nexant's dual participation analysis. Table 3-5 shows the distribution of participation and savings during the MyHER evaluation period across Duke Energy's residential portfolio.

Table 3-5: EE Program Participation by MyHER Customers

Filed Program Name	Number of Records	Net MWh/year	Net kW/year
DE Residential EE Products & Services	4,364	125.03	0.0116
DE Smart Saver Residential	2	37.21	0.0038
DEP Appliance Recycling Program	26,146	603.79	0.0777
DEP EnergyWise Home	301,399	0	1.051
DEP Home Energy Improvement	81,535	355.91	0.1055
DEP My Home Energy Report	51,990	96.09	0.026
DEP Neighborhood Energy Saver	160,004	451.52	0.0689
DEP New Construction Program	2,640	2,148.81	0.936
DEP ResEE Multi-Family	66,114	69.05	0.0068
DEP Residential Energy Assessment	10,074	371.14	0.0617
DEP Single Family Water Measures	141,800	60.17	0.0048
DEP Smart Saver Residential	26,942	165.73	0.0169

Nexant reduced the estimated MyHER impacts by the difference in average daily energy saved by MyHER treatment homes and control homes. The MyHER dual participation analysis included the following steps:

- Match the data to the treatment and control homes by Account ID.
- Assign each transaction to a bill month based on the participation date field in the tracking data.
- Exclude any installations that occurred prior to the home being assigned to the treatment or control group.
- Calculate the daily net energy savings for each efficiency measure.
- Sum the daily net energy impact by Account ID for measures installed prior to each bill month.
- Calculate the average savings per day for the treatment and control groups by bill month. This calculation is performed separately for each cohort.
- Calculate the incremental daily energy saved from energy efficiency (treatment – control) and multiply by the average number of days per bill month (30.4375).
- Take a weighted average across cohorts of the incremental energy savings observed in the treatment group.
- Subtract this value from the LFER estimates of treatment effect for each bill month.

3.2 Impact Findings

3.2.1 Per-Home kWh and Percent Impacts

Nexant estimates the average participating MyHER home saved 147.6 kWh of electricity from January 2016 to December 2016. This represents a 0.95 percent reduction in total electricity consumption, compared to the control group over the same period. These final estimates reflect a downward adjustment to prevent double-counting of savings attributable to incremental participation of treatment groups in Duke Energy's energy efficiency programs. Table 3-6 shows the impact estimates in each bill month for the average home assigned to treatment.

Table 3-6: MyHER Impact Estimates

Month	Treatment Homes Analyzed	kWh impact in Assigned Homes
2016m1	608,912	-21.1
2016m2	612,564	-22.1
2016m3	612,608	-15.1
2016m4	612,623	-13.2
2016m5	612,646	-10.3
2016m6	612,657	-8.7
2016m7	612,790	-2.8
2016m8	625,959	-0.8
2016m9	627,975	-7.5
2016m10	627,967	-12.1
2016m11	627,549	-18.0
2016m12	615,401	-17.5
Total		**149.4**

An adjustment factor of 1.8 annual kWh per home is applied to MyHER impact estimate estimates in Table 3-6 to arrive at the final net verified program impact per home.

Table 3-7: MyHER Impact Estimates with Adjustment for Dual Participation

kWh Savings in Treated Homes	Incremental kWh from EE Programs	Net MyHER Impact Estimate	Control Group Usage (kWh)	Percent Reduction
149.4	-1.8	147.6	15,612	0.95%

The filed per-home impact for MyHER in DEP is 183.7 kWh per home based on a previous evaluation study. The Nexant evaluation results amounts to a realization rate of 80%.

3.2.2 Aggregate Impacts

The total impact of the MyHER program in the DEP service territory is calculated by multiplying the per-home impacts (adjusted for incremental EE participation) for each bill month by the number of participating homes. Over the twelve month period examined by Nexant in this evaluation, MyHER participants conserved 97.5 GWh of electricity; or enough energy to power nearly 6,245 homes for an entire year. The aggregate impacts presented in Table 3-8 are at the meter level so they do not reflect line losses which occur during transmission and distribution between the generator and end-use customer.

Table 3-8: MyHER Aggregate Energy Impacts

Month	DEP Participant Count	Per Home kWh	Aggregate GWh
2016m1	690,461	-21.1	-14.5
2016m2	666,979	-22.0	-14.7
2016m3	666,979	-15.1	-10.0
2016m4	661,667	-13.1	-8.7
2016m5	661,667	-10.2	-6.8
2016m6	642,843	-8.5	-5.5
2016m7	646,260	-2.7	-1.8
2016m8	658,229	-0.7	-0.5
2016m9	649,009	-7.3	-4.7
2016m10	649,009	-11.9	-7.7
2016m11	642,874	-17.8	-11.5
2016m12	649,354	-17.2	-11.2
12-Month Total		**-147.6**	**-97.5**

3.2.3 Precision of Findings

The margin of error of the per-home impact estimate is ± 14 kWh at the 90% confidence interval. Nexant clustered the variation of the LFER model by Account ID to produce a robust estimate of the standard error associated with treatment coefficients. The standard normal z-statistic for the 90% confidence level of 1.645 was then used to estimate the uncertainty associated with each cohort estimate. This uncertainty was then aggregated across cohorts to quantify the precision of the program-level impacts estimates (Table 3-9).

Table 3-9: 90% Confidence Intervals Associated with MyHER Impact Estimates

Parameter	Lower Bound (90%)	Point Estimate	Upper Bound (90%)
Annual Savings per Home	134.1 kWh	147.6 kWh	161.2 kWh
Percent Reduction	0.86%	0.95%	1.03%
Aggregate Impact	88.1 GWh	97.5 GWh	105.9 GWh

The absolute precision of the result is ± 0.09% and the relative precision of ± 9.1% at the 90% confidence level.

3.2.4 Impact Estimates by Cohort

The per-home impact estimates shown in Table 3-6 reflect a weighted average impact across the five cohorts of MyHER customers analyzed. The impact estimates for the individual cohorts varied significantly for the study period. Table 3-10 shows point estimates for each cohort for the period January 2016 to December 2016.

Table 3-10: Annual kWh Impact Estimates by Cohort

Month	Cohort 1 (2014m12)	Cohort 2 (2015m12)	Cohort 3 (2016m6)	Cohort R (2015m10, Release)	Cohort X (2015m6)
January 2016	-20.6	-19.7	0.0	-10.4	-62.1
February 2016	-22.3	-4.2	0.0	-14.1	-52.4
March 2016	-14.4	-0.1	0.0	-10.9	-54.2
April 2016	-12.9	0.9	0.0	-8.3	-44.4
May 2016	-10.6	0.0	0.0	-4.7	-27.3
June 2016	-8.6	-7.4	0.0	0.4	-35.4
July 2016	-2.8	-8.1	0.0	3.9	-18.0
August 2016	-1.8	4.1	21.4	1.3	-1.3
September 2016	-7.9	16.9	-28.4	-3.8	-11.9
October 2016	-12.5	9.8	-17.2	-9.8	-21.4
November 2016	-17.5	-1.5	-22.9	-11.6	-56.5
December 2016	-17.1	-8.5	-34.7	-10.3	-62.2
Cohort Total	**-149**	**-17.8**	**-81.8**	**-78.3**	**-447.1**
Cohort Weights	**83%**	**3%**	**1%**	**10%**	**4%**
Weighted Impact	**-123.8**	**-0.4**	**-2.0**	**-7.7**	**-15.5**
Period total = 149.4 – 1.8 = 147.6					

Cohorts 1 and 5 show the largest average impact during the study period. Table 3-11 shows the margin of error at the 90% confidence level for each cohort's annual impact estimate. The combined margin of error for the entire program is lower than the error for any single cohort because the combined program impact estimate is based on a larger pool of customers. Individual cohort margins of error are high for the small cohorts due to the sizes of these groups relative to the underlying variation in consumption among the treatment and control groups constituting each cohort.

Table 3-11: 90% Confidence Intervals Associated with Cohort Estimates

Cohort Number	Cohort Description	Margin of Error in kWh at 90% Confidence Level
1	2014m12	± 9.5
2	2015m12	± 30.7
3	2016m6	± 16.1
R	2015m10	± 13.6
X	2015m6	± 40.8

3.2.5 Temporal Patterns

3.2.6 Temporal Distribution of Savings

Duke Energy currently mails MyHER to the treatment group eight times per year. These mailers target the summer and winter months and skip the shoulder months. The blue series in Figure 3-4 shows the average estimated monthly treatment effect in each month from January 2016 to December 2016. There is a definite seasonal pattern to the DEP MyHER savings profile, with the largest impacts occurring during cold months and the smallest impacts occurring during warm summer months.

Nexant notes the distribution of impacts throughout the year is essentially the inverse of the pattern observed for the Duke Energy Carolinas (DEC) evaluation, which indicated higher summer savings and lower winter savings. While the two companies are located in the Carolinas there are many differences between the underlying customer populations served by them that could combine to produce the apparent differences in the seasonality of impacts. A definitive conclusion about the causes of the difference in seasonal distribution of savings is beyond the scope of the current analysis, and an in-depth analysis of the potential cause of this difference is likely to be expensive, time consuming and ultimately inconclusive. Nexant investigated potential causes of the observed seasonal difference with the limited data available. We found the customers in the DEP territory appear to exhibit more weather-responsive consumption patterns when compared to DEC. That is, DEP customers consume more electricity when weather conditions are extreme than DEC customers. This means more winter consumption during a cold winter and more summer consumption during a hot summer. This pattern suggests that the seasonal differences in consumption result from differences in the housing stock (i.e., vintage, floor plans, HVAC system fuel types etc.) and possibly customers' preferences for comfort and convenience.

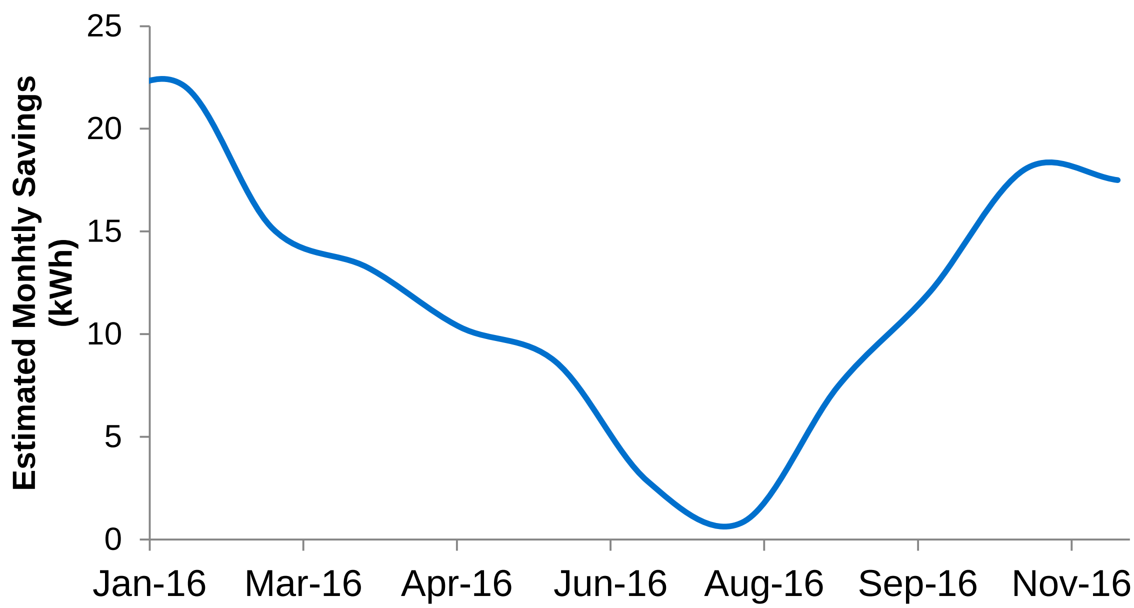
There are several other factors that might contribute to differences between the two jurisdictions, such as the following, among others:

- The jurisdictions were evaluated at different points in time, and under different weather conditions. While the RCT program design eliminates the need to control for weather when estimating impacts within a single jurisdiction, differences in weather across time and location may contribute to differences in savings patterns for the two jurisdictions.

- The age of the program differs for the two jurisdictions. There is strong evidence of a maturation effect associated with duration of exposure to behavioral stimuli such as that provided by the MyHER program and this maturation effect may be confounded with the above described differences in weather over time.
- Each jurisdiction is composed of a set of customer cohorts that reflect the timeline of program rollout and population patterns inherent to the jurisdiction. These cohorts may differ in ways that affect program performance, and the mix of cohorts and customers in a jurisdiction may generate differences when jurisdictions are compared.
- Unobservable differences – there may be other factors not captured in available data that indicate differences, such as differences in utility legacy utility marketing and energy efficiency programs and differences in the physical infrastructure (e.g. housing stock or fuel sources) found in the communities served by the two jurisdictions.

Nexant presents the hypotheses in order to demonstrate the differences across jurisdictions should perhaps be expected, even between two jurisdictions ostensibly as similar as DEP and Duke Energy Carolinas.

Figure 3-4: DEP Average Weighted kWh Savings by Month



Based on the observed savings trends, MyHER is actually performing quite well during shoulder months when Tendril does not mail reports. The treatment effect is still relatively strong at approximately 10-15 kWh per home each month. If Duke Energy wishes to explore the effect of changing the frequency or timing of MyHER delivery, Nexant recommends an experimental design where a portion of the treatment group is randomly selected for an alternative schedule while keep the remaining homes on the current delivery schedule.

Seasonal trends in MyHER average treatment effects likely reflect customers' differing abilities to respond by season. Customers' summer and winter savings may be higher than shoulder, which is due to the fact that there are more opportunities to conserve energy relative to baseline demands for energy in each season. Winter demands can be mitigated by dressing more warmly, using more blankets in the home, or shutting off lights more often (due to fewer daylight hours in the winter). The summer impacts can occur because small changes to thermostat set points can have a greater impact on hot days than on comparatively milder summer days.

3.2.7 Uplift in Other Programs

Section 3.1.6 outlined the methodology Nexant used to calculate the annual kWh savings attributable to increased participation in other DEP programs, a downward adjustment of 1.8 kWh per home, or 1.1 GWh in aggregate, as shown in Table 3-12.

Table 3-12: Monthly Adjustment for Overlapping Participation in Other EE Programs

Bill Month	Incremental kWh from Other EE Programs
2016m1	0.07
2016m2	0.08
2016m3	0.09
2016m4	0.11
2016m5	0.12
2016m6	0.13
2016m7	0.13
2016m8	0.16
2016m9	0.19
2016m10	0.22
2016m11	0.23
2016m12	0.26
Incremental kWh from EE netted out of MyHER	**1.8**

Although these additional savings must be subtracted from the MyHER effect to prevent double-counting, the MyHER promotional messaging clearly played an important role in harvesting these savings. The MyHER treatment group showed a frequency of program participation in other DEP programs than the control group. Nexant only counted savings for measures installed in the "post" period so the cohorts that have been assigned to MyHER for the longest period of time have accumulated the most savings.

Table 3-13: Uplift Percentage by Cohort

Cohort	Cohort Description	Daily Net kWh Savings from EE (Treatment Group)	Daily Net kWh Savings from EE (Control Group)	Uplift Percentage
1	2014m12	0.847	0.92	8.6%
2	2015m12	0.33	0.357	8.2%
3	2016m6	0.141	0.137	-3.1%
R	2015m10	0.847	0.882	4.1%
X	2015m6	0.847	0.68	-19.7%

3.2.8 Summer Demand Impacts

Nexant estimated MyHER demand savings using Duke Energy's system load profile data from 2014. This load profile data was provided to Nexant by Duke Energy's load forecasting team for residential customers in North Carolina. Nexant used the 2014 hourly demand estimate to identify the system peak demand hour of July 14, 2014, hour ending 17. Nexant applied the proportion of annual residential load in this hour to our annual MyHER impact savings estimate of 147.6 kWh; the result is an estimated MyHER residential peak demand savings of 0.0264 kW.

Table 3-14: MyHER Demand Impacts

Month	DEP Participant Count	Per Home kW Savings	Aggregate MW
2016m7	646,260	0.0239	15,446

3.3 MyHER Interactive Portal

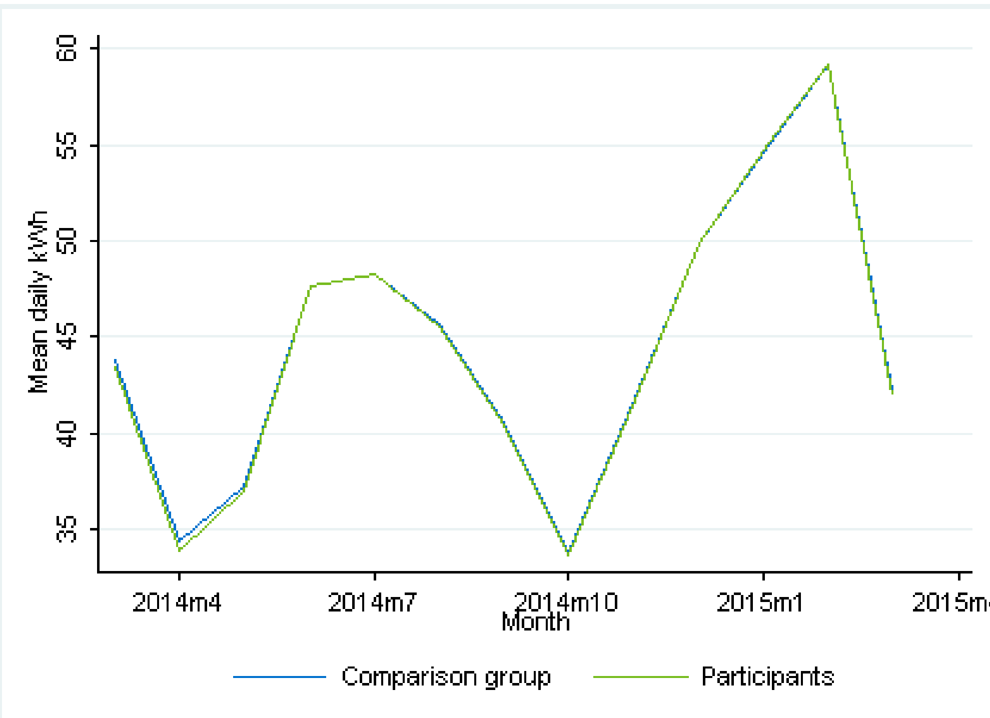
Nexant also evaluated the incremental energy savings generated by Duke Energy’s new enhancement to the standard MyHER paper report. Duke Energy launched the MyHER Interactive Portal in March 2015. The portal offers additional means for customers to customize or update Duke Energy’s data on their premises, demographics, and other characteristics that affect consumption and the classification of each customer.

The portal also provides additional custom tips based on updated data provided by the customer. MyHER Interactive also sends email challenges that seek to engage customer in active energy management, additional efficiency upgrades, and conservation behavior. Nexant evaluated the impacts of the MyHER Interactive Portal using a matched comparison group because the MyHER Interactive Portal was not deployed as a randomized, controlled trial (RCT).

3.3.1 Estimation Procedures for MyHER Interactive

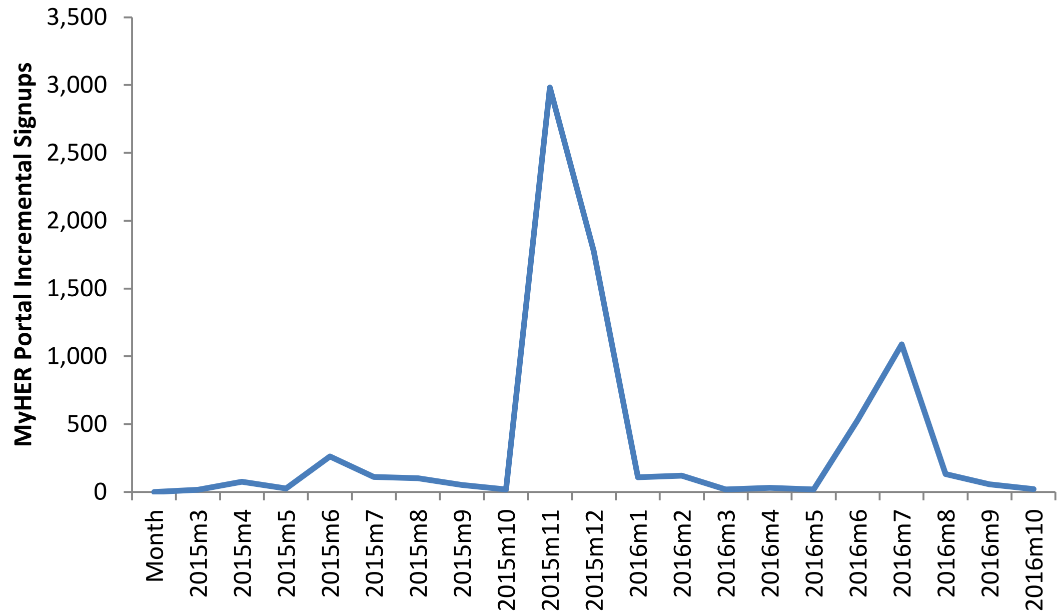
A matched comparison group is a standard approach for establishing a counterfactual baseline when there is no random assignment to treatment and control. The goal of matching estimators is to estimate impacts by matching treatment customers to similar customers that did not participate in the program. The key assumption to matched comparison approaches is that MyHER Interactive participants closely resemble non-participants, except for the fact that one of these two groups participated in the program while the other did not. When a strong comparison group is established, evaluators can reliably conclude that any differences observed after enrollment are due to program's stimulus. After replacing the control group with a matched comparison group, the same statistical modeling approach is used to estimate energy savings impacts. Figure 3-5 presents the pre-treatment consumption for MyHER Interactive customers and a matched comparison group comprised of MyHER customers that receive only paper reports. The matching approach generates two groups with nearly identical consumption patterns over the time period prior to customers' enrollment in MyHER Interactive. Some minor differences remain among the limited numbers of customers that signed up towards the end of this current evaluation period; yet, the fixed effects model specification Nexant applies controls for pre-treatment differences, as discussed earlier in Section 3.1.5.

Figure 3-5: MyHER Interactive Portal Customers and Matched Comparison Group



Duke Energy provided Nexant total customer signups, beginning March 2015. Figure 3-6, plots the number of customers signing up for MyHER Interactive in each month of the impact evaluation period. Nexant was able to estimate MyHER Interactive impacts for these 7,543 customers.

Figure 3-6: Incremental MyHER Interactive Portal Enrollment



3.3.2 Results and Precision

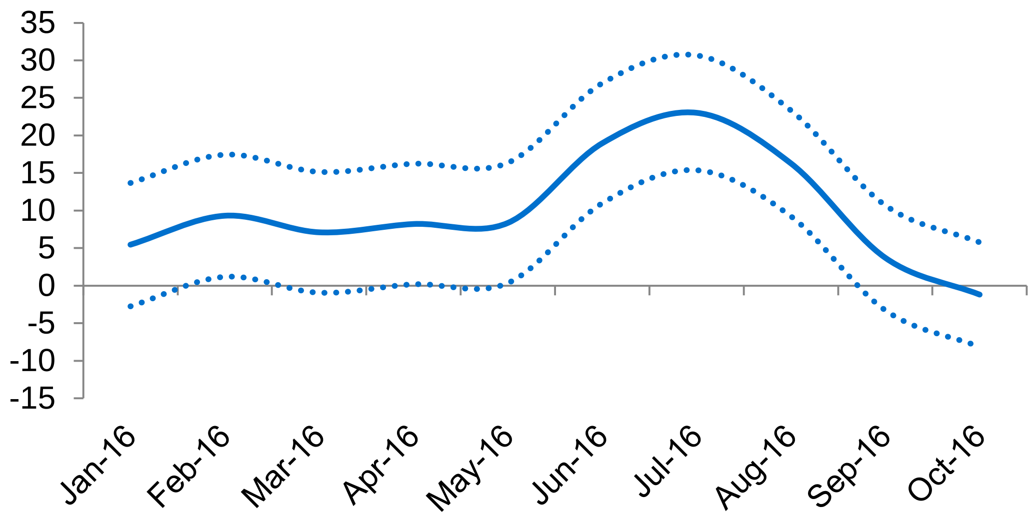
Duke Energy participant counts indicate the total enrollment for the MyHER Interactive portal in December 2016 was 8,960 customers for the DEP territory. This figure represents approximately 1.4% of total MyHER participants. For this evaluation period, the MyHER Interactive Portal customers save an additional 99 kWh more than MyHER paper-only customers. Nexant calculated the relative precision of these impacts at ± 40%. Table 3-15 provides impact model results, along with the margin of error for estimated impacts.

Table 3-15: MyHER Interactive Model Results

Bill Month	Impact Estimate (kWh)	Margin of Error (kWh)
Jan-16	-5.5	8.2
Feb-16	-9.3	8.1
Mar-16	-7.1	8.0
Apr-16	-8.2	8.0
May-16	-8.4	8.0
Jun-16	-19.0	8.0
Jul-16	-23.0	7.6
Aug-16	-16.3	7.0
Sep-16	-3.7	7.0
Oct-16	1.2	7.0
Nov-16	-5.5	8.2
Dec-16	-9.3	8.1
Annual Totals:	**-99**	**39.6**

The point estimate for annual impacts indicates a savings of 99 kWh, but the margins of error around the estimates are larger than the point estimates themselves in all but the summer months. Nexant concludes that the MyHER Interactive Portal succeeded in generating additional savings during the summer months of this evaluation period. Figure 3-7 illustrates the monthly impact estimates for MyHER Interactive, along with their associated margins of error. The margin of error for all but the summer months includes zero, indicating savings in these months are not statistically significant at the 90% confidence level.

Figure 3-7: MyHER Interactive Incremental Savings and 90% Confidence Interval



3.4 Impact Conclusions and Recommendations

Nexant's impact evaluation shows that Duke Energy's MyHER program continues to trigger a reduction in electric consumption among homes exposed to the program messaging. DEP MyHER is currently achieving 147.6 kWh annual savings within the time period evaluated. Although MyHER is achieving its primary target of delivering cost-effect savings to the company, and its secondary goal of promoting other DEP initiatives, Nexant provides the following conclusions and recommendations for consideration:

- **Continue the practice, adopted in September 2015, of simultaneous control and treatment assignment.** Assignment of new accounts to the MyHER treatment and control group should be limited to once or twice per year.
- **Continue to monitor engagement and evaluate the impacts of the Interactive Portal.** The MyHER Interactive Portal appears to generate incremental savings above and beyond the standard MyHER paper edition. If Duke Energy continues to maintain the interactive portal as a supplement to paper or electronic MyHER reports, then incremental savings may be generated by this level of customer interaction and engagement. MyHER Interactive Portal customers volunteered to participate in this option when offered by Duke Energy; therefore, the savings exhibited by this group do not necessarily represent the level of savings that might be generated by the MyHER Portal Product if implemented as an RCT design.

4 Process Evaluation

This section presents the results of process evaluation activities including in-depth interviews with Duke Energy and implementation staff and a survey of control and treatment households.

4.1 Methods

Process evaluations support continuous program improvement by identifying opportunities to improve the effectiveness and efficiency of program operations and services. Process evaluations also identify successful program components that should be enhanced or replicated. Process evaluation activities for MyHER sought to document program operational processes and to understand the experience of those receiving MyHER mailings. The customer survey focused on investigating the recall and influence of MyHER messages among recipients, the extent to which MyHER affects customer engagement and satisfaction with Duke Energy, and subsequent actions taken by participants to reduce household energy consumption. A survey of control group households provided a point of comparison for estimating the effect of MyHER on behavior and attitudes of treatment households.

4.1.1 Data Collection and Sampling Plan

The process evaluation included two primary data collection activities: in-depth interviews with program management and implementation staff, and surveys with a sample of households selected to receive MyHER reports as well as a sample of control group households.

Nexant deployed the household surveys using a mixed-mode survey measurement protocol, outlined in Table 4-1. In this protocol, customers were contacted by letter on Duke Energy stationery (to assure recipients of the validity of the survey) asking them to go online and complete the survey. The letter contained a two-dollar bill as a cost-effective measure to maximize the survey completion rates. The letter also included a personalized URL for the online survey that points the recipient to a unique location on the internet at which they were able to complete the survey. Customers for whom email addresses were available also received an email inviting them to take the survey online, which also included the same personalized URL that appeared in the letter leading to the survey website at the location where they could complete it. After three weeks, customers who did not respond to the web survey received another letter, this time containing a paper copy of the survey and a return postage-paid envelope asking them to complete the survey by mail. Survey recipients also had the option of calling Nexant at a toll-free telephone number to complete the survey by telephone.

Table 4-1: Summary of Process Evaluation Activities

Population	Approach	Population	Sample		Confidence/Precision	
			Expected	Actual	Expected	Actual
Program management and implementation	In-depth interviews	~10	2-5	3	Not Applicable	Not Applicable
Treatment households	Mixed-mode; mail, web, and phone	~700,000	189	217	90/06	90/06
Control group households	Mixed-mode; mail, web, and phone	~97,000	189	217	90/06	90/06

4.1.1.1 Interviews

Nexant conducted interviews with key contacts at Duke Energy and at Tendril. The interviews built upon information obtained during 2015 evaluations of the Duke Energy Ohio and Duke Energy Indiana MyHER programs, in addition to the 2016 evaluation of the Duke Energy Carolinas MyHER program. The interviews were designed to allow the evaluation team to understand any developments or enhancements in program delivery in 2016. A central objective of the interviews was to understand program operations and the main activities required to develop and mail the MyHER to DEP customers approximately eight times a year.

4.1.1.2 Household Surveys

Both treatment and control groups were surveyed. For the treatment households, the survey included questions about the experience of the reports themselves as well as questions to assess engagement and understanding of household energy use; awareness of Duke Energy efficiency program offers; and satisfaction with the services Duke Energy provides to help households manage their energy use. The control group survey excluded questions about the information and utility of the MyHER reports, but included identical questions on the other aspects to facilitate comparison with the treatment group.

Nexant analyzed the survey results to identify differences between treatment and control group households on the following:

- Reported levels of stated intention for future action;
- Levels of awareness of and interest in household energy use;
- The level of behavioral action or equipment-based upgrades;
- Satisfaction with Duke Energy service and efficiency options; and
- Inclination to seek information on managing household energy use from Duke Energy.

This survey approach is consistent with the RCT design of the program and supports both the impact and process evaluation activities by providing additional insight into potential program effects.

Survey Disposition

We mailed 550 letters to randomly selected residential customers in both the treatment and control groups, respectively. The survey was completed by 217 treatment households and 217 control households, representing a treatment group response rate of 39% and a control group response rate of 39%. More than half, 59%, of both the treatment group surveys and the control group surveys were completed online. Table 4-2 outlines the treatment and control group survey dispositions.

Table 4-2: Survey Disposition

Mode	Treatment		Control	
	Count	Percent	Count	Percent
Completes by Mode				
Web-based Survey	128	59%	127	59%
Mail/Paper Survey	85	39%	88	41%
Inbound Phone Survey	4	2%	2	1%
Total Completes	**217**	**100%**	**217**	**100%**

4.2 Findings

This section presents the findings from in-depth interviews with staff and implementation contractors and the results of the customer surveys.

4.2.1 Program Processes and Operations

Similar to other Duke Energy jurisdictions, MyHER for DEP is managed primarily through a core team of three Duke Energy staff members: a Manager of Behavioral Programs with oversight of both residential and nonresidential behavioral programs, a Program Manager in charge of the day-to-day operations of the MyHER program, and a Data Analyst responsible for the substantial data tracking and cleaning tasks and program reporting that occur at Duke Energy to support the contracted implementation team.

At Tendril, Duke Energy's contracted program implementer, MyHER is supported by a team of people including an Operations Manager, a Home Energy Report Product Manager, an Engineering Manager, a dedicated Operations Engineer, and an Account Manager responsible for ensuring that the Duke Energy MyHER products meet expectations for quality, timing, and customer satisfaction. Tendril staff track the number of reports sent, the quality of the reports, the timing of reports, and indications of customer satisfaction.

As MyHER is Duke Energy's flagship behavioral energy efficiency program, its primary goals are to achieve energy savings, increase customer satisfaction, and cross-promote enrollment into Duke Energy energy efficiency and demand response programs. Staff at both organizations described continuous, close coordination to ensure that the data behind the MyHER comparisons are accurate, the tips provided to specific households are appropriate, and that MyHERs are delivered within the relatively short timeframe between bills. Program operations are conducted with a customer-focused orientation where the commitment to producing a high-quality product is a demanding process that must be executed consistently throughout the year.

4.2.1.1 MyHER Production

During the period of time under study by this evaluation, MyHER were mailed out to DEP customers on paper through the U.S. Mail service about eight times a year, where the mailing gaps generally occurred in February, April, September, and November. During the eight treatment months, the reports are generated twice per week, a cadence that is designed to facilitate meeting a key performance indicator: that MyHER arrive at the customers' homes near the mid-point of their billing cycle so as to make the information presentment as useful and timely as possible.

The production process for any given treatment month begins as soon as meter reads for the first billing cycle are processed by Duke Energy's meter data management system. After processing, billing data is uploaded nightly, five times a week, to Tendril. Once the data has been received, report production proceeds according to the following process: Tendril runs report production and conducts quality control checks. Then a flat file containing all the data from the reports is sent to Duke Energy for an independent quality control check. Upon approval, Tendril produces the PDFs of the reports and promotes them for another Duke Energy quality control check. Upon approval, Tendril then sends the PDFs to the printhouse, and the printhouse generates a final proof for Duke Energy approval. Finally, after the proof is approved, the printhouse prints and mails all the reports, and commences the process of reporting the printing and mailing to Duke Energy.

This long production chain moves quickly: once Tendril generates a batch of reports, the time elapsed until transfer to the printhouse is generally 2-3 business days when all processes are completed according to plan. If any quality control problems emerge, that elapsed time can double, which would likely result in the batch's cancellation and merge with the next batch. Considering that the printhouse has one week to complete the mailing, and Standard Rate postage can take another week to deliver, making the mid-cycle in-home delivery goal takes dedicated effort to achieve.

The prior MyHER process evaluation, for the Duke Energy Carolinas jurisdiction, found that this fast-moving process has seen improvements through the implementation of various changes: firstly, by moving from once-a-week mailings to twice-a-week; and secondly, by developing increased speed with which the data transfer process from Duke Energy to Tendril can be completed. These efforts have resulted in improvements in in-home date performance, and has enabled Tendril to realize service-level agreement (SLA) incentives for exceeding in-home delivery date goals. Further operational improvements in 2016 to the MyHER program included shifting the responsibility for determining which treatment customers are (still) eligible to receive a MyHER each month. This change has resulted in fewer problems found during report batch quality control checks.

Embedded in the early days of this production cycle is a quality control process that is undertaken to ensure that the reports contain accurate information and are of high quality production. Duke Energy analyzes a dataset containing all of the information presented in the reports for each production cycle. This data is checked for essentially anything that could be erroneous, ranging from verifying that all the customers receiving reports are eligible to receive them, that no control customers are getting reports, that the reported electricity usage is correct, that no customers who have opted-out are getting reports, and that no one has gotten more than one report a month. Duke Energy also checks for unexpected cluster assignment changes, presentment of messaging and tips and overall print quality.

These checks have proven to be crucial. In general, problems have not been found to occur every week but some have occurred each quarter, and are subsequently reviewed in Tendril's governance sessions. This visibility typically results in issue resolution on a going-forward basis, however, sometimes the same issues have been reported to pop back up a year or two later. As one Duke Energy staffperson put it, smooth report batch production tends to go in 2-3 month streaks before either a new or old issue crops up. These findings echo what was reported in the prior MyHER evaluation, however, particular to this DEP evaluation, the May 2016 billing cycle report batch was severely impacted by data quality problems, to the extent that half the May reports were cancelled. Those customers who did not receive a May report received an extra report in November 2016. The problems identified in the May reports ranged from Tendril providing data to Duke Energy late, presentment of invalid URLs, reports generated for customers that should have been removed from the mailing, unexpected reclustering of customers, and problems with the Action/Tips display. These issues were resolved in time for the June report batch production.

Duke Energy and Tendril staff have recognized in prior evaluations of Duke Energy's MyHER program in other jurisdictions, as well as this one, that problems, when they occur, usually occur following changes to the report or report cycle process. Ongoing management of changes to production processes is a weakness for Tendril. However, our interviewees also recognized that Tendril's strength lies in their willingness to dive deep into details and processes to solve problems that may only affect a relatively few customers, and to go the extra mile to help address problems that in fact originate on the Duke Energy side. Additionally, both Duke Energy and Tendril staff spoke highly of the collaborative partnership shared by Duke Energy and Tendril in running the MyHER program and the open lines of communication that exist and function very well at all levels of program and corporate management.

An important component of MyHER program change management and general operations is a shared document repository (SharePoint) accessible to program staff across both Duke Energy and Tendril. The SharePoint site contains areas for Duke Energy staff that present program dashboard information summarizing participation, reports of inbound customer calls, emails, and letters pertaining to MyHER, as well as information on the number of program opt-outs and reasons for opting out. The area shared with Tendril has documentation of approved program changes, contractual requirements, issue resolution logs and information on program processes, including messaging calendars for the free-form text section of the reports. Importantly, the Sharepoint site also documents the QC procedures undertaken internally prior to every report mailing. An original program operations playbook that was created at the inception of the MyHER program is still available and used as a reference document for program eligibility criteria and as a data dictionary.

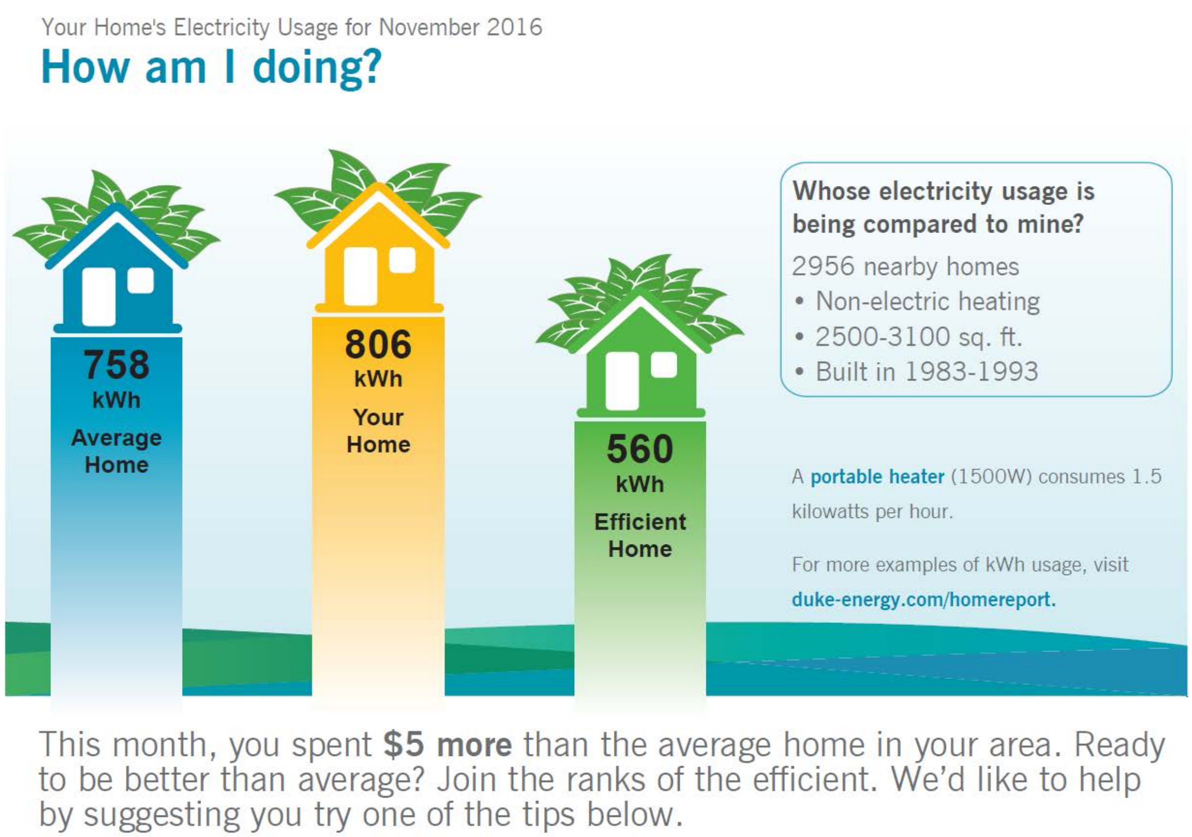
Opportunities for improving the quality of MyHERs continue to include successful resource planning and turnover management at Tendril, so that enough appropriate resources are consistently directed at the program. Turnover management has impacted product quality control and Duke Energy program reporting processes the most. Tendril supports a number of Duke Energy internal program reporting and management functions and has not been consistent in providing the relevant reports and data extracts throughout each month. Improvement on Tendril's part in that area is desired as well.

Other opportunities include continuing to maintain documentation in the MyHER Sharepoint filesharing repository that documents internal operations that are most critical to MyHER. Given that a relatively small team manages MyHER, this can help manage risk associated with the potential for turnover internal to Duke Energy.

4.2.1.2 MyHER Components

MyHER reports include several key elements that are customized each month: the bar chart, tips, trend chart, and messages. The front page includes a graph comparing the subject home to the average and most efficient homes for an assigned cluster or "neighborhood." Previously, in Duke Energy jurisdictions with the earliest MyHER program implementations, these graphs were labeled with dollars, but this occasionally caused confusion among recipients if the dollar amount didn't exactly match their recall of a recent bill. In March 2013, Duke Energy shifted to using kWh as the unit of measurement for the bar charts[4]; Duke Energy conducted customer focus groups in an effort to understand the level of confusion this shift might cause and found that customers reported not paying attention to unit of measurement: they were simply absorbing the shape and directionality of the bar charts (Figure 4-1).

Figure 4-1: MyHER Electricity Usage Comparison Bar Chart



4 The MyHER program was not yet implemented in the Progress jurisdiction at the time of this change to the MyHER reports at Duke Energy.

A small box next to the graph provides the size of the group of comparison homes, the assumed heating type, the approximate square footage, and the approximate age of similar homes. According to MyHER staff, a common reason for customer phone calls about MyHER is simply correcting assumed information about a given home. For example, the MyHER could indicate that Duke Energy assumes a home has electric heat when it does not, or have a home in the wrong size category. Any corrections provided in this manner are considered highly reliable and are not changed based on subsequent uploads of third party data.

In addition to the comparison graph, each MyHER includes a set of customized tips under the heading “What can I do to save money and energy?” (Figure 4-2).These tips are designed to provide information relevant to homes with similar characteristics, as presented in the box accompanying the comparison graph.

Figure 4-2: MyHER Tips on Saving Money and Energy

Tips Based on Your Usage and Home Profile

What can I do to save money and energy?

A bright idea for outside!

Use efficient bulbs for your outdoor lighting

Save up to $15 per year.

Consider efficient compact fluorescent (CFL) bulbs for your outdoor lighting needs. CFL bulbs use 75% less energy, and they last 10 times longer than incandescent bulbs. Here's the bonus: CFL bulbs last so long, you won't have to get out your ladder as often to change them.

Reach for that crock pot all year!

Dust off that crock pot

Save up to $12 per year.

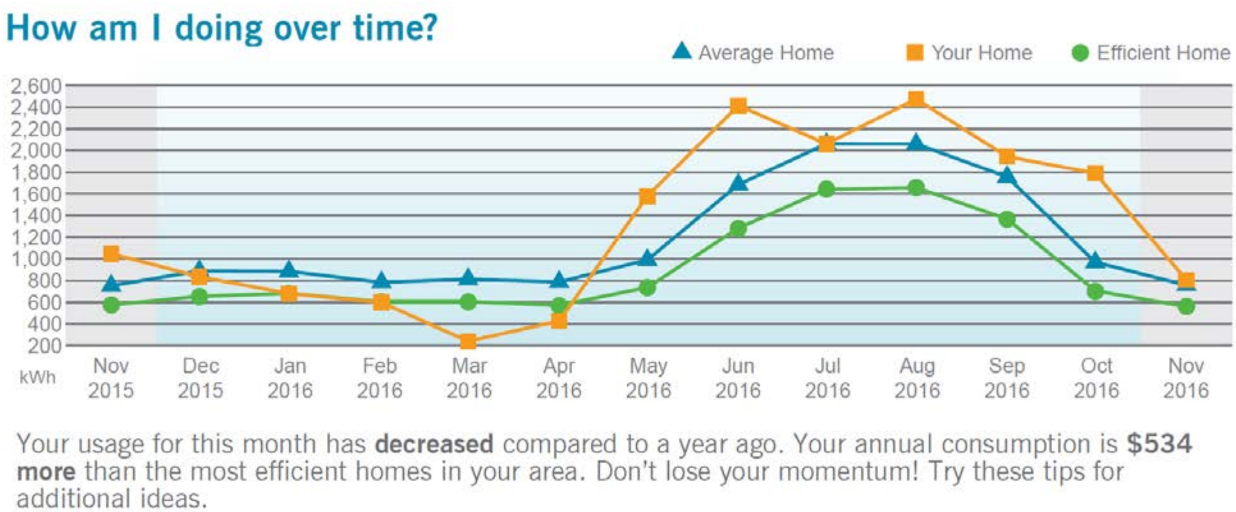
Cooking in a crock pot can be much more efficient and convenient than using your oven. A crock pot costs 10 cents to run for 8 hours while an oven costs 32 cents to run for just one hour. Dust off that crock pot and fill it with your favorite meal. You'll savor the flavor and enjoy the savings.

The left margin on the front page of each report contains elements consistent for all recipients: information about what the report does, why Duke Energy is sending them to customers, and email and telephone contact information. Customers occasionally contact Duke Energy with questions or concerns about MyHERs and, rarely, to opt-out. Duke Energy’s efforts to maintain a high-quality MyHER customer experience is reflected by the high value that is placed on program participant satisfaction and as such, it is closely monitored. Only 1% of MyHER customers contact Duke Energy annually and less than 1% of MyHER treatment customers contact Duke Energy to opt-out. Prior studies have found a 70% top-three box[5] satisfaction score and the rigorous quality control efforts described earlier have kept most quality-related issues from ever reaching customers.

[5] Using an 11-point 0 to 10 scale to measure satisfaction levels.

In addition, each MyHER includes a trend chart that displays how the recipient's home compares to the average and efficient home in energy usage over a year (Figure 4-3). This trend chart can help customers identify certain months where their usage increased relative to the efficient or average home—helping them focus on the equipment and activities most likely to affect their usage. For example, if a home tracks the average home until mid-winter and then spikes well above, that could indicate the heating equipment should be checked.

Figure 4-3: MyHER 12 Month Trend Chart



Finally, MyHERs include space on the back page for Duke Energy to include seasonal and programmatic (free-form) messaging that reflects Duke Energy-specific communication objectives. Ensuring that these messages are relevant, and do not conflict with the actions or tips provided on the front page, requires ongoing coordination and monitoring. Occasionally the action text on the front page will be disabled to accommodate the free form text. These messages are developed annually in cooperation with Duke Energy's marketing and communications group. The schedule is maintained in a campaign calendar, which consists of primary and alternate messages for two content boxes. Duke Energy staff strive to develop messages that are clever, relevant, and upbeat—some recognize events on the calendar (such as Earth Day) while others provide specific program promotional information or promote general home upgrades (even for measures outside of current programs).

Program contacts confirmed that establishing the message calendar early in the program year and stabilizing the messages to avoid late changes continues to be challenging. The message calendar can be difficult to manage because of periodic changes to program promotions and incentive levels. A contact at Tendril confirmed this, noting that while they try to get this text solidified 30 days ahead of the mailing date in the calendar, last minute changes are not uncommon.

In addition to developing the messages included in each MyHER, the program team must also ensure that the messages conform to expectations established to protect the customer experience. Broad targeting efforts taking advantage of seasonal relevance, program eligibility, presence of end use such as pools, are used to cross-promote Duke Energy programs. Customer participation databases are cross checked each month to ensure that customers only receive information about programs they have not already participated in; if a customer is found to have participated in the program being promoted in a given month, that customer will receive an alternate, typically more generic, message.

Few issues were cited during staff interviews related to the production process specifically around action tips and messaging – checking messaging is part of the QC process. The most difficult part of the free-form message process is managing review and revision between Duke Energy corporate communications staff, MyHER program staff, and Tendril staff. As a result Duke Energy has prioritized a request to Tendril for developing a tool to allow faster review of messaging proofs earlier in the production cycle.

Regarding tips, MyHER has a large library of actions tips, between 80 and 90. Half of them were initially developed internally at Duke Energy, and Tendril has continued to add to them. The large library has enabled the program to avoid any repeats to customers for the past three years. Tip freshness is also managed with display rules that ensure that a diversity of tip types (both in the value of the tip and the area of the household they apply to) is shown. There is an opportunity to comprehensively review the tip library to make sure they are still accurate and relevant. Here Duke Energy does check for quality as well: the monetary values estimated by Tendril for each tip action are validated for reasonableness.

4.2.1.3 MyHER Interactive

MyHER Interactive, the web portal component of the MyHER program, was available to MyHER customers throughout this DEP evaluation period. Interactive provides a variety of online content for MyHER recipients to engage with. Customers can:

- Review MyHER data from the prior month;
- Fill out a home profile for more accurate load disaggregation in the reports;
- View a forecast of disaggregated loads for the upcoming month and year ahead;
- Implement a savings plan, using specific energy-saving actions, and then see how the plan will affect their usage over a 3-month horizon; and
- Post questions about saving energy to “Ask an expert” area.

Enrollment in MyHER Interactive is still relatively low. The most successful enrollment generators are sweepstakes and cross-promotion with the High Bill Alerts program. Envelope messaging has also been used, and email campaigns have been found to be quite successful. An email collection campaign is currently planned at Duke Energy, and the MyHER program plans to benefit from that campaign by initiating another email promotion once additional customer email addresses are made available. Email campaigns are a very successful enrollment generator because they can use personalized uniform resource locator PURLs (to enable clicking through to Interactive screen where the customers’ account number is auto-populated in the registration process).

Few quality control or process issues pertaining to Interactive were reported in our interviews, however, it should be noted that there is currently no mechanism by which Duke Energy can use or check the quality of data presented on Interactive in a systematic or bulk fashion. All checks are made on an individual customer basis.

4.2.1.4 MyHER Plans to Further Improve Program Operations

Looking forward, Duke Energy and Tendril have a number of plans underway that are anticipated to further improve program performance and the customer experience with the program:

- Reports were introduced to customers in multi-family dwellings in December 2016;
- A quality control process enhancement that will allow Duke Energy staff to access PDF proofs prior to promotion into downstream systems will be introduced that will make it easier correct problems if they are identified;
- An initiative is underway to visually refresh the MyHER product to include more pictures, update report colors, and add new content informing customers of disaggregated usage. These changes are planned for rollout in August 2017;
- MyHER report text will be rewritten to test readability at an even more accessible reading level for Duke Energy customers;
- Tendril is transitioning to Amazon Web Services (AWS) and expects to support much faster data processing times;
- A Duke Energy email acquisition campaign will provide new email addresses for another MyHER Interactive email enrollment campaign; and
- The viability of producing reports for dual-fuel customers will be studied and considered.

4.2.2 Customer Surveys

The customer surveys included a section of questions focused specifically on the experience of and satisfaction with the information provided in MyHERs—these questions were asked only of households in the treatment group. Both treatment and control households answered the remaining questions, which focused on assessing:

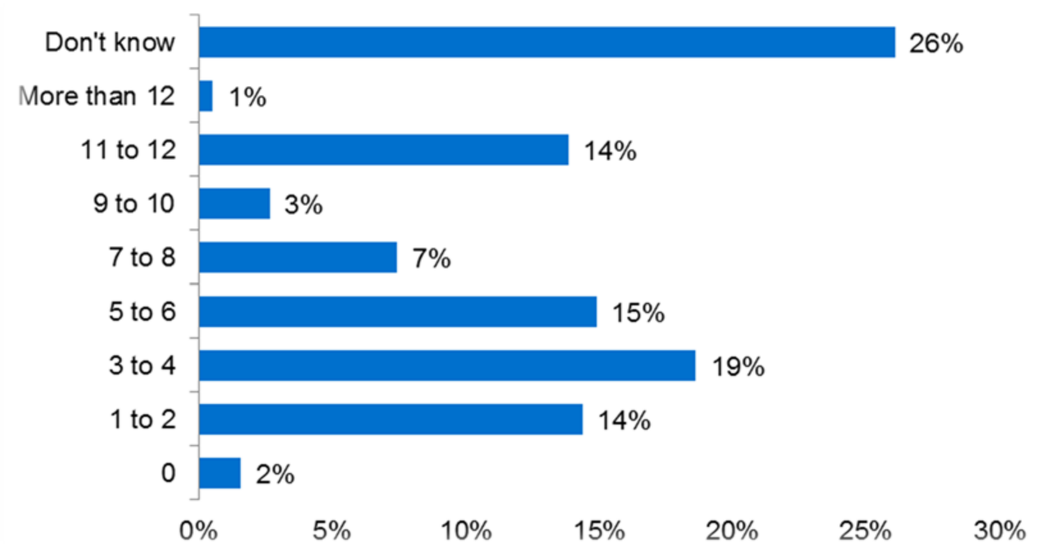
- Awareness of Duke Energy efficiency program offers;
- Satisfaction with the services Duke provides to help households manage their energy use;
- Levels of awareness of and interest in household energy use; motivations and perceived importance; and
- Reported behavioral or equipment-based upgrades.

4.2.2.1 Treatment Households: Experience and Satisfaction with MyHER

A large majority of treatment household respondents, 87%, (188 of 217) recalled receiving at least one of the MyHER reports.

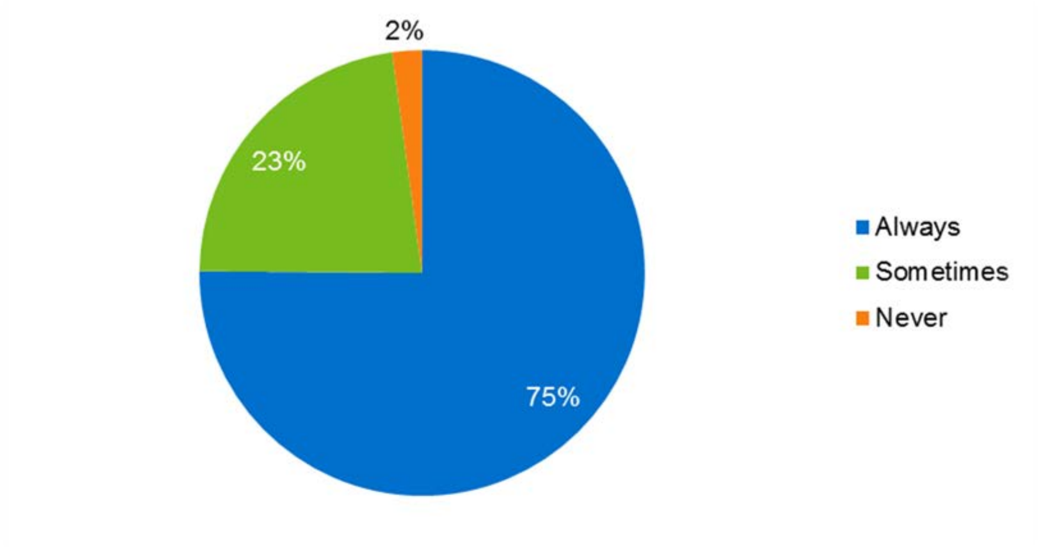
The survey asked those that could recall receiving at least one MyHER report if they could recall how many individual reports they had received “in the past 12 months” (Figure 4-4). The survey launched in January 2017, which means that most recipients would have received 8 MyHERs over the course of 2016. Twenty-six percent (49 of 188) responded that they could not identify the number of home energy reports that were received in the past 12 months. The distribution of responses related to recall is consistent with the difficulty of recalling an exact number of reports, however the question is valuable for grounding respondents in the experience of receiving a MyHER before asking them more specific questions about the document.

Figure 4-4: Reported Number of MyHERs Received “In the past 12 months” (n=188)



Survey respondents indicated high interest in the MyHER reports. As shown in Figure 4-5, when asked how often they read the reports, 98% of respondents indicated they “always” or “sometimes” read the reports. Four respondents (2%) indicated they do not read the reports.

Figure 4-5: How Often Customers Report Reading the MyHER (n=185)



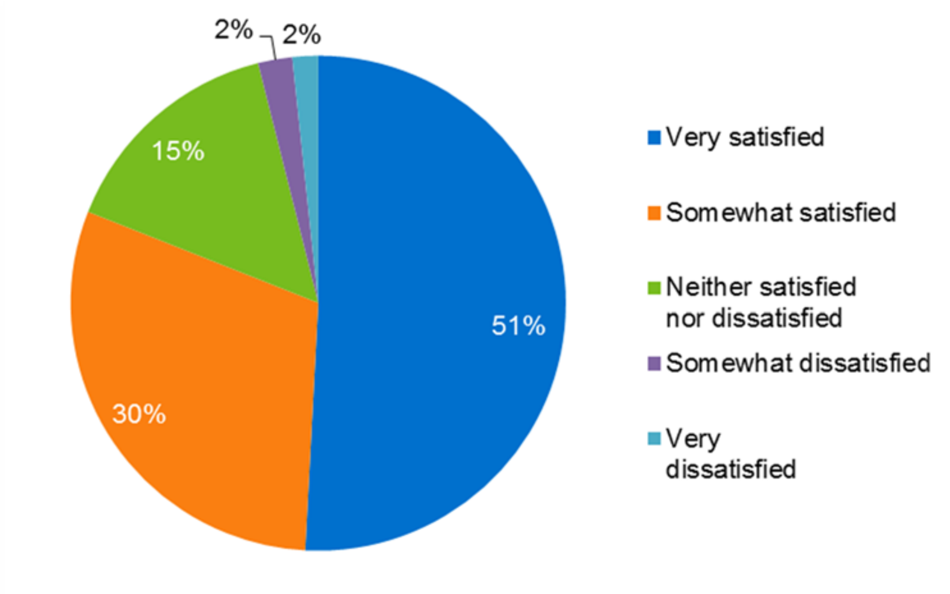
Despite a high “open rate” for MyHER reports, only 34% (61 of 181) of survey respondents recalled specific tips from their reports. The survey asked these 61 respondents to then provide an open-ended description of the specific tips they could recall (Table 4-3). Forty-four respondents were able to recall 63 separate MyHER tips. The most commonly reported tips pertained to thermostat settings, insulation/weatherization recommendations, switching to energy efficient lighting, and using cold water for washing.

Table 4-3: Distribution of Recalled Tips/Information (Multiple Responses Allowed)

Tip or Information	Count	Percent of Respondents Mentioning (n=44)	Percent of Total Mentions (n=63)
Thermostat settings	11	25%	17%
Weatherization	9	20%	14%
Efficient lighting	8	18%	13%
Cold water	8	18%	13%
Upgrade TV/appliance	4	9%	6%
Turn things off/unplug	4	9%	6%
Comparison	4	9%	6%
Hot water	3	7%	5%
Other	12	27%	19%

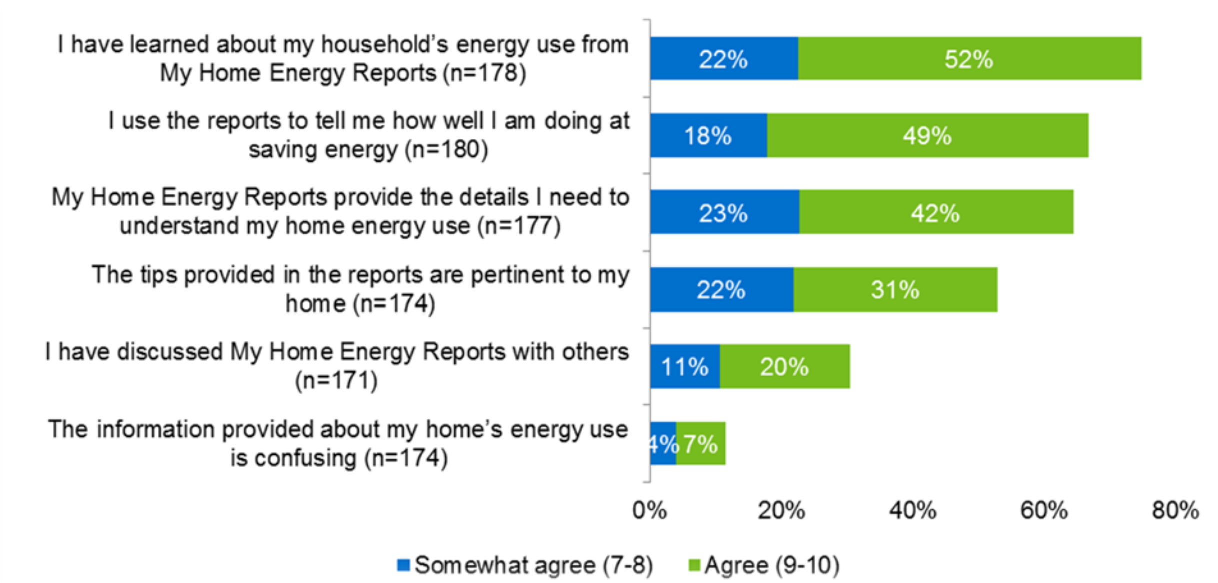
Eighty-one percent (145 of the 179 respondents that provided a rating) reported being “somewhat” or “very” satisfied with the information contained in the reports (Figure 4-6).

Figure 4-6: Satisfaction with the Information in MyHER Reports (n=179)



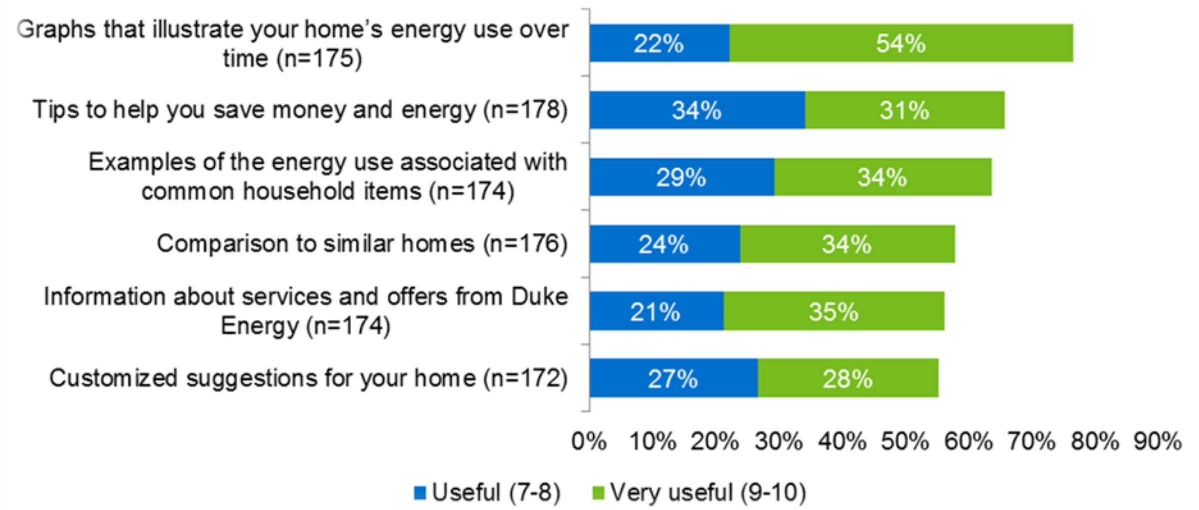
When asked to rate their agreement with a series of statements about MyHERs on a scale of 0 to 10, recipients largely agreed that the reports helped them understand their home's energy use, with 74% of respondents rating their agreement a seven or higher on a 0-10 point scale, and that they use the report to gauge how successful they are at saving energy (67% rating a seven or higher). Respondents provided weaker agreement to statements about the applicability of the tips provided and desire for more detailed information. A relatively small percentage (11%) agreed with the idea that the information provided is confusing (Figure 4-7).

Figure 4-7: Level of Agreement with Statements about MyHER (0-10 Scale)



The results shown in Figure 4-8 illustrate that 76% of respondents in treatment group rated the time series graphs of home energy consumption a seven or higher on a 0-10 point scale of usefulness, indicating that a large majority of treatment households find this feature to be useful, followed by a 65% useful rating for tips to help save money and energy. Treatment households rated the time-series graphs more useful than the other MyHER features, as indicated in Figure 4-8. The usefulness of customized suggestions for home was rated the lowest, receiving a seven or higher score of 55%.

Figure 4-8: Rating Usefulness of Key HER Features (0-10 Scale)



The survey provided an open-ended question to elicit suggestions about potential improvements to MyHER among those that had reported reading at least one report. Only 20% (38 of 188) offered suggestions, including ten who offered only appreciative comments. Among those offering suggestions for improvement, the most common request, mentioned by 15 of the 38 with suggestions, reflected a desire for more specific information or details about their home and specific actions they should take. Some of these requests reflected interest in understanding at a more granular level how their home uses energy and energy consumption information related to appliances:

- *"Factor in the electricity generated by our solar system - show whether what we use from it is part of the indicated use or not..."*
- *"Provide more information on the comparable properties. For example, I heat, cook, and produce hot water with natural gas. If the comparable properties are using electricity for these uses, then my comparison is not average but higher than average..."*
- *"Include offers, ideas and sq.ft. comparisons."*
- *"Break down energy usage by time of day, if possible. We could then compare our usage to regional time-based demands, and perhaps better adjust household demands around peak usage times..."*
- *"Use more demographic info when compiling reports. i.e., compare my household with other households with the same number of occupants..."*

Other comments centered on unique features or occupancy patterns at respondent homes, disbelief in the relevance of comparison homes, and a few respondents that simply did not see value in the reports. Responses coded as recommending production changes focus on changing the delivery method of *MyHER* reports as follows:

- *"Deliver online, interactive, push energy audits, provide discounts on ways to save energy dollars through technology and simple tasks/steps."*
- *"Keep sending them by email. I like to read them. Add more energy saving tips..."*

Nexant categorized these suggestions on the general basis of their content; the results are presented in Table 4-4.

Table 4-4: Distribution Suggestions for Improvement (Multiple Responses Allowed)

Suggestion	Count	Percent of Respondents Mentioning (n=38)	Percent of Total Mentions (n=40)
Provide more specific information or details	15	39%	38%
Don't believe comparison/accuracy	10	26%	25%
Appreciate the Home Energy Report	7	18%	18%
Expressed frustration	3	8%	8%
Don't see value/dislike	2	5%	5%
Address unique home/circumstances	2	5%	5%
Change production (mail, paper, format)	1	3%	3%

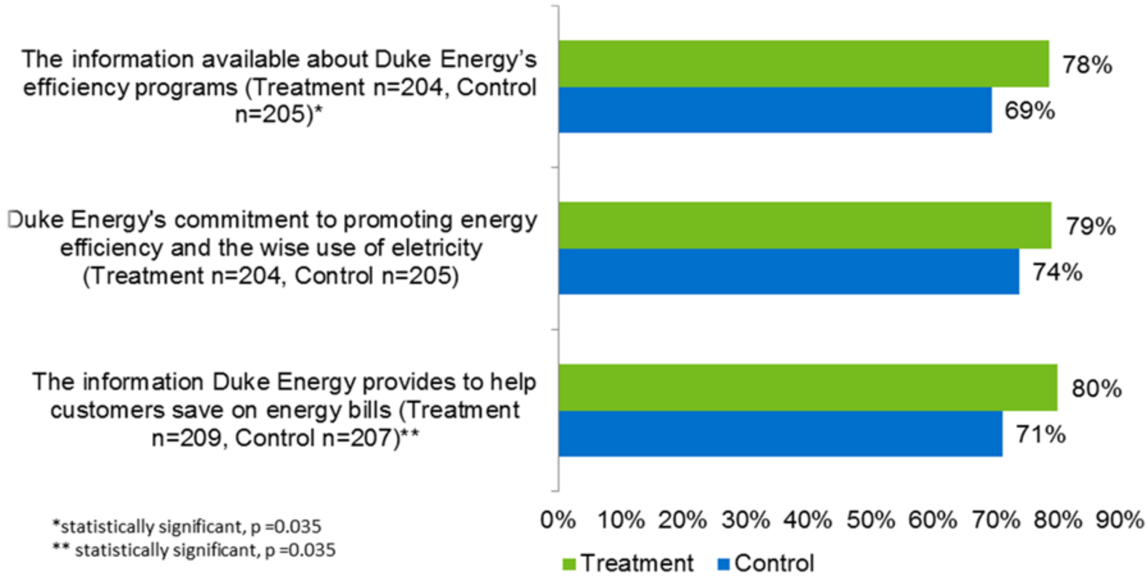
4.2.2.2 Comparing Treatment and Control Responses

This section presents the results of survey questions asked of both treatment and control households and compares the response patterns provided. Statistically significant differences between treatment and control households are noted.

Duke Energy Customer Satisfaction

Both treatment and control groups' overall satisfaction with Duke Energy are high. Eighty-two percent of treatment customers and 79% of control customers are satisfied or very satisfied with Duke Energy as their electric supplier (rated eight or higher on a 0-10 point scale); the difference is not statistically significant with a 90% level of confidence. Treatment group responses indicate somewhat higher levels of satisfaction with certain aspects of DEP energy efficiency efforts than the control group (Figure 4-9). The differences between treatment and control customers with respect to satisfaction with the information available about Duke Energy's efficiency programs and the information Duke Energy provides to help customers save on energy bills are statistically significant.

Figure 4-9: Portion Satisfied with Each Communication Element



Engagement with Duke Energy's Website

Both groups answered several questions about their use of the Duke Energy website, a proxy for overall engagement with information provided by the utility on energy efficiency and household energy use. Table 4-5 shows that half of the treatment group and 48% of the control group reported they had never logged in to their Duke Energy account. Among those that had logged in, the most commonly reported purpose was to pay their bill. Treatment customers are significantly more likely to report that they used their online account to review their energy consumption and significantly more likely to say that they used their online account to look for energy efficiency alternatives.

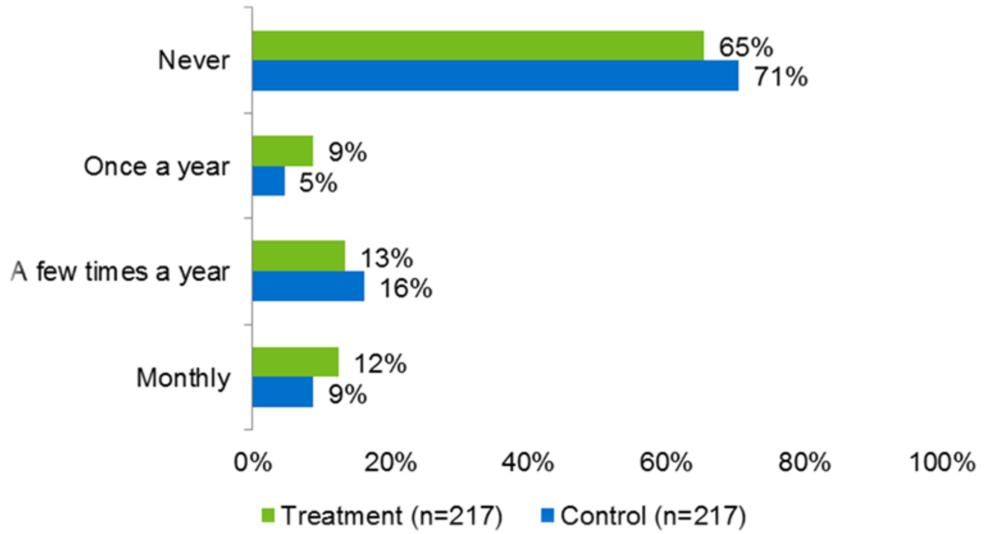
Table 4-5: Use of Duke Energy Online Account

Online Account Activity	Treatment Group (n=217)	Control Group (n=217)
Never logged in	50%	48%
Pay my bill	31%	31%
Review energy consumption graphs*	23%	16%
Look for energy efficiency opportunities or ideas**	12%	4%

*statistically significant, p=0.089
**statistically significant, p=0.003

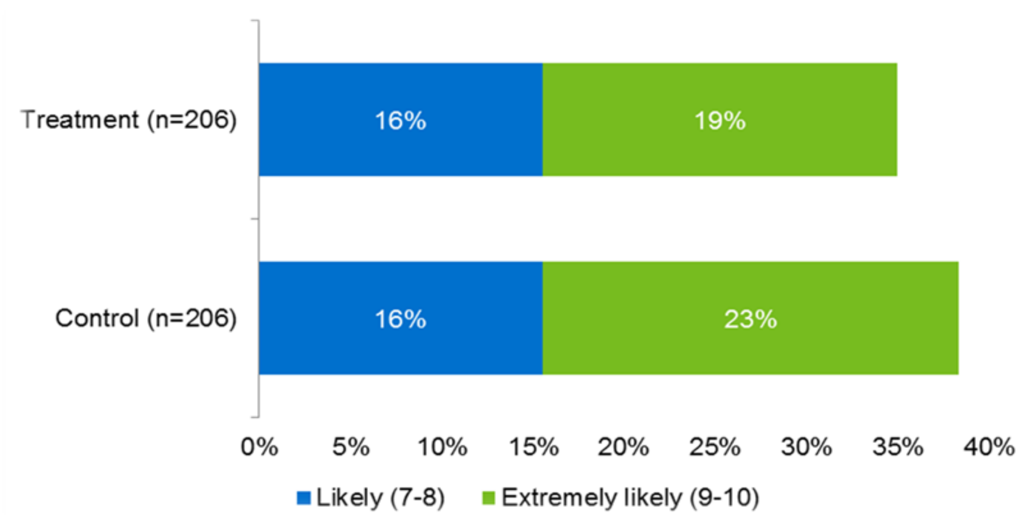
Treatment group households were more likely to report that they accessed the Duke Energy website to search for *other* information (for example, information about rebate programs, or how to make their home more energy efficient), but the difference is not statistically significant. Relatively small percentages of both groups report regular usage of the website for purposes other than bill payment, as shown in Figure 4-10.

Figure 4-10: Frequency Accessing the Duke Energy Website to Search for Other Information



About one-third of both groups reported they would be likely to check the DEP website for information before purchasing major household equipment. The portion rating their likelihood a "7" or higher on an 11-point scale of likelihood is plotted in Figure 4-11.

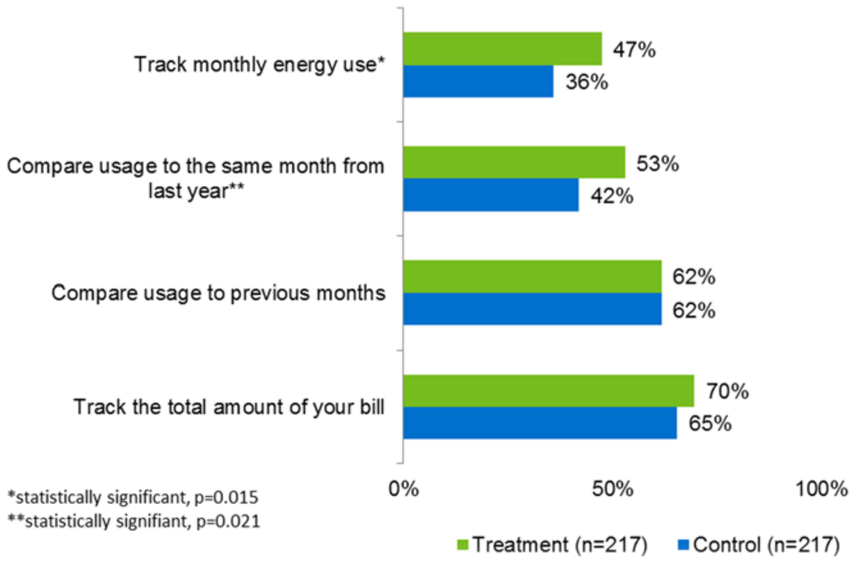
Figure 4-11: Portion Likely to Check DEP Website prior to Purchasing Major Home Equipment



Reported Energy Saving Behaviors

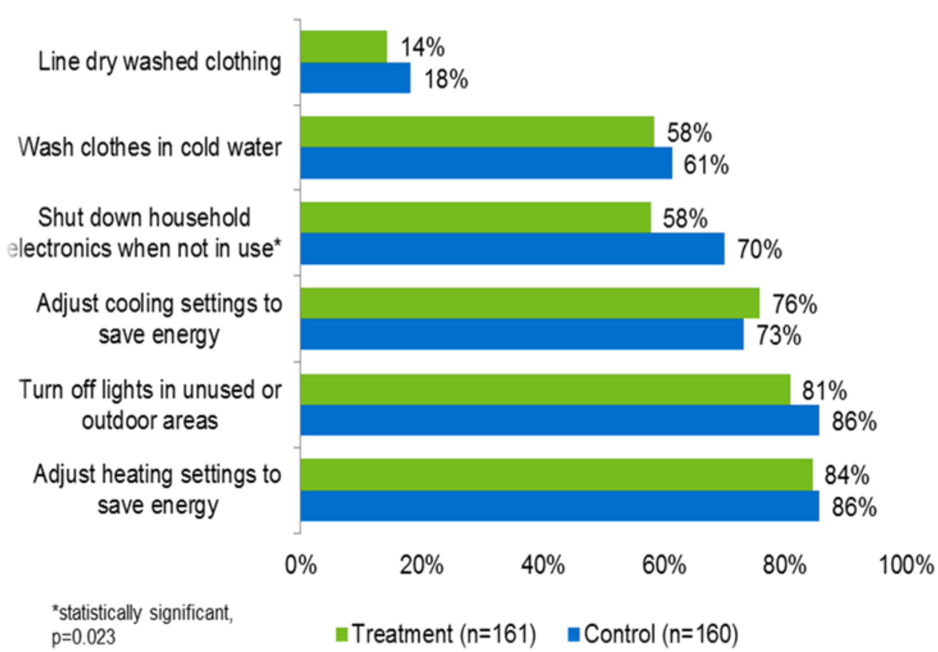
Both groups of respondents report similar strategies for comparing usage to previous months. The treatment group was more likely to track monthly energy use, to compare usage to the same month from last year, and to track the total amount of their bill than the control group. Figure 4-12 depicts these results. The differences between treatment and control group on tracking monthly energy use and comparing usage to the same month from last year were statistically significant, with a 95% level of confidence.

Figure 4-12: "Which of the Following Do You Do with Regard to Your Household's Energy Use?



Both groups also reported similar levels of energy saving behaviors, as shown in Figure 4-13. The treatment group was slightly more likely to adjust cooling settings to save energy. Control customers were slightly more likely to wash clothes in cold water, adjust heating settings, turn off lights in unused or outdoor areas, line dry washed clothes and shut down household electronics when not in use. Only the difference between treatment and control customers' reported behavior on shutting down household electronics when not in use is statistically significant.

Figure 4-13: Reported Energy Saving Behaviors



Equipment Purchases: Past and Future Intention

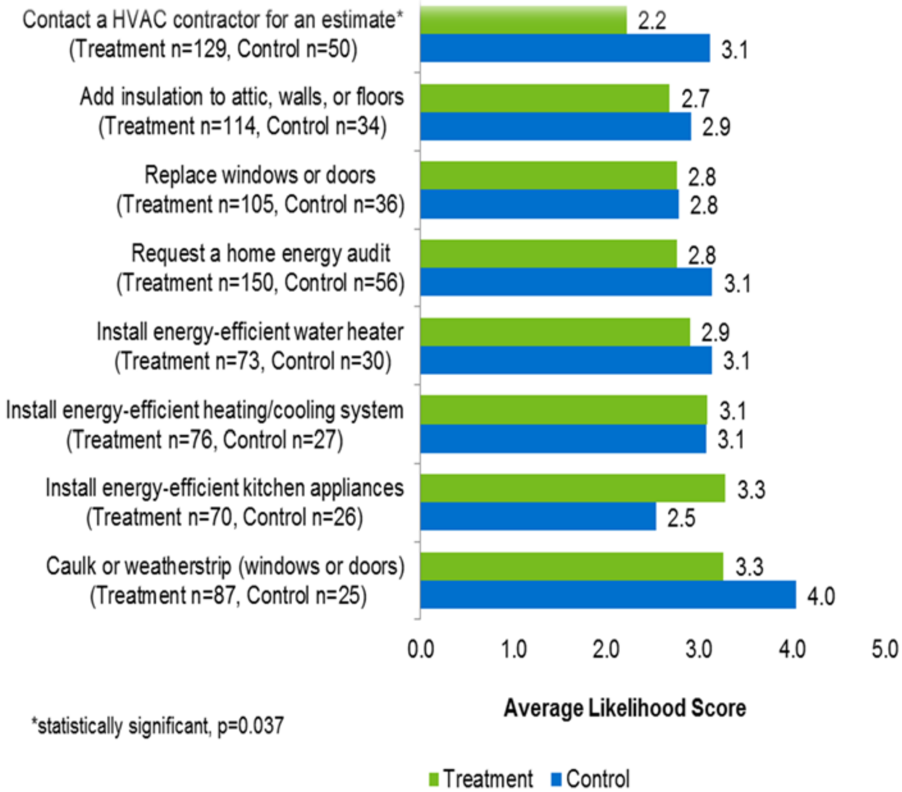
Respondents were provided with a list of potential energy efficiency improvements to their home that customers only rarely implement and asked if they had already done or intended to do each one. The treatment group has a higher percentage of customers reported having already installed energy efficient kitchen appliances, installed an energy efficient water heater, installed energy efficient heating/cooling system, contacted a HVAC contractor for an estimate, and requested a home energy audit than the customers in control group did (Table 4-6). However, those differences were not statistically significant at a 90% level of confidence.

Table 4-6: Portion Indicating they had "Already Done" Each Upgrade

Upgrade	Control	Treatment
Install energy efficient kitchen appliances (Treatment n=201, Control n=88)	53%	59%
Install an energy efficient water heater (Treatment n=191, Control n=87)	51%	57%
Install energy efficient heating/cooling system (Treatment n=191, Control n=87)	53%	55%
Caulk or weatherstrip (windows or doors) (Treatment n=192, Control n=94)	54%	48%
Replace windows or doors (Treatment n=194, Control n=92)	39%	38%
Add insulation to attic, walls, or floors (Treatment n=192, Control n=93)	39%	29%
Contact a HVAC contractor for an estimate (Treatment n=181, Control n=87)	14%	15%
Request a home energy audit (Treatment n=181, Control n=86)	3%	6%

The control group report higher likelihoods of completing, in the next 12 months, most of the listed potential energy upgrades than the treatment group. Perhaps unsurprisingly, the most commonly reported likely upgrade for both groups is the one homeowners can complete without help from a professional; caulking windows and doors. In fact, the tips offered emphasize the "do-it-yourself" aspect of caulking and sealing. The control group reported higher average likelihood scores of completing the energy efficiency improvements, including contacting an HVAC contractor for an estimate, adding insulation to attic, walls or floors, requesting a home energy audit, installing an energy-efficient water heater, and caulking or weatherstripping windows or doors. The average likelihood scores of treatment and control customers on a scale of 0 to10 is presented in Figure 4-14.

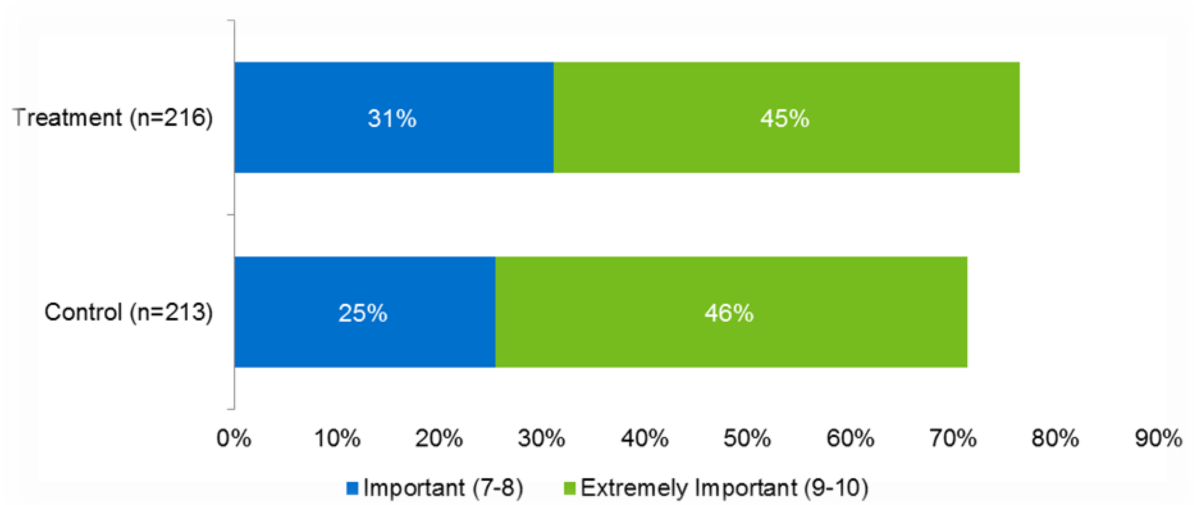
Figure 4-14: Likelihood of Completing Upgrades in the Next 12 Months



Customer Motivation and Awareness

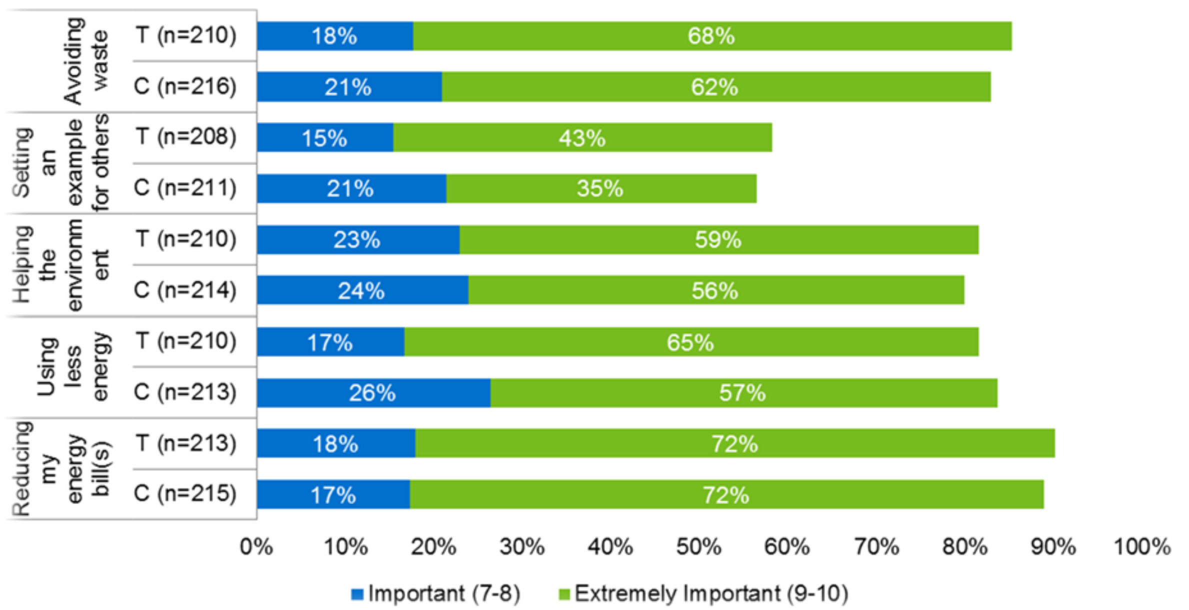
The treatment group is slightly more motivated than the control group to save energy. Seventy-six percent of treatment customers indicated that knowing they are using energy wisely is important or very important, compared to 71% of control customers. This difference is not statistically significant (Figure 4-15).

Figure 4-15: "How Important Is It for You to Know if Your Household is Using Energy Wisely?"



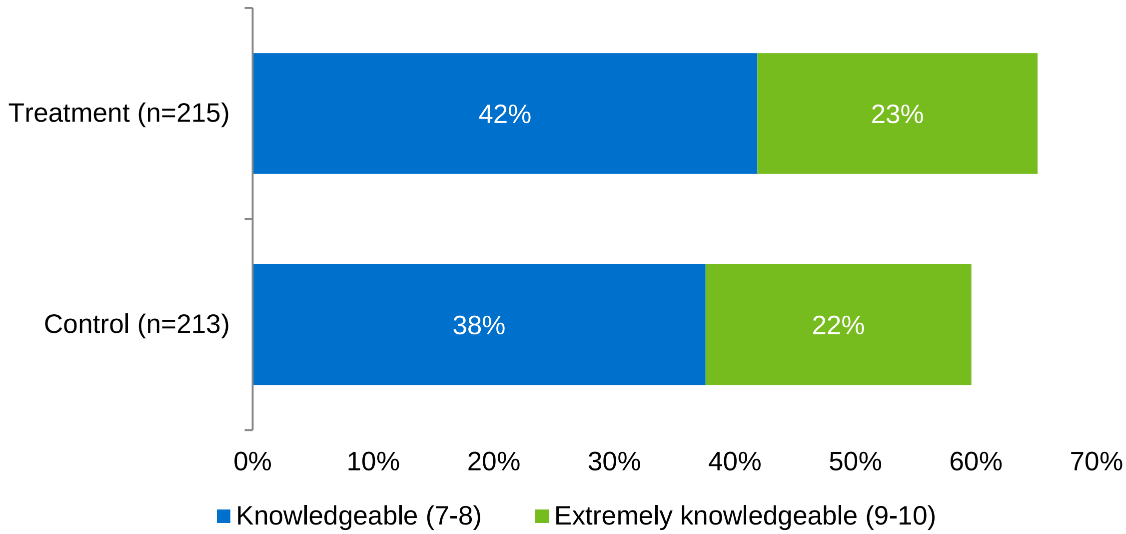
Customers were asked to rate, on a scale of 0 to 10, the importance of various reasons for why they might try to reduce their home's energy use. The strongest motivation for both groups is saving money on their energy bills, where 72% of treatment respondents and 72% of control respondents reported that saving money on their energy bills was "very important". Sixty-eight percent of treatment respondents indicated that "avoiding waste" was very important to them, while 62% of control customers said as much. Sixty-five percent of treatment customers reported that "using less energy" was very important to them, compared to 57% of control respondents. None of the differences are statistically significant. Figure 4-16 contains the frequency of responses to this question, shown as a percentage for both the treatment and control group.

Figure 4-16: "Please Indicate How Important Each Statement Is to You"



As indicated by Figure 4-17, the treatment group was also more likely to rate themselves as knowledgeable about saving energy in the home. Within the group of treatment customers, 65% rate themselves above a seven on a 0-10 point scale. Only 60% of control group customers rated themselves this way. The difference is not statistically significant at the 90% level of confidence.

Figure 4-17: "How Would You Rate Your Knowledge of the Different Ways You Can Save Energy in Your Home?"



Earlier in this section, we presented the portion of treatment households that found each HER feature useful. A similar question was asked of control group respondents, somewhat rephrased to ask them how useful they might expect each feature to be. Table 4-7 presents the portion rating each item a "7" or higher on a 11-point scale. The treatment group rated the usefulness of the time series graph and comparisons to similar homes significantly higher than the control group, indicating that customers don't know or appreciate how useful that information is until they have been exposed to it.

Table 4-7: Usefulness or Hypothetical Usefulness of HER Features Treatment and Control

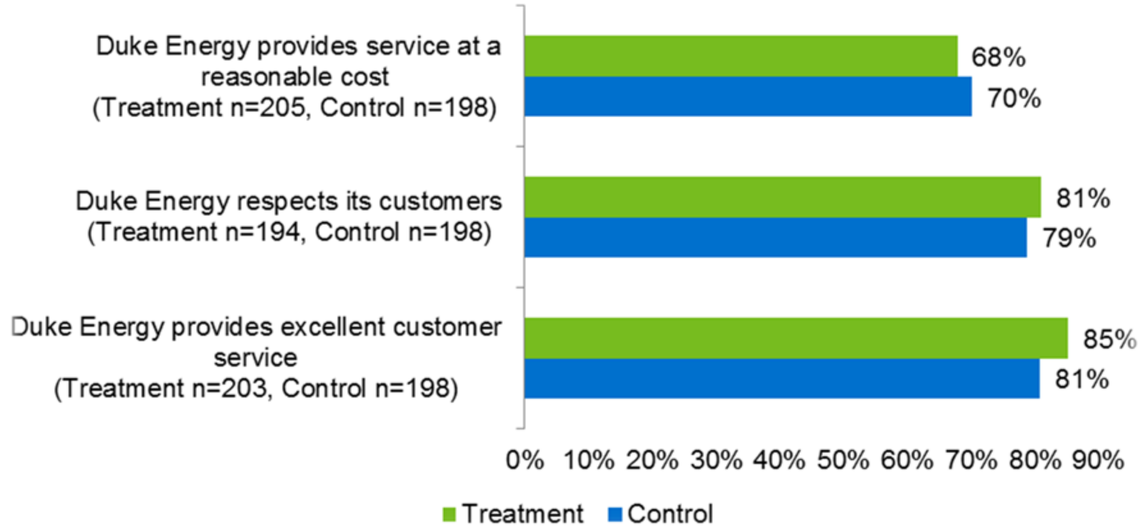
HER Feature	Control Group	Treatment Group
Graphs that illustrate home energy use over time*	56% (n=208)	77% (n=175)
Tips to help save money and energy	66% (n=211)	66% (n=178)
Examples of the energy use associated with common household items	59% (n=208)	64% (n=174)
Information about services and offers from Duke Energy	50% (n=210)	56% (n=174)
Comparisons to similar homes**	45% (n=207)	58% (n=176)
Customized suggestions for your home	52% (n=206)	55% (n=172)

* Statistically significant, p=0.0000
** Statistically significant, p=0.014

Satisfaction with Duke Energy

Control households rated DEP higher on providing service at a reasonable cost, and treatment customers rated DEP higher on providing excellent customer service and respecting its customers (Figure 4-18).

Figure 4-18: Satisfaction with Various Aspects of Customer Service



Evidence of MyHER Effects

As noted above, while formal statistical testing found some differences among treatment and control group households for individual questions, the Nexant team sought to understand if the overall pattern of survey responses differed among treatment and control households. To do this we categorized each survey question by topic area and then counted any survey item in which the treatment households provided a more positive response than the control households.

Nexant's approach consists of the following logical elements:

- Assume the number of positive responses between treatment and control customers will be equal if MyHER lacks influence;
- Count the total number of topics and questions asked of both groups;
- Note any item for which the treatment group outperformed the control group; and
- Calculate the probability that the difference in response patterns is due to chance, rather than an underlying difference in populations: 7% (p-value = 0.0694).

Because this analysis compares the response patterns between the treatment and control groups, if the MyHER program did not influence customers, one would expect the treatment group to "score higher" on roughly half of the questions. In other words, if the MyHER is not influencing treatment group customers, there is a 50/50 chance that they will "outperform" the control group as many times as not. For a more detailed description of the index framework, see Appendix F.

The pattern of responses displayed in Table 4-8 indicates that the DEP MyHER program moderately affects DEP customers' behaviors, opinions, attitudes, and level of engagement with energy efficiency overall. The responses indicate that, in particular, MyHER's strengths lie in positively affecting customers' perception of Duke Energy's public stance on energy efficiency, customers' motivation, engagement, and awareness of energy efficiency, and customer satisfaction. While the number of questions in these categories are too small to subject to formal statistical tests, the results are indicative of the most success in these areas relative to others. In fact, the area of customer motivation, engagement and awareness of energy efficiency is arguably a *raison d'etre* of behavioral programs such as MyHER; the increased engagement in this area among treatment customers should be viewed as a success in MyHER's core mission.

Table 4-8: Survey Response Pattern Index

Question Category	Count of Questions where T>C	Number of Questions in Topic Area	Portion of Questions where T>C
Duke Energy's Public Stance on Energy Efficiency	3	3	100%
Customer Engagement with Duke Energy Website	4	6	67%
Customers' Reported Energy-saving Behaviors	1	7	14%
Customers' Past & Future Equipment Purchases	7	16	44%
Customer Motivation, Engagement & Awareness of Energy Efficiency	9	11	82%
Customer Satisfaction with Duke Energy	3	4	75%
Total	**27**	**47**	**57%**

Respondent Demographics

Nearly all respondents—93% of treatment group customers and 91% of control group customers—own their residence. More than half of households surveyed have two or fewer residents, but about 22% of treatment households and 20% control households have four or more residents. There are no apparent systematic differences in the age of homes assigned to the treatment and control groups (Figure 4-19).

Figure 4-19: "In What Year Was Your Home Built?"

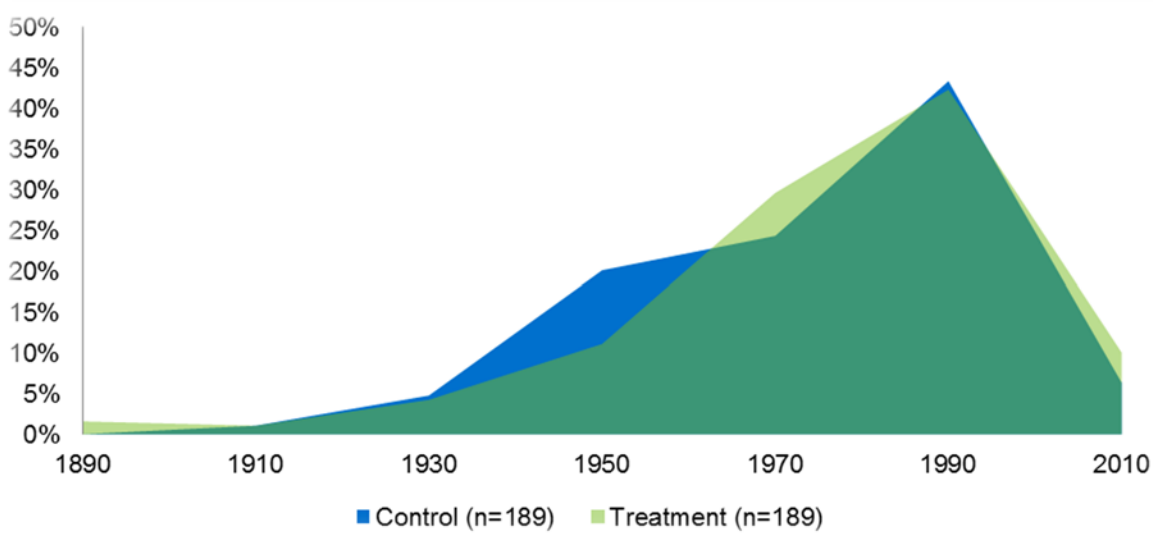
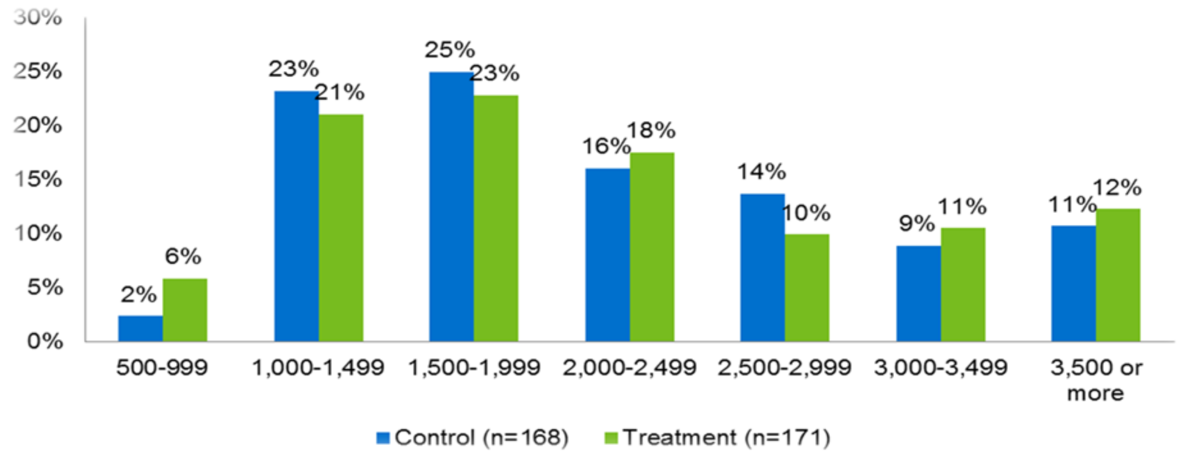


Figure 4-20 shows distribution of home square footage is similar between control and treatment households. The average square footage above ground is 2,288 for control households and 2,281 for treatment households.

Figure 4-20: How many square feet is above ground living space?



Respondent samples are relatively close to those reported by the U.S. Census for the Carolinas. The lowest age category (25-34) is often underrepresented when sampling based on residence in single family homes, given that many members of that population are in apartments, dormitories, or living with other family members. This common underrepresentation was true in this survey study, as well. The average age of control and treatment group respondents was 60 and 61 respectively (see Table 4-9).

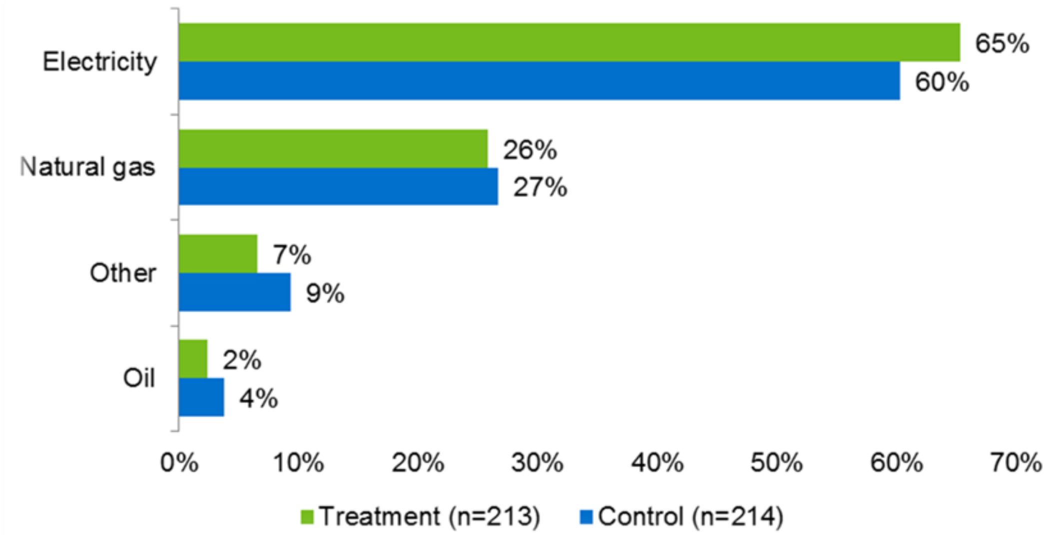
Table 4-9: Respondent Age Relative to Carolinas Census

Age	Treatment Group (n=196)	Control Group (n=193)	Carolinas Census[6]
25-34	5%	4%	13%
35-44	7%	8%	13%
45-54	16%	15%	14%
55-59	10%	10%	7%
60 and over	57%	56%	20%

Figure 4-21 shows the primary heating fuel type used in control and treatment customers' households. The majority of treatment (65%) and control (60%) customers use electricity in their households for heating. Twenty-six percent of treatment customers and 27% of control customers use natural gas for heating.

[6] ACS Demographic and Housing Estimates, 2010-2014 American Community Survey 5-Year Estimates, North Carolina and South Carolina. https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_14_5YR_DP05&prodType=table

Figure 4-21: Primary Heating Fuel in Households



4.3 Summary of Process Evaluation Findings

The DEP MyHER program has benefited from a number of process and product management improvements that have enabled meeting and sometimes exceeding in-home date goals. These goals are designed to ensure that reports arrive as close to the mid-point of the customer's billing cycle as possible, maximizing the timeliness and utility of the information presented. These improvements include speeding up the data transfer speed between Duke Energy and Tendril, increasing the frequency of report mailings from once per week to twice per week, and prioritizing major program changes and rollouts. Both Duke Energy and Tendril staff noted the importance of careful change management as an enabler of maintaining a production process that consistently meets quality control standards.

The DEP MyHER program is delivered to about seven hundred thousand residential customers in the Carolinas and is managed with high attention to quality and customer service. Both Duke Energy and Tendril staff described a rigorous quality control process that has been very successful in preventing lapses in report quality from reaching the customers. Areas for improvement to the program generally circle around opportunities to better support this process and manage risks to it. Appropriate staffing at Tendril to support the technical and data-centered ongoing quality control processes for report mailings is critical to success in this area. Additionally, increased adherence or better development of a data delivery schedule on Tendril's part to initiate the quality control process and to support internal reporting and program management will improve Duke Energy's ability to conduct their checks in a timely and complete manner. The increased pace of report mailings represents a long chain of quality control tasks for Duke Energy; responsibility for completing these tasks rests with a relatively small staff; Duke Energy should contemplate and manage risks to MyHER program operations presented by turnover or outages in availability of their staff, planned or otherwise.

A survey of DEP treatment and control customers shows that, among treatment group households:

- 87% recalled receiving at least one MyHER and 98% of those indicated that they “always” or “sometimes” read the reports.
- 81% reported being “very” or “somewhat” satisfied with information provided by MyHER.
- Around three-quarters of respondents give strong agreement ratings to the statement “I have learned about my household’s energy use from My Home Energy Reports”. Few (7%) strongly agree with the idea that the energy usage information presented by the reports is confusing.
- The most useful features of the reports, as rated by treatment customer respondents, are the graphs that illustrate the home’s energy usage over time. The least useful-rated features are customized suggestions for the home.
- Most (80%) had no suggestions to improve the program. Those that did most frequently requested more specific or detailed information in their MyHERs.

In comparing responses of treatment and control group respondents, there were a number of areas where treatment customers provided responses that more favorably reflected increased awareness, engagement, or attitudes towards energy savings opportunities and actions relative to control customers:

- Treatment group respondents reported significantly higher levels of satisfaction with the information Duke Energy makes available about energy efficiency programs, and with the information Duke Energy provides to help customers save on energy bills.
- Treatment group respondents reported higher levels overall satisfaction with Duke Energy as their electric service supplier: 82% of treatment customers gave a satisfaction score of 8 or higher (on a scale of 0 to 10), compared to 79% of control customers, but the difference is not statistically significant.
- Treatment and control respondents reported similar usage of the Duke Energy website to search for *other* information. Control customers are more likely to check the Duke Energy website prior to major household purchases: 39% of control customers report that they are likely to do so vs. 35% of treatment customers.
- Treatment and control customers report using similar strategies for tracking household energy use and report having taken similar energy saving actions.
- Similar portions of treatment and control respondents report having already completed certain energy-savings home upgrades, and similar portions of treatment and control respondents report intending to take those actions in the future.
- The vast majority, 90%, of treatment group customers say that “reducing their energy bills” is important to them, compared to 89% of control customers. Eighty-one percent of treatment group respondents report that “using less energy” is important to them, compared to 84% of control customers. “Helping the environment” is important to 81% of treatment group respondents and is important to 80% of control respondents. All these differences between treatment and control group responses are not statistically significant.

An index designed to account for overall survey-wide differences in response patterns found that the more positive response pattern in simple frequencies is not likely due to chance. Rather, we conclude that exposure to MyHER is affecting customer attitudes, where strengths lie in positively affecting customers' perception of Duke Energy's public stance on energy efficiency, customers' motivation, engagement, and awareness of energy efficiency, and customer satisfaction.

5 Conclusions and Recommendations

Nexant found that the MyHER program is an effective channel for increasing customer engagement with energy efficiency and demand side management. The RCT program design facilitates reliable estimates of program energy savings. Further, the energy saving generated by the program are corroborated by survey findings of respondent engagement and focus on the importance of saving energy. As a valuable secondary benefit, Nexant found the MyHER is a useful tool for enhancing Duke Energy customer engagement and increases uptake in other Duke Energy efficiency programs. The MyHER program has achieved full deployment among Duke Energy Progress customers and Nexant recommends that Duke Energy continue to focus on program processes and operations to further increase the efficiency of program delivery.

Duke Energy launched the MyHER Interactive Portal in March, 2015. The portal offers additional means for customers to customize or update Duke Energy's data on their premises, demographics, and other characteristics that affect consumption and the classification of each customer. The portal also provides additional custom tips based on updated data provided by the customer. MyHER Interactive also sends email challenges that seek to engage customer in active energy management, additional efficiency upgrades, and conservation behavior. Nexant evaluated the impacts of the MyHER Interactive Portal using a matched comparison group because the MyHER Interactive Portal was not deployed as a randomized, controlled trial (RCT).

5.1 Impact Findings

Nexant's impact findings result in an effective realization rate of 80%. This estimate decreases the previously filed participant impact from 183.7 kWh to 147.6 kWh annually. Impact estimates account for the fact that MyHER increases uptake of other Duke Energy Carolinas programs. This finding subtracts 1.8 kWh annually from the average household impact of the MyHER program. The time period of evaluated impacts is from January 2016 to December 2016. Nexant estimates the MyHER program saved a total of 97 GWh during this time period. The confidence and relative precision of this estimate is 90% and 9.1%, respectively.

For this evaluation period, the MyHER Interactive Portal savings estimates indicate the portal generates 99 kWh of incremental savings above and beyond the standard MyHER paper edition. These impacts occurred during the summer of 2016. Since MyHER Interactive Portal customers volunteered to participate in the portal product, their savings may not represent the expected savings if all customers were assigned to the portal product by default.

5.2 Process Findings

The DEP MyHER program is Duke Energy's most mature behavioral program in terms of delivered energy savings. The large volume of data required to generate MyHER and support the program delivery schedule is the primary driver of program activities and focus. Duke Energy and its implementation contractor, Tendril, are successfully managing this process and providing DEP customers valuable information for managing home energy consumption.

The DEP MyHER program has benefited from a number of process and product management improvements that have enabled meeting and sometimes exceeding in-home date goals. These enhancements include speeding up the data transfer speed between Duke Energy and Tendril, increasing the frequency of report mailings from once per week to twice per week, and prioritizing major program changes and rollouts. Careful change management is a key enabler of maintaining a production process that consistently meets MyHER quality control standards.

The DEP MyHER program is delivered to about seven hundred thousand residential customers in the Carolinas and is managed with high attention to quality and customer service. Appropriate staffing at Tendril to support the ongoing technical and data-centered quality control processes for report mailings is critical to success in this area. To date, the ability to continuously direct enough and appropriate Tendril resources to the project has been challenged at times, but with a small and very dedicated project team at Duke Energy, attention to potential risks to the successful operation of the program due to internal turnover or staffing outages should also be taken and mitigated as well.

MyHER participants have been found in this evaluation's customer surveys to display moderately higher overall levels or incidence of energy savings behaviors, opinions, attitudes, and engagement with energy efficiency. MyHER's strengths, in the DEP jurisdiction, are positively affecting customer's perception of Duke Energy's public stance on energy efficiency, customer motivation, engagement, and awareness of energy efficiency, and customer satisfaction. These strengths indicate success in the key program goals of cross-promotion of energy efficiency and demand response programs and increasing customer satisfaction.

5.3 Program Recommendations

- **Continue the practice, adopted in September 2015, of simultaneous control and treatment assignment.** Assignment of new accounts to the MyHER treatment and control group should be limited to once or twice per year.
- **Continue to monitor engagement and evaluate the impacts of the Interactive Portal.** The MyHER Interactive Portal appears to generate incremental savings above and beyond the standard MyHER paper edition. If Duke Energy continues to maintain the interactive portal as a supplement to paper or electronic MyHER reports, then incremental savings may be generated by this level of customer interaction and engagement. MyHER Interactive Portal customers volunteered to participate in this option when offered by Duke Energy; therefore, the savings exhibited by this group do not necessarily represent the level of savings that might be generated by the MyHER Portal Product if implemented as an RCT design.
- **Continue to manage MyHER operations with an eye towards change management and prioritization of program changes**. Challenges in quality control have historically followed on the heels of program changes and enhancements. Introduce changes slowly to consistently maintain a product that meets quality control standards and results in report cycles that pass quality assurance checks the first time.
- **Prioritize appropriate project staffing.** With MyHER's long, demanding, and ongoing production process, outages in appropriate staff can have implications for product quality and timely delivery. Outages and risk of outages of key project resources should be closely managed.

Appendix A Summary Form

MyHER Progress

Completed EMV Fact Sheet

Description of program

Duke Energy offers the My Home Energy Report (MyHER) to residential customers. MyHER relies on principles of behavioral science to encourage customer engagement with home energy management and energy efficiency. The program accomplishes this primarily by delivering a personalized report comparing each customer's energy use to a peer group of similar homes.

Date	January 2017 – May 2017
Region(s)	Progress
Evaluation Period	January 2016 – December 2016
Annual kWh Savings	97.5 GWh
Per Participant kWh Savings	147.6 kWh/home
Coincident kW Impact	0.0264 kW/home
Net-to-Gross Ratio	Not Applicable
Process Evaluation	Yes
Previous Evaluation(s)	None

Evaluation Methodology

Impact Evaluation Activities

- *Eligible accounts are randomly assigned to either a treatment (participant) group or a control group. The control group accounts are not exposed to MyHER in order to provide the baseline for estimating savings attributable to the Home Energy Reports. In this randomized controlled trial (RCT) design, the only explanation for the observed differences in energy consumption between the treatment and control group is exposure to MyHER.*
- *The impact estimate is based on monthly billing data and program participation data provided by Duke Energy.*
- *The RCT delivery method of the program removes the need for a net-to-gross analysis as the billing analysis directly estimates the net impact of the program.*

Impact Evaluation Findings

- *Realization rate = 81% for energy impacts; 147.6 kWh per home*

Process Evaluation Activities

- *217 web surveys of treatment customers, 217 web surveys for control group customers and staff interviews.*

Process Evaluation Findings

Review and finalize any content that can be developed ahead of the monthly production schedule before the data transfers begin.

Appendix B Measure Impact Results

Table B-1: DSMore Measure Impact Results

Measure Category	Prod Code	State	Gross Energy Savings (kWh)	Gross Summer Coincident Demand (kW)	Gross Winter Coincident Demand (kW)	Net to Gross Ratio	Net Energy Savings (kWh)	Net Summer Coincident Demand (kW)	Net Winter Coincident Demand (kW)	Measure Life
NC_ My Home Energy Report	HECR	NC/SC	147.6	0.0239	N/A	100%	147.6	0.0239	N/A	1

Appendix C Survey Instruments

C.1 Treatment Households

Q1. First, we'd like to ask you about your overall opinion of Duke Energy. Please rate how satisfied you are with Duke Energy as your electric supplier.

Not at all Satisfied										Completely Satisfied
0	1	2	3	4	5	6	7	8	9	10

Q2. We would also like to know how satisfied you are with several aspects of communication from Duke Energy. Please rate your overall satisfaction with each of the following.

	Very Satisfied	Somewhat Satisfied	Neither	Somewhat Dissatisfied	Very Dissatisfied
The information available about Duke Energy's efficiency programs.	☐	☐	☐	☐	☐
Duke Energy's commitment to promoting energy efficiency and the wise use of electricity.	☐	☐	☐	☐	☐
The information Duke Energy provides to help customers save on energy bills.	☐	☐	☐	☐	☐

Q3. When you log in to your Duke Energy account, which of the following have you done? Check all that apply.

- ☐ I have never logged in
- ☐ Pay my bill
- ☐ Review energy consumption graphs
- ☐ Look for energy efficiency opportunities or ideas
- ☐ None of the above

Q4. How often do you access the Duke Energy website to search for other information (for example: information about rebate programs, or how to make your home more energy efficient)? Select only one.

- ☐ Monthly
- ☐ Once a year
- ☐ A few times a year
- ☐ Never

Q5. If you needed to replace major home equipment or were considering improvements to your home's energy performance today, how likely would you be to check the Duke Energy website for information about energy efficient solutions or incentives?

Not at all Likely										Extremely Likely
0	1	2	3	4	5	6	7	8	9	10

Q6. Over the past 12 months, have you taken any actions to reduce your household energy use?

- ☐ Yes
- ☐ No – **Skip to Q8**

Q7. What actions have you taken? Check all that apply.

- ☐ Adjust heating settings to save energy
- ☐ Adjust cooling settings to save energy
- ☐ Wash clothes in cold water
- ☐ Shut down household electronics when not in use
- ☐ Turn off lights in unused or outdoor areas
- ☐ Line dry washed clothing
- ☐ Other, please specify: ______________________________
- ☐ Other, please specify: ______________________________

Q8a. Have you **already** made any of the following energy efficiency improvements in your home?

Q8b. **For the items you selected "No" on in 8a**, how likely are you to make those energy efficiency improvements **in the next 12 months**?

	Yes	No	Don't know	Not at all likely 0	1	2	3	4	5	6	7	8	9	Extremely likely 10	Don't know
Install energy-efficient kitchen appliances	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Install energy-efficient heating/cooling system	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Install energy-efficient water heater	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Replace windows or doors	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Caulk or weatherstrip (windows or doors)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Add insulation to attic, walls, or floors	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Contact a HVAC contractor for an estimate	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Request a home energy audit	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Q9. How important is it for you to know if your household is using energy wisely?

Not at all Important										Extremely Important
0	1	2	3	4	5	6	7	8	9	10

Q10. Which of the following do you do with regard to your household's energy use? Check all that apply.

- ☐ Track monthly energy use
- ☐ Track the total amount of your bill
- ☐ Compare usage to previous months
- ☐ Compare usage to the same month from last year
- ☐ None of the above

Q11. How would you rate your knowledge of the different ways you can save energy in your home?

Not at all Knowledgeable										Extremely Knowledgeable
0	1	2	3	4	5	6	7	8	9	10

Q12. Duke Energy sends a personalized report called *My Home Energy Report* to a select group of homes. These documents are mailed in a standard envelope every few months and provide customers with information on how their home's electric energy usage compares with similar homes. Have you seen one of these reports?

☐ Yes ☐ No – **Skip to Q21**

Q13. About how many *My Home Energy Reports* have you received in the past 12 months? __ **If zero, skip to Q21**

Q14. How often do you read the *My Home Energy Reports*?

☐ Always ☐ Sometimes ☐ Never – **Skip to Q21**

Q15. Please indicate how much you agree or disagree with the following statements about *My Home Energy Reports*. Scale: 0 = Strongly Disagree; 10 = Strongly Agree

	Strongly Disagree										Strongly Agree
I have learned about my household's energy use from *My Home Energy Reports*.	0	1	2	3	4	5	6	7	8	9	10
I use the reports to tell me how well I am doing at saving energy.	0	1	2	3	4	5	6	7	8	9	10
The tips provided in the reports are pertinent to my home.	0	1	2	3	4	5	6	7	8	9	10
My Home Energy Reports provide the details I need to understand my home's energy use.	0	1	2	3	4	5	6	7	8	9	10
I have discussed *My Home Energy Reports* with others.	0	1	2	3	4	5	6	7	8	9	10
The information provided about my home's energy use is confusing.	0	1	2	3	4	5	6	7	8	9	10

Q16. How could Duke Energy make *My Home Energy Reports* more useful for your household? Please provide any suggestions you may have to improve the reports.

Q17. Do you recall any specific tips or information from the *My Home Energy Reports*?

☐ Yes ☐ No – **Skip to Q19**

Q18. What specific tips do you recall?

Q19. Below is a list of *My Home Energy Report* features. Please rate how useful each feature is to you.
Scale: 0 = Not at all Useful; 10 = Extremely Useful

	Not at all Useful										Extremely Useful
Comparison to similar homes	0	1	2	3	4	5	6	7	8	9	10
Tips to help you save money and energy	0	1	2	3	4	5	6	7	8	9	10
Examples of the energy use associated with common household items	0	1	2	3	4	5	6	7	8	9	10
Customized suggestions for your home	0	1	2	3	4	5	6	7	8	9	10
Graphs that illustrate your home's energy use over time	0	1	2	3	4	5	6	7	8	9	10
Information about services and offers from Duke Energy	0	1	2	3	4	5	6	7	8	9	10

Q20. Please rate your satisfaction with the information in the *My Home Energy Reports* you've received.

- ☐ Very Satisfied
- ☐ Somewhat Satisfied
- ☐ Neither Satisfied nor Dissatisfied
- ☐ Somewhat Dissatisfied
- ☐ Very Dissatisfied

Q20a. Why do you say that? ____________________

____

Q21. The statements below provide reasons why households might try to reduce their home's energy use. Please indicate how important each statement is to you. Scale: 0 = Not at all Important; 10 = Extremely Important

	Not at all Important										Extremely Important
Reducing my energy bill(s)	0	1	2	3	4	5	6	7	8	9	10
Using less energy	0	1	2	3	4	5	6	7	8	9	10
Helping the environment	0	1	2	3	4	5	6	7	8	9	10
Setting an example for others	0	1	2	3	4	5	6	7	8	9	10
Avoiding waste	0	1	2	3	4	5	6	7	8	9	10

Q22. Please indicate your level of agreement with each of the following statements:

	Strongly Disagree	Somewhat Disagree	Neither	Somewhat Agree	Strongly Agree
Duke Energy provides excellent customer service	☐	☐	☐	☐	☐
Duke Energy respects its customers	☐	☐	☐	☐	☐
Duke Energy provides service at a reasonable cost	☐	☐	☐	☐	☐

We would like to understand the lighting products customers in the Carolinas are using.

Q23a. About how many light bulbs are installed in your home? (Some fixtures contain multiple bulbs.) ________

Q23b. About how many CFLs are installed in your home? Compact fluorescent light bulbs, or CFLs, are small fluorescent bulbs that fit in regular light bulb sockets. They are often made out of thin tubes of twisted glass. ________

Q23c. About how many LED bulbs are installed in your home? LED light bulbs also fit in regular light bulb sockets. They produce light using semiconductor chips and use a lot less energy than incandescent bulbs. ________

Q24. Do you own or rent this residence? ☐ Own ☐ Rent

Q25. Including yourself, how many people live in your home? ________

Q26. In what year was your home built? ________

Q27. How many square feet is the above-ground living space? ________

Q28. What is your primary heating fuel? ☐ Electricity ☐ Natural Gas ☐ Oil ☐ Other

Q29. In what year were you born? ________

C.2 Control Households

Q1. First, we'd like to ask you about your overall opinion of Duke Energy. Please rate how satisfied you are with Duke Energy as your electric supplier.

Not at all Satisfied										Completely Satisfied
0	1	2	3	4	5	6	7	8	9	10

Q2. We would also like to know how satisfied you are with several aspects of communication from Duke Energy. Please rate your overall satisfaction with each of the following.

	Very Satisfied	Somewhat Satisfied	Neither	Somewhat Dissatisfied	Very Dissatisfied
The information available about Duke Energy's efficiency programs.	☐	☐	☐	☐	☐
Duke Energy's commitment to promoting energy efficiency and the wise use of electricity.	☐	☐	☐	☐	☐
The information Duke Energy provides to help customers save on energy bills.	☐	☐	☐	☐	☐

Q3. When you log in to your Duke Energy account, which of the following have you done? Check all that apply.

- ☐ I have never logged in
- ☐ Pay my bill
- ☐ Review energy consumption graphs
- ☐ Look for energy efficiency opportunities or ideas
- ☐ None of the above

Q4. How often do you access the Duke Energy website to search for other information (for example: information about rebate programs, or how to make your home more energy efficient)? Select only one.

- ☐ Monthly
- ☐ A few times a year
- ☐ Once a year
- ☐ Never

Q5. If you needed to replace major home equipment or were considering improvements to your home's energy performance today, how likely would you be to check the Duke Energy website for information about energy efficient solutions or incentives?

Not at all Likely										Extremely Likely
0	1	2	3	4	5	6	7	8	9	10

Q6. Over the past 12 months, have you taken any actions to reduce your household energy use?

- ☐ Yes
- ☐ No – **Skip to Q8**

Q7. What actions have you taken? Check all that apply.

- ☐ Adjust heating settings to save energy
- ☐ Adjust cooling settings to save energy
- ☐ Wash clothes in cold water
- ☐ Shut down household electronics when not in use
- ☐ Turn off lights in unused or outdoor areas
- ☐ Line dry washed clothing
- ☐ Other, please specify: ____
- ☐ Other, please specify: ____

Q8a. Have you **already** made any of the following energy efficiency improvements in your home?

Q8b. **For the items you selected "No" on in 8a,** how likely are you to make those energy efficiency improvements **in the next 12 months?**

	Yes	No	Don't know	Not at all likely 0	1	2	3	4	5	6	7	8	9	Extremely likely 10	Don't know
Install energy-efficient kitchen appliances	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Install energy-efficient heating/cooling system	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Install energy-efficient water heater	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Replace windows or doors	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Caulk or weatherstrip (windows or doors)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Add insulation to attic, walls, or floors	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Contact a HVAC contractor for an estimate	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Request a home energy audit	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Q9. How important is it for you to know if your household is using energy wisely?

Not at all Important										Extremely Important
0	1	2	3	4	5	6	7	8	9	10

Q10. Which of the following do you do with regard to your household's energy use? Check all that apply.

- ☐ Track monthly energy use
- ☐ Track the total amount of your bill
- ☐ Compare usage to previous months
- ☐ Compare usage to the same month from last year
- ☐ None of the above

Q11. How would you rate your knowledge of the different ways you can save energy in your home?

Not at all Knowledgeable										Extremely Knowledgeable
0	1	2	3	4	5	6	7	8	9	10

Q12. Thinking about the information you have about your home's energy use, please rate how useful each of the following items would be for your household. Scale: 0 = Not at all Useful; 10 = Extremely Useful

	Not at all Useful										Extremely Useful
Your home's energy use compared to that of similar homes	0	1	2	3	4	5	6	7	8	9	10
Tips to help you save money and energy	0	1	2	3	4	5	6	7	8	9	10
Examples of the energy use associated with common household items	0	1	2	3	4	5	6	7	8	9	10
Customized suggestions for your home	0	1	2	3	4	5	6	7	8	9	10
Graphs that illustrate your home's energy use over time	0	1	2	3	4	5	6	7	8	9	10
Information about services and offers from Duke Energy	0	1	2	3	4	5	6	7	8	9	10

Q13. The statements below provide reasons why households might try to reduce their home's energy use. Please indicate how important each statement is to you. Scale: 0 = Not at all Important; 10 = Extremely Important

	Not at all Important										Extremely Important
Reducing my energy bill(s)	0	1	2	3	4	5	6	7	8	9	10
Using less energy	0	1	2	3	4	5	6	7	8	9	10
Helping the environment	0	1	2	3	4	5	6	7	8	9	10
Setting an example for others	0	1	2	3	4	5	6	7	8	9	10
Avoiding waste	0	1	2	3	4	5	6	7	8	9	10

Q14. Please indicate your level of agreement with each of the following statements:

	Strongly Disagree	Somewhat Disagree	Neither	Somewhat Agree	Strongly Agree
Duke Energy provides excellent customer service	☐	☐	☐	☐	☐
Duke Energy respects its customers	☐	☐	☐	☐	☐
Duke Energy provides service at a reasonable cost	☐	☐	☐	☐	☐

We would like to understand the lighting products customers in the Carolinas are using.

Q15a. About how many light bulbs are installed in your home? (Some fixtures contain multiple bulbs.) ________

Q15b. About how many CFLs are installed in your home? Compact fluorescent light bulbs, or CFLs, are small fluorescent bulbs that fit in regular light bulb sockets. They are often made out of thin tubes of twisted glass. __________

Q15c. About how many LED bulbs are installed in your home? LED light bulbs also fit in regular light bulb sockets. They produce light using semiconductor chips and use a lot less energy than incandescent bulbs. _________

Q16. Do you own or rent this residence? ☐ Own ☐ Rent

Q17. Including yourself, how many people live in your home? __________

Q18. In what year was your home built? __________

Q19. How many square feet is the above-ground living space? __________

Q20. What is your primary heating fuel? ☐ Electricity ☐ Natural Gas ☐ Oil ☐ Other

Q21. In what year were you born? __________

Thank you! Please return your completed survey using the enclosed envelope.

Appendix D Survey Frequencies: DEP

Q1 First, we'd like to ask you about your overall opinion of Duke Energy. Please rate how satisfied you are with Duke Energy as your electric supplier.

Group	0	1	2	3	4	5	6	7	8	9	10	Don't know	Total
Control	1	1	1	5	2	13	9	13	51	39	80	2	217
Percent	**0**	**0**	**0**	**2**	**1**	**6**	**4**	**6**	**24**	**18**	**37**	**1**	**100**
Treatment	3	0	0	0	2	8	8	17	49	40	88	2	217
Percent	**1**	**0**	**0**	**0**	**1**	**4**	**4**	**8**	**23**	**18**	**41**	**1**	**100**
Total	4	1	1	5	4	21	17	30	100	79	168	4	434
Percent	**1**	**0**	**0**	**1**	**1**	**5**	**4**	**7**	**23**	**18**	**39**	**1**	**100**

Q2 We would also like to know how satisfied you are with several aspects of communication from Duke Energy. Please rate your overall satisfaction with each of the following.

Q2_r1 The information available about Duke Energy's efficiency programs

Group	Very Satisfied	Somewhat Satisfied	Neither	Somewhat Dissatisfied	Very Dissatisfied	Don't know	Total
Control	85	57	38	5	20	12	217
Percent	**39**	**26**	**18**	**2**	**9**	**6**	**100**
Treatment	96	64	27	3	14	13	217
Percent	**44**	**29**	**12**	**1**	**6**	**6**	**100**
Total	181	121	65	8	34	25	434
Percent	**42**	**28**	**15**	**2**	**8**	**6**	**100**

Q2_r2 Duke Energy's commitment to promoting energy efficiency and the wise use of electricity

Group	Very Satisfied	Somewhat Satisfied	Neither	Somewhat Dissatisfied	Very Dissatisfied	Don't know	Total
Control	85	66	25	5	24	12	217
Percent	**39**	**30**	**12**	**2**	**11**	**6**	**100**
Treatment	102	59	24	7	12	13	217
Percent	**47**	**27**	**11**	**3**	**6**	**6**	**100**
Total	187	125	49	12	36	25	434
Percent	**43**	**29**	**11**	**3**	**8**	**6**	**100**

Q2_r3 The information Duke Energy provides to help customers save on energy bills

Group	Very Satisfied	Somewhat Satisfied	Neither	Somewhat Dissatisfied	Very Dissatisfied	Don't know	Total
Control	79	68	32	7	21	10	217
Percent	36	31	15	3	10	5	100
Treatment	103	64	19	9	14	8	217
Percent	47	29	9	4	6	4	100
Total	182	132	51	16	35	18	434
Percent	41.94	30	12	4	8	4	100

Q3 When you log in to your Duke Energy account, which of the following have you done? Check all that apply.

Q3_1 I have never logged in

Group	I have never logged in	I logged in	Total
Control	105	112	217
Percent	48	52	100
Treatment	109	108	217
Percent	50	50	100
Total	214	220	434
Percent	49	51	100

Q3_2 Pay my bill

Group	No	Yes	Total
Control	149	68	217
Percent	69	31	100
Treatment	149	68	217
Percent	69	31	100
Total	298	136	434
Percent	69	31	100

Q3_3 Review energy consumption graphs

Group	No	Yes	Total
Control	182	35	217
Percent	84	16	100
Treatment	168	49	217
Percent	77	23	100
Total	350	84	434
Percent	81	19	100

Q3_4 Look for energy efficiency opportunities or ideas

Group	No	Yes	Total
Control	208	9	217
Percent	**96**	**4**	**100**
Treatment	191	26	217
Percent	**88**	**12**	**100**
Total	399	35	434
Percent	**92**	**8**	**100**

Q3_5 None of the above

Group	Not Checked	Checked	Total
Control	185	32	217
percent	**85**	**15**	**100**
Treatment	200	17	217
percent	**92**	**8**	**100**
Total	385	49	434
percent	**89**	**11**	**100**

Q4 How often do you access the Duke Energy website to search for other information (for example: information about rebate programs, or how to make your home more energy efficient)? Select only one.

Group	Monthly	A few times a year	Once a year	Never	Total
Control	19	35	10	153	217
Percent	**9**	**16**	**5**	**71**	**100**
Treatment	27	29	19	142	217
Percent	**12**	**13**	**9**	**65**	**100**
Total	46	64	29	295	434
Percent	**11**	**15**	**7**	**68**	**100**

Q5 If you needed to replace major home equipment or were considering improvements to your home's energy performance today, how likely would you be to check the Duke Energy website for information about energy efficient solutions or incentives?

Group	0	1	2	3	4	5	6	7	8	9	10	Don't know	Total
Control	46	11	14	9	4	26	17	16	16	15	32	11	217
Percent	21	5	6	4	2	12	8	7	7	7	15	5	100
Treatment	50	12	15	11	6	24	16	10	22	15	25	11	217
Percent	23	6	7	5	3	11	7	5	10	7	12	5	100
Total	96	23	29	20	10	50	33	26	38	30	57	22	434
Percent	22	5	7	5	2	12	8	6	9	7	13	5	100

Q6 Over the past 12 months, have you taken any actions to reduce your household energy use?

Group	No	Yes	Total
Control	57	160	217
Percent	26	74	100
Treatment	56	161	217
Percent	26	74	100
Total	113	321	434
Percent	26	74	100

Q7 What actions have you taken? Check all that apply.

Q7_1 Adjust heating settings to save energy

Group	No	Yes	Missing	Total
Control	23	137	57	217
Percent	11	63	26	100
Treatment	25	136	56	217
Percent	12	63	26	100
Total	48	273	113	434
Percent	11	63	26	100

Q7_2 Adjust cooling settings to save energy

Group	No	Yes	Missing	Total
Control	43	117	57	217
Percent	20	54	26	100
Treatment	39	122	56	217
Percent	18	56	26	100
Total	82	239	113	434
Percent	19	55	26	100

Q7_3 Wash clothes in cold water

Group	No	Yes	Missing	Total
Control	62	98	57	217
Percent	**29**	**45**	**26**	**100**
Treatment	67	94	56	217
Percent	**31**	**43**	**26**	**100**
Total	129	192	113	434
Percent	**30**	**44**	**26**	**100**

Q7_4 Shut down household electronics when not in use

Group	No	Yes	Missing	Total
Control	48	112	57	217
Percent	**22**	**52**	**26**	**100**
Treatment	68	93	56	217
Percent	**31**	**43**	**26**	**100**
Total	116	205	113	434
Percent	**27**	**47**	**26**	**100**

Q7_5 Turn off lights in unused or outdoor areas

Group	No	Yes	Missing	Total
Control	23	137	57	217
Percent	**11**	**63**	**26**	**100**
Treatment	31	130	56	217
Percent	**14**	**60**	**26**	**100**
Total	54	267	113	434
Percent	**12**	**62**	**26**	**100**

Q7_6 Line dry washed clothing

Group	No	Yes	Missing	Total
Control	131	29	57	217
Percent	**60**	**13**	**26**	**100**
Treatment	138	23	56	217
Percent	**64**	**11**	**26**	**100**
Total	269	52	113	434
Percent	**62**	**12**	**26**	**100**

Q7_7 Other

Group	No	Yes	Missing	Total
Control	125	35	57	217
Percent	58	16	26	100
Treatment	123	38	56	217
Percent	57	18	26	100
Total	248	73	113	434
Percent	57	17	26	100

Q7_8 Other

Group	No	Yes	Missing	Total
Control	158	2	57	217
Percent	73	1	26	100
Treatment	154	7	56	217
Percent	71	3	26	100
Total	312	9	113	434
Percent	72	2	26	100

Q8a. Have you already made any of the following energy efficiency improvements in your home?

Q8b. For the items you selected "No" in 8a, how likely are you to make those energy efficiency improvements in the next 12 months?

Q8a_r1 Install energy efficient kitchen appliances

Group	Yes	No	Don't know	Total
Control	61	144	12	217
Percent	28	66	6	100
Treatment	119	82	16	217
Percent	55	38	7	100
Total	180	226	28	434
Percent	41	52	6	100

Q8b_r1 Install energy efficient kitchen appliances

Group	0	1	2	3	4	5	6	7	8	9	10	Don't know	Missing	Total
Control	74	10	6	5	5	5	3	3	4	3	11	41	47	217
Percent	34	5	3	2	2	2	1	1	2	1	5	19	22	100
Treatment	35	4	3	5	2	11	4	3	1	1	1	28	119	217
Percent	16	2	1	2	1	5	2	1	0	0	0	13	55	100
Total	109	14	9	10	7	16	7	6	5	4	12	69	166	434
Percent	25	3	2	2	2	4	2	1	1	1	3	16	38	100

Q8a_r2 Install energy-efficient heating/cooling system

Group	Yes	No	Don't know	Missing	Total
Control	65	139	10	3	217
Percent	30	64	5	1	100
Treatment	105	86	16	10	217
Percent	48	40	7	5	100
Total	170	225	26	13	434
Percent	39	52	6	3	100

Q8b_r2 Install energy-efficient heating/cooling system

Group	0	1	2	3	4	5	6	7	8	9	10	Don't know	Missing	Total
Control	77	10	6	3	1	8	4	3	2	3	16	34	50	217
Percent	35	5	3	1	0	4	2	1	1	1	7	16	23	100
Treatment	40	7	4	5	1	8	2	5	1	0	3	26	115	217
Percent	18	3	2	2	0	4	1	2	0	0	1	12	53	100
Total	117	17	10	8	2	16	6	8	3	3	19	60	165	434
Percent	27	4	2	2	0	4	1	2	1	1	4	14	38	100

Q8a_r3 Install energy-efficient water heater

Group	Yes	No	Don't know	Missing	Total
Control	60	144	13	0	217
Percent	28	66	6	0	100
Treatment	108	83	19	7	217
Percent	50	38	9	3	100
Total	168	227	32	7	434
Percent	39	52	7	2	100

Q8b_r3 Install energy-efficient water heater

Group	0	1	2	3	4	5	6	7	8	9	10	Don't know	Missing	Total
Control	66	10	8	5	4	8	3	4	8	4	15	38	44	217
Percent	30	5	4	2	2	4	1	2	4	2	7	18	20	100
Treatment	41	3	4	7	3	6	5	1	1	0	2	29	115	217
Percent	19	1	2	3	1	3	2	0	0	0	1	13	53	100
Total	107	13	12	12	7	14	8	5	9	4	17	67	159	434
Percent	25	3	3	3	2	3	2	1	2	1	4	15	37	100

Q8a_r4 *Replace windows or doors*

Group	Yes	No	Don't know	Missing	Total
Control	46	163	6	2	217
Percent	21	75	3	1	100
Treatment	74	120	9	14	217
Percent	34	55	4	6	100
Total	120	283	15	16	434
Percent	28	65	3	4	100

Q8b_r4 *Replace windows or doors*

Group	0	1	2	3	4	5	6	7	8	9	10	Don't know	Missing	Total
Control	84	14	6	6	4	5	6	0	3	6	11	34	38	217
Percent	39	6	3	3	2	2	3	0	1	3	5	16	18	100
Treatment	65	6	4	6	2	10	2	3	4	0	3	24	88	217
Percent	30	3	2	3	1	5	1	1	2	0	1	11	41	100
Total	149	20	10	12	6	15	8	3	7	6	14	58	126	434
Percent	34	5	2	3	1	3	2	1	2	1	3	13	29	100

Q8a_r5 *Caulk or weatherstrip (windows or doors)*

Group	Yes	No	Don't know	Missing	Total
Control	63	148	6	0	217
Percent	29	68	3	0	100
Treatment	93	99	11	14	217
Percent	43	46	5	6	100
Total	156	247	17	14	434
Percent	36	57	4	3	100

Q8b_r5 *Caulk or weatherstrip (windows or doors)*

Group	0	1	2	3	4	5	6	7	8	9	10	Don't know	Missing	Total
Control	50	9	4	7	6	10	5	5	8	7	19	36	51	217
Percent	23	4	2	3	3	5	2	2	4	3	9	17	24	100
Treatment	48	4	4	5	2	10	4	1	3	3	3	22	108	217
Percent	22	2	2	2	1	5	2	0	1	1	1	10	50	100
Total	98	13	8	12	8	20	9	6	11	10	22	58	159	434
Percent	23	3	2	3	2	5	2	1	3	2	5	13	37	100

Q8a_r6 *Add insulation to attic, walls, or floors*

Group	Yes	No	Don't know	Missing	Total
Control	49	161	6	1	217
Percent	**23**	**74**	**3**	**0**	**100**
Treatment	56	136	10	15	217
Percent	**26**	**63**	**5**	**7**	**100**
Total	105	297	16	16	434
Percent	**24**	**68**	**4**	**4**	**100**

Q8b_r6 *Add insulation to attic, walls, or floors*

Group	0	1	2	3	4	5	6	7	8	9	10	Don't know	Missing	Total
Control	78	10	4	6	6	6	3	4	6	3	15	39	37	217
Percent	**36**	**5**	**2**	**3**	**3**	**3**	**1**	**2**	**3**	**1**	**7**	**18**	**17**	**100**
Treatment	66	12	4	6	4	13	2	1	3	0	3	31	72	217
Percent	**30**	**6**	**2**	**3**	**2**	**6**	**1**	**0**	**1**	**0**	**1**	**14**	**33**	**100**
Total	144	22	8	12	10	19	5	5	9	3	18	70	109	434
Percent	**33**	**5**	**2**	**3**	**2**	**4**	**1**	**1**	**2**	**1**	**4**	**16**	**25**	**100**

Q8a_r7 *Contact a HVAC contractor for an estimate*

Group	Yes	No	Don't know	Missing	Total
Control	21	183	11	2	217
Percent	**10**	**84**	**5**	**1**	**100**
Treatment	27	154	12	24	217
Percent	**12**	**71**	**6**	**11**	**100**
Total	48	337	23	26	434
Percent	**11**	**78**	**5**	**6**	**100**

Q8b_r7 *Contact a HVAC contractor for an estimate*

Group	0	1	2	3	4	5	6	7	8	9	10	Don't know	Missing	Total
Control	96	14	5	5	6	4	4	3	6	5	11	44	14	217
Percent	**44**	**6**	**2**	**2**	**3**	**2**	**2**	**1**	**3**	**2**	**5**	**20**	**6**	**100**
Treatment	87	11	6	4	4	10	2	2	0	0	3	37	51	217
Percent	**40**	**5**	**3**	**2**	**2**	**5**	**1**	**1**	**0**	**0**	**1**	**17**	**24**	**100**
Total	183	25	11	9	10	14	6	5	6	5	14	81	65	434
Percent	**42**	**6**	**3**	**2**	**2**	**3**	**1**	**1**	**1**	**1**	**3**	**19**	**15**	**100**

Q8a_r8 Request a home energy audit

Group	Yes	No	Don't know	Missing	Total
Control	8	195	12	2	217
Percent	**4**	**90**	**6**	**1**	**100**
Treatment	11	170	14	22	217
Percent	**5**	**78**	**6**	**10**	**100**
Total	19	365	26	24	434
Percent	**4**	**84**	**6**	**6**	**100**

Q8b_r8 Request a home energy audit

Group	0	1	2	3	4	5	6	7	8	9	10	Don't know	Missing	Total
Control	102	14	5	5	2	10	7	1	5	4	8	49	5	217
Percent	**47**	**6**	**2**	**2**	**1**	**5**	**3**	**0**	**2**	**2**	**4**	**23**	**2**	**100**
Treatment	88	11	6	8	7	19	2	1	1	3	4	34	33	217
Percent	**41**	**5**	**3**	**4**	**3**	**9**	**1**	**0**	**0**	**1**	**2**	**16**	**15**	**100**
Total	190	25	11	13	9	29	9	2	6	7	12	83	38	434
Percent	**44**	**6**	**3**	**3**	**2**	**7**	**2**	**0**	**1**	**2**	**3**	**19**	**9**	**100**

Q9 How important is it for you to know if your household is using energy wisely?

Group	0	1	2	3	4	5	6	7	8	9	10	Don't know	Total
Control	6	2	6	3	6	20	18	23	31	35	63	4	217
Percent	**3**	**1**	**3**	**1**	**3**	**9**	**8**	**11**	**14**	**16**	**29**	**2**	**100**
Treatment	3	5	3	3	2	20	15	22	45	31	67	1	217
Percent	**1**	**2**	**1**	**1**	**1**	**9**	**7**	**10**	**21**	**14**	**31**	**0**	**100**
Total	9	7	9	6	8	40	33	45	76	66	130	5	434
Percent	**2**	**2**	**2**	**1**	**2**	**9**	**8**	**10**	**18**	**15**	**30**	**1**	**100**

Q10 Which of the following do you do with regard to your household's energy use? Check all that apply.

Q10_1 Track monthly energy use

Group	No	Yes	Total
Control	139	78	217
Percent	**64**	**36**	**100**
Treatment	114	103	217
Percent	**53**	**47**	**100**
Total	253	181	434
Percent	**58**	**42**	**100**

Q10_2 Track the total amount of your bill

Group	No	Yes	Total
Control	75	142	217
Percent	35	65	100
Treatment	66	151	217
Percent	30	70	100
Total	141	293	434
Percent	32	68	100

Q10_3 Compare usage to previous months

Group	No	Yes	Total
Control	83	134	217
Percent	38	62	100
Treatment	83	134	217
Percent	38	62	100
Total	166	268	434
Percent	38	62	100

Q10_4 Compare usage to the same month from last year

Group	No	Yes	Total
Control	126	91	217
Percent	58	42	100
Treatment	102	115	217
Percent	47	53	100
Total	228	206	434
Percent	53	47	100

Q10_5 None of the above

Group	No	Yes	Total
Control	193	24	217
Percent	89	11	100
Treatment	194	23	217
Percent	89	11	100
Total	387	47	434
Percent	89	11	100

Q10_6 Don't know

Group	Know	Don't know	Total
Control	210	7	217
Percent	**97**	**3**	**100**
Treatment	216	1	217
Percent	**100**	**0**	**100**
Total	426	8	434
Percent	**98**	**2**	**100**

Q11 How would you rate your knowledge of the different ways you can save energy in your home?

Group	0	1	2	3	4	5	6	7	8	9	10	Don't know	Total
Control	6	2	2	11	7	33	25	37	43	25	22	4	217
Percent	**3**	**1**	**1**	**5**	**3**	**15**	**12**	**17**	**20**	**12**	**10**	**2**	**100**
Treat	3	2	3	10	7	31	19	39	51	30	20	2	217
Percent	**1**	**1**	**1**	**5**	**3**	**14**	**9**	**18**	**24**	**14**	**9**	**1**	**100**
Total	9	4	5	21	14	64	44	76	94	55	42	6	434
Percent	**2**	**1**	**1**	**5**	**3**	**15**	**10**	**18**	**22**	**13**	**10**	**1**	**100**

Q12 Duke Energy sends a personalized report called My Home Energy Report to a select group of homes. These documents are mailed in a standard envelope every few months and provide customers with information on how their home's electric energy usage compares with similar homes. Have you seen one of these reports? (Only for treatment group)

Group	Yes	No	Total
Treatment	188	29	**217**
Percent	**87**	**13**	**100**

Q13 About how many My Home Energy Reports have you received in the past 12 months? (Only for treatment group)

Group	0	1	2	3	4	5	6	7	8	10	11	12	13	Don't know	Missing	Total
Treatment	3	12	15	12	23	4	24	5	9	5	1	25	1	49	29	217
Percent	**1**	**6**	**7**	**6**	**11**	**2**	**11**	**2**	**4**	**2**	**0**	**12**	**0**	**23**	**13**	**100**

Q14 How often do you read the My Home Energy Reports? (Only for treatment group)

Group	Always	Sometimes	Never	Missing	Total
Treatment	139	42	4	32	217
percent	**64**	**19**	**2**	**15**	**100**

Q15 Please indicate how much you agree or disagree with the following statements about My Home Energy Reports. Scale: 0 = Strongly Disagree; 10 = Strongly Agree (Only for treatment group)

Q15_r1 I have learned about my household's energy use from My Home Energy Reports

Group	0	1	2	3	4	5	6	7	8	9	10	Don't know	Missing	Total
Treatment	4	2	2	8	6	16	7	15	25	26	67	3	36	217
Percent	2	1	1	4	3	7	3	7	12	12	31	1	17	100

Q15_r2 I use the reports to tell me how well I am doing at saving energy

Group	0	1	2	3	4	5	6	7	8	9	10	Don't know	Missing	Total
Treatment	5	4	3	6	7	25	10	12	20	30	58	1	36	217
Percent	2	2	1	3	3	12	5	6	9	14	27	0	17	100

Q15_r3 The tips provided in the reports are pertinent to my home

Group	0	1	2	3	4	5	6	7	8	9	10	Don't know	Missing	Total
Treatment	9	6	1	6	13	30	17	21	17	19	35	7	36	217
Percent	4	3	0	3	6	14	8	10	8	9	16	3	17	100

Q15_r4 My Home Energy Reports provide the details I need to understand my home's energy use

Group	0	1	2	3	4	5	6	7	8	9	10	Don't know	Missing	Total
Treatment	7	5	2	7	5	22	15	16	24	19	55	4	36	217
Percent	3	2	1	3	2	10	7	7	11	9	25	2	17	100

Q15_r5 I have discussed My Home Energy Reports with others

Group	0	1	2	3	4	5	6	7	8	9	10	Don't know	Missing	Total
Treatment	51	12	7	10	5	20	14	8	10	5	29	10	36	217
Percent	24	6	3	5	2	9	6	4	5	2	13	5	17	100

Q15_r6 The information provided about my home's energy use is confusing

Group	0	1	2	3	4	5	6	7	8	9	10	Don't know	Missing	Total
Treatment	76	25	8	13	8	19	5	3	4	4	9	7	36	217
Percent	35	12	4	6	4	9	2	1	2	2	4	3	17	100

Q17 Do you recall any specific tips or information from the My Home Energy Reports? (Only for treatment group)

Group	Yes	No	Missing	Total
Treatment	61	120	36	217
Percent	28	55	17	100

Q19T Below is a list of My Home Energy Report features. Please rate how useful each feature is to you.
Scale: 0 = Not at all Useful; 10 = Extremely Useful (for treatment group)

Q19T_r1 Comparison to similar homes

Group	0	1	2	3	4	5	6	7	8	9	10	Don't know	Missing	Total
Treatment	16	4	4	4	6	24	16	16	26	15	45	5	36	217
Percent	7	2	2	2	3	11	7	7	12	7	21	2	17	100

Q19T_r2 Tips to help you save money and energy

Group	0	1	2	3	4	5	6	7	8	9	10	Don't know	Missing	Total
Treatment	12	1	3	4	4	18	19	25	36	15	41	3	36	217
Percent	6	0	1	2	2	8	9	12	17	7	19	1	17	100

Q19T_r3 Examples of the energy use associated with common household items

Group	0	1	2	3	4	5	6	7	8	9	10	Don't know	Missing	Total
Treatment	12	2	4	3	7	18	17	17	34	21	39	7	36	217
Percent	6	1	2	1	3	8	8	8	16	10	18	3	17	100

Q19T_r4 Customized suggestions for your home

Group	0	1	2	3	4	5	6	7	8	9	10	Don't know	Missing	Total
Treatment	14	7	3	5	4	28	16	18	28	13	36	9	36	217
Percent	6	3	1	2	2	13	7	8	13	6	17	4	17	100

Q19T_r5 Graphs that illustrate your home's energy use over time

Group	0	1	2	3	4	5	6	7	8	9	10	Don't know	Missing	Total
Treatment	9	0	1	2	2	13	14	6	33	25	70	6	36	217
Percent	4	0	0	1	1	6	6	3	15	12	32	3	17	100

Q19T_r6 *Information about services and offers from Duke Energy*

Group	0	1	2	3	4	5	6	7	8	9	10	Don't know	Missing	Total
Treatment	12	3	5	7	5	33	11	13	24	19	42	7	36	217
Percent	6	1	2	3	2	15	5	6	11	9	19	3	17	100

Q19C Thinking about the information you have about your home's energy use, please rate how useful each of the following items would be for your household. Scale: 0 = Not at all Useful; 10 = Extremely Useful (Modified question – asked only of control group, not treatment.)

Q19C_r1 *Your home's energy use compared to that of similar homes*

Group	0	1	2	3	4	5	6	7	8	9	10	Don't know	Missing	Total
Control	33	11	10	13	6	25	15	21	26	15	32	10	0	217
Percent	15	5	5	6	3	12	7	10	12	7	15	5	0	100

Q19C_r2 *Tips to help you save money and energy*

Group	0	1	2	3	4	5	6	7	8	9	10	Don't know	Missing	Total
Control	15	5	6	7	8	25	5	23	33	29	55	6	0	217
Percent	7	2	3	3	4	12	2	11	15	13	25	3	0	100

Q19C_r3 *Examples of the energy use associated with common household items*

Group	0	1	2	3	4	5	6	7	8	9	10	Don't know	Missing	Total
Control	17	8	9	8	9	21	13	19	34	27	43	9	0	217
Percent	8	4	4	4	4	10	6	9	16	12	20	4	0	100

Q19C_r4 *Customized suggestions for your home*

Group	0	1	2	3	4	5	6	7	8	9	10	Don't know	Missing	Total
Control	25	10	10	6	7	32	9	13	29	20	45	11	0	217
Percent	12	5	5	3	3	15	4	6	13	9	21	5	0	100

Q19C_r5 *Graphs that illustrate your home's energy use over time*

Group	0	1	2	3	4	5	6	7	8	9	10	Don't know	Missing	Total
Control	26	9	6	4	8	27	11	14	27	28	48	9	0	217
Percent	12	4	3	2	4	12	5	6	12	13	22	4	0	100

Q19C_r6 Information about services and offers from Duke Energy

Group	0	1	2	3	4	5	6	7	8	9	10	Don't know	Missing	Total
Control	25	7	7	11	9	30	17	14	24	28	38	7	0	217
Percent	12	3	3	5	4	14	8	6	11	13	18	3	0	100

Q20 Please rate your satisfaction with the information in the My Home Energy Reports you've received (Only for treatment group)

Group	Very satisfied	Somewhat satisfied	Neither satisfied nor dissatisfied	Somewhat dissatisfied	Very dissatisfied	Don't know	Missing	Total
Treatment	91	54	27	4	3	2	36	217
percent	42	25	12	2	1	1	17	100

Q21 The statements below provide reasons why households might try to reduce their home's energy use. Please indicate how important each statement is to you. Scale: 0 = Not at all Important; 10 = Extremely Important

Q21_r1 Reducing my energy bill(s)

Group	0	1	2	3	4	5	6	7	8	9	10	Don't know	Total
Control	2	1	2	1	2	7	9	15	22	29	125	2	217
Percent	1	0	1	0	1	3	4	7	10	13	58	1	100
Treat	1	1	3	2	3	6	5	11	27	26	128	4	217
Percent	0	0	1	1	1	3	2	5	12	12	59	2	100
Total	3	2	5	3	5	13	14	26	49	55	253	6	434
Percent	1	0	1	1	1	3	3	6	11	13	58	1	100

Q21_r2 Using less energy

Group	0	1	2	3	4	5	6	7	8	9	10	Don't know	Total
Control	4	2	2	2	5	10	10	16	40	28	94	4	217
Percent	2	1	1	1	2	5	5	7	18	13	43	2	100
Treatment	4	3	4	4	6	12	6	14	21	26	110	7	217
percent	2	1	2	2	3	6	3	6	10	12	51	3	100
Total	8	5	6	6	11	22	16	30	61	54	204	11	434
percent	2	1	1	1	3	5	4	7	14	12	47	3	100

Q21_r3 Helping the environment

Group	0	1	2	3	4	5	6	7	8	9	10	Don't know	Total
Control	6	2	3	3	5	17	7	17	34	33	87	3	217
Percent	3	1	1	1	2	8	3	8	16	15	40	1	100
Treat	6	5	2	5	5	10	6	16	32	27	96	7	217
Percent	3	2	1	2	2	5	3	7	15	12	44	3	100
Total	12	7	5	8	10	27	13	33	66	60	183	10	434
Percent	3	2	1	2	2	6	3	8	15	14	42	2	100

Q21_r4 Setting an example for others

Group	0	1	2	3	4	5	6	7	8	9	10	Don't know	Total
Control	23	6	5	8	9	27	14	20	25	15	59	6	217
Percent	11	3	2	4	4	12	6	9	12	7	27	3	100
Treat	20	5	8	9	10	27	8	12	20	20	69	9	217
Percent	9	2	4	4	5	12	4	6	9	9	32	4	100
Total	43	11	13	17	19	54	22	32	45	35	128	15	434
Percent	10	3	3	4	4	12	5	7	10	8	29	3	100

Q21_r5 Avoiding waste

Group	0	1	2	3	4	5	6	7	8	9	10	Don't know	Total
Control	4	1	1	3	4	16	8	12	33	37	97	1	217
Percent	2	0	0	1	2	7	4	6	15	17	45	0	100
Treatment	3	4	2	2	2	15	3	11	26	26	116	7	217
Percent	1	2	1	1	1	7	1	5	12	12	53	3	100
Total	7	5	3	5	6	31	11	23	59	63	213	8	434
Percent	2	1	1	1	1	7	3	5	14	15	49	2	100

Q22 Please indicate your level of agreement with each of the following statements:

Q22_r1 Duke Energy provides excellent customer service

Group	Strongly disagree	Somewhat disagree	Neither	Somewhat agree	Strongly agree	Don't know	Total
Control	5	9	24	65	95	19	217
Percent	2	4	11	30	44	9	100
Treatment	4	3	23	61	112	14	217
Percent	2	1	11	28	52	6	100
Total	9	12	47	126	207	33	434
Percent	2	3	11	29	48	8	100

Q22_r2 Duke Energy respects its customers

Group	Strongly disagree	Somewhat disagree	Neither	Somewhat agree	Strongly agree	Don't know	Total
Control	7	9	26	54	102	19	217
Percent	3	4	12	25	47	9	100
Treatment	4	8	25	48	109	23	217
Percent	2	4	12	22	50	11	100
Total	11	17	51	102	211	42	434
Percent	3	4	12	24	49	10	100

Q22_r3 Duke Energy provides service at a reasonable cost

Group	Strongly disagree	Somewhat disagree	Neither	Somewhat agree	Strongly agree	Don't know	Total
Control	6	22	31	72	67	19	217
Percent	3	10	14	33	31	9	100
Treatment	5	20	41	73	66	12	217
Percent	2	9	19	34	30	6	100
Total	11	42	72	145	133	31	434
Percent	3	10	17	33	31	7	100

Q24 Do you own or rent this residence?

Group	Own	Rent	Prefer not to answer	Total
Control	193	20	4	217
Percent	89	9	2	100
Treatment	199	16	2	217
Percent	92	7	1	100
Total	392	36	6	434
Percent	90	8	1	100

Q25 Including yourself, how many people live in your home?

Group	1	2	3	4	5	6	7	9	Don't know	Prefer not to answer	Total
Control	52	87	29	30	10	2	0	1	2	4	217
Percent	24	40	13	14	5	1	0	0	1	2	100
Treatment	44	91	27	32	10	3	1	0	3	6	217
Percent	20	42	12	15	5	1	0	0	1	3	100
Total	96	178	56	62	20	5	1	1	5	10	434
Percent	22	41	13	14	5	1	0	0	1	2	100

Q28 What is your primary heating fuel?

Group	Electricity	Natural Gas	Oil	Other	Don't know	Prefer not to answer	Total
Control	129	57	8	20	1	2	217
Percent	**59**	**26**	**4**	**9**	**0**	**1**	**100**
Treatment	139	55	5	14	2	2	217
Percent	**64**	**25**	**2**	**6**	**1**	**1**	**100**
Total	268	112	13	34	3	4	434
Percent	**62**	**26**	**3**	**8**	**1**	**1**	**100**

Appendix E Detailed Regression Outputs/Models

Table D-1: Regression Coefficients for Cohort 1

Linear regression, absorbing indicators		
	Number of obs =	21126849
	F(268,20536609)=	31250.36
	Prob > F =	0
	R-squared =	0.7347
	Adj R-squared =	0.7271
	Root MSE =	13.7838

dailykwh	Coef.	Std. Err.	t	P>t	[90% Conf.	Interval]
ym						
Feb-14	-3.2058	0.0263	-121.8800	0.0000	-3.2491	-3.1626
Mar-14	-15.3914	0.0263	-585.1500	0.0000	-15.4347	-15.3481
Apr-14	-25.2989	0.0263	-961.8100	0.0000	-25.3422	-25.2557
May-14	-22.2900	0.0263	-847.4300	0.0000	-22.3332	-22.2467
Jun-14	-12.2936	0.0263	-467.3800	0.0000	-12.3368	-12.2503
Jul-14	-11.3937	0.0263	-433.1700	0.0000	-11.4370	-11.3504
Aug-14	-13.7366	0.0263	-522.2400	0.0000	-13.7799	-13.6933
Sep-14	-19.1355	0.0263	-727.5000	0.0000	-19.1788	-19.0922
Oct-14	-25.6111	0.0263	-973.6900	0.0000	-25.6544	-25.5679
Nov-14	-17.0720	0.0263	-649.0400	0.0000	-17.1153	-17.0287
Dec-14	-8.5429	0.0263	-324.7900	0.0000	-8.5862	-8.4997
Jan-15	-3.3799	0.0263	-128.5000	0.0000	-3.4232	-3.3366
Feb-15	1.0069	0.0280	35.9500	0.0000	0.9608	1.0530
Mar-15	-16.4559	0.0307	-536.3800	0.0000	-16.5064	-16.4054
Apr-15	-28.2466	0.0375	-752.5400	0.0000	-28.3083	-28.1848
May-15	-22.6036	0.0447	-506.1200	0.0000	-22.6771	-22.5302
Jun-15	-8.9018	0.0491	-181.1300	0.0000	-8.9827	-8.8210
Jul-15	-5.9468	0.0538	-110.5600	0.0000	-6.0352	-5.8583
Aug-15	-11.4191	0.0537	-212.8200	0.0000	-11.5073	-11.3308
Sep-15	-21.2561	0.0538	-395.4300	0.0000	-21.3445	-21.1677
Oct-15	-28.7303	0.0540	-531.8300	0.0000	-28.8191	-28.6414
Nov-15	-24.6132	0.0540	-455.6200	0.0000	-24.7021	-24.5244
Dec-15	-18.0266	0.0540	-333.6900	0.0000	-18.1155	-17.9377
Jan-16	-7.0063	0.0540	-129.6900	0.0000	-7.0951	-6.9174
Feb-16	-9.5632	0.0540	-177.0200	0.0000	-9.6521	-9.4744
Mar-16	-24.0631	0.0540	-445.4200	0.0000	-24.1519	-23.9742
Apr-16	-28.4982	0.0540	-527.5200	0.0000	-28.5871	-28.4094
May-16	-24.7361	0.0540	-457.8800	0.0000	-24.8249	-24.6472
Jun-16	-13.3139	0.0540	-246.4500	0.0000	-13.4027	-13.2250
Jul-16	-4.2371	0.0540	-78.4300	0.0000	-4.3259	-4.1482
Aug-16	-5.5746	0.0541	-103.0200	0.0000	-5.6636	-5.4856
Sep-16	-17.6224	0.0541	-325.4600	0.0000	-17.7115	-17.5334

Oct-16	-28.1798	0.0542	-520.3600	0.0000	-28.2689	-28.0908
Nov-16	-22.1045	0.0542	-407.8200	0.0000	-22.1937	-22.0154
Dec-16	-16.6147	0.0542	-306.3400	0.0000	-16.7039	-16.5255
dateadded#ym						
201501 648	-0.8205	0.2018	-4.0700	0.0000	-1.1525	-0.4886
201501 649	-1.4647	0.2018	-7.2600	0.0000	-1.7967	-1.1327
201501 650	-1.7417	0.2018	-8.6300	0.0000	-2.0737	-1.4097
201501 651	-1.7983	0.2018	-8.9100	0.0000	-2.1303	-1.4662
201501 652	-2.1727	0.2019	-10.7600	0.0000	-2.5048	-1.8407
201501 653	-0.0628	0.2018	-0.3100	0.7560	-0.3948	0.2691
201501 654	-0.6387	0.2018	-3.1600	0.0020	-0.9707	-0.3067
201501 655	-1.9407	0.2018	-9.6100	0.0000	-2.2727	-1.6087
201501 656	-1.2117	0.2018	-6.0000	0.0000	-1.5437	-0.8798
201501 657	-0.9475	0.2018	-4.7000	0.0000	-1.2795	-0.6156
201501 658	0.5829	0.2018	2.8900	0.0040	0.2509	0.9148
201501 659	0.2514	0.2018	1.2500	0.2130	-0.0806	0.5833
201501 660	-0.6764	0.2018	-3.3500	0.0010	-1.0083	-0.3444
201501 661	0.0002	0.2034	0.0000	0.9990	-0.3344	0.3347
201501 662	-0.7029	0.2031	-3.4600	0.0010	-1.0369	-0.3689
201501 663	-0.5599	0.2022	-2.7700	0.0060	-0.8926	-0.2272
201501 664	0.9908	0.2021	4.9000	0.0000	0.6585	1.3232
201501 665	0.1511	0.2020	0.7500	0.4540	-0.1812	0.4833
201501 666	-1.0792	0.2020	-5.3400	0.0000	-1.4114	-0.7470
201501 667	-0.1070	0.2020	-0.5300	0.5960	-0.4391	0.2252
201501 668	0.6129	0.2020	3.0300	0.0020	0.2807	0.9452
201501 669	-0.3578	0.2020	-1.7700	0.0760	-0.6900	-0.0256
201501 670	-0.0768	0.2019	-0.3800	0.7040	-0.4090	0.2554
201501 671	-0.3886	0.2019	-1.9200	0.0540	-0.7207	-0.0564
201501 672	0.1825	0.2019	0.9000	0.3660	-0.1496	0.5147
201501 673	0.0133	0.2019	0.0700	0.9480	-0.3189	0.3454
201501 674	-0.3741	0.2020	-1.8500	0.0640	-0.7062	-0.0419
201501 675	-0.1888	0.2019	-0.9300	0.3500	-0.5210	0.1434
201501 676	0.0993	0.2020	0.4900	0.6230	-0.2329	0.4315
201501 677	0.4154	0.2019	2.0600	0.0400	0.0832	0.7476
201501 678	1.2250	0.2019	6.0700	0.0000	0.8929	1.5572
201501 679	1.5426	0.2019	7.6400	0.0000	1.2105	1.8748
201501 680	0.1783	0.2019	0.8800	0.3770	-0.1538	0.5105
201501 681	0.1728	0.2020	0.8600	0.3920	-0.1594	0.5050
201501 682	-0.0737	0.2020	-0.3700	0.7150	-0.4060	0.2585
201501 683	0.0000	(omitted)				
201502 648	5.0324	0.3954	12.7300	0.0000	4.3820	5.6828
201502 649	-7.6307	0.3345	-22.8100	0.0000	-8.1809	-7.0805
201502 650	-0.9682	0.3345	-2.8900	0.0040	-1.5185	-0.4179
201502 651	0.7763	0.3346	2.3200	0.0200	0.2260	1.3266
201502 652	-2.4038	0.3346	-7.1800	0.0000	-2.9541	-1.8535

201502 653	-2.0589	0.3346	-6.1500	0.0000	-2.6093	-1.5085
201502 654	-2.4808	0.3345	-7.4200	0.0000	-3.0310	-1.9305
201502 655	-1.8556	0.3345	-5.5500	0.0000	-2.4059	-1.3054
201502 656	-1.5111	0.3345	-4.5200	0.0000	-2.0614	-0.9609
201502 657	-1.4736	0.3345	-4.4100	0.0000	-2.0238	-0.9234
201502 658	-1.8744	0.3345	-5.6000	0.0000	-2.4246	-1.3242
201502 659	-2.3584	0.3345	-7.0500	0.0000	-2.9086	-1.8082
201502 660	-2.2350	0.3345	-6.6800	0.0000	-2.7852	-1.6848
201502 661	-2.9465	0.3346	-8.8000	0.0000	-3.4970	-2.3961
201502 662	-1.5288	0.3345	-4.5700	0.0000	-2.0790	-0.9785
201502 663	-0.1566	0.3348	-0.4700	0.6400	-0.7073	0.3941
201502 664	-0.0085	0.3346	-0.0300	0.9800	-0.5589	0.5420
201502 665	-0.5276	0.3346	-1.5800	0.1150	-1.0779	0.0228
201502 666	-0.4483	0.3346	-1.3400	0.1800	-0.9986	0.1021
201502 667	-0.2097	0.3346	-0.6300	0.5310	-0.7600	0.3407
201502 668	0.2376	0.3346	0.7100	0.4780	-0.3127	0.7880
201502 669	0.1627	0.3346	0.4900	0.6270	-0.3876	0.7131
201502 670	-0.4319	0.3346	-1.2900	0.1970	-0.9822	0.1185
201502 671	-0.6788	0.3346	-2.0300	0.0420	-1.2291	-0.1284
201502 672	-1.2843	0.3346	-3.8400	0.0000	-1.8347	-0.7340
201502 673	-1.2332	0.3346	-3.6900	0.0000	-1.7836	-0.6829
201502 674	-0.1884	0.3346	-0.5600	0.5730	-0.7387	0.3620
201502 675	0.2655	0.3346	0.7900	0.4270	-0.2848	0.8158
201502 676	0.8647	0.3346	2.5800	0.0100	0.3143	1.4150
201502 677	0.6830	0.3346	2.0400	0.0410	0.1327	1.2334
201502 678	0.6311	0.3346	1.8900	0.0590	0.0808	1.1815
201502 679	0.8892	0.3346	2.6600	0.0080	0.3388	1.4395
201502 680	0.9204	0.3346	2.7500	0.0060	0.3700	1.4707
201502 681	0.9240	0.3346	2.7600	0.0060	0.3736	1.4744
201502 682	0.2490	0.3347	0.7400	0.4570	-0.3015	0.7995
201502 683	0.0000	(omitted)				
201503 648	7.0059	0.6822	10.2700	0.0000	5.8838	8.1281
201503 649	-8.4148	0.3649	-23.0600	0.0000	-9.0150	-7.8146
201503 650	-5.2144	0.3032	-17.2000	0.0000	-5.7131	-4.7158
201503 651	-3.4926	0.3032	-11.5200	0.0000	-3.9913	-2.9938
201503 652	-0.3329	0.3032	-1.1000	0.2720	-0.8316	0.1658
201503 653	-1.4263	0.3032	-4.7000	0.0000	-1.9250	-0.9277
201503 654	-2.8698	0.3032	-9.4700	0.0000	-3.3684	-2.3711
201503 655	-2.4981	0.3032	-8.2400	0.0000	-2.9967	-1.9994
201503 656	-1.7517	0.3032	-5.7800	0.0000	-2.2504	-1.2531
201503 657	-1.3664	0.3032	-4.5100	0.0000	-1.8651	-0.8678
201503 658	-0.8799	0.3032	-2.9000	0.0040	-1.3786	-0.3813
201503 659	-1.1993	0.3032	-3.9600	0.0000	-1.6979	-0.7006
201503 660	-1.0358	0.3032	-3.4200	0.0010	-1.5344	-0.5371
201503 661	1.6673	0.3033	5.5000	0.0000	1.1684	2.1662
201503 662	1.0925	0.3036	3.6000	0.0000	0.5931	1.5918

201503 663	-0.7286	0.3032	-2.4000	0.0160	-1.2273	-0.2299
201503 664	-0.4326	0.3033	-1.4300	0.1540	-0.9315	0.0663
201503 665	-0.6868	0.3033	-2.2600	0.0240	-1.1856	-0.1879
201503 666	-1.3235	0.3032	-4.3600	0.0000	-1.8223	-0.8247
201503 667	-0.6872	0.3032	-2.2700	0.0230	-1.1860	-0.1884
201503 668	-0.0141	0.3032	-0.0500	0.9630	-0.5129	0.4847
201503 669	-0.1503	0.3032	-0.5000	0.6200	-0.6491	0.3485
201503 670	1.1511	0.3033	3.8000	0.0000	0.6522	1.6499
201503 671	0.7544	0.3032	2.4900	0.0130	0.2556	1.2532
201503 672	1.8280	0.3032	6.0300	0.0000	1.3292	2.3268
201503 673	0.2497	0.3032	0.8200	0.4100	-0.2491	0.7485
201503 674	0.0670	0.3032	0.2200	0.8250	-0.4318	0.5658
201503 675	0.2138	0.3032	0.7100	0.4810	-0.2850	0.7126
201503 676	0.1875	0.3032	0.6200	0.5360	-0.3113	0.6863
201503 677	0.1679	0.3032	0.5500	0.5800	-0.3309	0.6667
201503 678	-0.1278	0.3032	-0.4200	0.6730	-0.6266	0.3710
201503 679	0.0170	0.3032	0.0600	0.9550	-0.4818	0.5158
201503 680	0.5569	0.3032	1.8400	0.0660	0.0581	1.0557
201503 681	0.4767	0.3033	1.5700	0.1160	-0.0221	0.9756
201503 682	-0.1366	0.3033	-0.4500	0.6520	-0.6355	0.3623
201503 683	0.0000	(omitted)				
201505 648	-2.5764	0.4057	-6.3500	0.0000	-3.2437	-1.9091
201505 649	-4.2578	0.3678	-11.5800	0.0000	-4.8628	-3.6528
201505 650	-8.7140	0.2569	-33.9200	0.0000	-9.1366	-8.2914
201505 651	-6.1507	0.2002	-30.7200	0.0000	-6.4800	-5.8214
201505 652	-4.9831	0.1853	-26.8900	0.0000	-5.2880	-4.6783
201505 653	-5.2719	0.1853	-28.4400	0.0000	-5.5768	-4.9671
201505 654	-4.3258	0.1853	-23.3400	0.0000	-4.6307	-4.0210
201505 655	-3.6281	0.1853	-19.5800	0.0000	-3.9329	-3.3232
201505 656	-2.4804	0.1853	-13.3800	0.0000	-2.7853	-2.1756
201505 657	-1.2720	0.1853	-6.8600	0.0000	-1.5769	-0.9672
201505 658	-1.0664	0.1853	-5.7500	0.0000	-1.3712	-0.7615
201505 659	-1.2600	0.1853	-6.8000	0.0000	-1.5649	-0.9552
201505 660	-1.0979	0.1853	-5.9200	0.0000	-1.4028	-0.7931
201505 661	-1.0099	0.1856	-5.4400	0.0000	-1.3152	-0.7047
201505 662	-0.9505	0.1860	-5.1100	0.0000	-1.2565	-0.6445
201505 663	-0.9280	0.1873	-4.9500	0.0000	-1.2360	-0.6199
201505 664	-1.4669	0.1889	-7.7700	0.0000	-1.7776	-1.1562
201505 665	-2.2860	0.1856	-12.3200	0.0000	-2.5912	-1.9808
201505 666	-2.4923	0.1855	-13.4400	0.0000	-2.7974	-2.1872
201505 667	-1.6934	0.1855	-9.1300	0.0000	-1.9985	-1.3883
201505 668	-0.7242	0.1855	-3.9000	0.0000	-1.0292	-0.4191
201505 669	-0.1311	0.1855	-0.7100	0.4800	-0.4362	0.1740
201505 670	-0.1804	0.1855	-0.9700	0.3310	-0.4855	0.1247
201505 671	-0.4205	0.1855	-2.2700	0.0230	-0.7256	-0.1155
201505 672	-0.1745	0.1855	-0.9400	0.3470	-0.4795	0.1306

201505 673	0.0782	0.1855	0.4200	0.6730	-0.2268	0.3833
201505 674	0.1039	0.1855	0.5600	0.5760	-0.2012	0.4089
201505 675	0.0733	0.1855	0.3900	0.6930	-0.2318	0.3783
201505 676	-0.0641	0.1855	-0.3500	0.7290	-0.3692	0.2409
201505 677	-0.9017	0.1855	-4.8600	0.0000	-1.2068	-0.5967
201505 678	-1.8477	0.1855	-9.9600	0.0000	-2.1528	-1.5426
201505 679	-1.3677	0.1855	-7.3700	0.0000	-1.6728	-1.0626
201505 680	-0.1919	0.1855	-1.0300	0.3010	-0.4969	0.1132
201505 681	0.5186	0.1855	2.8000	0.0050	0.2135	0.8237
201505 682	0.2139	0.1855	1.1500	0.2490	-0.0913	0.5190
201505 683	0.0000	(omitted)				
201507 648	-4.0527	1.0588	-3.8300	0.0000	-5.7943	-2.3112
201507 649	-6.6345	1.0503	-6.3200	0.0000	-8.3621	-4.9068
201507 650	-4.4475	1.0135	-4.3900	0.0000	-6.1146	-2.7804
201507 651	-2.4889	0.9804	-2.5400	0.0110	-4.1016	-0.8762
201507 652	-3.6508	0.9405	-3.8800	0.0000	-5.1978	-2.1038
201507 653	-4.4289	0.3236	-13.6900	0.0000	-4.9611	-3.8967
201507 654	-7.0298	0.2531	-27.7700	0.0000	-7.4462	-6.6134
201507 655	-4.4819	0.2531	-17.7100	0.0000	-4.8983	-4.0656
201507 656	-2.9934	0.2531	-11.8300	0.0000	-3.4098	-2.5771
201507 657	-1.9988	0.2532	-7.9000	0.0000	-2.4152	-1.5824
201507 658	0.2780	0.2532	1.1000	0.2720	-0.1385	0.6944
201507 659	-0.5848	0.2531	-2.3100	0.0210	-1.0012	-0.1684
201507 660	-1.8235	0.2531	-7.2000	0.0000	-2.2398	-1.4071
201507 661	-1.3543	0.2533	-5.3500	0.0000	-1.7710	-0.9375
201507 662	-1.5137	0.2537	-5.9700	0.0000	-1.9309	-1.0964
201507 663	-1.2830	0.2546	-5.0400	0.0000	-1.7018	-0.8642
201507 664	0.1224	0.2558	0.4800	0.6320	-0.2983	0.5431
201507 665	-1.2645	0.2566	-4.9300	0.0000	-1.6865	-0.8424
201507 666	-2.2137	0.2575	-8.6000	0.0000	-2.6373	-1.7901
201507 667	-0.2418	0.2532	-0.9600	0.3390	-0.6582	0.1746
201507 668	0.9697	0.2532	3.8300	0.0000	0.5531	1.3862
201507 669	-0.2653	0.2532	-1.0500	0.2950	-0.6819	0.1512
201507 670	-0.4775	0.2532	-1.8900	0.0590	-0.8940	-0.0609
201507 671	-0.8788	0.2532	-3.4700	0.0010	-1.2954	-0.4623
201507 672	-0.1324	0.2532	-0.5200	0.6010	-0.5489	0.2842
201507 673	-0.1675	0.2532	-0.6600	0.5080	-0.5841	0.2490
201507 674	-0.1965	0.2532	-0.7800	0.4380	-0.6130	0.2201
201507 675	0.0748	0.2532	0.3000	0.7680	-0.3418	0.4913
201507 676	0.0909	0.2532	0.3600	0.7200	-0.3256	0.5075
201507 677	-0.4964	0.2532	-1.9600	0.0500	-0.9129	-0.0798
201507 678	0.6845	0.2532	2.7000	0.0070	0.2679	1.1010
201507 679	1.2321	0.2532	4.8700	0.0000	0.8155	1.6486
201507 680	0.1962	0.2532	0.7700	0.4390	-0.2204	0.6127
201507 681	0.6406	0.2532	2.5300	0.0110	0.2240	1.0571
201507 682	0.1569	0.2533	0.6200	0.5350	-0.2596	0.5735

201507 683	0.0000	(omitted)				
201508 648	-6.9184	1.1015	-6.2800	0.0000	-8.7302	-5.1066
201508 649	-7.1204	1.0857	-6.5600	0.0000	-8.9062	-5.3345
201508 650	-6.3968	1.0766	-5.9400	0.0000	-8.1677	-4.6260
201508 651	-4.3047	1.0648	-4.0400	0.0000	-6.0561	-2.5532
201508 652	-6.2682	1.0562	-5.9300	0.0000	-8.0054	-4.5309
201508 653	-8.2849	0.9761	-8.4900	0.0000	-9.8904	-6.6794
201508 654	-10.3441	0.3075	-33.6400	0.0000	-10.8498	-9.8384
201508 655	-5.5731	0.2520	-22.1100	0.0000	-5.9877	-5.1585
201508 656	-3.5315	0.2520	-14.0100	0.0000	-3.9460	-3.1169
201508 657	-1.9806	0.2520	-7.8600	0.0000	-2.3951	-1.5660
201508 658	-1.8268	0.2520	-7.2500	0.0000	-2.2414	-1.4123
201508 659	-2.5243	0.2520	-10.0200	0.0000	-2.9389	-2.1097
201508 660	-2.3889	0.2520	-9.4800	0.0000	-2.8034	-1.9743
201508 661	-2.3563	0.2522	-9.3400	0.0000	-2.7711	-1.9414
201508 662	-1.5870	0.2525	-6.2800	0.0000	-2.0024	-1.1717
201508 663	-0.9333	0.2535	-3.6800	0.0000	-1.3502	-0.5164
201508 664	-1.2606	0.2546	-4.9500	0.0000	-1.6795	-0.8418
201508 665	-2.5276	0.2555	-9.8900	0.0000	-2.9479	-2.1074
201508 666	-2.1412	0.2564	-8.3500	0.0000	-2.5630	-1.7194
201508 667	-1.3685	0.2564	-5.3400	0.0000	-1.7902	-0.9467
201508 668	-0.2487	0.2520	-0.9900	0.3240	-0.6633	0.1658
201508 669	0.2243	0.2521	0.8900	0.3740	-0.1904	0.6390
201508 670	-0.2800	0.2521	-1.1100	0.2670	-0.6947	0.1347
201508 671	-0.6402	0.2521	-2.5400	0.0110	-1.0549	-0.2255
201508 672	-0.6699	0.2521	-2.6600	0.0080	-1.0847	-0.2552
201508 673	-0.3831	0.2521	-1.5200	0.1290	-0.7978	0.0316
201508 674	0.2678	0.2521	1.0600	0.2880	-0.1469	0.6826
201508 675	0.5379	0.2521	2.1300	0.0330	0.1232	0.9526
201508 676	0.5957	0.2521	2.3600	0.0180	0.1810	1.0105
201508 677	-0.1892	0.2521	-0.7500	0.4530	-0.6039	0.2255
201508 678	-0.9874	0.2521	-3.9200	0.0000	-1.4021	-0.5727
201508 679	-0.6270	0.2521	-2.4900	0.0130	-1.0417	-0.2123
201508 680	0.4088	0.2521	1.6200	0.1050	-0.0060	0.8235
201508 681	1.1570	0.2521	4.5900	0.0000	0.7423	1.5717
201508 682	0.3426	0.2522	1.3600	0.1740	-0.0721	0.7574
201508 683	0.0000	(omitted)				
ym#c.treatment						
Jan-14	0.0000	(omitted)				
Feb-14	0.0000	(omitted)				
Mar-14	0.0000	(omitted)				
Apr-14	0.0000	(omitted)				
May-14	0.0000	(omitted)				
Jun-14	0.0000	(omitted)				
Jul-14	0.0000	(omitted)				

Aug-14	0.0000	(omitted)				
Sep-14	0.0000	(omitted)				
Oct-14	0.0000	(omitted)				
Nov-14	0.0000	(omitted)				
Dec-14	0.0000	(omitted)				
Jan-15	0.0000	(omitted)				
Feb-15	-0.4453	0.0460	-9.6900	0.0000	-0.5209	-0.3697
Mar-15	-0.0483	0.0383	-1.2600	0.2070	-0.1113	0.0147
Apr-15	-0.3915	0.0401	-9.7600	0.0000	-0.4575	-0.3255
May-15	-0.4021	0.0462	-8.7100	0.0000	-0.4780	-0.3262
Jun-15	-0.5397	0.0500	-10.7900	0.0000	-0.6220	-0.4574
Jul-15	0.0153	0.0547	0.2800	0.7800	-0.0748	0.1053
Aug-15	-0.1828	0.0545	-3.3500	0.0010	-0.2724	-0.0931
Sep-15	-0.2787	0.0546	-5.1000	0.0000	-0.3685	-0.1889
Oct-15	-0.3375	0.0550	-6.1400	0.0000	-0.4279	-0.2470
Nov-15	-0.4197	0.0550	-7.6300	0.0000	-0.5101	-0.3292
Dec-15	-0.4667	0.0550	-8.4900	0.0000	-0.5572	-0.3763
Jan-16	-0.6783	0.0550	-12.3400	0.0000	-0.7687	-0.5879
Feb-16	-0.7333	0.0550	-13.3400	0.0000	-0.8238	-0.6429
Mar-16	-0.4745	0.0550	-8.6300	0.0000	-0.5649	-0.3841
Apr-16	-0.4258	0.0550	-7.7500	0.0000	-0.5162	-0.3354
May-16	-0.3496	0.0550	-6.3600	0.0000	-0.4400	-0.2592
Jun-16	-0.2844	0.0550	-5.1700	0.0000	-0.3748	-0.1940
Jul-16	-0.0934	0.0550	-1.7000	0.0890	-0.1838	-0.0030
Aug-16	-0.0578	0.0551	-1.0500	0.2930	-0.1484	0.0327
Sep-16	-0.2598	0.0551	-4.7200	0.0000	-0.3505	-0.1692
Oct-16	-0.4117	0.0551	-7.4700	0.0000	-0.5023	-0.3211
Nov-16	-0.5750	0.0551	-10.4300	0.0000	-0.6657	-0.4843
Dec-16	-0.5637	0.0552	-10.2100	0.0000	-0.6544	-0.4729
_cons	59.8932	0.0192	3125.6700	0.0000	59.8617	59.9247

account_id	F(589971,	20536609)	=	82.115	0.0000	(589972 categories)

Table D-2: Regression Coefficients for Cohort 2

Linear regression, absorbing indicators			
	Number of obs	=	796626
	F(222, 768730)	=	1277.28
	Prob > F	=	0
	R-squared	=	0.7075
	Adj R-squared	=	0.6969
	Root MSE	=	14.013

dailykwh	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
ym						
Feb-14	-3.5445	0.2887	-12.2800	0.0000	-4.1103	-2.9787
Mar-14	-18.5798	0.2861	-64.9400	0.0000	-19.1406	-18.0191
Apr-14	-28.2019	0.2837	-99.3900	0.0000	-28.7581	-27.6458
May-14	-29.2009	0.2812	-103.8400	0.0000	-29.7521	-28.6498
Jun-14	-14.7801	0.2791	-52.9500	0.0000	-15.3272	-14.2330
Jul-14	-13.9779	0.2770	-50.4600	0.0000	-14.5209	-13.4350
Aug-14	-21.3248	0.2539	-83.9700	0.0000	-21.8226	-20.8271
Sep-14	-27.1476	0.2389	-113.6600	0.0000	-27.6157	-26.6794
Oct-14	-30.6080	0.2308	-132.6200	0.0000	-31.0604	-30.1557
Nov-14	-21.7884	0.2266	-96.1400	0.0000	-22.2326	-21.3442
Dec-14	-13.6025	0.2253	-60.3900	0.0000	-14.0440	-13.1610
Jan-15	-8.4498	0.2253	-37.5100	0.0000	-8.8913	-8.0083
Feb-15	-4.3464	0.2253	-19.3000	0.0000	-4.7879	-3.9049
Mar-15	-21.4927	0.2253	-95.4100	0.0000	-21.9342	-21.0512
Apr-15	-32.7500	0.2253	-145.3900	0.0000	-33.1915	-32.3085
May-15	-27.7537	0.2253	-123.2100	0.0000	-28.1952	-27.3122
Jun-15	-15.3653	0.2253	-68.2100	0.0000	-15.8068	-14.9239
Jul-15	-12.0198	0.2253	-53.3600	0.0000	-12.4613	-11.5783
Aug-15	-16.7934	0.2253	-74.5500	0.0000	-17.2349	-16.3519
Sep-15	-25.4239	0.2253	-112.8700	0.0000	-25.8654	-24.9824
Oct-15	-32.1561	0.2253	-142.7500	0.0000	-32.5976	-31.7146
Nov-15	-28.2155	0.2253	-125.2600	0.0000	-28.6570	-27.7740
Dec-15	-22.1147	0.2253	-98.1800	0.0000	-22.5562	-21.6732
Jan-16	-10.6906	0.2389	-44.7500	0.0000	-11.1588	-10.2224
Feb-16	-13.1859	0.2478	-53.2200	0.0000	-13.6716	-12.7003
Mar-16	-27.3150	0.2479	-110.2100	0.0000	-27.8008	-26.8292
Apr-16	-31.5812	0.2479	-127.3800	0.0000	-32.0671	-31.0953
May-16	-28.1128	0.2480	-113.3800	0.0000	-28.5987	-27.6268
Jun-16	-17.3826	0.2480	-70.1000	0.0000	-17.8686	-16.8966
Jul-16	-8.8237	0.2480	-35.5800	0.0000	-9.3097	-8.3376
Aug-16	-9.6200	0.2480	-38.7800	0.0000	-10.1062	-9.1338

Sep-16	-20.6325	0.2481	-83.1700	0.0000	-21.1187	-20.1463
Oct-16	-30.9027	0.2481	-124.5700	0.0000	-31.3889	-30.4165
Nov-16	-25.3406	0.2482	-102.1100	0.0000	-25.8270	-24.8542
Dec-16	-20.3441	0.2482	-81.9500	0.0000	-20.8307	-19.8576
dateadded#ym						
201601 648	23.8403	5.7631	4.1400	0.0000	12.5449	35.1357
201601 649	7.4370	5.7629	1.2900	0.1970	-3.8582	18.7322
201601 650	19.6520	5.7628	3.4100	0.0010	8.3571	30.9469
201601 651	23.0994	5.7627	4.0100	0.0000	11.8047	34.3941
201601 652	-2.4074	5.7626	-0.4200	0.6760	-13.7018	8.8870
201601 653	12.6174	5.7624	2.1900	0.0290	1.3232	23.9116
201601 654	1.8845	5.7623	0.3300	0.7440	-9.4095	13.1785
201601 655	-3.6326	5.4361	-0.6700	0.5040	-14.2872	7.0221
201601 656	0.0613	5.4354	0.0100	0.9910	-10.5919	10.7145
201601 657	-4.6181	5.4350	-0.8500	0.3950	-15.2706	6.0344
201601 658	26.0862	5.4349	4.8000	0.0000	15.4340	36.7383
201601 659	23.3694	4.7485	4.9200	0.0000	14.0625	32.6762
201601 660	7.1225	4.5817	1.5500	0.1200	-1.8575	16.1025
201601 661	27.4250	4.3062	6.3700	0.0000	18.9851	35.8650
201601 662	12.1969	3.7585	3.2500	0.0010	4.8303	19.5635
201601 663	-2.8672	3.6315	-0.7900	0.4300	-9.9847	4.2504
201601 664	3.7948	3.3039	1.1500	0.2510	-2.6808	10.2704
201601 665	7.6454	3.2029	2.3900	0.0170	1.3678	13.9229
201601 666	2.7553	3.0622	0.9000	0.3680	-3.2466	8.7572
201601 667	3.0579	2.9305	1.0400	0.2970	-2.6858	8.8015
201601 668	2.7455	2.8932	0.9500	0.3430	-2.9251	8.4160
201601 669	-3.6220	2.8262	-1.2800	0.2000	-9.1613	1.9173
201601 670	-1.6938	2.7678	-0.6100	0.5410	-7.1187	3.7310
201601 671	-0.2577	2.7678	-0.0900	0.9260	-5.6825	5.1672
201601 672	5.7838	2.7690	2.0900	0.0370	0.3567	11.2109
201601 673	0.6090	2.7698	0.2200	0.8260	-4.8196	6.0377
201601 674	-4.1258	2.7698	-1.4900	0.1360	-9.5544	1.3029
201601 675	-5.8015	2.7698	-2.0900	0.0360	-11.2302	-0.3728
201601 676	-5.7756	2.7698	-2.0900	0.0370	-11.2043	-0.3469
201601 677	-3.9258	2.7698	-1.4200	0.1560	-9.3545	1.5028
201601 678	0.3850	2.7698	0.1400	0.8890	-5.0437	5.8137
201601 679	2.0930	2.7688	0.7600	0.4500	-3.3338	7.5198
201601 680	-5.3296	2.7687	-1.9200	0.0540	-10.7562	0.0970
201601 681	-5.7422	2.7687	-2.0700	0.0380	-11.1689	-0.3156
201601 682	-3.7030	2.7687	-1.3400	0.1810	-9.1296	1.7236
201601 683	0.0000	(omitted)				
201602 648	15.1457	19.8188	0.7600	0.4450	-23.6984	53.9899
201602 649	7.9382	19.8187	0.4000	0.6890	-30.9058	46.7823
201602 650	5.6963	19.8187	0.2900	0.7740	-33.1477	44.5403

201602 651	-11.7278	19.8187	-0.5900	0.5540	-50.5717	27.1161
201602 652	-3.6246	19.8186	-0.1800	0.8550	-42.4685	35.2192
201602 653	0.3186	19.8186	0.0200	0.9870	-38.5251	39.1624
201602 654	-6.8694	19.8186	-0.3500	0.7290	-45.7131	31.9744
201602 655	-5.2943	19.8182	-0.2700	0.7890	-44.1374	33.5487
201602 656	-15.4487	19.8180	-0.7800	0.4360	-54.2914	23.3939
201602 657	-10.4575	19.8179	-0.5300	0.5980	-49.3000	28.3849
201602 658	14.8942	19.8178	0.7500	0.4520	-23.9482	53.7365
201602 659	12.1199	19.8178	0.6100	0.5410	-26.7224	50.9621
201602 660	23.7260	19.8178	1.2000	0.2310	-15.1163	62.5682
201602 661	24.8744	19.8178	1.2600	0.2090	-13.9678	63.7167
201602 662	-3.1122	19.8178	-0.1600	0.8750	-41.9545	35.7301
201602 663	-17.1128	19.8178	-0.8600	0.3880	-55.9551	21.7295
201602 664	-10.3122	19.8178	-0.5200	0.6030	-49.1545	28.5301
201602 665	-1.2351	19.8178	-0.0600	0.9500	-40.0774	37.6072
201602 666	-1.9550	19.8178	-0.1000	0.9210	-40.7973	36.8873
201602 667	-10.6895	19.8178	-0.5400	0.5900	-49.5318	28.1528
201602 668	-16.8558	19.8178	-0.8500	0.3950	-55.6981	21.9865
201602 669	-13.4379	19.8178	-0.6800	0.4980	-52.2802	25.4044
201602 670	6.7307	19.8178	0.3400	0.7340	-32.1115	45.5730
201602 671	3.7418	19.8178	0.1900	0.8500	-35.1005	42.5841
201602 672	17.0113	19.8180	0.8600	0.3910	-21.8313	55.8540
201602 673	15.5182	19.8181	0.7800	0.4340	-23.3247	54.3611
201602 674	-10.3995	19.8181	-0.5200	0.6000	-49.2424	28.4434
201602 675	-10.5586	19.8179	-0.5300	0.5940	-49.4011	28.2839
201602 676	-9.7419	19.8179	-0.4900	0.6230	-48.5844	29.1006
201602 677	-5.8624	19.8179	-0.3000	0.7670	-44.7049	32.9801
201602 678	-8.0222	19.8179	-0.4000	0.6860	-46.8647	30.8203
201602 679	-12.5645	19.8179	-0.6300	0.5260	-51.4070	26.2780
201602 680	-14.3906	19.8179	-0.7300	0.4680	-53.2331	24.4519
201602 681	-18.5905	19.8179	-0.9400	0.3480	-57.4329	20.2521
201602 682	2.7275	19.8179	0.1400	0.8910	-36.1150	41.5700
201602 683	0.0000	(omitted)				
201603 648	1.8817	11.1215	0.1700	0.8660	-19.9160	23.6795
201603 649	-16.0914	11.1214	-1.4500	0.1480	-37.8890	5.7063
201603 650	-10.5404	9.4735	-1.1100	0.2660	-29.1082	8.0273
201603 651	-7.0974	9.4734	-0.7500	0.4540	-25.6650	11.4702
201603 652	-12.1249	9.4733	-1.2800	0.2010	-30.6924	6.4425
201603 653	-4.6579	8.5276	-0.5500	0.5850	-21.3718	12.0559
201603 654	-8.9662	8.5275	-1.0500	0.2930	-25.6799	7.7475
201603 655	-7.8594	8.5268	-0.9200	0.3570	-24.5716	8.8528
201603 656	-5.8062	8.5263	-0.6800	0.4960	-22.5175	10.9051
201603 657	-7.1632	8.5261	-0.8400	0.4010	-23.8740	9.5476
201603 658	5.3853	8.5259	0.6300	0.5280	-11.3253	22.0959
201603 659	-11.0851	8.5259	-1.3000	0.1940	-27.7956	5.6254
201603 660	-16.2809	8.5259	-1.9100	0.0560	-32.9914	0.4296

201603 661	13.5344	7.8957	1.7100	0.0870	-1.9410	29.0097
201603 662	-0.7283	6.8401	-0.1100	0.9150	-14.1347	12.6781
201603 663	-5.6485	6.8401	-0.8300	0.4090	-19.0549	7.7579
201603 664	-1.1124	6.6251	-0.1700	0.8670	-14.0974	11.8726
201603 665	11.0267	6.6251	1.6600	0.0960	-1.9583	24.0117
201603 666	10.9869	6.6251	1.6600	0.0970	-1.9980	23.9719
201603 667	0.5797	6.6251	0.0900	0.9300	-12.4052	13.5647
201603 668	0.2340	6.4453	0.0400	0.9710	-12.3987	12.8667
201603 669	-2.8672	6.4453	-0.4400	0.6560	-15.4999	9.7655
201603 670	1.6385	6.4453	0.2500	0.7990	-10.9942	14.2712
201603 671	2.6495	6.4453	0.4100	0.6810	-9.9831	15.2822
201603 672	8.4282	6.4459	1.3100	0.1910	-4.2054	21.0619
201603 673	4.9482	6.4462	0.7700	0.4430	-7.6862	17.5825
201603 674	-2.7166	6.4462	-0.4200	0.6730	-15.3510	9.9177
201603 675	-4.4785	6.4462	-0.6900	0.4870	-17.1129	8.1558
201603 676	-4.1472	6.4462	-0.6400	0.5200	-16.7816	8.4871
201603 677	-5.6127	6.4462	-0.8700	0.3840	-18.2471	7.0216
201603 678	-0.5747	6.4462	-0.0900	0.9290	-13.2091	12.0596
201603 679	0.0939	6.4456	0.0100	0.9880	-12.5392	12.7270
201603 680	-5.4796	6.4456	-0.8500	0.3950	-18.1127	7.1535
201603 681	-5.0507	6.4456	-0.7800	0.4330	-17.6838	7.5824
201603 682	-0.5619	6.4456	-0.0900	0.9310	-13.1950	12.0712
201603 683	0.0000	(omitted)				
201604 648	8.2427	16.4189	0.5000	0.6160	-23.9378	40.4232
201604 649	-0.3599	16.4189	-0.0200	0.9830	-32.5404	31.8205
201604 650	-1.7022	16.4188	-0.1000	0.9170	-33.8826	30.4781
201604 651	-6.9634	16.4188	-0.4200	0.6710	-39.1437	25.2168
201604 652	-9.4970	16.4187	-0.5800	0.5630	-41.6772	22.6832
201604 653	-19.6044	16.4187	-1.1900	0.2320	-51.7844	12.5757
201604 654	-21.4661	16.4187	-1.3100	0.1910	-53.6461	10.7139
201604 655	-16.2649	16.4183	-0.9900	0.3220	-48.4441	15.9143
201604 656	-14.0222	16.4180	-0.8500	0.3930	-46.2009	18.1566
201604 657	-2.2015	16.4179	-0.1300	0.8930	-34.3800	29.9771
201604 658	6.2010	16.4178	0.3800	0.7060	-25.9774	38.3794
201604 659	3.4859	16.4178	0.2100	0.8320	-28.6925	35.6643
201604 660	5.8672	16.4178	0.3600	0.7210	-26.3112	38.0456
201604 661	6.9115	16.4178	0.4200	0.6740	-25.2669	39.0898
201604 662	-0.7127	16.4178	-0.0400	0.9650	-32.8911	31.4657
201604 663	-5.5024	16.4178	-0.3400	0.7380	-37.6808	26.6760
201604 664	-12.7487	16.4178	-0.7800	0.4370	-44.9271	19.4297
201604 665	-20.0999	16.4178	-1.2200	0.2210	-52.2783	12.0784
201604 666	-19.9234	16.4178	-1.2100	0.2250	-52.1018	12.2549
201604 667	-18.1345	11.4427	-1.5800	0.1130	-40.5618	4.2928
201604 668	-14.6402	11.4427	-1.2800	0.2010	-37.0675	7.7871
201604 669	-11.8976	11.4427	-1.0400	0.2980	-34.3249	10.5297
201604 670	-7.9450	11.4427	-0.6900	0.4870	-30.3723	14.4823

201604 671	-4.1840	11.4427	-0.3700	0.7150	-26.6113	18.2433
201604 672	-1.5024	11.4430	-0.1300	0.8960	-23.9302	20.9254
201604 673	-1.3383	11.4431	-0.1200	0.9070	-23.7665	21.0899
201604 674	-9.2602	11.4431	-0.8100	0.4180	-31.6884	13.1680
201604 675	-12.1084	11.4431	-1.0600	0.2900	-34.5366	10.3198
201604 676	-12.9221	11.4431	-1.1300	0.2590	-35.3502	9.5061
201604 677	-12.8324	11.4431	-1.1200	0.2620	-35.2606	9.5958
201604 678	-16.6171	11.4431	-1.4500	0.1460	-39.0453	5.8111
201604 679	-15.6112	11.4432	-1.3600	0.1720	-38.0393	6.8170
201604 680	-13.6053	11.4432	-1.1900	0.2340	-36.0335	8.8229
201604 681	-9.5144	11.4432	-0.8300	0.4060	-31.9426	12.9138
201604 682	-2.9272	11.4432	-0.2600	0.7980	-25.3554	19.5010
201604 683	0.0000	(omitted)				
201605 648	-1.1595	4.0960	-0.2800	0.7770	-9.1875	6.8686
201605 649	-2.0324	4.0959	-0.5000	0.6200	-10.0602	5.9953
201605 650	1.3366	4.0365	0.3300	0.7410	-6.5748	9.2479
201605 651	0.8181	4.0363	0.2000	0.8390	-7.0930	8.7291
201605 652	3.9941	4.0361	0.9900	0.3220	-3.9166	11.9047
201605 653	1.8476	4.0360	0.4600	0.6470	-6.0628	9.7579
201605 654	1.6980	4.0358	0.4200	0.6740	-6.2120	9.6081
201605 655	5.4964	3.9793	1.3800	0.1670	-2.3030	13.2958
201605 656	4.8290	3.9784	1.2100	0.2250	-2.9685	12.6264
201605 657	-0.1888	3.8797	-0.0500	0.9610	-7.7929	7.4152
201605 658	0.8022	3.8794	0.2100	0.8360	-6.8014	8.4058
201605 659	1.7584	3.8794	0.4500	0.6500	-5.8450	9.3618
201605 660	0.0211	3.8794	0.0100	0.9960	-7.5824	7.6245
201605 661	1.5692	3.8351	0.4100	0.6820	-5.9475	9.0858
201605 662	-1.5743	3.7937	-0.4100	0.6780	-9.0098	5.8612
201605 663	-0.0230	3.7216	-0.0100	0.9950	-7.3173	7.2713
201605 664	3.8030	3.7216	1.0200	0.3070	-3.4913	11.0973
201605 665	7.7532	3.7216	2.0800	0.0370	0.4589	15.0475
201605 666	7.0418	3.7216	1.8900	0.0580	-0.2525	14.3361
201605 667	6.1590	3.6869	1.6700	0.0950	-1.0673	13.3853
201605 668	4.2959	3.6541	1.1800	0.2400	-2.8661	11.4579
201605 669	1.2095	3.6541	0.3300	0.7410	-5.9525	8.3714
201605 670	0.4569	3.6541	0.1300	0.9000	-6.7051	7.6189
201605 671	-0.4456	3.6541	-0.1200	0.9030	-7.6076	6.7164
201605 672	-2.0094	3.6550	-0.5500	0.5820	-9.1730	5.1542
201605 673	-2.8753	3.6556	-0.7900	0.4320	-10.0401	4.2895
201605 674	-1.1195	3.6556	-0.3100	0.7590	-8.2843	6.0452
201605 675	-0.4708	3.6556	-0.1300	0.8980	-7.6356	6.6940
201605 676	-0.8915	3.6556	-0.2400	0.8070	-8.0563	6.2733
201605 677	1.8780	3.6556	0.5100	0.6070	-5.2868	9.0427
201605 678	4.0669	3.6554	1.1100	0.2660	-3.0976	11.2314
201605 679	2.5153	3.6554	0.6900	0.4910	-4.6492	9.6798
201605 680	0.9629	3.6554	0.2600	0.7920	-6.2016	8.1274

201605 681	1.3170	3.6554	0.3600	0.7190	-5.8474	8.4815
201605 682	-0.6714	3.6554	-0.1800	0.8540	-7.8359	6.4931
201605 683	0.0000	(omitted)				
ym#c.treatment						
Jan-14	0.0000	(omitted)				
Feb-14	0.0000	(omitted)				
Mar-14	0.0000	(omitted)				
Apr-14	0.0000	(omitted)				
May-14	0.0000	(omitted)				
Jun-14	0.0000	(omitted)				
Jul-14	0.0000	(omitted)				
Aug-14	0.0000	(omitted)				
Sep-14	0.0000	(omitted)				
Oct-14	0.0000	(omitted)				
Nov-14	0.0000	(omitted)				
Dec-14	0.0000	(omitted)				
Jan-15	0.0000	(omitted)				
Feb-15	0.0000	(omitted)				
Mar-15	0.0000	(omitted)				
Apr-15	0.0000	(omitted)				
May-15	0.0000	(omitted)				
Jun-15	0.0000	(omitted)				
Jul-15	0.0000	(omitted)				
Aug-15	0.0000	(omitted)				
Sep-15	0.0000	(omitted)				
Oct-15	0.0000	(omitted)				
Nov-15	0.0000	(omitted)				
Dec-15	0.0000	(omitted)				
Jan-16	-0.6492	0.1732	-3.7500	0.0000	-0.9888	-0.3097
Feb-16	-0.1394	0.1779	-0.7800	0.4330	-0.4880	0.2093
Mar-16	-0.0037	0.1780	-0.0200	0.9830	-0.3525	0.3451
Apr-16	0.0298	0.1780	0.1700	0.8670	-0.3191	0.3787
May-16	0.0013	0.1780	0.0100	0.9940	-0.3477	0.3502
Jun-16	-0.2427	0.1781	-1.3600	0.1730	-0.5917	0.1063
Jul-16	-0.2661	0.1781	-1.4900	0.1350	-0.6151	0.0829
Aug-16	0.1338	0.1780	0.7500	0.4520	-0.2151	0.4827
Sep-16	0.5552	0.1780	3.1200	0.0020	0.2062	0.9041
Oct-16	0.3220	0.1780	1.8100	0.0710	-0.0270	0.6709
Nov-16	-0.0491	0.1782	-0.2800	0.7830	-0.3984	0.3001
Dec-16	-0.2780	0.1784	-1.5600	0.1190	-0.6276	0.0716
_cons	60.8531	0.2086	291.7700	0.0000	60.4443	61.2619

account_id	F(27673,	768730)	=	56.687	0	(27674 categories)

Table D-3: Regression Coefficients for Cohort 3

Linear regression, absorbing indicators			
	Number of obs	=	1080653
	F(107,1032392)	=	3398.45
	Prob > F	=	0
	R-squared	=	0.6972
	Adj R-squared	=	0.683
	Root MSE	=	14.0369

dailykwh	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
ym						
Feb-14	-7.2090	0.3170	-22.7400	0.0000	-7.8302	-6.5878
Mar-14	-17.4844	0.3157	-55.3800	0.0000	-18.1031	-16.8656
Apr-14	-25.4481	0.3145	-80.9100	0.0000	-26.0646	-24.8316
May-14	-32.3283	0.3135	-103.1200	0.0000	-32.9428	-31.7138
Jun-14	-12.7358	0.3123	-40.7900	0.0000	-13.3478	-12.1238
Jul-14	-14.1299	0.3108	-45.4600	0.0000	-14.7391	-13.5207
Aug-14	-24.3918	0.3092	-78.8800	0.0000	-24.9978	-23.7857
Sep-14	-27.2628	0.3077	-88.6000	0.0000	-27.8659	-26.6597
Oct-14	-32.3447	0.3058	-105.7600	0.0000	-32.9441	-31.7453
Nov-14	-16.5474	0.3037	-54.4900	0.0000	-17.1426	-15.9523
Dec-14	-10.7350	0.2790	-38.4700	0.0000	-11.2818	-10.1881
Jan-15	-10.0213	0.2614	-38.3400	0.0000	-10.5335	-9.5090
Feb-15	-4.9926	0.2525	-19.7800	0.0000	-5.4874	-4.4978
Mar-15	-24.0502	0.2466	-97.5200	0.0000	-24.5335	-23.5668
Apr-15	-34.9558	0.2430	-143.8400	0.0000	-35.4321	-34.4795
May-15	-28.2000	0.2403	-117.3500	0.0000	-28.6710	-27.7290
Jun-15	-16.3831	0.2384	-68.7200	0.0000	-16.8504	-15.9159
Jul-15	-13.9528	0.2376	-58.7200	0.0000	-14.4186	-13.4871
Aug-15	-18.1688	0.2376	-76.4600	0.0000	-18.6345	-17.7030
Sep-15	-26.2924	0.2376	-110.6400	0.0000	-26.7581	-25.8266
Oct-15	-32.6655	0.2376	-137.4600	0.0000	-33.1312	-32.1997
Nov-15	-28.5565	0.2376	-120.1700	0.0000	-29.0222	-28.0907
Dec-15	-22.3493	0.2376	-94.0500	0.0000	-22.8151	-21.8836
Jan-16	-10.8935	0.2376	-45.8400	0.0000	-11.3592	-10.4277
Feb-16	-13.3796	0.2376	-56.3000	0.0000	-13.8454	-12.9139
Mar-16	-27.5767	0.2376	-116.0500	0.0000	-28.0425	-27.1110
Apr-16	-31.8538	0.2376	-134.0500	0.0000	-32.3195	-31.3880
May-16	-28.3905	0.2376	-119.4700	0.0000	-28.8562	-27.9248
Jun-16	-17.8520	0.2376	-75.1300	0.0000	-18.3178	-17.3863
Jul-16	-8.1930	0.2376	-34.4800	0.0000	-8.6587	-7.7272
Aug-16	-9.1907	0.2409	-38.1500	0.0000	-9.6628	-8.7186
Sep-16	-20.8542	0.2416	-86.3300	0.0000	-21.3277	-20.3808
Oct-16	-30.6291	0.2416	-126.7800	0.0000	-31.1026	-30.1556
Nov-16	-25.0267	0.2416	-103.5800	0.0000	-25.5003	-24.5532

Dec-16	-19.5811	0.2418	-80.9800	0.0000	-20.0550	-19.1072
dateadded#ym						
201609 648	0.0000	(empty)				
201609 649	0.0000	(empty)				
201609 650	0.0000	(empty)				
201609 651	0.0000	(empty)				
201609 652	0.0000	(empty)				
201609 653	0.0000	(empty)				
201609 654	0.0000	(empty)				
201609 655	0.0000	(empty)				
201609 656	0.0000	(empty)				
201609 657	0.0000	(empty)				
201609 658	0.0000	(empty)				
201609 659	0.0000	(empty)				
201609 660	0.0000	(empty)				
201609 661	0.0000	(empty)				
201609 662	0.0000	(empty)				
201609 663	0.0000	(empty)				
201609 664	0.0000	(empty)				
201609 665	0.0000	(empty)				
201609 666	0.0000	(empty)				
201609 667	-4.1035	17.3701	-0.2400	0.8130	-38.1483	29.9413
201609 668	-5.1369	14.0373	-0.3700	0.7140	-32.6495	22.3757
201609 669	-0.9122	14.0373	-0.0600	0.9480	-28.4248	26.6004
201609 670	1.4807	14.0373	0.1100	0.9160	-26.0320	28.9933
201609 671	6.2951	14.0373	0.4500	0.6540	-21.2175	33.8077
201609 672	-0.4519	14.0373	-0.0300	0.9740	-27.9645	27.0607
201609 673	-2.1778	14.0373	-0.1600	0.8770	-29.6904	25.3348
201609 674	5.9183	14.0373	0.4200	0.6730	-21.5943	33.4310
201609 675	-1.1037	14.0373	-0.0800	0.9370	-28.6163	26.4090
201609 676	2.9598	14.0373	0.2100	0.8330	-24.5528	30.4725
201609 677	2.1426	14.0373	0.1500	0.8790	-25.3700	29.6552
201609 678	-3.0864	14.0373	-0.2200	0.8260	-30.5990	24.4263
201609 679	-5.3158	14.0373	-0.3800	0.7050	-32.8285	22.1969
201609 680	-2.6878	14.0374	-0.1900	0.8480	-30.2005	24.8249
201609 681	3.0747	14.0374	0.2200	0.8270	-24.4381	30.5874
201609 682	3.2291	14.0374	0.2300	0.8180	-24.2837	30.7418
201609 683	0.0000	(omitted)				
201610 648	0.0000	(empty)				
201610 649	0.0000	(empty)				
201610 650	0.0000	(empty)				
201610 651	0.0000	(empty)				
201610 652	0.0000	(empty)				
201610 653	0.0000	(empty)				
201610 654	0.0000	(empty)				

201610 655	0.0000	(empty)				
201610 656	0.0000	(empty)				
201610 657	0.0000	(empty)				
201610 658	0.0000	(empty)				
201610 659	0.0000	(empty)				
201610 660	0.0000	(empty)				
201610 661	0.0000	(empty)				
201610 662	0.0000	(empty)				
201610 663	0.0000	(empty)				
201610 664	0.0000	(empty)				
201610 665	0.0000	(empty)				
201610 666	0.0000	(empty)				
201610 667	8.3844	14.0373	0.6000	0.5500	-19.1282	35.8970
201610 668	8.2948	14.0373	0.5900	0.5550	-19.2178	35.8074
201610 669	7.5292	14.0373	0.5400	0.5920	-19.9835	35.0418
201610 670	7.9927	14.0373	0.5700	0.5690	-19.5199	35.5053
201610 671	9.6343	14.0373	0.6900	0.4920	-17.8783	37.1470
201610 672	3.5676	14.0373	0.2500	0.7990	-23.9450	31.0802
201610 673	3.8109	14.0373	0.2700	0.7860	-23.7018	31.3235
201610 674	8.0511	14.0373	0.5700	0.5660	-19.4615	35.5637
201610 675	6.9897	14.0373	0.5000	0.6190	-20.5229	34.5023
201610 676	11.7776	14.0373	0.8400	0.4010	-15.7350	39.2903
201610 677	4.9375	14.0373	0.3500	0.7250	-22.5752	32.4501
201610 678	4.1582	14.0373	0.3000	0.7670	-23.3545	31.6708
201610 679	21.0180	14.0373	1.5000	0.1340	-6.4947	48.5307
201610 680	15.3397	14.0374	1.0900	0.2740	-12.1730	42.8525
201610 681	22.0652	14.0374	1.5700	0.1160	-5.4475	49.5780
201610 682	13.4817	14.0374	0.9600	0.3370	-14.0310	40.9945
201610 683	0.0000	(omitted)				
201611 648	-10.8646	14.0390	-0.7700	0.4390	-38.3806	16.6514
201611 649	-7.4198	14.0390	-0.5300	0.5970	-34.9358	20.0962
201611 650	-8.4141	14.0390	-0.6000	0.5490	-35.9300	19.1018
201611 651	-10.0220	14.0389	-0.7100	0.4750	-37.5379	17.4938
201611 652	-0.3833	14.0389	-0.0300	0.9780	-27.8991	27.1325
201611 653	-14.2496	14.0389	-1.0200	0.3100	-41.7654	13.2661
201611 654	-15.0151	14.0389	-1.0700	0.2850	-42.5308	12.5005
201611 655	-6.4632	14.0388	-0.4600	0.6450	-33.9788	21.0524
201611 656	-8.6244	14.0388	-0.6100	0.5390	-36.1399	18.8911
201611 657	-6.3627	14.0387	-0.4500	0.6500	-33.8782	21.1527
201611 658	-13.8671	14.0387	-0.9900	0.3230	-41.3824	13.6483
201611 659	-10.5413	14.0381	-0.7500	0.4530	-38.0556	16.9729
201611 660	-6.7795	14.0378	-0.4800	0.6290	-34.2931	20.7340
201611 661	-1.5061	14.0376	-0.1100	0.9150	-29.0193	26.0071
201611 662	-0.6014	14.0375	-0.0400	0.9660	-28.1144	26.9115
201611 663	-5.3080	14.0374	-0.3800	0.7050	-32.8208	22.2048
201611 664	-6.4505	14.0374	-0.4600	0.6460	-33.9633	21.0622

201611 665	-6.7328	14.0373	-0.4800	0.6310	-34.2455	20.7798
201611 666	-6.5681	14.0373	-0.4700	0.6400	-34.0807	20.9446
201611 667	-8.3864	14.0373	-0.6000	0.5500	-35.8991	19.1262
201611 668	-5.8191	14.0373	-0.4100	0.6780	-33.3317	21.6935
201611 669	-3.2926	14.0373	-0.2300	0.8150	-30.8053	24.2200
201611 670	-8.0828	14.0373	-0.5800	0.5650	-35.5955	19.4298
201611 671	-9.8243	14.0373	-0.7000	0.4840	-37.3369	17.6884
201611 672	-7.7086	14.0373	-0.5500	0.5830	-35.2212	19.8041
201611 673	-3.2859	14.0373	-0.2300	0.8150	-30.7985	24.2267
201611 674	-8.1002	14.0373	-0.5800	0.5640	-35.6128	19.4124
201611 675	-4.8020	14.0373	-0.3400	0.7320	-32.3146	22.7107
201611 676	-3.9521	14.0373	-0.2800	0.7780	-31.4648	23.5605
201611 677	-6.6590	14.0373	-0.4700	0.6350	-34.1716	20.8537
201611 678	-7.5887	14.0373	-0.5400	0.5890	-35.1013	19.9239
201611 679	-7.0746	14.0373	-0.5000	0.6140	-34.5874	20.4381
201611 680	-1.5475	14.0374	-0.1100	0.9120	-29.0602	25.9652
201611 681	-1.2430	14.0374	-0.0900	0.9290	-28.7558	26.2697
201611 682	1.1628	14.0374	0.0800	0.9340	-26.3500	28.6755
201611 683	0.0000	(omitted)				
ym#c.treatment						
Jan-14	0.0000	(omitted)				
Feb-14	0.0000	(omitted)				
Mar-14	0.0000	(omitted)				
Apr-14	0.0000	(omitted)				
May-14	0.0000	(omitted)				
Jun-14	0.0000	(omitted)				
Jul-14	0.0000	(omitted)				
Aug-14	0.0000	(omitted)				
Sep-14	0.0000	(omitted)				
Oct-14	0.0000	(omitted)				
Nov-14	0.0000	(omitted)				
Dec-14	0.0000	(omitted)				
Jan-15	0.0000	(omitted)				
Feb-15	0.0000	(omitted)				
Mar-15	0.0000	(omitted)				
Apr-15	0.0000	(omitted)				
May-15	0.0000	(omitted)				
Jun-15	0.0000	(omitted)				
Jul-15	0.0000	(omitted)				
Aug-15	0.0000	(omitted)				
Sep-15	0.0000	(omitted)				
Oct-15	0.0000	(omitted)				
Nov-15	0.0000	(omitted)				
Dec-15	0.0000	(omitted)				
Jan-16	0.0000	(omitted)				

Feb-16	0.0000	(omitted)				
Mar-16	0.0000	(omitted)				
Apr-16	0.0000	(omitted)				
May-16	0.0000	(omitted)				
Jun-16	0.0000	(omitted)				
Jul-16	0.0000	(omitted)				
Aug-16	0.7047	0.1486	4.7400	0.0000	0.4133	0.9960
Sep-16	-0.9327	0.1427	-6.5300	0.0000	-1.2125	-0.6530
Oct-16	-0.5664	0.1427	-3.9700	0.0000	-0.8460	-0.2868
Nov-16	-0.7522	0.1426	-5.2700	0.0000	-1.0318	-0.4727
Dec-16	-1.1420	0.1443	-7.9200	0.0000	-1.4248	-0.8593
_cons	60.7000	0.2284	265.7500	0.0000	60.2524	61.1477
account_id	F(48153,	1032392)	=	41.515	0	(48154 categories)

Table D-4: Regression Coefficients for Cohort R

Linear regression, absorbing indicators		
Number of obs	=	4721115
F(49,4589900)	=	38989.73
Prob > F	=	0
R-squared	=	0.737
Adj R-squared	=	0.7295
Root MSE	=	13.8513

dailykwh	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
ym						
Feb-14	-3.3711	0.0541	-62.3200	0.0000	-3.4772	-3.2651
Mar-14	-15.6923	0.0541	-290.1100	0.0000	-15.7984	-15.5863
Apr-14	-25.6756	0.0541	-474.6700	0.0000	-25.7816	-25.5696
May-14	-22.5164	0.0541	-416.2700	0.0000	-22.6224	-22.4104
Jun-14	-12.3635	0.0541	-228.5700	0.0000	-12.4696	-12.2575
Jul-14	-11.4494	0.0541	-211.6700	0.0000	-11.5554	-11.3434
Aug-14	-13.7384	0.0541	-253.9900	0.0000	-13.8444	-13.6323
Sep-14	-19.3218	0.0541	-357.2100	0.0000	-19.4278	-19.2158
Oct-14	-25.9167	0.0541	-479.1400	0.0000	-26.0227	-25.8107
Nov-14	-17.2881	0.0541	-319.6200	0.0000	-17.3941	-17.1821
Dec-14	-8.6821	0.0541	-160.5100	0.0000	-8.7881	-8.5760
Jan-15	-3.4365	0.0541	-63.5300	0.0000	-3.5425	-3.3305
Feb-15	0.8183	0.0541	15.1300	0.0000	0.7123	0.9243
Mar-15	-16.8362	0.0541	-311.2600	0.0000	-16.9423	-16.7302
Apr-15	-28.8819	0.0541	-533.9600	0.0000	-28.9879	-28.7759
May-15	-23.1261	0.0541	-427.5500	0.0000	-23.2321	-23.0201
Jun-15	-9.2909	0.0541	-171.7700	0.0000	-9.3969	-9.1849
Jul-15	-5.6686	0.0541	-104.8000	0.0000	-5.7746	-5.5626
Aug-15	-11.3893	0.0541	-210.5600	0.0000	-11.4954	-11.2833
Sep-15	-21.5125	0.0541	-397.7200	0.0000	-21.6185	-21.4065
Oct-15	-29.2625	0.0541	-541.0000	0.0000	-29.3685	-29.1565
Nov-15	-25.1655	0.0617	-408.1700	0.0000	-25.2864	-25.0447
Dec-15	-18.4275	0.0651	-283.2800	0.0000	-18.5550	-18.3000
Jan-16	-7.2800	0.0651	-111.8000	0.0000	-7.4076	-7.1524
Feb-16	-9.8706	0.0652	-151.4800	0.0000	-9.9983	-9.7429
Mar-16	-24.5391	0.0652	-376.5500	0.0000	-24.6669	-24.4114
Apr-16	-29.0086	0.0652	-445.1200	0.0000	-29.1363	-28.8808
May-16	-25.1239	0.0652	-385.5200	0.0000	-25.2516	-24.9962
Jun-16	-13.4666	0.0652	-206.6300	0.0000	-13.5943	-13.3389
Jul-16	-4.2260	0.0652	-64.8100	0.0000	-4.3538	-4.0982
Aug-16	-5.5997	0.0652	-85.8700	0.0000	-5.7276	-5.4719
Sep-16	-17.8823	0.0652	-274.2200	0.0000	-18.0101	-17.7545
Oct-16	-28.6773	0.0652	-439.7300	0.0000	-28.8051	-28.5495
Nov-16	-22.5577	0.0652	-345.7500	0.0000	-22.6856	-22.4298
Dec-16	-16.9912	0.0653	-260.3200	0.0000	-17.1191	-16.8632

ym#c.treatment						
Jan-14	0.0000	(omitted)				
Feb-14	0.0000	(omitted)				
Mar-14	0.0000	(omitted)				
Apr-14	0.0000	(omitted)				
May-14	0.0000	(omitted)				
Jun-14	0.0000	(omitted)				
Jul-14	0.0000	(omitted)				
Aug-14	0.0000	(omitted)				
Sep-14	0.0000	(omitted)				
Oct-14	0.0000	(omitted)				
Nov-14	0.0000	(omitted)				
Dec-14	0.0000	(omitted)				
Jan-15	0.0000	(omitted)				
Feb-15	0.0000	(omitted)				
Mar-15	0.0000	(omitted)				
Apr-15	0.0000	(omitted)				
May-15	0.0000	(omitted)				
Jun-15	0.0000	(omitted)				
Jul-15	0.0000	(omitted)				
Aug-15	0.0000	(omitted)				
Sep-15	0.0000	(omitted)				
Oct-15	0.0000	(omitted)				
Nov-15	-0.0552	0.0810	-0.6800	0.4950	-0.2139	0.1035
Dec-15	-0.2298	0.0784	-2.9300	0.0030	-0.3835	-0.0761
Jan-16	-0.3420	0.0784	-4.3600	0.0000	-0.4957	-0.1883
Feb-16	-0.4648	0.0784	-5.9300	0.0000	-0.6184	-0.3112
Mar-16	-0.3584	0.0784	-4.5700	0.0000	-0.5121	-0.2048
Apr-16	-0.2721	0.0784	-3.4700	0.0010	-0.4257	-0.1184
May-16	-0.1546	0.0784	-1.9700	0.0490	-0.3083	-0.0010
Jun-16	0.0120	0.0784	0.1500	0.8790	-0.1417	0.1656
Jul-16	0.1268	0.0784	1.6200	0.1060	-0.0268	0.2804
Aug-16	0.0426	0.0784	0.5400	0.5870	-0.1110	0.1962
Sep-16	-0.1244	0.0784	-1.5900	0.1120	-0.2780	0.0292
Oct-16	-0.3238	0.0784	-4.1300	0.0000	-0.4774	-0.1702
Nov-16	-0.3812	0.0784	-4.8600	0.0000	-0.5349	-0.2275
Dec-16	-0.3381	0.0785	-4.3100	0.0000	-0.4919	-0.1842
_cons	60.6457	0.0382	1585.6200	0.0000	60.5707	60.7207
account_id	F(131165,	4589900)	=	83.519	0	(131166 categories)

Table D-5: Regression Coefficients for Cohort X

Linear regression, absorbing indicators						
				Number of obs	=	571766
				F(54, 555376)	=	3208.58
				Prob > F	=	0
				R-squared	=	0.695
				Adj R-squared	=	0.686
				Root MSE	=	14.585

dailykwh	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
ym						
Feb-14	3.3116	0.2040	16.2300	0.0000	2.9117	3.7115
Mar-14	-4.4739	0.2039	-21.9400	0.0000	-4.8737	-4.0742
Apr-14	-9.8888	0.2037	-48.5500	0.0000	-10.2881	-9.4896
May-14	-16.5353	0.2032	-81.3900	0.0000	-16.9335	-16.1372
Jun-14	-18.2093	0.1936	-94.0300	0.0000	-18.5889	-17.8298
Jul-14	-7.7126	0.1866	-41.3300	0.0000	-8.0784	-7.3468
Aug-14	-7.6490	0.1866	-40.9800	0.0000	-8.0148	-7.2832
Sep-14	-10.3115	0.1866	-55.2500	0.0000	-10.6773	-9.9457
Oct-14	-15.3948	0.1866	-82.4900	0.0000	-15.7605	-15.0290
Nov-14	-22.4188	0.1866	-120.1300	0.0000	-22.7846	-22.0530
Dec-14	-14.2048	0.1866	-76.1100	0.0000	-14.5705	-13.8390
Jan-15	-7.1002	0.1866	-38.0400	0.0000	-7.4660	-6.7345
Feb-15	-4.0733	0.1866	-21.8300	0.0000	-4.4391	-3.7075
Mar-15	-0.7802	0.1866	-4.1800	0.0000	-1.1460	-0.4145
Apr-15	-14.9767	0.1866	-80.2500	0.0000	-15.3425	-14.6109
May-15	-24.4442	0.1866	-130.9800	0.0000	-24.8100	-24.0784
Jun-15	-16.5473	0.1866	-88.6600	0.0000	-16.9131	-16.1815
Jul-15	-3.7487	0.1866	-20.0900	0.0000	-4.1145	-3.3829
Aug-15	-1.0572	0.2078	-5.0900	0.0000	-1.4645	-0.6500
Sep-15	-5.7907	0.2185	-26.5000	0.0000	-6.2190	-5.3625
Oct-15	-15.4010	0.2185	-70.4800	0.0000	-15.8293	-14.9728
Nov-15	-23.6266	0.2185	-108.1300	0.0000	-24.0549	-23.1983
Dec-15	-20.2827	0.2185	-92.8300	0.0000	-20.7109	-19.8544
Jan-16	-14.5286	0.2185	-66.4900	0.0000	-14.9568	-14.1003
Feb-16	-5.5209	0.2185	-25.2700	0.0000	-5.9491	-5.0926
Mar-16	-8.2623	0.2185	-37.8100	0.0000	-8.6906	-7.8341
Apr-16	-20.1217	0.2185	-92.0900	0.0000	-20.5499	-19.6934
May-16	-23.6067	0.2185	-108.0400	0.0000	-24.0350	-23.1785
Jun-16	-19.3082	0.2185	-88.3700	0.0000	-19.7364	-18.8799
Jul-16	-7.7339	0.2185	-35.4000	0.0000	-8.1621	-7.3056
Aug-16	2.3526	0.2185	10.7700	0.0000	1.9243	2.7808
Sep-16	1.0863	0.2185	4.9700	0.0000	0.6581	1.5146
Oct-16	-11.8743	0.2185	-54.3400	0.0000	-12.3026	-11.4461
Nov-16	-22.8125	0.2185	-104.4000	0.0000	-23.2407	-22.3842
Dec-16	-18.2100	0.2186	-83.3100	0.0000	-18.6384	-17.7816

Jan-17	-13.3789	0.2189	-61.1200	0.0000	-13.8080	-12.9499
ym#c.treatment						
Jan-14	0.0000	(omitted)				
Feb-14	0.0000	(omitted)				
Mar-14	0.0000	(omitted)				
Apr-14	0.0000	(omitted)				
May-14	0.0000	(omitted)				
Jun-14	0.0000	(omitted)				
Jul-14	0.0000	(omitted)				
Aug-14	0.0000	(omitted)				
Sep-14	0.0000	(omitted)				
Oct-14	0.0000	(omitted)				
Nov-14	0.0000	(omitted)				
Dec-14	0.0000	(omitted)				
Jan-15	0.0000	(omitted)				
Feb-15	0.0000	(omitted)				
Mar-15	0.0000	(omitted)				
Apr-15	0.0000	(omitted)				
May-15	0.0000	(omitted)				
Jun-15	0.0000	(omitted)				
Jul-15	0.0000	(omitted)				
Aug-15	-0.5503	0.2394	-2.3000	0.0220	-1.0195	-0.0810
Sep-15	-0.5749	0.2352	-2.4400	0.0150	-1.0358	-0.1139
Oct-15	-0.1500	0.2352	-0.6400	0.5230	-0.6110	0.3109
Nov-15	-1.3555	0.2352	-5.7600	0.0000	-1.8164	-0.8945
Dec-15	-2.1480	0.2352	-9.1300	0.0000	-2.6090	-1.6871
Jan-16	-2.3791	0.2352	-10.1200	0.0000	-2.8400	-1.9182
Feb-16	-2.0279	0.2352	-8.6200	0.0000	-2.4888	-1.5670
Mar-16	-1.7111	0.2352	-7.2800	0.0000	-2.1720	-1.2502
Apr-16	-1.7798	0.2352	-7.5700	0.0000	-2.2407	-1.3189
May-16	-1.4600	0.2352	-6.2100	0.0000	-1.9210	-0.9991
Jun-16	-0.9072	0.2352	-3.8600	0.0000	-1.3681	-0.4463
Jul-16	-1.1785	0.2352	-5.0100	0.0000	-1.6394	-0.7176
Aug-16	-0.6048	0.2352	-2.5700	0.0100	-1.0657	-0.1439
Sep-16	-0.0557	0.2352	-0.2400	0.8130	-0.5166	0.4052
Oct-16	-0.4034	0.2352	-1.7200	0.0860	-0.8643	0.0575
Nov-16	-0.7194	0.2352	-3.0600	0.0020	-1.1803	-0.2584
Dec-16	-1.8585	0.2353	-7.9000	0.0000	-2.3196	-1.3973
Jan-17	-2.0379	0.2381	-8.5600	0.0000	-2.5046	-1.5712
_cons	52.9484	0.1474	359.1200	0.0000	52.6594	53.2373

account_id	F(16335,	555376)	=	66.827	0	(16336 categories)

Appendix F Awareness and Engagement

The increased engagement and awareness generated by the MyHER program can be difficult to measure. Nexant designed a survey approach that measures different aspects of the MyHER effect, but no one survey question can fully capture the numerous and subtle effects of MyHER that ultimately resulted in the observed energy impacts. Instead, one might expect the overall pattern of survey responses to signal a difference in behavior and attitudes between the MyHER treatment and control group.

Nexant developed a framework for measuring this pattern of MyHER influence by applying straightforward statistical concepts to develop a holistic look at the program's influence on customer behavior. While a single survey question may not result in statistically significant differences between the treatment and control group, if the treatment group responds more favorably than the control group to a set of survey questions, then we can estimate the probability that the collection of responses fits a hypothesis of MyHER influence.

Consider a series of coin flips. What is the probability of obtaining 27 heads in 47 coin flips if there is a 50/50 chance of obtaining a heads or tails on any one coin flip? This same principle can be applied to the survey: what is the probability that the treatment group gives a more favorable response to 27 out of 47 survey questions if MyHER has no influence on customer awareness and attitudes about energy efficiency?

Nexant assigned each survey question a category. Table F-1 shows the categories, the count of questions in each category for which the treatment group provided a more favorable response than the control group, and the number of questions in each category. A response is considered "favorable" if the treatment group gave a response that is consistent with the program objectives of MyHER.

Table F-1: Classification of Survey Responses and Treatment Group "Success Rate"

Question Category	Count of Questions where T>C	Number of Questions in Topic Area	Portion of Questions where T>C
Duke Energy's Public Stance on Energy Efficiency	3	3	100%
Customer Engagement with Duke Energy Website	4	6	67%
Customers' Reported Energy-saving Behaviors	1	7	14%
Customers' Past & Future Equipment Purchases	7	16	44%
Customer Motivation, Engagement & Awareness of Energy Efficiency	9	11	82%
Customer Satisfaction with Duke Energy	3	4	75%
Total	**27**	**47**	**57%**

If the MyHER program had no effect on participants' awareness, attitudes, and opinions, then we would expect the control group to score better than the treatment group on approximately half of the survey questions. The treatment group provided answers consistent with a MyHER treatment effect in approximately 57% of the survey questions. Using standard statistical techniques (specifically, the non-parametric sign test), Nexant calculated the probability of randomly obtaining this result is 7%. Nexant concludes that the overall pattern of survey responses indicate that MyHER moderately affects DEP customers' behaviors, opinions, attitudes, and level of engagement with energy efficiency. Specifically, the statistical test shows that, overall, we reject the hypothesis that the MyHER has no effect on customer' behaviors, opinions, attitudes and level of engagement with energy efficiency with 90% confidence. These survey responses indicate that, at DEP, MyHER's strengths lie in positively affecting customers' perception of Duke Energy's public stance on energy efficiency, customers' motivation, engagement, and awareness of energy efficiency, and customer satisfaction.

Appendix G Review of Ex-ante Savings Estimates Memo

February 10, 2016

To: Benjamin Lowe, Melinda Goins, Rose Stoeckle, Jean Williams; Duke Energy
From: Rush Childs, Mike Sullivan; Nexant
CC: Jim Herndon, Patrick Burns, Dulane Moran; Nexant
RE: Review of Ex-Ante Savings Assumptions – DEC & DEP

Background

Duke Energy has retained Nexant to perform an impact and process evaluation of its MyHER program in Duke Energy Carolinas (DEC) and Duke Energy Progress (DEP) jurisdictions. The evaluation period of performance will be May 2015 through April 2016 for both jurisdictions. This memorandum is pursuant to Milestone D of the Statement of Work for the evaluation – "Review of Ex Ante Estimated/Deemed Savings Assumptions". The MyHER program is an energy awareness and conservation initiative that provides participating homes with reports eight times per year that compare their energy consumption to comparable homes and provide recommendations for saving energy. The review presented in this memo is based on evaluations conducted in other jurisdictions as well as files describing energy consumption for treatment and control groups provided to Nexant by Duke for a 2015 sample size simulation analysis. A brief description of these files is included below.

1) **MyHER deemed savings report DEI DEO DEK DEC 02 01 2015.xlsx.** The savings assumptions shown in Table G-1 were taken from this spreadsheet.

Table G-1: DEC and DEP MyHER Ex-Ante Savings Assumptions

State	Measure Name	Annual kWh Gross w/o losses	Saved Summer Coincident kW w/o losses	Annual non-coincident kW w/o losses	Measure Life	Free Rider %
SC	My Home Energy Report (EMV 11.1.13)	183.7	0.0389	0.0572	1	0.00%
NC	My Home Energy Report (EMV 11.1.13)	183.7	0.0389	0.0572	1	0.00%

2) **Program Year 2 (2012-2013) EM&V Report for the Residential Energy Efficiency Benchmarking Program.** This previous evaluation report was submitted in 2014 and examined impacts of an HER offering from a different vendor on approximately 60,000 households.

3) **Process and Impact Evaluation of the My Home Energy Report (MyHER) Program in the Carolina System.** This previous evaluation was submitted in February 2014 and is the basis of the 183.7 kWh per home savings estimate in Table G-1.

4) **DEC and DEP Sample Composition and Size Analysis - Data Request Response.** On June 5, 2015 Nexant requested a participant list and billing history of each account in the MyHER control and treatment group in the Carolinas. The intent of this data request was to examine the relationship between control group size and the precision of MyHER impact estimates. Ultimately, Nexant recommended a reduction in the control group size for both jurisdictions and Duke implemented the control group release in October 2015. This data set provided useful information about the average electric consumption per home and early indication of the magnitude of savings.

5) **My Home Energy Report Program Evaluation.** This report was submitted in September 2015 and summarized Nexant's evaluation of MyHER in DEO service territory.

Benchmarking

The 184 kWh/year average impact per treatment customer claimed by Duke in the Carolinas is comparable to other deployments of home energy report programs across the United States. Table G-2 shows energy savings estimates from 12 other HER deployments, including two in the Duke Energy system. Although this type of summary information can be deceptive because it does not account for differences in the types of homes targeted, duration of exposure, heating fuel saturations, or weather, it indicates that 184 kWh per home annually is a comfortably in the middle of the annual impact estimates observed in other jurisdictions.

Table G-2: Annual Impact Estimates from HER Deployments

Utility	Implementation Period	# of Treatment Customers	Annual kWh per Treated Home
Pennsylvania Power & Light	June 2012-May 2013	93,924	388
AEP Ohio	2012	197,646	377
Puget Sound Energy	2013	40,000	325
Com-Ed	June 2010-May 2011	45,171	282
Indianapolis Power & Light Company	March 2012-February 2013	25,000	266
Duke Energy Ohio	March 2014-February 2015	299,000	256
Connexus Energy	March 2009-January 2010	40,000	229
Indiana Michigan Power	May 2012-December 2012	47,987	200
FirstEnergy Ohio	2013	73,000	175
Ameren Illinois	August 2010-November 2011	198,494	159
Duke Energy Indiana	August 2014-July 2015	~140,000	~150[1]
Pacific Gas & Electric	2014	1,017,692	104

[1] The DEI MyHER impact estimate is still preliminary at the time this memo was drafted and may change based on the QA\QC process

Because of the differences in pre-treatment electric consumption across jurisdictions and HER deployments it is helpful to also consider impacts on a relative or percent reduction basis. Nexant examined the average billed consumption for members of the DEC and DEP MyHER control groups in 2013 and 2014 and found that DEP homes have higher average consumption than DEC homes. Figure G-1 shows the average billed kWh by month for the two jurisdictions as well as the number of control group homes analyzed. The DEP average consumption is higher in all 24 months.

Figure G-1: Baseline Consumption Comparison

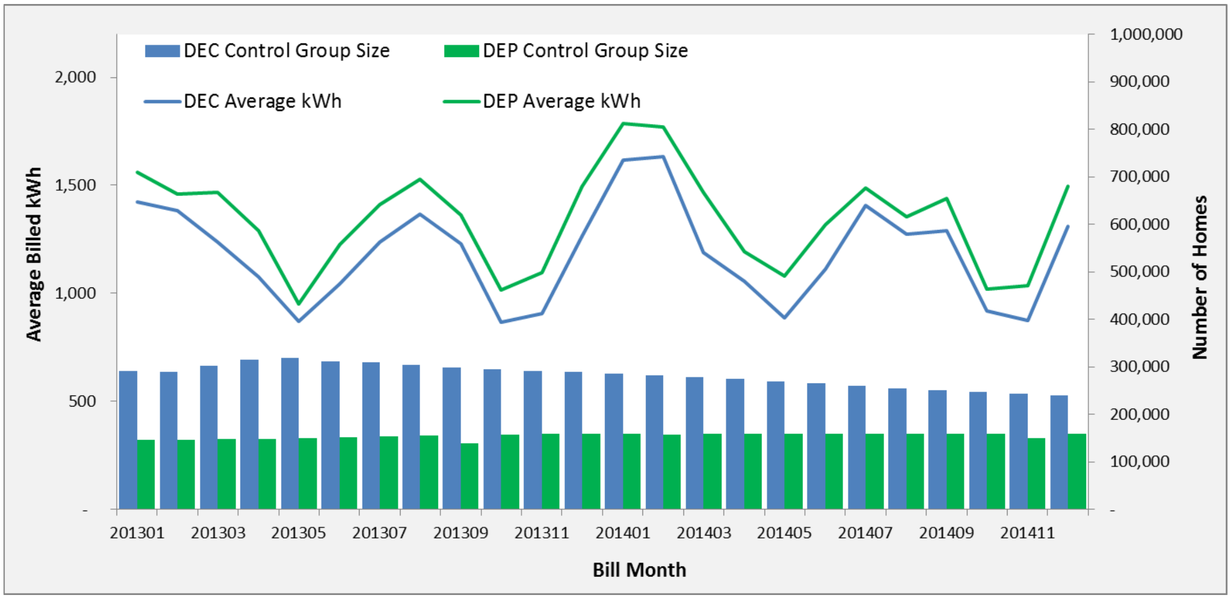


Table G-3 provides the average annual control group consumption by year for DEC and DEP in addition to a two-year average. The ex-ante savings claim of 183.7 kWh per home represents a 1.29% reduction in consumption for DEC and a 1.14% reduction in consumption for DEP. HER studies generally reveal a percent reduction between 1% and 2%, so the Carolinas ex-ante savings claim appears relatively conservative.

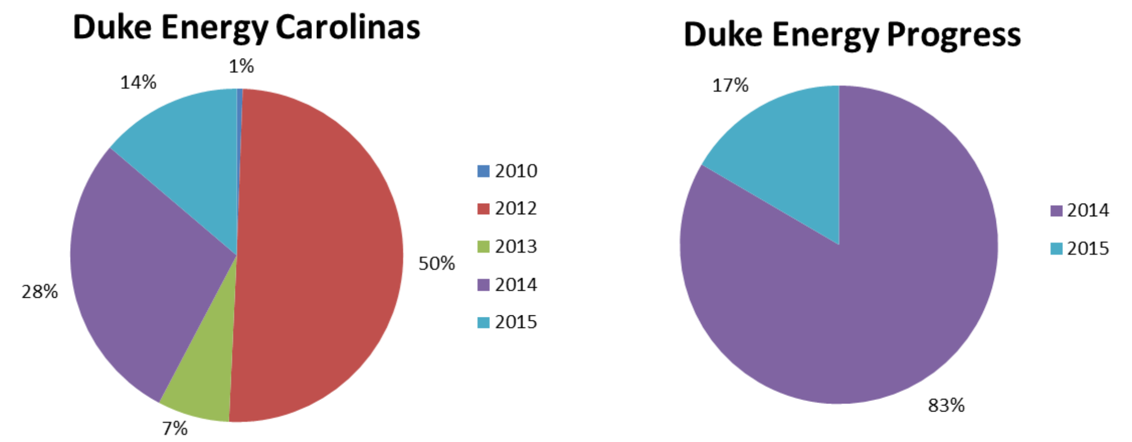
Table G-3: Average Annual Control Group Consumption by Jurisdiction

Year	DEC	DEP
2013	13,902	15,862
2014	14,569	16,445
Two Year Average	**14,235**	**16,154**

Duration of Exposure

While MyHER participants in DEP service territory have a higher average electric consumption, the MyHER program is more mature in DEC territory. Half of the MyHER treatment group in DEC territory has been receiving MyHER since fall 2012, while MyHER wasn't broadly rolled out in DEP until December 2014. Figure G-2 shows the shares of each jurisdiction's treatment group that began receiving MyHER in each year 2010-2015.

Figure G-2: Distribution of MyHER Treatment Group by Year of First MyHER Mailer



Nexant's evaluation of MyHER impacts in DEO service territory found a clear upward trend in the magnitude of savings as the duration of exposure increased. This finding is consistent with most other multi-year evaluations of HER impacts across North America. Table G-4 shows the average kWh impact for homes in the DEO treatment group that received MyHER consistently from beginning of 2012. Each year the kWh savings increase by more than 50 kWh over the previous year.

Table G-4: Increasing Effect of MyHER over Time (MyHER DEO)

Year	Average Observed kWh Savings per Home	HDD (Base 65 F)	CDD (Base 65 F)
2012	110	4,199	1,439
2013	168	5,029	1,150
2014	220	5,438	1,077

Nexant's analysis to date of MyHER impacts in DEI territory also supports the correlation between duration of exposure and average kWh per home. The homes in DEI who have been receiving MyHER since 2012 produce average annual[2] impacts over 200 kWh per home, while the large group of homes assigned to MyHER in February 2014 averaged less than 150 kWh per home. If the expected relationship between duration of exposure and kWh impacts holds true in the Carolinas, we would expect to see a larger average treatment effect (on a % basis) in DEC territory than DEP.

Control Group Release

The shares presented in Figure G-2 were calculated after fairly large change in the MyHER group composition that occurred in the middle of the evaluation period of performance. In October 2015 approximately 72,000 homes in DEP and 147,000 homes in DEC were released from the MyHER control group to the treatment group and began receiving MyHER mailers[3].

[2] The DEI period of performance analyzed by Nexant is August 2014 through July 2015

[3] For the period May to October 2015, the share of homes that began receiving treatment in 2015 would be lower than what is presented in Figure 5-2

While this control group release increases the number of homes receiving MyHER, it likely dilutes the average per home impact because the average duration of exposure of homes in the DEC and DEP treatment groups was reduced for November 2015 through April 2016. In both jurisdictions approximately 10% of the treatment group from November 2015 to April 2016 will consist of homes that are new to MyHER and should be expected to have modest savings levels as they will be in the first six months of treatment.

Previous Evaluation

Nexant also reviewed the previous impact evaluation reports and found no methodological issues that would compromise the findings. However, there are some important programmatic changes that limit the applicability of findings on a forward looking basis.

1) The previous DEP evaluation conducted by Navigant (*Program Year 2 (2012-2013) EM&V Report for the Residential Energy Efficiency Benchmarking Program)* found an average per home annual impact of 260 kWh. During the period analyzed the program was much smaller than its current scope in DEP at approximately 60,000 treatment group homes. The HER vendor for this period was also different with Opower implementing the program rather than Tendril. This evaluation found a difference in savings for the two waves of homes consistent with previous discussions about duration of exposure. The Initial Wave of homes produced average savings of 1.63% (280 kWh) while the Refill Wave that began treatment 18 months later produced average savings of 1.22% (172 kWh).

2) The previous DEC evaluation conducted by TecMarket Works and Integral Analytics (*Process and Impact Evaluation of the My Home Energy Report (MyHER) Program in the Carolina System)* was the basis of the 183.7 kWh per home ex-ante savings. This analysis examined the impacts from June 2012 (SC) and October 2012 (NC) to August 2013 and included approximately 750,000 treatment group homes. The homes analyzed in this previous evaluation represent approximately half of the total DEC treatment group homes Nexant will be analyzing so it is a good indicator of expected impacts. These 750,000 homes will have been exposed to the program for several additional years so their average impacts would be expected to increase. DEC treatment groups that have been added since the previous evaluation will have a shorter duration of exposure and may offset the expected gains from Legacy homes.

Both evaluations utilized a linear fixed effects regression (LFER) model to estimate the treatment effect using billed consumption data provided by Duke. Nexant reviewed the methodology and results presented in the two reports and found no methodological concerns with the approach taken that would cast doubt on the resulting impact estimates. In both the cases, it is important to remember that the current program composition is very different from what was studied previously.

Randomization

In December 2014 the current DEP MyHER program was launched and the DEC MyHER program was expanded substantially. The kWh savings observed among these waves of homes assigned to MyHER will be critical to the results of the upcoming evaluation as they make up approximately 30% of the current DEC treatment group and over 80% of the current DEP treatment group. Fortunately a large number of homes were randomly assigned to the control group at the same time.

Figure G-3 compares the usage of the DEC treatment and control groups added in December 2014 for each month in 2014 (before anyone received a MyHER report). Figure G-4 provides a similar comparison for DEP homes assigned to MyHER in December 2014. The dark blue box extends from the 25th percentile to the 75th percentile and the small vertical line is the median. Both plots show that electric consumption patterns of the treatment and control groups are very well aligned. This high quality randomization will minimize the degree to which the regression analysis will need to control for pre-existing differences and produce highly defensible impact estimates.

Figure G-3: Comparison of 2014 Usage for December 2014 DEC Assignments

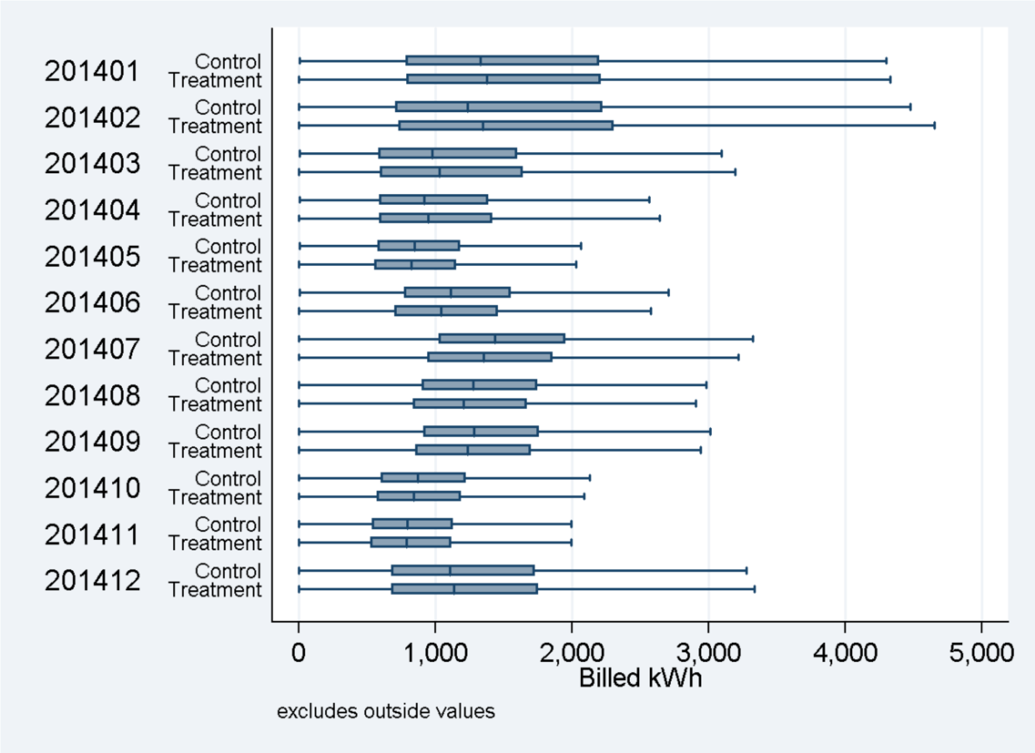
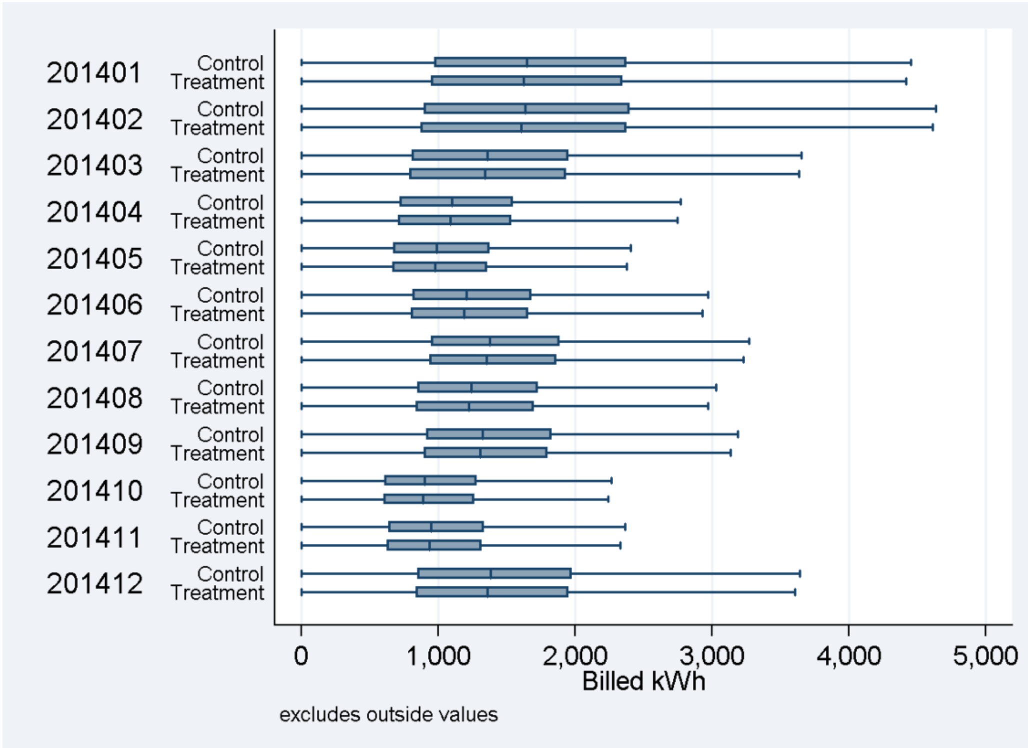


Figure G-4: Comparison of 2014 Usage for December 2014 DEP Assignments



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EM&V Report for the Small Business Energy Saver Program

Duke Energy Progress and Duke Energy Carolinas

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September 27, 2016
Revised June 6, 2017

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1. EVALUATION SUMMARY

1.1 Program Summary

The Small Business Energy Saver (SBES) Program is part of a portfolio of energy efficiency programs operated by Duke Energy. Duke Energy selected Lime Energy to implement the SBES program again in the Duke Energy Progress (DEP) jurisdiction, as well as the Duke Energy Carolinas (DEC) jurisdiction for this evaluation cycle. The program caters specifically to small business customers and offers a performance-based incentive up to 80 percent of the total project cost, inclusive of both materials and installation, on high-efficiency lighting and refrigeration equipment.

The SBES Program generates energy savings and peak demand reductions by offering eligible customers a streamlined service including marketing outreach, technical expertise, and performance incentives to reduce equipment and installation costs from market rates on high-efficiency lighting, refrigeration, and HVAC equipment. The SBES Program seeks to bundle all eligible measures together and sell them as a single project in order to maximize the total achievable energy and demand savings, while working with customers to advise equipment selection to meet their unique needs.

1.2 Evaluation Objectives and High Level Findings

Evaluation, Measurement, and Verification (EM&V) involves the use of a variety of analytic approaches, including on-site verification of installed measures and application of engineering models. EM&V also encompasses an evaluation of program processes and customer feedback, typically conducted through participant surveys and program staff interviews. This report details the EM&V activities that Navigant Consulting, Inc. (Navigant) performed on behalf of Duke Energy for the SBES Program.

This report covers EM&V activities performed for projects covering the following periods, referenced simply as PY2015 for the remainder of this report:

- January 1, 2015 through February 29, 2016 (DEP)
- August 1, 2014 (program start) through February 29, 2016 (DEC)

The primary purpose of the evaluation assessment is to estimate net annual energy and peak demand impacts associated with SBES activity. Net savings are calculated as the reported “gross” savings from Duke Energy, verified and adjusted through EM&V, and netted for free ridership (i.e., savings that would have occurred even in the absence of the program) and spillover (i.e., additional savings attributable to the program but not captured in program records).

The EM&V assessment of the SBES program included impact and process evaluations.

- The impact evaluation consisted of engineering analysis and on-site field verification and metering to validate energy and demand impacts of reported measure categories, as well as a customer survey to assess net impacts.
- The process evaluation used customer surveys with 151 participants and interviews with program staff and the implementation contractor to characterize the program delivery and identify opportunities to improve the program design and processes. The customer survey data also formed the basis of the evaluation team’s estimation of free ridership and spillover, used to calculate an NTG ratio.

The evaluation team verified gross energy savings at 111 percent of deemed reported energy savings for DEP and 112 percent for DEC, and gross peak demand reductions at 96 percent for DEP and DEC. A net-to-gross (NTG) ratio was estimated at 1.03, yielding total verified net energy savings of 55,947 megawatt-hours (MWh) for DEP and 89,506 MWh for DEC, and net peak demand reductions of 11.5 megawatts (MW) for DEP and 20.4MW for DEC (Table 1-1 through Table 1-4).

Table 1-1. Program Claimed and Evaluated Gross Energy Impacts

	Jurisdiction	Claimed	Evaluated	Realization Rate
Gross Energy Impacts (MWh)	DEP	48,772	54,318	1.11
Gross Energy Impacts (MWh)	DEC	77,269	86,899	1.12

Source: Navigant analysis and Duke Energy tracking data.

Table 1-2. Program Claimed and Evaluated Gross Peak Demand Impacts

	Jurisdiction	Claimed	Evaluated	Realization Rate
Gross Summer Peak Demand Impacts (MW)	DEP	11.7	11.2	0.96
Gross Winter Peak Demand Impacts (MW)	DEP	11.7	6.2	0.53
Gross Summer Peak Demand Impacts (MW)	DEC	20.5	19.8	0.96
Gross Winter Peak Demand Impacts (MW)	DEC	20.5	10.9	0.53

Source: Navigant analysis and Duke Energy tracking data.

Table 1-3. Program Net Energy Impacts

	Jurisdiction	MWh
Net Energy Impacts (MWh)	DEP	55,947
Net Energy Impacts (MWh)	DEC	89,506

Source: Navigant analysis.

Table 1-4. Program Net Peak Demand Impacts

	Jurisdiction	MW
Net Summer Peak Demand Impacts (MW)	DEP	11.5
Net Winter Peak Demand Impacts (MW)	DEP	6.4
Net Summer Peak Demand Impacts (MW)	DEC	20.4
Net Winter Peak Demand Impacts (MW)	DEC	11.2

Source: Navigant analysis.

1.3 Evaluation Parameters and Sample Period

To accomplish the evaluation objectives, Navigant performed a variety of primary and secondary research activities including:

- Engineering review of measure savings algorithms
- Field verification and metering to assess installed quantities and characteristics
- Participant surveys with customers to assess satisfaction and decision-making processes.

Table 1-5 summarizes the evaluated parameters. The targeted sampling confidence and precision for both DEP and DEC was 90 percent ± 10 percent, and the achieved was 90 percent ± 7.0 percent for energy savings, 8.5 percent for summer and 12.4 percent for winter peak demand reductions.[1]

Table 1-5. Evaluated Parameters

Evaluated Parameter	Description	Details
Efficiency Characteristics	Inputs and assumptions used to estimate energy and demand savings	1. Lighting wattage 2. Operating hours 3. Coincidence factors 4. HVAC interactive effects 5. Baseline characteristics
In-Service Rates	The percentage of program measures in use as compared to reported	1. Measure quantities found onsite
Satisfaction	Customer satisfaction with various stages of their project	1. Overall satisfaction with program 2. Satisfaction with implementation and installation contractors 3. Satisfaction with program equipment
Free Ridership	Fraction of reported savings that would have occurred in the absence of the program	
Spillover	Additional, non-reported savings that occurred as a result of participation in the program	

Source: Navigant analysis

[1] Navigant designed the impact sample to achieve 90/10 confidence and precision using the industry-standard coefficient of variation of 0.5 and results from previous (PY2013 and PY2014) SBES program evaluations in the DEP jurisdiction. The sample quotas were met as planned, and the final precision was different due to natural variation in individual site level characteristics.

This evaluation covers program participation from August 2014 through February 2016. Table 1-6 shows the start and end dates of Navigant's sample period for evaluation activities.

Table 1-6. Sample Period Start and End Dates

Activity	Start Date	End Date
Field Verification and metering	March 15, 2016	April 22, 2016
Participant Phone Surveys	May 3, 2016	May 5, 2016

Source: Navigant analysis

1.4 Recommendations

The evaluation team recommends five discrete actions for improving the SBES Program, based on insights gained through the comprehensive evaluation effort. These recommendations provide Duke Energy with a roadmap to fine-tune the SBES Program for continued success and include the following broad objectives. Table 1-7 summarizes these program recommendations.

Table 1-7. Summary of PY2015 SBES Recommendations

Increasing Program Participation
1. **Continue to emphasize non-energy benefits** of program participation, such as increased lighting quality, comfort for both business employees and customers, environmental benefits, and reduced maintenance. Now that the program has transitioned primarily to LED measures, increased education on the benefits that LED measures offer should enhance participation.
Increasing Customer Satisfaction
2. **Continue to prioritize customer satisfaction through installation contractor training and customer follow-up services**. The IC has improved in this area from PY2014, but a minority of customers are still reporting issues with installation and communication. Additionally, some customers are not perceiving savings on their electric bill, so managing this expectation would enhance customer satisfaction.
3. **Phase out fluorescent T8 lighting systems**. Linear LED lighting offers substantial savings above high-performance/reduced wattage T8 lamps and ballasts, which may be perceived as outdated.
Improving Accuracy of Reported Savings
4. **Add HVAC interactive effects and update coincidence factors for lighting measures**. This is the key impact finding to improve the accuracy of savings estimates. The IC should apply relevant HVAC interactive effects and coincidence factors to lighting measures as is appropriate, and ensure that outdoor lighting measures on daylight sensors do not accrue peak demand reductions during summer daylight hours.
5. **Ensure that efficient lighting power ratings for linear LED systems are accurate**. Navigant did not perform live measurements of connected linear LED systems to determine power draw, and upon review of manufacturer specifications for lighting power there are different wattages that the system may draw depending on the specific configuration. As the share of savings attributed to linear LED systems grow, this should be quantified to reduce EM&V risk in future years.

Source: Navigant analysis

2. PROGRAM DESCRIPTION

The Small Business Energy Saver (SBES) Program is part of a portfolio of energy efficiency programs operated by Duke Energy. The program began as a pilot in early 2013 in South Carolina before expanding into the remainder of the Duke Energy Progress (DEP) jurisdiction. The program further expanded into the Duke Energy Carolina (DEC) jurisdiction in August 2014. In 2015, the program showed continued growth compared to 2014 measured by both participant count and claimed energy savings and peak demand reductions.

2.1 Program Design

The SBES Program is available to qualifying commercial customers with less than 100 kilowatts (kW) demand service. The SBES Program recognizes that customers with lower savings potential may benefit from a streamlined, one-stop, turnkey delivery model and relatively high incentives to invest in energy efficiency. Additionally, small businesses may lack internal staffing dedicated to energy management and can benefit from energy audits and installations performed by an outside vendor.

The program offers incentives in the form of a discount for the installation of measures, including high-efficiency lighting and refrigeration equipment. These incentives increase adoption of efficient technologies beyond what would occur naturally in the market. In PY2015, the SBES Program (IC) achieved the majority of program savings from lighting measures, which tend to be the most cost-effective and easiest to market to potential participants. The IC also achieved program savings from refrigeration measures at a similar level to PY2014.

The program offers a performance-based incentive up to 80 percent of the total project cost, inclusive of both materials and installation. Multiple factors drive the total project cost, including selection of equipment and unique installation requirements.

2.2 Reported Program Participation and Savings

Duke Energy maintains a tracking database that identifies key characteristics of each project, including participant data, installed measures, and estimated energy and peak demand reductions based on assumed (“deemed”) savings values. In addition, the IC maintains a tracking database that contains additional measure level details that are useful for EM&V activities. For PY2015 Navigant only reviewed the IC database. Duke Energy ensured that the IC database savings accurately represent all claimed program savings.

Table 2-1 provides a summary of the gross reported energy and demand savings and participation for PY2013 through PY2015. Note the significant year over year growth for PY2015, along with an increase in average measures installed per project and average savings per project.

Table 2-1. Reported Participation and Gross Savings Summary

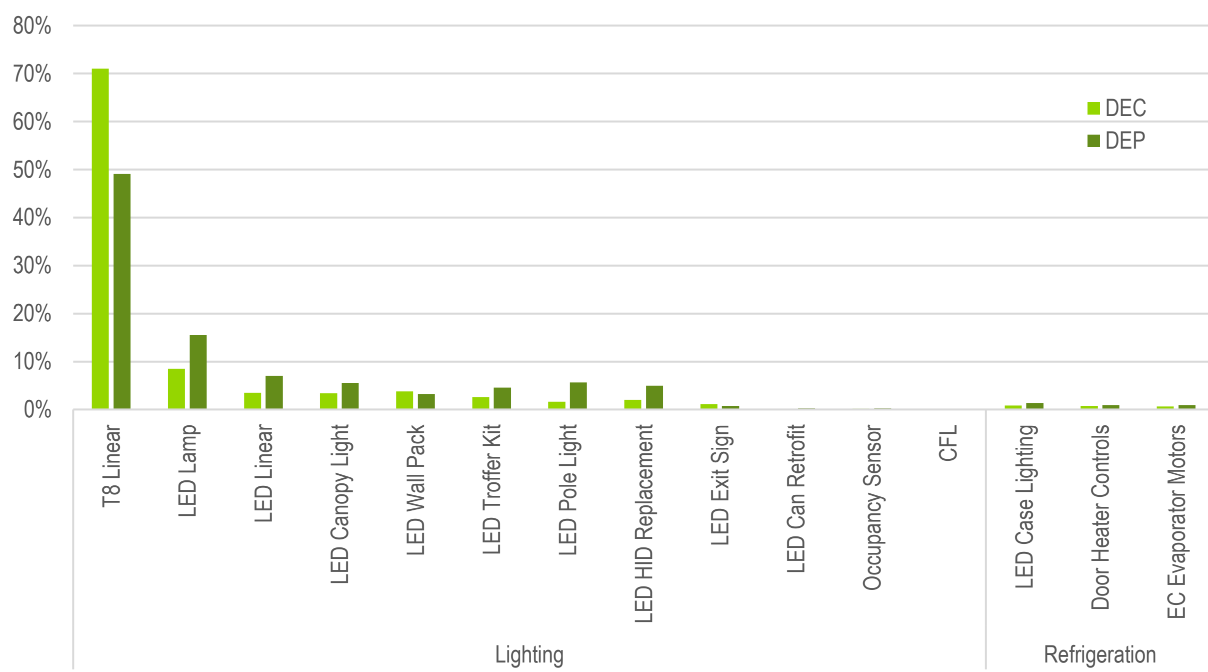
Reported Metrics	PY2013 (DEP)	PY2014 (DEP)	PY2015 (DEP)	PY2015 (DEC)
Participants	675	1,759	1,790	3,080
Measures Installed	42,537	108,816	132,977	234,788
Gross Annual Energy Savings (MWh)	14,242	38,665	48,772	77,269
Average Quantity of Measures per Project	63	62	74	76
Average Gross Savings Per Project (MWh)	21.1	22.0	27.2	25.1

Source: SBES Tracking Database

2.2.1 Program Summary by Measure

Efficient T8 lighting retrofits were the highest contributor to program energy savings in PY2015 across both jurisdictions, followed by a variety of LED lighting measures. In addition, refrigeration measures, compact fluorescent lamps (CFLs), and occupancy sensors also contributed to savings. Navigant found a higher share of savings from T8 fluorescent retrofits in the DEC jurisdiction, likely due to the fall and winter 2014 projects that were part of this evaluation cycle. The SBES program has rapidly adopted LED lighting products in PY2015. Figure 2-1 shows the reported gross savings by measure category as reported by Duke Energy.

Figure 2-1. Reported Gross Energy Savings by Measure Category and Jurisdiction

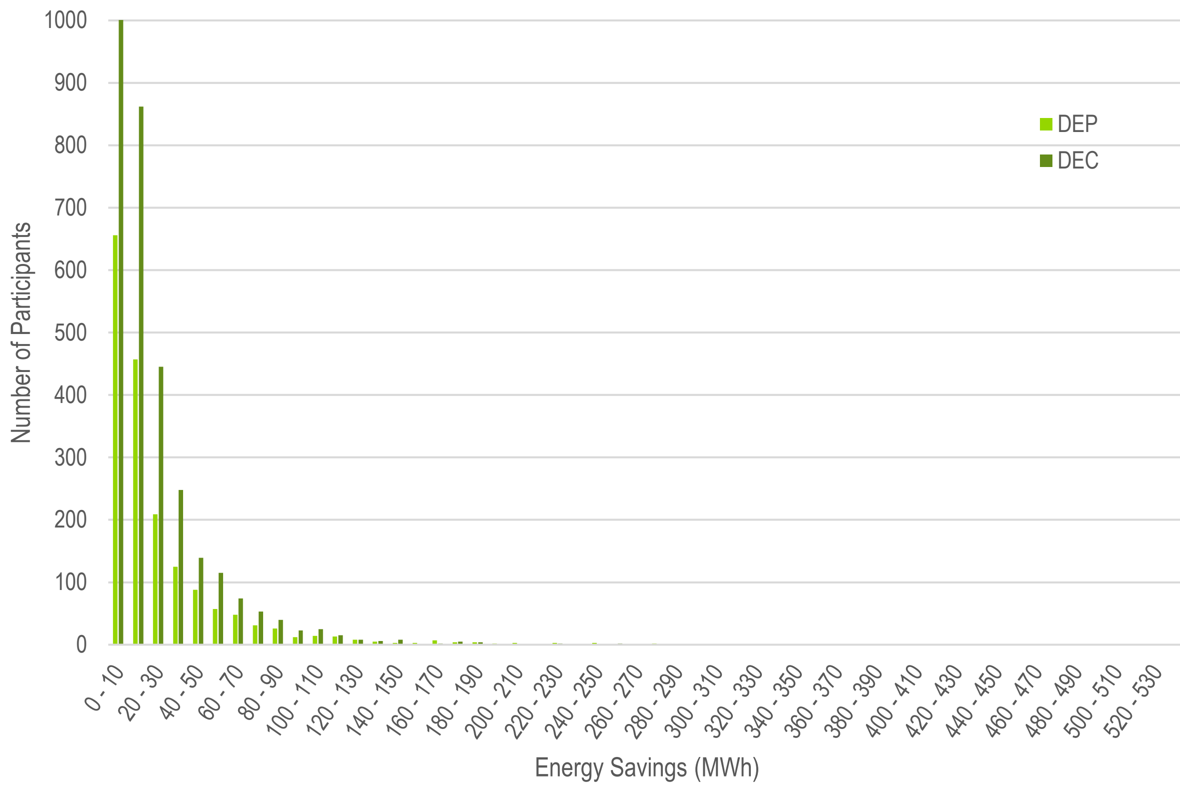


Source: SBES Tracking Database

2.2.2 Savings by Project

Because the SBES program is limited to small business customers only, the variations in project energy and peak demand savings and the quantity of measures installed exhibit less spread than typical large business program offerings. Nevertheless, there is still a mix of various project sizes, as shown in Figure 2-2, with very few project sites reporting savings over 200 MWh per year. The largest site reported savings of over 500 MWh per year.

Figure 2-2. Histogram of Reported Energy Savings per Project



Source: SBES Tracking Database

The evaluation team reviewed the business type data in the tracking database as well, but found that there was not a facility type field that could be easily mapped to deemed savings values for HVAC interactive effects and coincidence factors, which will be explored further in this report.

3. KEY RESEARCH OBJECTIVES

As outlined in the Statement of Work (SOW), the primary purpose of the EM&V activities is to estimate verified net annual energy and peak demand impacts associated with program activity for PY2015. Additional research objectives include the following:

3.1 Impact Evaluation

The impact evaluation focuses on quantifying the magnitude of verified energy savings and peak demand reductions. Objectives include:

- Verify deemed savings estimates through review of measure assumptions and calculations.
- Perform on-site verification of measure installations, and collect data for use in an engineering analysis.
- Estimate the amount of observed energy and peak demand savings (both summer and winter) by measure via engineering analysis.

3.2 Net-to-Gross Analysis

The net-to-gross analysis focuses on estimating the share of energy savings and peak demand reductions that can be directly attributed to the SBES program itself. Objectives include:

- Assess the Net-to-Gross ratio by addressing spillover and free-ridership in customer surveys.

3.3 Process Evaluation

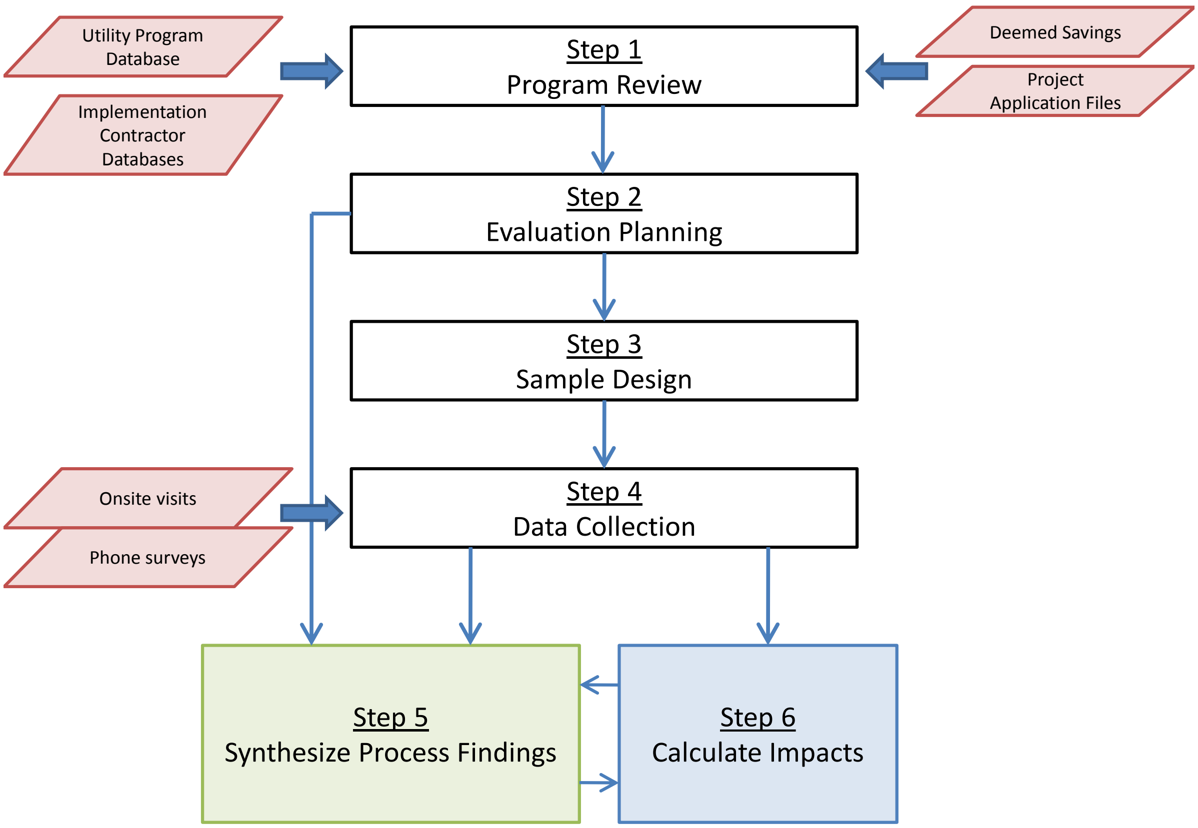
The process evaluation focuses on the program implementation and the customer experience. Objectives include:

- Perform interviews with program management and Implementation Contractor.
- Perform participant surveys with customers.
- Identify barriers to participation in the program, and how the program can address these barriers.
- Identify program strengths and the potential for introducing additional measures.

3.4 Evaluation Overview

Figure 3-1 outlines the high-level approach used for evaluating the SBES Program, which is designed to address the research objectives outlined above. The impact, net-to-gross, and process sections provide further detail for each of the individual EM&V activities.

Figure 3-1. Evaluation Process Flow Diagram



Source: Navigant

4. IMPACT EVALUATION

The purpose of this impact evaluation is to quantify the verified energy and demand savings estimates for the SBES Program in both the DEP and DEC jurisdictions. Table 4-1 and Table 4-2 show high-level program results of Navigant's impact analysis. Ultimately, Duke Energy can use these results as an input to system planning.

Table 4-1. PY2015 SBES Summary of Program Impacts for DEP

DEP	Energy Savings (MWh)	Summer Peak Demand Reductions (MW)	Winter Peak Demand Reductions (MW)
Reported Gross Savings	48,772	11.7	11.7
Realization Rate	1.11	0.96	0.53
Verified Gross Savings	54,318	11.2	6.2
NTGR	1.03	1.03	1.03
Verified Net Savings	55,947	11.5	6.4

Source: Navigant analysis

Table 4-2. PY2015 SBES Summary of Program Impacts for DEC

DEC	Annual Energy Savings (MWh)	Summer Peak Demand Reductions (kW)	Winter Peak Demand Reductions (kW)
Reported Gross Savings	77,269	20.5	20.5
Realization Rate	1.12	0.96	0.53
Verified Gross Savings	86,899	19.8	10.9
NTGR	1.03	1.03	1.03
Verified Net Savings	89,506	20.4	11.2

Source: Navigant analysis

4.1 Impact Methodology

The methodology for assessing the gross energy savings and peak demand reductions follows IPMVP Option A (Retrofit Isolation: Key Parameter Measurement). This involves an engineering-based approach for estimating savings, supplemented by key parameter measurements. This included using time-of-use lighting loggers to directly measure operating hours and coincidence factors for program- incented lighting measures. Note that for the limited set of refrigeration measures, verification activities were performed on-site to assess installation and operation.

The evaluation team employed the following steps to conduct the impact analysis:

1. **Review Field Data and Design Sample** – First, the team analyzed the tracking data to determine the most appropriate sampling methodology. The team created four strata (small, medium, and large lighting, and refrigeration) to ensure that a variety of different businesses and

measures were captured in the site visits. A subset of each strata was selected for more detailed logging (19 of 57 total sites visits were logged).

2. **Pull Sample** – Next, the team pulled a sample from the four strata and scheduled site visits, including several backup sites in the event that a visitation could not be arranged.
3. **Perform Participant Site Visits** – The evaluation team used an electronic data collection system in the field to ensure consistency and decrease data processing time. For all site visits, Navigant field technicians uploaded all collected site data to the online system as soon as they were completed. Navigant performed quality control verifications for all field data collection forms and online data entry. This included a thorough inspection of each site's building characteristic inputs, operating schedules, measure-level in-service rates, and descriptions. The following steps were taken at each participant site:
    a. At each customer site, the team first determined the in-service rate (ISR) of the equipment for each measure found. The field technicians accomplished this by visually verifying and counting all equipment included in the project documentation at each site.
    b. The team then calculated the difference in watts between the base-case fixtures and the energy-efficient fixtures for each fixture type installed on-site. The team verified efficient fixture wattage through visual inspection, while deriving base-case fixture wattage from customer-provided data found in the documentation review, if available, or from information found by field technicians during the site visits. There is typically little to no information about the specifications of base-case equipment that has been removed from a site. If both customer data and field data were insufficient, the team utilized the IC tracking data and assessed the reasonableness of their assumptions.
    c. Operating hours were determined from a detailed customer interview for each unique lighting schedule in the building, and adjusted for holiday building closures. For the subset of sites that received logging, the EM&V team left time-of-use loggers in place for roughly three weeks and then returned to retrieve the logging equipment.
    d. Coincidence factors were taken from prior EEB program findings[2] and previous SBES reports[3] for similar building types for the verification only sites. For logged sites, the team calculated both summer and winter coincidence factors from the logger data.
4. **Calculate Site-Level Savings** – The team calculated site-level energy and demand savings for each site in the sample based on operational characteristics found on site and engineering-based parameter estimates.
5. **Calculate Program-Level Savings** – The team calculated verification rates for all sites and applied a ratio, representing the adjustment based on the logger data, resulting in final verified savings for each sampled site. Lastly, the team calculated stratum-level realizations rates, applied those realization rates to the projects that fell into their respective strata, and arrived at final program-level realization rates. Navigant utilized the stratified ratio estimation method to determine program-level verified gross savings for each jurisdiction by applying strata-level realization rates to the projects within each jurisdiction.

[2] PY2013 DEP EEB EM&V Report

[3] PY2013 and PY2014 DEP SBES EM&V Report

4.2 Sample Design

After reviewing the Duke Energy and IC tracking data, the evaluation team opted to split up the population of projects into four strata based on the projects' estimated energy savings to ensure that the sample represented both small, medium and large customers, and that field verification assessed a large percentage of program savings. The strata were designed according to the following guidelines:

1. First, all projects with refrigeration measures were assigned to a single stratum.
2. The remaining projects were sorted from highest claimed savings to lowest claimed savings.
3. The team then examined the reported savings and selected criteria that would result in three strata, each containing an approximately equal share of total claimed savings:
    - Lighting Large – greater than 65,000 kWh reported savings;
    - Lighting Medium – between 25,000 kWh and 65,000 kWh reported savings;
    - Lighting Small – less than 25,000 kWh savings;
    - Refrigeration – all projects with refrigeration savings.

Note that the stratum cutoff points for PY2015 are higher than in PY2014 due to the larger average per-project savings in this evaluation. The limits in PY2014 were 20,000 kWh and 40,000 kWh.

In order to achieve a 10 percent relative precision at a 90 percent confidence interval, the evaluation team targeted 57 total sites, which were spread roughly equally among the three lighting strata and a smaller refrigeration stratum.

The evaluation team conducted on-site verification at 57 sites during the summer of 2016. While on-site, the team conducted customer interviews and visual verification to collect data on building operation, HVAC system details, and seasonal and holiday schedules. Key evaluation parameters came primarily from on-site data; however, where this data was lacking or was deemed unusable, customer application data was used in its place. As there are many parameter inputs to the savings calculation for each site, this approach ensures that the best available data are used for each site's savings estimation. Table 4-3 below details the final site visit disposition.

Table 4-3. Onsite Sample Summary

Strata	Population Size	Onsite Verification Sample Size	Onsite Metering Sample Size (Subset of Verification Sample)
Lighting Large	328	16	6
Lighting Medium	1025	18	7
Lighting Small	3,327	17	6
Refrigeration	195	6	0
Total	**4,875**	**57**	**19**

Source: Navigant analysis

4.3 Algorithms and Parameters

Navigant used data collected from the field and the engineering review to calculate site-level energy and demand savings, using the following algorithms. Table 4-4 shows the algorithms that the evaluation team used to calculate verified savings for lighting measures. The impact evaluation effort focused on verifying the inputs for these algorithms.

Table 4-4. Verified Savings Algorithms for Lighting Measures

Measure	Energy Savings Algorithm	Coincident Peak Demand Savings Algorithm
Lighting Measures	kWh_Verified = Qty_Verified x HOU x Verified_Watts_Reduced x IF_Energy	kW_Verified = Verified x CF x Verified_Watts_Reduced x IF_Demand
Refrigeration	kWh_Verified = Unit_Savings x Qty_Verified	kW_Verified = Unit_Savings x Qty_Verified

ISR = in-service rate (not in calculation, calculated to provide context)
Fixture_Quantity_Verified = quantity of equipment verified on-site
HOU = verified operating hours
CF = coincidence factor
IF_Energy = heating, ventilating, and air conditioning (HVAC) interaction factor for energy savings calculations
IF_Demand = interaction factor for demand savings calculations
Verified Watts Reduced = watts of baseline equipment - watts of energy-efficient equipment.
Unit_Savings = deemed per unit savings appropriate for measure.

Source: Navigant analysis

The detailed description of each parameter and any related assumption are as follows:

4.3.1 Fixture Quantity Verified and In-Service Rate (ISR)

The Navigant evaluation team visually counted fixtures on-site to quantify the quantity and type of lighting equipment installed. The team calculated the ISR as the ratio between the findings from the on-site verification compared to the quantity reported in the program-tracking databases. On-site verifications determined the total number of installed measure-level equipment.

4.3.2 Verified Watts

The team calculated base and efficient watts at the measure level. Efficient nameplate wattages were determined using manufacturer specifications based on fixture-level data collected on-site. The project documentation contained in the IC tracking database determined base wattages. In the cases where efficient fixture data were unavailable, due to inaccessible fixtures, the wattages found in the IC database values were applied.

4.3.3 HVAC Interactive Effects

Reductions in lighting energy generally increase a building's heating requirements (load) and decrease cooling requirements. The HVAC interactive effects accounts for these secondary effects on the HVAC system energy use and acts as a multiplier in the energy savings algorithms. The team applied the HVAC interactive effects used in prior EEB and SBES program evaluations (both 2013 and 2014) for consistency, which were sourced from a 2011 Navigant study (including over 120 buildings) in Maryland that used building energy models of field-verified building characteristics (i.e., HVAC, lighting, and envelope) and actual billing data to assess the interactive effects of lighting energy reductions on HVAC system energy use. The resulting interaction factors are specific to both building type (e.g., office, warehouse) and heating/cooling systems.

4.3.4 Annual Operating Hours

Measure-level annual operating hours were determined from a detailed interview with the SBES customer. Hours used per day or week were rolled up to annual hours of use and corrected for holidays, seasonal variations in use, and any other change in operating characteristics. For logged sites, the team extrapolated the time of use logger data to develop annual hours of operation.

4.3.5 Coincidence Factor (CF)

Coincidence factors represent the portion of installed lighting that is operational during the utility peak performance hours. These were determined similarly to HVAC interactive effects by using deemed values by building type in addition to data collected on-site. For example, light-emitting diode (LED) exit signs that are on all day receive a CF on 1.0, while exterior lights on daylight sensors receive a CF of 0.0. For logged sites, the team extrapolated the time of use logger data to develop coincidence factors.

4.3.6 Unit Savings

For refrigeration measures, the engineering analysis follows a deemed savings methodology based on the NY Technical Reference Manual (TRM) unit savings. The assumptions and parameters used to estimate reported energy savings and peak demand reductions were deemed appropriate by the evaluation team. The team verified that the measures were installed and operational during on-site visits to projects that installed efficient refrigeration equipment.

4.4 Key Impact Findings

The energy realization rates by strata are shown in Table 4-5. This shows the verification realization rate, the metering realization rate, and the final realization rate by strata. Note that strata-level realization rates are derived from both DEP and DEC projects, and are applied to each jurisdiction separately to calculate program level verified energy savings and peak demand reductions.

Table 4-5. Energy Impacts by Strata

Strata	Verification Realization Rate (kWh)	Metering Realization Rate Adjustment (kWh)	Total Realization Rate (kWh)
Lighting Large	0.94	1.12	1.06
Lighting Medium	1.09	1.03	1.12
Lighting Small	1.20	1.00	1.20
Refrigeration	1.05	n/a	1.05
Total	**1.08**	**1.04**	**1.12**

Source: Navigant analysis

The summer and winter peak demand reductions are shown in Table 4-6 and Table 4-7. Contrary to the energy adjustments based on metering, there is a more substantial reduction in the realization due to application of measure-specific coincidence factors based on logger data for both the summer and winter periods. A winter coincidence factor was calculated based on the logged data, with the summer coincidence factors used as the basis for statistical comparison given the lack of more appropriate parameters.

Table 4-6. Summer Peak Demand Impacts by Strata

Strata	Verification Realization Rate (kW)	Metering Realization Rate Adjustment (kW)	Total Realization Rate (kW)
Lighting Large	1.09	1.01	1.11
Lighting Medium	1.04	0.93	0.96
Lighting Small	1.27	0.72	0.91
Refrigeration	0.58	n/a	0.58
Total	**1.10**	**0.87**	**0.96**

Source: Navigant analysis

Table 4-7. Winter Peak Demand Impacts by Strata

Strata	Verification Realization Rate (Winter kW)	Metering Realization Rate Adjustment (Winter kW)	Total Realization Rate (Winter kW)
Lighting Large	0.83	0.70	0.58
Lighting Medium	0.77	0.72	0.56
Lighting Small	0.94	0.50	0.47
Refrigeration	0.47	n/a	0.47
Total	**0.82**	**0.64**	**0.53**

Source: Navigant analysis

Overall, the verification realization rates are slightly above 1.0 for energy savings and summer peak demand reduction. This indicates that the program is accurately reporting impacts at the aggregate program level, despite varying realization rates for each individual stratum. The winter peak demand reductions were not characterized specifically by Duke Energy, so in turn Navigant compared verified winter savings with deemed reported summer savings.

4.5 Detailed Impact Findings

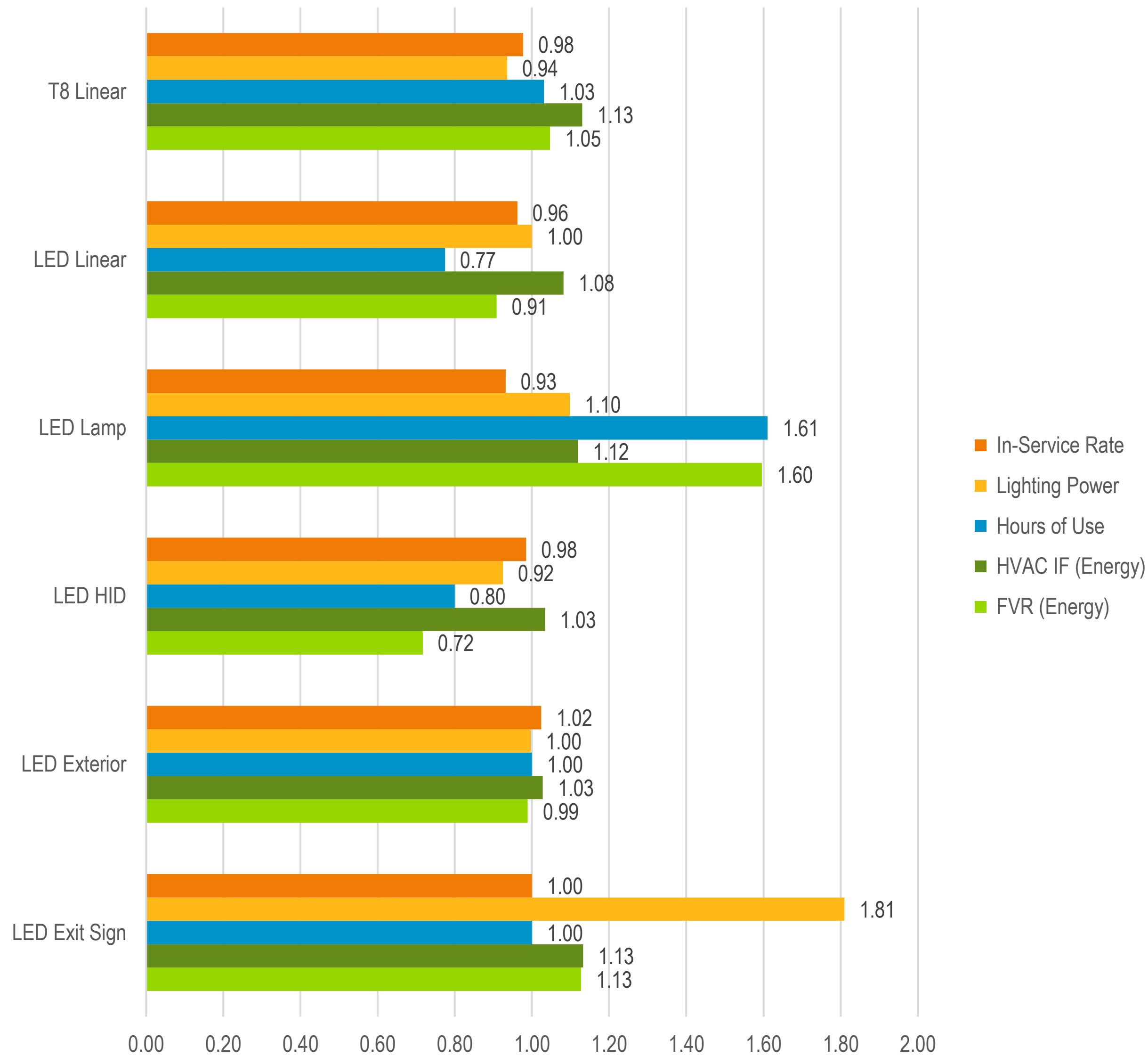
This section examines findings from the evaluation of lighting measures in order to identify the main drivers of the verified savings values. The evaluation team uses the Field Verification Rate (FVR) to describe the overall verified savings relative to the reported savings for each measure. FVRs reflect differences between the quantity of equipment installed on-site and the quantity reported in the tracking database, as well as differences between operating characteristics verified in the field and assumed operating characteristics in the program deemed savings estimates. The team calculates the field verification rate as the verified savings divided by the reported savings by measure, which is driven by a combination of the in-service rate, the hours of use adjustment rate, the lighting power adjustment rate, the HVAC interactive effect adjustment rate, and the coincidence factor, described as follows:

1. **In-Service Rate**[4] **(ISR)** is the ratio of the verified (i.e., installed) quantity to the reported quantity.
2. **Hours of Use (HOU) Adjustment Rate** reflects discrepancies between reported and verified operating hours.
3. **Lighting Power Adjustment Rate** is a ratio of the verified wattage difference between the efficient and baseline equipment to the reported wattage difference between the efficient and baseline equipment.
4. **HVAC Interactive Effect (IE) Adjustment Rate** is a multiplier that reflects HVAC interactive effects due to space heating and cooling loads due to a reduction in heat output from efficient lighting. Note that the IC did not deem HVAC IE for any measures so this adjustment is equal to the average HVAC IE itself. There are separate adjustments for energy savings and peak demand reduction.
5. **Coincidence Factor** represents the portion of installed lighting that is on during the peak utility hours. This affects only summer and winter peak demand reductions, not energy savings.

Figure 4-1 below shows the relative effect of each of the aforementioned adjustment rates on the measure-level FVR for energy savings, which the following subsections describe in further detail. Note that FVR cannot be used to derive program level realization rates. This is because the contributions of each parameter update are described relative to their reported value, while the program analysis was structured to stratify savings by participant energy savings per site rather than by individual measures.

[4] In-Service Rate is an industry-standard term that describes verified quantities of installed equipment relative to reported quantities.

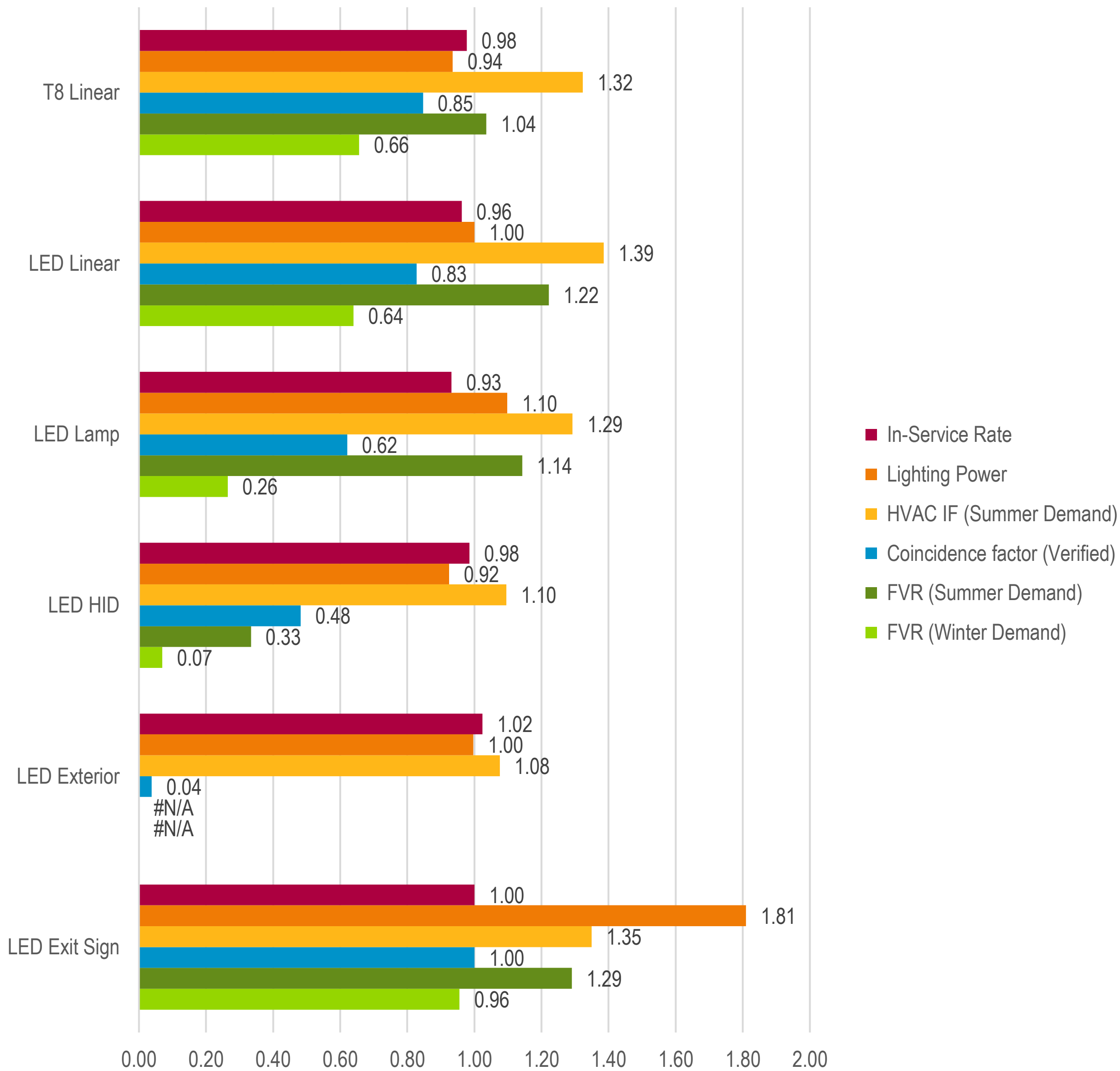
Figure 4-1. Gross Energy Savings Field Verification Rates



Source: Navigant analysis

Figure 4-2 below shows the relative effect of each of the aforementioned adjustment rates on the measure-level FVR for summer peak demand reductions, which the following subsections describe in further detail.

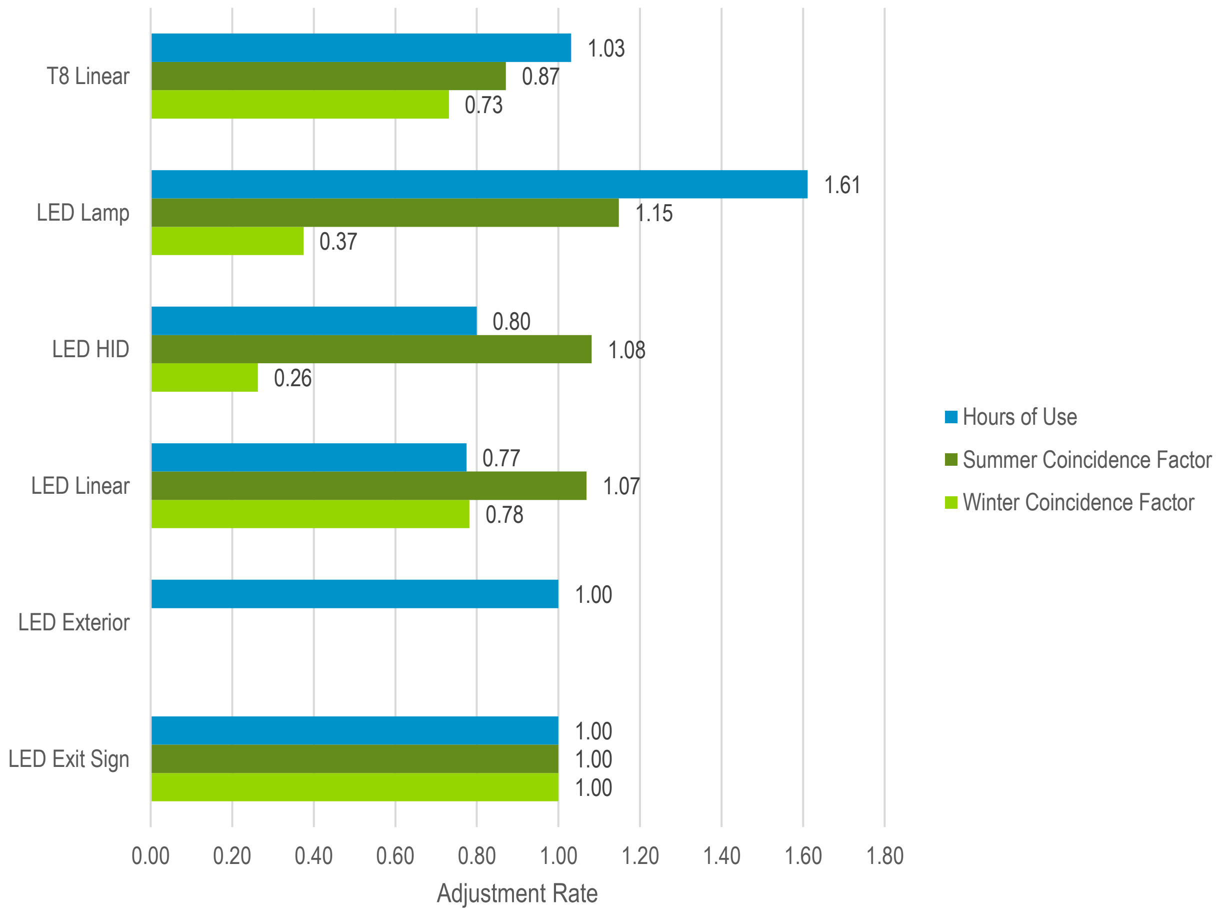
Figure 4-2. Gross Peak Demand Reductions Field Verification Rates



Source: Navigant analysis

The final adjustment to develop site-specific verified gross savings is the ratio of metered HOU and CF compared to estimated (or deemed) HOU and CF used for verification. The results of these adjustments, analogous to FVR, are shown in Figure 4-3 below. The metered data results in a downward adjustment for both HOU and CF, but this effect is more pronounced for CF due to the high rigor of the HOU estimates compared to the CF estimates in the tracking data.

Figure 4-3. HOU and CF Adjustments from Metered Data



Source: Navigant analysis

The remainder of this section discusses in more detail the parameters that are part of the energy and peak demand savings algorithms: ISR, HOU, lighting power, HVAC interactive effects and coincidence factors.

4.5.1 In-Service Rates

One of the primary functions of evaluation, particularly for lighting measures, is to verify the quantity of the installed equipment relative to the reported quantity. The resulting ratio is the ISR. As shown in Figure 4-1 above, the ISR for each measure varies from 0.93 for LED screw-in lamps and 1.02 for LED exterior fixtures.

4.5.2 Hours-of-Use Adjustments

HOU is another key parameter for estimating lighting energy savings. The evaluation team estimated this parameter through customer interviews for each unique lighting schedule, similar to the approach taken by the IC. During the on-site customer interviews, the team found that the hours of use that site technicians reported was very close to the HOU reported in the tracking database. The team notes that overall the IC is accurately characterizing hours of use based on both customer interviews and, the metered data.

4.5.3 Lighting Power

The evaluation team based the lighting power parameter on the actual power draw of the baseline and efficient equipment. The baseline equipment is assumed to be as-found lighting installed and in use at the time of the audit; however, because the baseline equipment was no longer present at the participant sites, the team could not verify the baseline power draw and defaulted to the IC-provided value.

The evaluation team verified the efficient equipment wattage from manufacturer specification sheets to provide a more accurate lighting power figure than the deemed values that the IC used. Overall lighting power level differences were minor across the measure categories, between 0.92 for LED HID replacements and 1.81 for LED Exit Signs. This is an improvement from PY2014 and contributes to a higher realization rate for PY2015. The high wattage adjustment resulted overall in a small increase in savings due to the relative contributions of this measure.

The evaluation team would like to note that newer linear LED systems can be configured in a variety of ways, including with or without an electronic ballast. The manufacturer specifications for these systems typically do not account for every installation scenario with different ballast brands, models, and configurations possible. The team did not perform power measurements as part of this evaluation, but encourages the IC team to ensure that the power consumption of these systems is accurately characterized as their contribution to total program savings grows.

4.5.4 HVAC Interactive Effects

The evaluation team applied HVAC interactive effects for both energy, summer and winter peak demand. The deemed values are based on the building type and the heating and cooling system types as verified in the field for the sample sites. However, the IC did not apply HVAC IE for any of the lighting measures claimed in PY2015, as in previous evaluations. This adjustment is between 1.03 and 1.13 for energy and 1.08 and 1.39 for summer peak demand. Deemed values are described in Section 9 below for energy and summer peak demand; winter peak demand interactive effects were assumed to be 1.0 for all measures.

4.5.5 Coincidence Factors

Similar to the HVAC interactive effects, the team applied coincidence factors consistent with the deemed values used in the EEB Program. This factor takes into account that not all lights are on for the duration of the peak demand period. Coincidence factors range from 0.42 to 0.99, based on building type. The IC applied a coincidence factor of 1.0 for all lighting measures with the exception of occupancy sensors. Deemed values are shown in Section 8 below. The metered data further validates the deemed coincidence factors, but a sufficient sample size was not developed to determine new deemed coincidence factors at this time.

5. NET-TO-GROSS ANALYSIS

The impact analysis described in the preceding sections addresses *gross program savings*, based on program records, modified by an engineering review, field verification, and metering of measure installations. *Net savings* incorporate the influence of free ridership (savings that would have occurred even in the absence of the program) and spillover (additional savings influenced by the program but not captured in program records) and are commonly expressed as a NTG ratio applied to the verified gross savings values.

Table 5-1 shows the results of Navigant's NTG analysis. Navigant anticipated low free ridership and spillover based on previous findings from the PY2013 and PY2014 SBES evaluations. The estimated free-ridership and spillover shown for PY2015 are slightly higher than thefindings from the previous evaluations

Table 5-1. Net-to-Gross Results

	PY2013 (DEP)	PY2014 (DEP)	PY2015 (DEP & DEC)
Estimated Free Ridership	0.04	0.04	0.06
Estimated Spillover	0.02	0.07	0.09
Estimated NTG	0.98	1.03	1.03

Source: Navigant analysis

The results are consistent with the program theory and delivery model, whereby the Implementation Contractor (IC) actively recruits participants and presents a suite of energy efficiency measures to potential customers. Customers are not eligible to retroactively claim incentives under this program, which reduces the potential for free ridership significantly.

This report provides definitions, methods, and further detail on the analysis and findings of the net savings assessment. The discussion is divided into the following three sections:

- Defining free ridership, spillover, and net-to-gross (NTG) ratio
- Methods for estimating free ridership and spillover
- Results for free ridership, spillover, and NTG ratio

5.1 Defining Free Ridership, Spillover, and Net-to-Gross Ratio

The methodology for assessing the energy savings attributable to a program is based on a NTG ratio. The NTG ratio has two main components: free ridership and spillover.

Free ridership is the share of the gross savings that is due to actions participants would have taken even in the absence of the program (i.e., actions that the program did not induce). This is meant to account for naturally occurring adoption of energy efficient technology. The SBES Program covers a range of energy efficient lighting and refrigeration measures and is designed to move the overall market for energy efficiency forward. However, it is likely that some participants would have wanted to install, for various reasons, some high efficiency equipment (possibly a subset of those installed under the SBES Program), even if they had not participated in the program or been influenced by the program in any way.

Spillover captures program savings that go beyond the measures installed through the program. Also called "market effects," the term "spillover" is often used because it reflects savings that extend beyond the bounds of the program records. Spillover adds to a program's measured savings by incorporating indirect (i.e., non-incentivized) savings and effects that the program has had on the market above and beyond the directly incentivized or directly induced program measures.

Total spillover is a combination of non-reported actions to be taken at the project site itself (*within-facility spillover*) and at other sites (*outside-facility spillover*). Each type of spillover is meant to capture a different aspect of the energy savings caused by the program, but not included in program records.

The **overall NTG ratio** accounts for both the net savings at participating projects and spillover savings that result from the program but are not included in the program's accounting of energy savings. When the NTG ratio is multiplied by the estimated gross program savings, the result is an estimate of energy savings that are attributable to the program (i.e., savings that would not have occurred without the program).

The basic equation is shown in Equation 1.

Equation 1. Net-to-Gross Ratio

$$NTG = 1 - \text{Free Ridership} + \text{Spillover}$$

The underlying concept inherent in the application of the NTG formula is that *only* savings caused by the program should be included in the final net program savings estimate but that this estimate should include *all* savings caused by the program.

5.2 Methods for Estimating Free Ridership and Spillover

5.2.1 Estimating Free Ridership

Data to assess free ridership were gathered through the self-report method—a series of survey questions asked of SBES participants. Free ridership was asked in both direct questions, which aimed at obtaining respondent estimates of the appropriate free ridership rate that should be applied to them, and in supporting or influencing questions, which could be used to verify whether the direct responses are consistent with participants' views of the program's influence.

Respondents were asked three categories of program-influence questions:

- **Likelihood:** to estimate the likelihood that they would have incorporated lighting measures "of the same high level of efficiency," if not for the assistance of the SBES Program. In cases where respondents indicated that they might have incorporated some, but not all, of the measures, they were asked to estimate the share of measures that would have been incorporated anyway at high efficiency. This flexibility in how respondents could conceptualize and convey their views on free ridership allowed respondents to give their most informed response, thus improving the accuracy of the free-ridership estimates.
- **Prior planning:** to further estimate the probability that a participant would have implemented the measures without the program. Participants were asked the extent to which they had considered installing the same level of energy-efficient lighting prior to participating in the program. The general approach holds that if customers were not definitively planning to install all of the

efficiency lighting prior to participation, then the program can reasonably be credited with at least a portion of the energy savings resulting from the high-efficiency lighting. Strong free ridership is reflected by those participants who indicated they had already allocated funds for the purchase and selected the lighting and an installer.

- **Program importance:** to clarify the role that program components (e.g., information, incentives) played in decision-making, and to provide supporting information on free ridership. Responses to these questions were analyzed for each respondent, not just in aggregate, and were used to identify whether the direct responses on free ridership were consistent with how each respondent rated the "influence" of the program.

Free-ridership scores were calculated for each of these categories[5] and then averaged and divided by 100 to convert the scores into a free-ridership percentage. Next, a timing multiplier was applied to the average of the three scores to reflect the fact that respondents indicating that their energy efficiency actions would not have occurred until far into the future may be overestimating their level of free ridership. Participants were asked, without the program, when they would have installed the equipment. Respondents who indicated that they would not have installed the lighting for at least two years were not considered free riders and had a timing multiplier of 0. If they would have installed at the same time as they did, they had a timing multiplier of 1; within one year, 0.67; and between one and two years, 0.33. Participants were also asked when they learned about the financial incentive; if they learned about it after the equipment was installed, then they had a free ridership ratio of 1.

5.2.2 Estimating Spillover

The basic method for assessing participant spillover (both within-facility and outside-facility) was an approach that asked a set of questions to determine the following:

- **Whether spillover exists at all.** These were yes/no questions that asked, for example, whether the respondent incorporated energy efficiency measures or designs that were not recorded in program records. Questions related to extra measures installed at the project site (within-facility spillover) and to measures installed in non-program projects (outside-facility spillover) within the service territory.

- **The share of those savings that could be attributed to the influence of the program.** Participants were asked if they could estimate the energy savings from these additional extra

[5] Scores were calculated by the following formulas:

» Likelihood: The likelihood score is 0 for those that "definitely would NOT have installed the same energy efficient measure" and 1 for those that "definitely WOULD have installed the same energy efficient measure." For those that "MAY HAVE installed the same energy efficient measure," the likelihood score is their answer to the following question: "On a scale of 0 to 10 where 0 is DEFINITELY WOULD NOT have installed and 10 is DEFINITELY WOULD have installed the same energy efficient measure, can you tell me the likelihood that you would have installed the same energy efficient measure?" If more than one measure was installed in the project, then this score was also multiplied by the respondent's answer to what share they would have done.

» Prior planning: If participants stated they had considered installing the measure prior to program participation, then the prior planning score is the average of their answers to the following two questions: "On a scale of 0 to 10, where 0 means you 'Had not yet planned for equipment and installation' and 10 means you 'Had identified and selected specific equipment and the contractor to install it', please tell me how far along your plans were" and "On a scale of 0 to 10, where 0 means 'Had not yet budgeted or considered payment' and 10 means 'Already had sufficient funds budgeted and approved for purchase', please tell me how far along your budget had been planned and approved."

» Program importance: This score was calculated by taking the maximum importance on a 0 to 10 scale of the four program importance questions and subtracting from 10 (i.e., the higher the program importance, the lower the influence on free ridership).

measures to be less than, similar to, or more than the energy savings from the SBES program equipment.

- **Program importance.** Estimates were derived from a question asking the program importance, on a 0 to 10 scale. Participants were also asked how the program influenced their decisions to incorporate additional energy efficiency measures.

If respondents said no, they did not install additional measures; they had a zero score for spillover. If they said yes, then the individual's spillover was estimated as the self-reported savings as a share of project savings, multiplied by the program-influence score. Then, a 50 percent discount was applied to reflect uncertainty in the self-reported savings and divided by 10 to convert the score to a spillover percentage.

5.2.3 Combining Results across Respondents

The evaluation team determined free ridership and spillover estimates for each of the following:

- Individual respondents, by evaluating the responses to the relevant questions and applying the rules-based approach discussed above
- Measure categories:
    - For free ridership: by taking the average of each respondent's score within each category
    - For spillover: by taking the sum of the individual spillover results for each measure category and weighting each category by the population
- The program as a whole, by combining measure-level results
    - For free ridership: measure category results were subsequently weighted by each category's share of total savings
    - For spillover: measure category results were summed and then weighted by the sum of the reported savings for the sample (which were also weighted by the population)

5.3 Results for Free Ridership, Spillover, and Net-to-Gross

This section presents the results of the attribution analysis for the SBES Program. Specifically, results are presented for free ridership and spillover (within-facility and outside-facility), which are used collectively to calculate an NTG ratio.

5.3.1 Review of Data Collection Efforts for Attribution Analysis

The EM&V team conducted 151 surveys with SBES participants to estimate free ridership, spillover, and NTG ratios. Table 5-2 shows the number of completions, by measure group.

Table 5-2. Attribution Survey Completes by Project Type

Measure Category	DEP Surverys	DEC Surveys	Total Surveys
Lighting	45	91	136
Refrigeration	7	8	15
Total	**52**	**99**	**151**

Source: Navigant analysis

5.3.2 Free-Ridership Results

The evaluation team asked participants a series of questions regarding the likelihood, scope, and timing of the investments in energy-efficient lighting if the respondent had not participated in the program. The purpose of the surveys was to elicit explicit estimates of free ridership and perspectives on the influence of the program. The evaluation team estimates free-ridership for the SBES Program at 6 percent of program-reported savings.

5.3.3 Spillover Results

The SBES Program influenced approximately 15 percent of participants to install additional energy efficiency measures on-site (up from 9 percent in PY2014) and influenced 12 percent of participants (up from 6 percent in PY2014) to install additional measures at other locations. Based on the survey findings, the evaluation team estimates the overall program spillover to be 9 percent of program-reported savings. Participants reported a variety of spillover measures installed, including AC units, additional lighting, and appliances.

5.3.4 Net-to-Gross Ratio

As stated above, the NTG ratio is defined as follows in Equation 2 below.

Equation 2. Net-to-Gross Ratio

$$NTG = 1 - \text{free ridership} + \text{spillover}$$

Using the overall free ridership value of 6 percent and the overall spillover value of 9 percent, the NTG ratio is 1 – 0.06 + 0.09 = 1.03. The estimated NTG ratio of 1.03 implies that for every 100 megawatt-hours (MWh) of realized savings recorded in SBES records, 103 MWh is attributable to the program.

Table 5-3. SBES Free Ridership, Spillover, and NTG Ratio

	Free Ridership	Spillover	NTG Ratio
SBES Program Total	0.06	0.09	1.03

Source: Navigant analysis

6. SUMMARY FORM

Program Name

Completed EMV Fact Sheet

Description of program

Duke Energy's Small Business Energy Saver Program provides energy efficient equipment to eligible small business customer at up to an 80 percent discount. The program is delivered through an implementation contractor that coordinates all aspects of the program, from the initial audit, ordering equipment, coordinating installation, and invoicing.

The program consists of lighting and refrigeration measures.

- **Lighting measures:** LED lamps and fixtures, T8 fluorescent fixtures, occupancy sensors.
- **Refrigeration measures:** LED case lighting, EC motor upgrades, compressor and fan motor controls.

Date	July 15, 2016
Region(s)	Duke Energy Progress; Duke Energy Carolinas
Evaluation Period	DEP 1/1/15 – 2/29/16 DEC 8/1/14 – 2/29/16
Annual kWh Savings	DEP 55,947,456 kWh DEC 89,505,687 kWh
Per Participant kWh Savings	DEP 27,247 DEC 25,087
Coincident kW Impact	DEP 11,650 DEC 20,603
Net-to-Gross Ratio	1.03
Process Evaluation	Annual
Previous Evaluation(s)	2013 and 2014 (DEP)

Evaluation Methodology

The evaluation team used engineering analysis, onsite field inspections, and time-of-use metering as the primary basis for estimating program impacts. Additionally, telephone surveys were conducted with participants to assess customer satisfaction and determine a net-to-gross ratio. Interviews were conducted with program and implementation team staff to understand program operational changes and enhancements.

Impact Evaluation Details

- **Onsite visits were conducted at 57 participant sites, while 19 of those sites were logged.** The evaluation team inspected program equipment to assess measure quantities and characteristics to compare with the program tracking database, and installed lighting loggers to verify hours of use and coincidence factors.
- **In-Service rates (ISRs) varied by equipment type.** The evaluation team found ISRs ranging from 0.93 for LED screw-in lamps to 1.02 for exterior LED fixtures.
- **Participants achieved an average of 27,247 kWh of energy savings per year in DEP, and 25,087 kWh in DEC.** The program is accurately characterizing energy and demand impacts.

7. PROCESS EVALUATION

The purpose of the process evaluation is to understand, document and provide feedback on the program implementation components and customer experience for the Small Business Energy Saver (SBES) Program in the DEP and DEC jurisdictions.

The feedback received indicates that **the SBES Program is a successful, mature program for PY2015, but could benefit from continuous improvements** as in previous years. Customer satisfaction with the implementer and contractor are very high, but there are instances where the installation contractor was responsible for a negative customer experience.

7.1 Process Methodology

The evaluation team conducted in-depth interviews with SBES Program staff, IC staff, and customer participant surveys, as noted previously. In addition, the team gathered information from interactions with participants during the site verification visits. The interviews with program and IC staff focused on program changes for PY2015 and included a review of program processes to provide the evaluation team with an understanding of the program's operations, nuances and qualitative and quantitative questions on customer satisfaction, participation, marketing, and outreach.

The process findings summarized in this document are based on the results of:

- Participant surveys with 151 program participants;
- Onsite visits at 57 program participant sites;
- Interviews with the Duke Energy Program Manager and the Implementation Contractor (IC) staff; and
- A review of the program documentation.

7.2 Sampling Plan and Achievements

The participant survey targeted a random sample of all PY2015 program participants broken out by measure family. The two measure families are lighting and refrigeration. Navigant weighed customer responses by their stratum savings for net-to-gross findings as described in the preceding section.

The survey effort targeted 150 participants and successfully completed surveys with 151 customers, of which 136 were participants that only installed lighting measures and 15 were participants that installed some refrigeration measures. The survey targets were loosely designed to achieve 90/10 confidence and precision, with significant oversampling due to the relatively inexpensive per-survey cost.

7.3 Program Review

The evaluation team designed the program review task to understand changes and updates to the program design, implementation and energy and demand savings assumptions. The key program characteristics include the following:

- **Program Design** – The SBES program is designed to offer high incentives (up to 80 percent of the total cost of the project) on efficient equipment to reduce energy use and peak demand. It specifically targets small business customers that are difficult to reach and often do not pursue energy efficiency on their own. In PY2015 the program rolled out new marketing materials centered around case studies for various types of small business customers.

- **Program Implementation** – A third-party contractor administers the SBES program on Duke Energy's behalf. The IC handles all aspects of the program, including customer recruitment, facility assessments, equipment installation (through independent installers contracted by the IC), and payment and incentive processing. The IC reports energy and peak demand reduction estimates to Duke Energy. The IC has continued to refine their processes to ensure that savings estimates are reasonable, customer complaints are handled in a timely manner.
- **Incentive Model** – The IC offers potential participants a recommended package of energy efficiency measures along with equipment pricing and installation costs. The incentive is proportional to estimated energy savings and can be as high as 80 percent of the total cost of the project.
- **Savings Estimates** – Energy and peak demand savings are estimated on a per-fixture basis, taking into account existing equipment, proposed equipment, and operational characteristics unique to each customer.

7.4 Key Process Findings

The following sections detail the process findings from all relevant sources of program information, including interviews with Duke Energy and IC staff, interactions with customers during verification site visits, and the results of the customer surveys, organized by topic. This discussion addresses 1) marketing and outreach; 2) customer experience; 3) implementation contractor; 4) installation contractor; 5) program incentives; 6) lighting equipment; and 7) participant suggested improvements.

The feedback received indicates that the SBES Program continues to be a successful program in PY2015, has expanded into the DEC jurisdiction effectively, and is a mature program in Duke Energy portfolio. The Duke Energy program management team and the IC staff and management have made several improvements to the program in PY2015, especially concerning installation contractor training, automated checks in the auditing tool, marketing, and new LED measures. Key findings are as follows:

- The primary channel through which customers hear about the program is Duke Energy (38 percent), followed by the implementation contractor (28 percent).
- Participants listed energy savings, reduced energy bills, and better quality equipment as the primary reasons for participating in the SBES Program.
- A majority of SBES participants were satisfied with the program. On a scale of 0 to 10, where 0 indicates "not satisfied at all" and 10 indicates "extremely satisfied":
    - 87 percent of participants indicated 8-10 for satisfaction with overall program experience.
    - 87 percent of participants indicated 8-10 for satisfaction with the contractor's quality of work.
    - 91 percent of participants indicated 8-10 for satisfaction with their new equipment.
- Eighty-nine percent of participants stated that equipment offered through the program allowed them to upgrade all of the equipment they wanted at the time.
- Eighty-seven percent of participants said they plan to participate in other Duke Energy programs in the future.

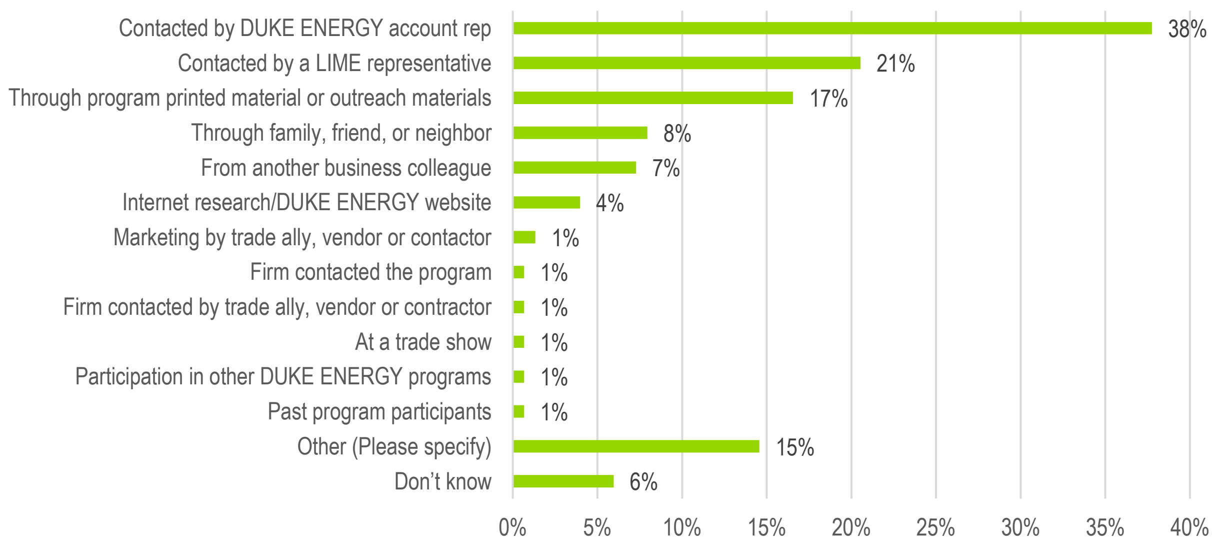
The following sections detail the process findings and addresses the following topics:

1. Marketing and outreach;
2. Customer experience;
3. Implementation contractor;
4. Installation contractor;
5. Measure incentives;
6. Upgraded equipment; and
7. Suggested improvements.

7.4.1 Marketing and Outreach

Duke Energy markets the program to eligible customers primarily through direct contact that Duke Energy and the IC initiate. Participants were asked to indicate all the sources through which they learned about the program. Over half of the participants indicated that they learned about the program directly from the IC staff (either through direct contact or outreach materials), and an additional quarter indicated they had learned about the program through Duke Energy themselves. Figure 7-1 shows the range of ways in which customers found out about the program. Significantly more customers reported that they learned about the program through Duke Energy directly (38 percent in PY2015 compared to 26 percent in PY2014)

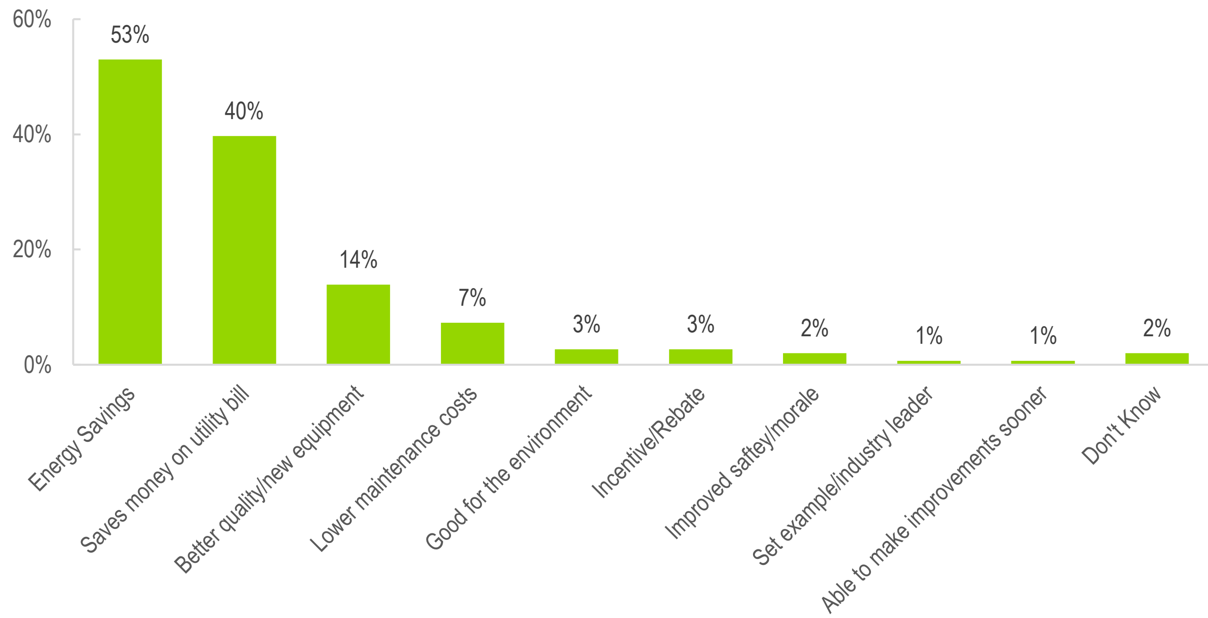
Figure 7-1. How Program Participants First Learned About the SBES Program (n = 151)



Source: Navigant analysis

When asked about the main benefits of participating in the program, over 50 percent of survey respondents cited energy savings as a reason they decided to participate in the program (see Figure 7-2 below). Beyond energy savings and, in turn, utility bill savings, participants cited higher-quality equipment, and the lower maintenance costs associated with new equipment as reasons to participate in the program. Coordinated efforts to market all of the benefits of program participation are key to enhancing participation across the variety of small business customer that Duke Energy serves.

Figure 7-2. Primary Reasons for Deciding to Participate in the Program[6] (n = 151)



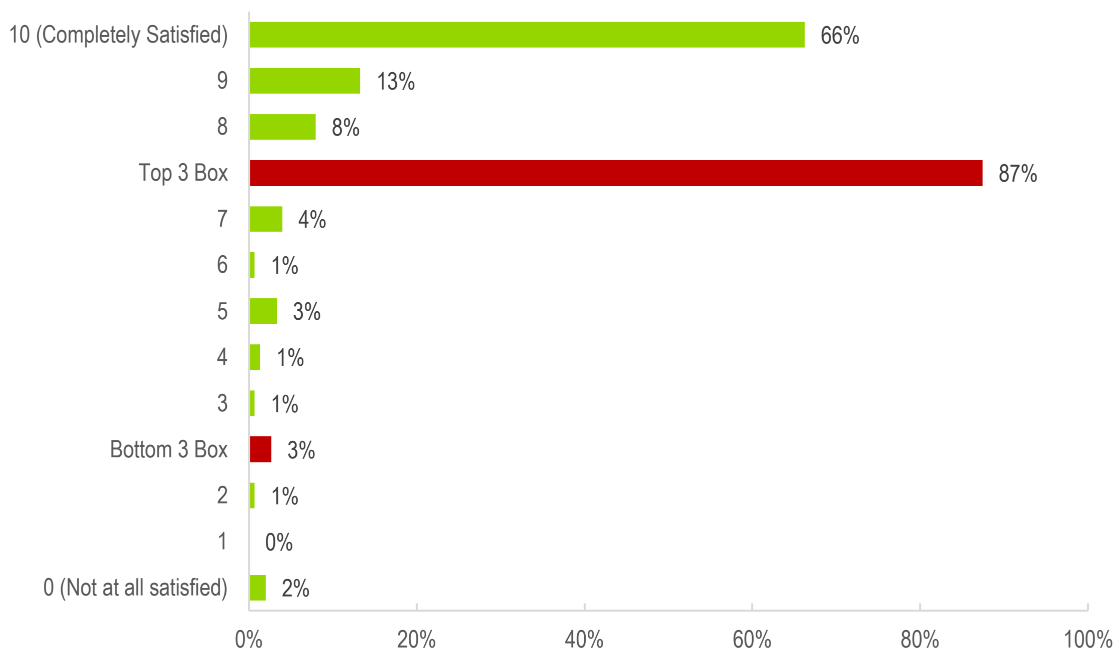
Source: Navigant analysis

[6]Totals exceed 100% because respondents could offer more than one answer.

7.4.2 Customer Experience

Customers reported very high satisfaction with their overall program experience in PY2015 through both the participant survey and informal polling conducted on-site during verification visits. On a scale of 0 to 10, where 0 is "not satisfied at all" and 10 is "extremely satisfied", 87 percent of participants scored their overall experience with the program as an 8, 9, or 10, with 66 percent responding that their experience was a 10 (see Figure 7-3). Participants who assigned low scores to their overall experience did so because typically they did not perceive monetary savings on their bill. One customer reported that they thought their new lights were already outdated, and another was not happy with the installation. Overall satisfaction remains similar to PY2014 levels.

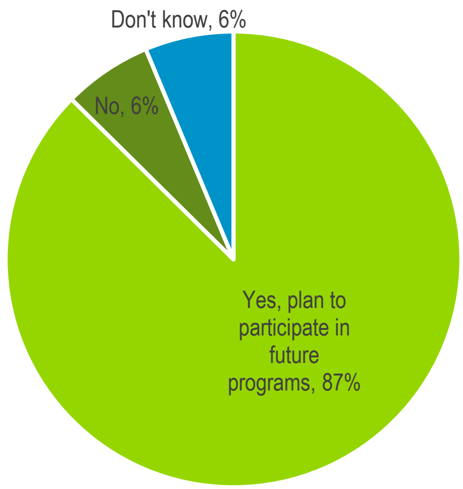
Figure 7-3: Customer Satisfaction with Overall Program (n=151)



Source: Navigant analysis

Eighty-seven percent of participants said they plan to participate in other Duke Energy programs in the future (see Figure 7-4), compared to 83 percent in PY2014. This indicates increased satisfaction as well, and a continued opportunity to market the program to previous participants as a wider range of measures become available and cost-effective.

Figure 7-4. Participants Who Plan to Participate in Other Duke Energy Programs in the Future (n = 151)



Source: Navigant analysis

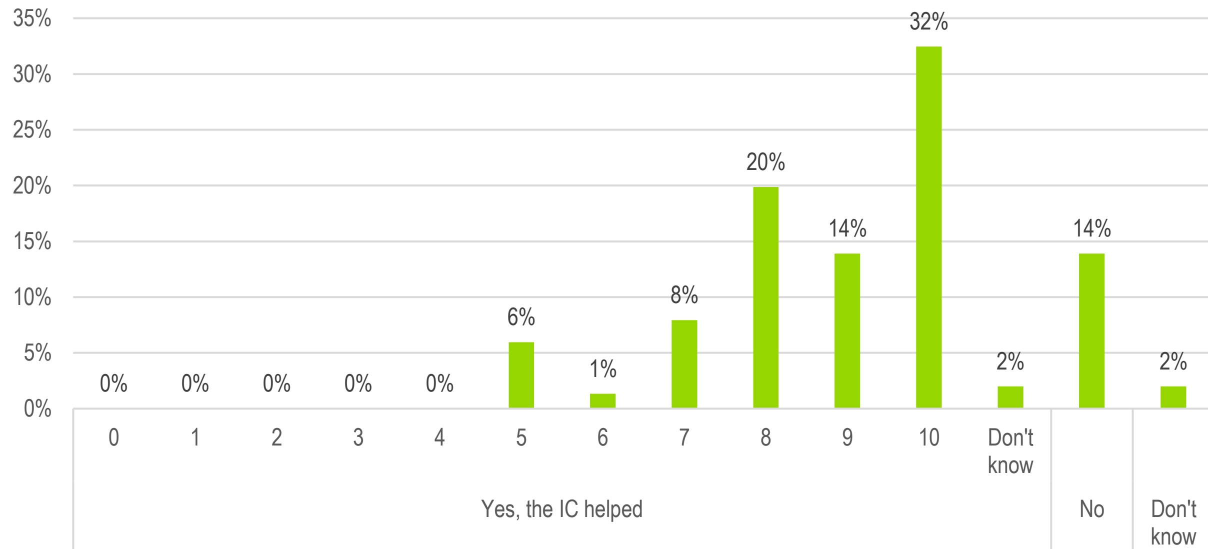
7.4.3 Implementation Contractor

Customer survey results indicate that the IC plays a critical role in all program processes in line with the program design, including program marketing, outreach, recruiting, auditing, billing and customer service, and providing detailed tracking data to Duke Energy.

Navigant found that the measure installation tracking data is thorough, accurate, and detailed. This enabled the field verification team to locate specific measure installations quickly. The IC conducted consistent and thorough audits for most completed projects and generally covered all of the lighting fixtures in a facility that were not already energy efficient. The auditor's intentions were clear in the tracking data and demonstrated an understanding of the lighting that would best serve the customer's needs while providing substantial energy savings. Navigant found some discrepancies between the final work as recorded by the implementation contractor in the database and what was found onsite (such as some fixtures that were not retrofitted), but overall the accuracy was found to be very high.

The IC helped 81 percent of SBES Program participants with their choice of lighting, and 66 percent stated that a recommendation from the IC was important (score of 8-10) in their decision to install the energy-efficient equipment (see Figure 7-5). Results are similar to PY2014.

Figure 7-5. Participants Whom the IC Helped in Their Equipment Decision (n = 151)

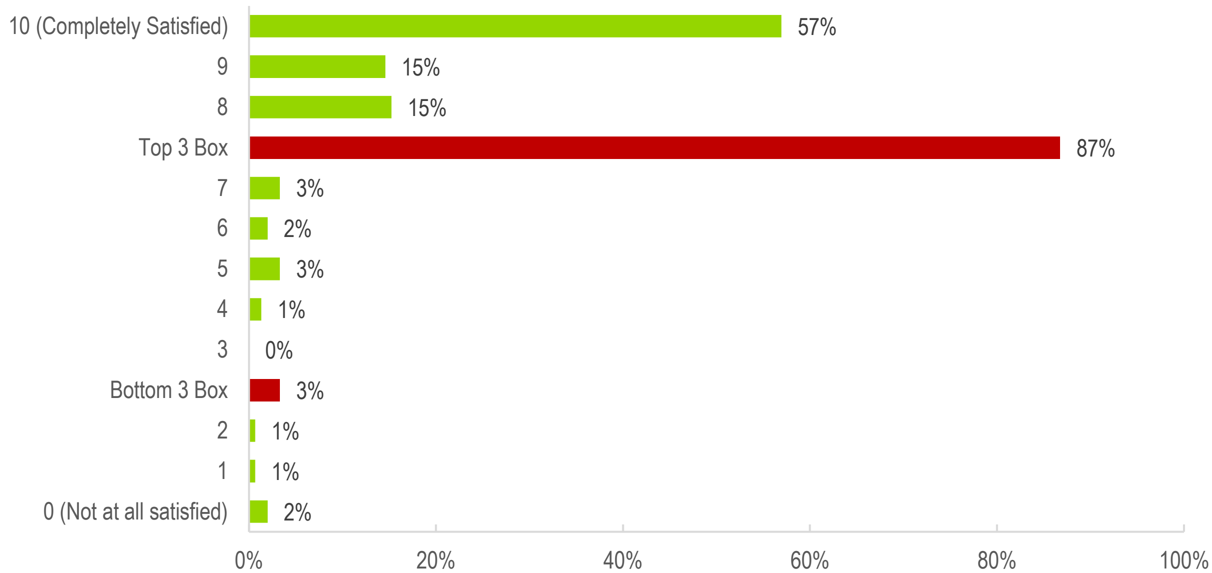


Source: Navigant analysis

7.4.4 Installation Contractors

Customer satisfaction with contractor quality of work is high, and has improved slightly from PY2014 as well. Figure 7-6 shows that 87 percent of survey respondents ranked their satisfaction with contractor work as an 8, 9, or 10, compared to 84 percent in PY2014.

Figure 7-6: Customer Satisfaction with Contractor Quality of Work (n=151)



Source: Navigant analysis

A few customers indicated that they experienced installation issues that required follow-up visits, or that work took longer than expected. Other participants were impressed by the speed the installation contractors were able to get the work done. This indicates that the customer experience varies between installation contractors, but overwhelmingly participants are satisfied with this portion of the program.

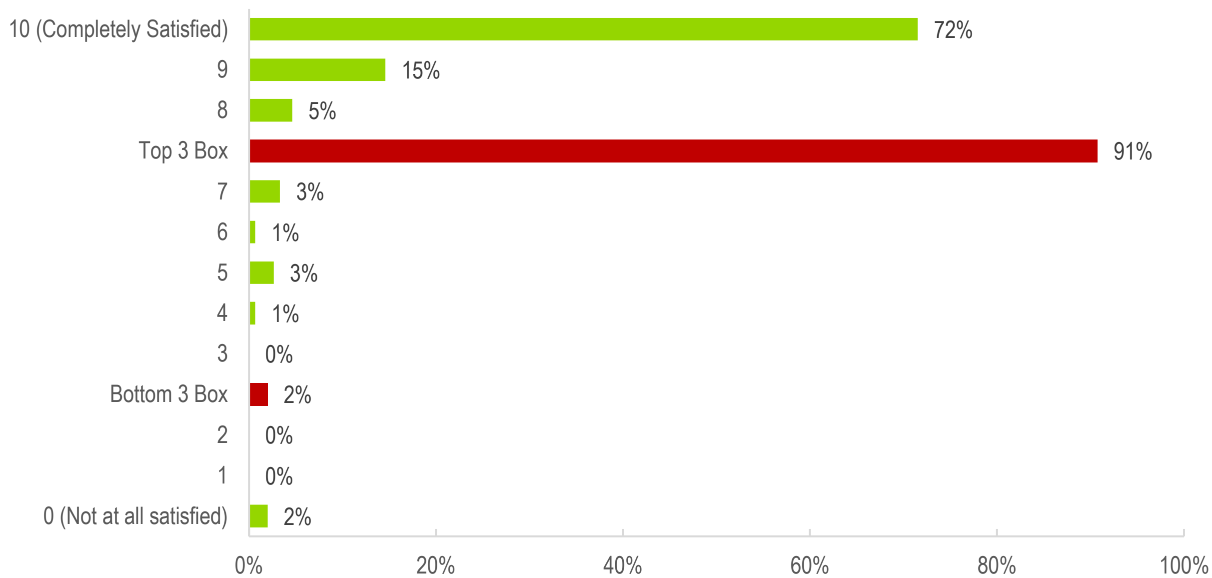
7.4.5 Measure Incentives

The incentives offered through the SBES program appear to sufficiently motivate customers to upgrade to energy-efficient lighting and refrigeration. From discussions with decision makers on site, the incentive levels were appropriate. Several customers also expressed interest in efficient HVAC equipment, but this was not available to them at the time.

7.4.6 Upgraded Equipment

The majority of customers agreed that the new lighting measures were a significant improvement in light quality, and that the auditors were willing to work with customers to make sure that the new lighting fit their needs. Almost all participants (91 percent) indicated they were satisfied with their new equipment (see Figure 7-7), similar to previous findings. A higher percentage of customer reported a top satisfaction score of 10 in PY2015 at 72 percent, compared to 67 percent in PY2014.

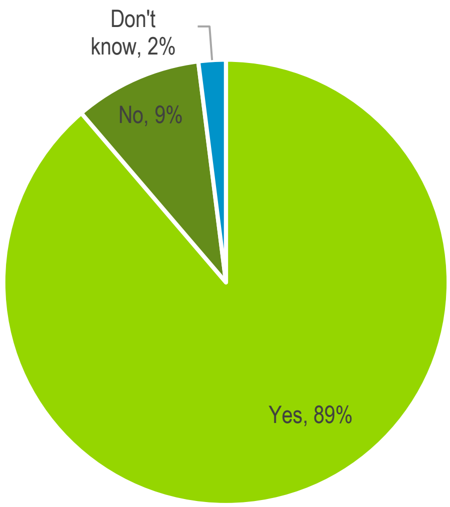
Figure 7-7: Participant Satisfaction with New Equipment (n=151)



Source: Navigant analysis

Another important survey finding was that 89 percent of participants stated that equipment offered through the program allowed them to upgrade all of the lighting equipment they wanted at the time of the project, rather than piecing together the upgrades in multiple phases (see Figure 7-8). This is an increase from 82 percent in PY2014, which indicates that auditors are getting better at capturing all possible measures at a site, or also that as LED prices have come down and savings have increased more lighting measures have become cost-effective.

Figure 7-8. Participants Who Stated that Equipment Offered Through the Program Allowed Them to Upgrade All of the Equipment They Wanted at the Time (n = 151)



Source: Navigant analysis

7.4.7 Suggested Improvements

Some customers reported difficulties they faced and provided suggested improvements in the survey's open-ended questions. The list below summarizes a few key points; responses that are more detailed will appear in the final SBES evaluation report.

Summary of Improvements Mentioned by Customers

- Higher incentives on eligible equipment;
- More equipment offerings, such as AC and motors;
- Greater publicity for the program and other Duke Energy offerings;
- More up-to-date equipment;
- Opportunity for savings for new construction

8. CONCLUSIONS AND RECOMMENDATIONS

The evaluation team performed extensive on-site work, telephone surveys, and analysis to determine gross and net verified savings. Overall conclusions and recommendations appear in the following sections.

8.1 Conclusions

Overall, the SBES Program is a well performing, mature program in the DEP jurisdiction that has successfully expanded into the DEC jurisdiction. The key to continued success is working through quality and training issues as they arise.

- **Participants continue to be overwhelmingly satisfied with the SBES Program and Duke Energy**, including overall service, pricing, installation, and efficient equipment quality.
- **Duke Energy has successfully expanded into the DEC jurisdiction** in PY2015. The program had no apparent issues scaling up operations in the DEC service territory, and there are no meaningful differences in the EM&V team's findings between the two jurisdictions.
- **The program has increased average project savings substantially** compared to PY2014. This is driven by new LED measures that have higher per-unit savings, and targeting of larger customers that are able to generate more savings per site.
- The Duke Energy program management team and the IC have **demonstrated a commitment to quality** by quickly implementing program changes based on evaluation feedback provided in the PY2014 evaluation. Additionally, the IC team has created new branded marketing materials with case studies for a variety of small business facilities.
- The **installation of high–efficiency equipment continues to be the key selling point**. The SBES Program successfully added linear LED retrofit measures to the suite of program offerings for PY2015, replacing T8 fluorescent fixtures. LED measures have grown considerably as a share of total program savings, while refrigeration has remained stable from PY2014 at under 10 percent.
- The **energy savings realization rate is 1.11 for DEP and 1.12 for DEC,** and is driven by several EM&V adjustments that roughly balanced out. The key adjustments the EM&V team made were the in-service rates and HVAC interactive effects. The **peak demand realization rate is lower at 0.96 for DEP and DEC** and is driven by HVAC interactive effects and coincidence factors.
- The evaluation effort estimated **free ridership for the SBES Program at 6 percent and spillover at 9 percent**, which drives an **NTG ratio of 1.03**. This indicates that the SBES Program is successfully reaching customers that would have not completed energy efficiency upgrades in the absence of the program. Spillover has increased from PY2014 and indicates that the program is showcasing the benefits of energy efficiency.

8.2 Recommendations

The evaluation team recommends five actions for improving the SBES Program, based on insights gained through the comprehensive evaluation effort for PY2015. These recommendations provide Duke

Energy with a roadmap to fine-tune the SBES Program for continued success and include the following broad objectives:

Increasing Program Participation

1. **Continue to emphasize non-energy benefits** of program participation, such as increased lighting quality, comfort for both business employees and customers, environmental benefits, and reduced maintenance. Now that the program has transitioned primarily to LED measures, increased education on the benefits that LED measures offer should enhance participation.

Increasing Customer Satisfaction

2. **Continue to prioritize customer satisfaction through installation contractor training and customer follow-up services.** The IC has improved in this area from PY2014, but a minority of customers are still reporting issues with installation and communication. Additionally, some customers are not perceiving savings on their electric bill, so managing this expectation would enhance customer satisfaction.
3. **Phase out fluorescent T8 lighting systems.** Linear LED lighting offers substantial savings above high-performance/reduced wattage T8 lamps and ballasts, which may be perceived as outdated.

Improving Accuracy of Reported Savings

4. **Add HVAC interactive effects and update coincidence factors for lighting measures**. This is the key impact finding to improve the accuracy of savings estimates. The IC should apply relevant HVAC interactive effects and coincidence factors to lighting measures as is appropriate, and ensure that outdoor lighting measures on daylight sensors do not accrue peak demand reductions during summer daylight hours.
5. **Ensure that efficient lighting power ratings for linear LED systems are accurate.** Navigant did not perform live metering of connected linear LED systems, but upon review of manufacturer specifications for lighting power there are different wattages that the system may draw depending on the specific configuration. As the share of savings attributed to linear LED systems grow, this should be quantified to reduce EM&V risk in future years.

9. MEASURE-LEVEL INPUTS FOR DUKE ENERGY ANALYTICS

The SBES program estimates deemed savings on a per-fixture basis that takes into account specific operational characteristics. This approach differs from a more traditional prescriptive approach that applies deemed parameters by measure type and building type only.

For the lighting measures, the EM&V team applied HVAC interactive effects and coincident factors in the analysis that differed from those used by the IC; the values used are shown in Table 9-1 and Table 9-2. Note that for the PY2015 SBES evaluation the EM&V team applied the summer coincidence factors for both summer and winter peak demand reductions, with additional adjustments based on logger data for each of the corresponding peak periods, as in previous years.

Table 9-1. HVAC Interactive Effects[7]

Building Type	Cooling Type	Heating Type	Energy HVAC Interactive Effect	Demand HVAC Interactive Effect
Grocery	Electric	Electric Resistance	1	1.43
Grocery	Electric	Electric HP	1.08	1.43
Grocery	Electric	Not Electric	1.22	1.42
Grocery	No Cooling	Electric Resistance	0.77	1
Grocery	No Cooling	Electric HP	0.86	1
Grocery	No Cooling	Not Electric	1	1
Grocery	DK	DK	1.14	1.36
Lodging	Electric	Electric Resistance	1.11	1.18
Lodging	Electric	Electric HP	1.11	1.18
Lodging	Electric	Not Electric	1.11	1.18
Lodging	No Cooling	Electric Resistance	1.11	1.18
Lodging	No Cooling	Electric HP	1.11	1.18
Lodging	No Cooling	Not Electric	1.11	1.18
Lodging	DK	DK	1.14	1.36
Manufacturing	Electric	Electric Resistance	1.1	1.29
Manufacturing	Electric	Electric HP	1.1	1.29
Manufacturing	Electric	Not Electric	1.1	1.29
Manufacturing	No Cooling	Electric Resistance	1.1	1.29
Manufacturing	No Cooling	Electric HP	1.1	1.29
Manufacturing	No Cooling	Not Electric	1.1	1.29

[7] PY2013 DEP EEB EM&V Report

Manufacturing	DK	DK	1.14	1.36
Medical	Electric	Electric Resistance	1.05	1.44
Medical	Electric	Electric HP	1.12	1.44
Medical	Electric	Not Electric	1.22	1.43
Medical	No Cooling	Electric Resistance	0.83	1
Medical	No Cooling	Electric HP	0.89	1
Medical	No Cooling	Not Electric	1	1
Medical	DK	DK	1.14	1.36
Office	Electric	Electric Resistance	1.05	1.44
Office	Electric	Electric HP	1.12	1.44
Office	Electric	Not Electric	1.22	1.43
Office	No Cooling	Electric Resistance	0.83	1
Office	No Cooling	Electric HP	0.89	1
Office	No Cooling	Not Electric	1	1
Office	DK	DK	1.14	1.36
Other	Electric	Electric Resistance	1.05	1.44
Other	Electric	Electric HP	1.12	1.44
Other	Electric	Not Electric	1.22	1.43
Other	No Cooling	Electric Resistance	0.83	1
Other	No Cooling	Electric HP	0.89	1
Other	No Cooling	Not Electric	1	1
Other	DK	DK	1.14	1.36
Restaurant	Electric	Electric Resistance	1	1.43
Restaurant	Electric	Electric HP	1.08	1.43
Restaurant	Electric	Not Electric	1.22	1.42
Restaurant	No Cooling	Electric Resistance	0.77	1
Restaurant	No Cooling	Electric HP	0.86	1
Restaurant	No Cooling	Not Electric	1	1
Restaurant	DK	DK	1.14	1.36
Retail	Electric	Electric Resistance	1	1.43
Retail	Electric	Electric HP	1.08	1.43
Retail	Electric	Not Electric	1.22	1.42
Retail	No Cooling	Electric Resistance	0.77	1
Retail	No Cooling	Electric HP	0.86	1
Retail	No Cooling	Not Electric	1	1
Retail	DK	DK	1.14	1.36

School	Electric	Electric Resistance	1.05	1.44
School	Electric	Electric HP	1.12	1.44
School	Electric	Not Electric	1.22	1.43
School	No Cooling	Electric Resistance	0.83	1
School	No Cooling	Electric HP	0.89	1
School	No Cooling	Not Electric	1	1
School	DK	DK	1.14	1.36
Warehouse	Electric	Electric Resistance	1.1	1.29
Warehouse	Electric	Electric HP	1.1	1.29
Warehouse	Electric	Not Electric	1.1	1.29
Warehouse	No Cooling	Electric Resistance	1.1	1.29
Warehouse	No Cooling	Electric HP	1.1	1.29
Warehouse	No Cooling	Not Electric	1	1
Warehouse	DK	DK	1.14	1.36

Table 9-2. Coincidence Factors[8]

Building Type	Summer Coincidence Factor
OFFICE	0.81
SCHOOL	0.42
COLLEGE/UNIVERSITY	0.68
RETAIL/SERVICE	0.88
RESTAURANT	0.68
HOTEL/MOTEL	0.67
MEDICAL	0.74
GROCERY	0.81
WAREHOUSE	0.84
LIGHT INDUSTRY	0.99
HEAVY INDUSTRY	0.99
AVERAGE/MISC	0.77
AGRICULTURAL	0.50

[8] PY2013 Savings Basis and Changes, December 10, 2013. EEB Program Documentation.

10. APPENDICES

One additional spreadsheet document details project level findings, and is embedded below:

- PY2015 DEP SBES Impact Summary.xlsx

PY2015 DEP_DEC
SBES Impact Summa

REPORT

Save Energy and Water Kits 2016 Program Year Evaluation Report

Submitted to Duke Energy
in partnership with Research into Action

November 29th, 2017

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1 Executive Summary

1.1 Program Summary

The Save Energy and Water Kit Program (SEWKP) is a Duke Energy program that provides free energy and water efficiency kits to pre-selected households in the Duke Energy Progress (DEP) and Duke Energy Carolinas (DEC) jurisdictions. The kits include aerators for kitchen and bathroom sink faucets, one or two showerheads, and water heater insulating pipe tape.

1.2 Evaluation Objectives and Results

This report presents the results and findings of evaluation activities for DEP/DEC SEWKP conducted by the evaluation team, collectively Nexant Inc. and our subcontracting partner, Research into Action, for the program year of January – December 2016.

1.2.1 Impact Evaluation

The evaluation team conducted the evaluation as detailed in this report to estimate energy and demand savings attributable to the DEP and DEC Save Energy and Water Kit programs. The evaluation was divided into two research areas - to determine gross and net savings (or impacts). Gross impacts are energy and demand savings estimated at a participant's home that are the direct result of the homeowner's installation of a measure included in the SEWKP kit. Net impacts reflect the degree to which the gross savings are a result of the program efforts and funds.

Table 1-1 and Table 1-2 present the summarized findings of the impact evaluation for the DEP jurisdiction.

Table 1-1: 2016 DEP Energy Savings per Kit

Measurement	Reported	Realization Rate	Gross Verified	Net-to-Gross Ratio	Net Verified
Energy (kWh)	432.0	91.7%	396.1	93.4%	370.1
Demand (kW)	0.07	188.6%	0.133		0.124

Table 1-2: 2016 DEP Program Level Energy Savings

Measurement	Reported	Realization Rate	Gross Verified	Net-to-Gross Ratio	Net Verified
Energy (kWh)	12,162,634	91.7%	11,153,216	93.4%	10,418,681
Demand (kW)	1,985.2	188.6%	3,744.5		3,497.9

The findings of the impact evaluation for the DEC jurisdiction are summarized in Table 1-3 and Table 1-4.

Table 1-3: 2016 DEC Energy Savings per Kit

Measurement	Reported	Realization Rate	Gross Verified	Net-to-Gross Ratio	Net Verified
Energy (kWh)	595.2	47.0%	279.6	93.2%	260.5
Demand (kW)	0.245	38.8%	0.095		0.089

Table 1-4: 2016 DEC Program Level Energy Savings

Measurement	Reported	Realization Rate	Gross Verified	Net-to-Gross Ratio	Net Verified
Energy (kWh)	19,669,692	47.0%	9,239,316	93.2%	8,608,979
Demand (kW)	8,101.2	38.8%	3,147.3		2,932.6

Gross verified energy and demand savings by measure and net to gross ratio details for both the DEP and DEC jurisdictions are presented in Figure 1-1 and Figure 1-2; Table 1-5 and Table 1-6, respectively.

Figure 1-1: 2016 DEP Gross Verified Energy Savings

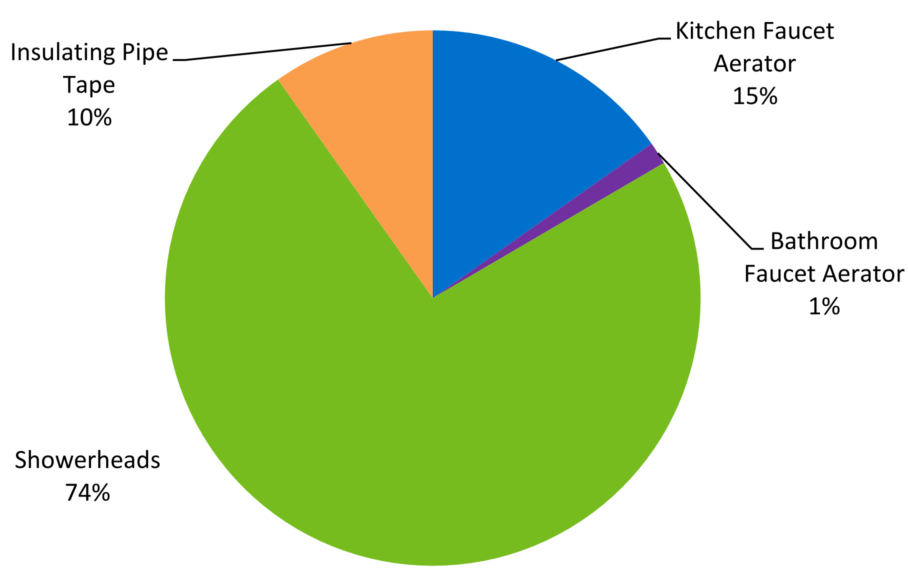


Table 1-5: DEP Program Year 2016 Verified Impacts by Measure

Measure	Gross Energy Savings per unit (kWh)	Gross Demand per unit (kW)	Free Ridership	Spillover	Net to Gross Ratio
1.5 GPM Showerhead	291.6	0.093	0.16	0.08	0.934
1.0 GPM Bathroom Faucet Aerator	5.4	0.003	0.15		
1.0 GPM Kitchen Faucet Aerator	60.3	0.032	0.13		
Insulating Pipe Tape*	38.8	0.004	0.10		
Total Kit Impacts	**396.1**	**0.133**	**0.15**	**0.08**	**0.934**

*Per package of pipe tape installed.

Figure 1-2: 2016 DEC Gross Verified Energy Savings

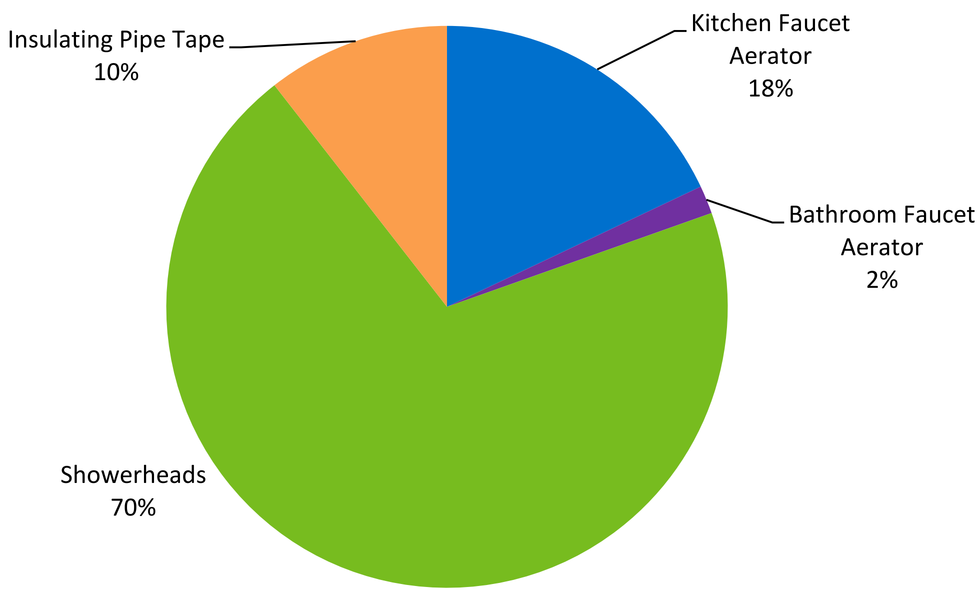


Table 1-6: DEC Program Year 2016 Verified Impacts by Measure

Measure	Gross Energy Savings per unit (kWh)	Gross Demand per unit (kW)	Free Ridership	Spillover	Net to Gross Ratio
1.5 GPM Showerhead	195.4	0.063	0.19	0.10	0.932
1.0 GPM Bathroom Faucet Aerator	4.5	0.002	0.10		
1.0 GPM Kitchen Faucet Aerator	50.2	0.027	0.13		
Insulating Pipe Tape	29.5	0.003	0.11		
Total Kit Impacts	**279.6**	**0.095**	**0.17**	**0.10**	**0.932**

*Per package of pipe tape installed.

1.2.2 Process Evaluation

The process evaluation assessed opportunities for improving the program's design and delivery in DEP and DEC service territories. It specifically documented participant experiences by investigating participating household responses to the kits and the extent to which the kits effectively motivate households to save energy.

The evaluation team reviewed program documents and conducted telephone and web surveys with households that received a kit (DEP n=131; DEC n=114). The team also conducted in-depth interviews with utility and implementation staff.

Program Successes

The 2016 DEP/DEC SEWKP evaluation found successes in the following areas:

Kit instructions are perceived as highly helpful among SEWKP participants. About four-fifths of participants in either jurisdiction (84% DEP; 82% DEC) said they read the instructional insert from their kit that offers detailed instructions on self-installing the measures, the majority of which said the instructions were highly helpful. These paper instructions are likely sufficient for most participants, as few respondents reported viewing the online instructional videos.

The program influenced household to install kit measures. Nearly all participating households installed at least one measure from the kit and the vast majority of measures, once installed, remained installed. Participants were highly influenced by the program to install kit measures, as demonstrated by low free ridership rates. Further, about one-third of respondents in either jurisdiction (30% DEP; 33% DEC) reported spillover actions.

Most participants are satisfied with kit items and report high satisfaction with the overall program. Ten percent or fewer of participants reported dissatisfaction with any of the specific measures they installed. Over four-fifths of participants in either jurisdiction (84% DEP; 86% DEC) reported they were highly satisfied with the overall program.

The kit size assignment algorithm is highly accurate. The kit size assignment algorithm assigns smaller kits to smaller homes (less than 1,500 square feet) and medium kits to larger homes (1,500 square feet or more). As a result, SEWKP typically delivers a useable number of units to most homes.

Program Challenges
The 2016 DEP/DEC SEWKP evaluation found some challenges in the following areas:

Insulating pipe tape is the least popular measure. Pipe tape was the least installed measure type, with less than half of participants in either jurisdiction (47% DEP; 40% DEC) reporting installing it.

Low water pressure is a significant contributor to dissatisfaction and uninstalls. Complaints of excessively low water pressure were the primary drivers of dissatisfaction with and uninstallation of water saving measures. However, only a minority of participants (were dissatisfied with (2% DEP; 0% DEC) or uninstalled them (6% DEC; 0% DEC).

Inadequate size is a common barrier hindering aerator installation. Of those who did not install the kitchen faucet aerator, over one-third (39% DEP; 41% DEC) reported they did not install the measure because it did not fit on their faucet. Similarly, over one-third (38% DEC; 46% DEC) of respondents who did not install any of the bathroom faucet aerators cited sizing issues.

A sizable minority of participants reported having natural gas water heaters. While the program targets customer homes with electric water heat, the evaluation team found that 18% of DEP and 29% of DEC customers reported having non-electric water heaters in their homes.

Many items do not get installed, especially multi-count measures. Across the DEP and DEC jurisdictions, ISRs ranged from 23% to 63%. ISRs were lowest for multi-count measures.

Medium kits had lower ISRs on every measure. Across the DEP and DEC jurisdictions, medium kits had lower ISRs than small kits on every measure.

1.3 Evaluation Conclusions and Recommendations

Based on evaluation findings, the evaluation team concludes the following and provides several recommendations for program improvement:

Conclusion 1: The program model is highly successful: it leverages low-cost measures to foster energy savings that would not have happened otherwise. Duke Energy's easy process for requesting and receiving a kit with free energy and water saving items motivated thousands of customers to request and install energy saving measures in their home. Most participants installed at least one measure from the kit and the vast majority of measures, once installed, stayed installed. Participants were highly influenced by the program to install these kit measures, as demonstrated by low free ridership rates. Further, about one-third of respondents in either jurisdiction reported spillover actions.

> **Recommendation**: Continue using SEWKP to encourage Duke Energy customers to save energy and water.

Conclusion 2: The water saving measures' low flow water pressure results in some minor satisfaction and uninstallation issues. Complaints of excessively low water pressure were the primary drivers of item dissatisfaction and uninstallation. However, only a minority of participants was dissatisfied with or uninstalled water saving items.

> **Recommendation**: Consider expanding participant-facing messaging around low-flow measures; water measure ISRs and satisfaction may increase if participants have better upfront expectations on the flow rates of the measures and better understand the energy saving benefits of low-flow fixtures.

> **Recommendation**: Consider investigating alternative products that provide the same GPM as the current aerator and showerhead offerings but offer higher perceived water pressure.

Conclusion 3: Despite delivering a useable number of units to most homes, there may be cost- effectiveness benefits to reducing the number of items delivered. The kit size assignment algorithm works fairly well:

- Small and medium kit recipients largely got the appropriate number of kitchen and bathroom aerators, given the number of faucets in their home.
- However, more than half of small kit recipients have two or more showers in their home.

Nonetheless, many items do not get installed, especially multi-count measures:

- Recipients of either kit size installed one bathroom aerator and one showerhead on average.
- Medium kits had lower ISRs on every measure, suggesting that delivering too many items may overwhelm participants and consequently hinder installations.

> **Recommendation**: Consider if there is a significant enough cost-effectiveness benefit to justify reducing the number of kit sizes and multi-count units offered. Reducing the number of items included in the kit, particularly the number of bathroom aerators provided, could increase ISRs and reduce program costs as the survey data reveals there is a negative relationship with number of kit items delivered and ISRs (that is, the more items Duke Energy provides, the lower the ISRs).

Conclusion 4: A high amount of non-electric water heater customers participated in the program. In total, the evaluation found that 18% of DEP and 29% of DEC customers in the program had non-electric water heaters. These saturations are comparable to the 2013 general population Duke Residential Appliance Saturation Survey which reflects non-electric water heat saturation of 25%.

> **Recommendation:** For future program recruitment, Duke Energy should continue to review and refine its customer screening techniques to better filter non-electric water heater customers from the program's solicitation.

2 Introduction and Program Description

2.1 Program Description

2.1.1 Overview

The Save Energy and Water Kit Program (SEWKP) is a Duke Energy program that provides free energy and water efficiency kits to pre-selected households in Duke Energy Progress (DEP) and Duke Energy Carolinas (DEC) territory. The kits include aerators for kitchen and bathroom sink faucets, one or two showerheads, and water heater insulating pipe tape.

2.1.2 Energy Efficiency Kit Measures

Table 2-1 lists the kit's contents included in the evaluation scope. There are two kit sizes, which dictate the number of showerheads and bathroom aerators the participant receives. In addition to the measures below, the kit includes plumbing tape, a rubber gasket opener to remove old aerators and showerheads, and an instructional insert that has detailed installation instructions. Duke Energy has additional installation instruction information available on their website.

Table 2-1: 2016 Kit Measures

Measures	Small Kit Count	Medium Kit Count
1.5 GPM Showerhead	1 low-flow showerhead	2 low-flow showerheads
1.0 GPM Bathroom Faucet Aerator	2 low-flow faucet aerators	4 low-flow faucet aerators
0.5/1.0/1.5 (adjustable) GPM Kitchen Faucet Aerator	1 low-flow kitchen aerator	1 low-flow kitchen aerator
Insulating Pipe Tape (2 inches wide, 15 feet long)	1 roll of pipe tape	1 roll of pipe tape

2.2 Program Implementation

2.2.1 Participant Identification and Recruitment

Every month Duke Energy's internal analytics department identifies households to recruit into the program: they look through customer accounts for single family electric-only accounts that have not participated in SEWKP or any other programs with similar measures (specifically, the Energy Efficiency Education in Schools and Home Energy House Call programs). Pre-selected households are then assigned either a small or medium kit based on household square footage data. Next, Duke Energy mails business reply cards (BRC) to all pre-selected households. Simultaneously, Duke Energy sends the implementer – Energy Federation, Inc. (EFI) – a list of pre-selected accounts that received the BRC that month. Households that receive the BRC simply detach the reply form and put it back in the mail (postage is pre-paid). These BRC reply forms are mailed to EFI. Upon receipt, EFI scans the unique barcodes on the BRCs to register responding households as participants. Alternatively, customers may also call a toll free number, provided on the BRC, to confirm eligibility and request their free kit. EFI then ships the appropriate kit (small or medium) to registered households.

2.2.2 Participation

For the defined evaluation period of January 2016 through December 2016, the program recorded a total of 63,876 kit recipients (28,799 kits distributed in DEP; 35,077 kits distributed in DEC). During survey recruitment of customers, 2.2% of sampled DEP participants and 5.8% of sampled DEC participants notified the evaluation team that their kits never arrived. The causation of this reported rate of non-received kits could not be fully identified by the evaluation team. Due to the program design of soliciting customers via a program mailer, customer address accuracy is expected to be very high for the program. However, this does not account for issues related to third party delivery failure or inaccurate customer recall.

2.3 Key Research Objectives

Over-arching project goals will follow the definition of impact evaluation established in the "Model Energy-Efficiency Program Impact Evaluation Guide – A Resource of the National Action Plan for Energy Efficiency," November 2007:

> *"Evaluation is the process of determining and documenting the results, benefits, and lessons learned from an energy-efficiency program. Evaluation results can be used in planning future programs and determining the value and potential of a portfolio of energy-efficiency programs in an integrated resource planning process. It can also be used in retrospectively determining the performance (and resulting payments, incentives, or penalties) of contractors and administrators responsible for implementing efficiency programs.*

Evaluation has two key objectives:

1) To document and measure the effects of a program and determine whether it met its goals with respect to being a reliable energy resource.
2) To help understand why those effects occurred and identify ways to improve the program.

2.3.1 Impact

As part of evaluation planning, the evaluation team outlined the following activities to assess the impacts of the DEP and DEC SEWKP:

- Quantify accurate and supportable energy (kWh) and demand (kW) savings for energy efficient measures implemented in participants' homes;
- Assess the rate of free riders from the participants' perspective and determine spillover effects;

- Benchmark verified measure-level energy impacts to applicable technical reference manual(s) and other Duke-similar programs in other jurisdictions.

2.3.2 Process

The process evaluation assessed opportunities for improving the design and delivery of the program in DEP and DEC service territories. It specifically documented participant experiences by investigating participant responses to the energy efficiency kits and the extent to which the kits effectively motivate households to save energy and water.

The evaluation team assessed several elements of the program delivery and customer experience, including:

Motivation:

- What motivated participants to request and install the measures in the kit?
- In what ways, if any, did the program motivate participants to adopt new energy and water saving behaviors?

Program experience and satisfaction:

- How satisfied are participants with the overall program experience and kit items in terms of ease of use and measure quality?

Challenges and opportunities for improvement:

- Are there any inefficiencies or challenges with the delivery of the program?
- Are there any measures that have particularly low installation rates? If so, why?
- Are there any measures that have particularly high uninstallation rates? If so, why?

Participant household characteristics:

- What are demographic characteristics of those who received the kits?

2.4 Evaluation Overview

The evaluation team divided its approach into key tasks to meet the goals outlined:

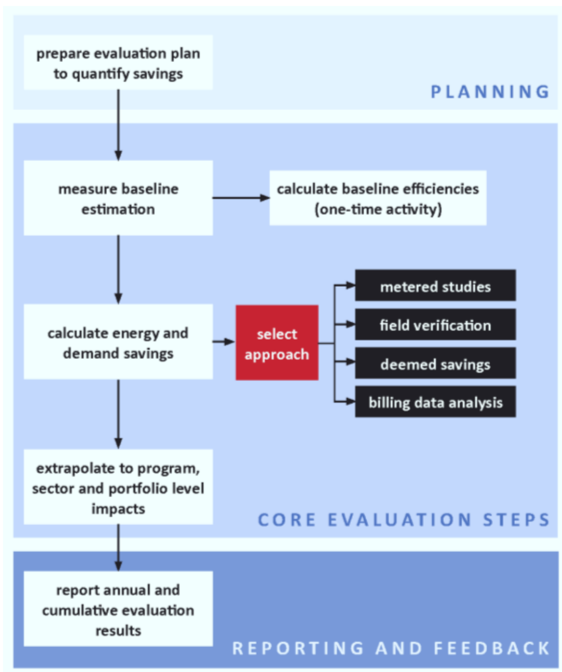
- **Task 1 –** Develop and manage evaluation work plan to describe the processes that will be followed to complete the evaluation tasks outlined in this project;
- **Task 2 –** Conduct a process review to determine how successfully the programs are being delivered to participants and to identify opportunities for improvement;
- **Task 3 –** Verify gross and net energy and peak demand savings resulting from SEWKP through verification activities of a sample of 2016 program participants.

2.4.1 Impact Evaluation

The primary determinants of impact evaluation costs are the sample size and the level of rigor employed in collecting the data used in the impact analysis. The accuracy of the study findings is in turn dependent on these parameters. Techniques that we used to conduct our evaluation, measurement, and verification (EM&V) activities, and to meet the goals for this evaluation, included telephone and web-based surveys with program participants, best practice review, and interviews with implementation and program staff.

Figure 2-1 demonstrates the principal evaluation team steps organized through planning, core evaluation activities, and final reporting.

Figure 2-1: Impact Evaluation Process



The evaluation is generally comprised of the following steps, which are described in further detail throughout this report:

- **Participant Surveys:** The file review for all sampled and reviewed program participation concluded with a telephone and/or web-based survey with the participants. Table 2-2 below summarizes the number of surveys and on-site inspections completed. The samples were drawn to meet a 90% confidence and 10% precision level based upon the expected and actual significance (or magnitude) of program participation, the level of certainty of savings, and the variety of measures.

- **Calculate Impacts:** Data collected via surveys enabled the evaluation team to calculate gross verified energy and demand savings[1] for each measure.
- **Estimate Net Savings**: Net impacts are a reflection of the degree to which the gross savings are a result of the program efforts and incentives. The evaluation team estimated free-ridership and spillover based on self-report methods through surveys with program participants. The ratio of net verified savings to gross verified savings is the net-to-gross ratio as an adjustment factor to the reported savings.

2.4.2 Process Evaluation

Process evaluation examines and documents:

- Program operations
- Stakeholder satisfaction
- Opportunities to improve the efficiency and effectiveness of program delivery

To satisfy the evaluation, measurement, and verification (EM&V) objectives for this research effort, the evaluation team reviewed program documents and conducted telephone and web surveys with participating households who received a kit. The team also held in-depth interviews (IDI) with utility and implementation staff. Table 2-2 provides a summary of the activities the evaluation team conducted as part of the DEP/DEC SEWKP process and impact evaluation.

Table 2-2: DEP/DEC SEWKP Summary of Evaluation Activities

Target Group	2016 Survey Population	Sample	Confidence /Precision	Method
Impact Activities				
DEP Participants	28,799	131	90/7.2	Telephone/Web Survey
DEC Participants	35,077	114	90/7.7	Telephone/Web Survey
Process Activities				
DEP Participants	28,799	131	90/7.2	Telephone/Web Survey
DEC Participants	35,077	114	90/7.7	Telephone/Web Survey
Duke Energy Program Staff	N/A	1	N/A	Telephone IDI
Implementer Staff: EFI	N/A	1	N/A	Telephone IDI

[1] Due to the small size of the measure and overall program impacts relative to annual consumption, a utility bill regression analysis was not feasible as such an analysis cannot effectively isolate the impacts from inherent noise in the billing data in absence of a randomized control trial. Therefore, the impact analysis relied on engineering algorithms to assess the program's savings impacts.

3 Impact Evaluation

3.1 Methodology

The evaluation team's impact analysis focused on the energy and demand savings attributable to the SEWKP for the period of January 2016 through December 2016. The evaluation was divided into two research areas: to determine gross and net savings (or impacts). Gross impacts are energy and demand savings estimated at a participant's home that are the direct result of the homeowner's installation of a measure included in the program-provided energy saving kit. Net impacts are a reflection of the degree to which the gross savings are a result of the program efforts and funds. The evaluation team verified energy and demand savings attributable to the program by conducting the following impact evaluation activities:

- Review of DEP and DEC participant databases.
- Completion of telephone and web-based surveys to verify key inputs into savings calculations.
- Estimation of gross verified savings using primary data collected from participants.
- Comparison of the gross-verified savings to program-evaluated results to determine kit-level realization rates.
- Application of attribution survey data to estimate net-to-gross ratios and net-verified savings at the program level.

3.2 Database and Historical Evaluation Review

Duke Energy provided the evaluation team with a program database for the SEWKP participation within each jurisdiction. The program database provided participant contact information including account number, address, phone number, email address (if available), and whether or not the participant was willing to be contacted. Because Duke Energy was able to provide both phone numbers and email addresses, we were able to design a sampling approach that could take advantage of both phone and web-based surveying.

The evaluation team conducted a benchmarking review of the uncertainty of ex-ante savings estimates by comparing multiple technical reference manuals (TRMs) and SEWK evaluations conducted in select Duke Energy jurisdictions. The details of the benchmarking review are referenced in Table 3-1. The listed savings values include the impact of in-service rates.

Table 3-1: Comparison of Ex-Ante SEWKP Energy Savings to Peer Group Estimates

Measure	Duke Energy Carolinas 2015 SEWKP evaluation[1]	Duke Energy Progress SEWKP ex ante savings[2]	Mid-Atlantic 2016 TRM[3]	Indiana 2012 TRM[4]	Texas 2015 TRM[5]	Pennsylvania 2016 TRM[6]
1.5 GPM Showerhead	293.87	143.00	296.63	71.59	340.26	327.96
1.0 GPM Bathroom Faucet Aerator	6.45	73.00	37.63	22.44	61.59	21.69
Adjustable Kitchen Faucet Aerator	183.37	61.00	37.63	33.66	61.59	130.73
Insulating Pipe Tape	111.50	155.00[7]	111.22	111.42	35.74	47.15

[1]Duke Energy Carolinas Save Energy and Water Kit Program evaluation. The Cadmus Group, revised April, 2016.
[2]Duke Energy provided.
[3]Mid-Atlantic Technical Reference Manual version 6.0. May, 2016.
[4]Indiana Technical Reference Manual, version 1.0. December, 2012.
[5]Texas Technical Reference Manual, version 3.0, Volume 2 Residential Measures. April, 2015.
[6]State of Pennsylvania Technical Reference Manual. June, 2016.
[7]DEP ex ante savings for pipe insulation based on an assumed installation of five feet of hot water pipe tape.

While Table 3-1 does illustrate variation in deemed savings among each source for each given measure, much of this variation reflects different in-service rate and water heat fuel type assumptions. Also of note is that the Mid-Atlantic, Indiana, and Texas TRMs do not differentiate parameter assumptions between bathroom and kitchen faucet aerators. For this reason, the evaluation team ultimately used assumptions outlined by the Pennsylvania TRM to capture different usage patterns between each aerator location. All other parameters not mined from the participant survey generally relied on the Mid-Atlantic TRM assumptions.

3.3 Sampling Plan and Achievement

To provide representative results and meet program evaluation goals, a sampling plan was created to guide all evaluation activity. A random sample was created to target 90/10 confidence and precision at the program level across both jurisdictions assuming a coefficient of variation (C_v) equal to 0.5.

3.3.1 DEP Sample

After reviewing the program database, we identified a population of 28,799 participants within our defined evaluation period. Based on this population, the evaluation team established sub-sample frames for phone and web-based survey administration. As illustrated in Table 3-2 below, we completed a total of 131 surveys. This sample size resulted in an achieved confidence and precision of 90/7.2.

Table 3-2: DEP Impact Sampling

Survey Mode	Sample Frame	Sampled Participants	Achieved Confidence/ Precisions
Phone	900[1]	37	90/7.2
Web-based	1,387	94	
Total	**2,287**	**131**	

[1]The total desired phone quota was completed before exhausting the sample frame. A total of 281 calls were dialed.

3.3.2 DEC Sample

The evaluation team identified a population of 35,077 participants within our defined evaluation period. Based on this population, we again established sub-sample frames for phone and web-based survey administration. As illustrated in Table 3-3 below, we completed a total of 114 surveys. This sample size resulted in an achieved confidence and precision of 90/7.7.

Table 3-3: DEC Impact Sampling

Survey Mode	Sample Frame	Sampled Participants	Achieved Confidence/ Precisions
Phone	900[1]	34	90/7.7
Web-based	1,613	80	
Total	**2,513**	**114**	

[1]The total desired phone quota was completed before exhausting the sample frame. A total of 260 calls were dialed.

3.4 Description of Analysis

3.4.1 Telephone and web-based surveys

The evaluation team performed telephone and web-based surveys to gain key pieces of information used in the savings calculations. Results of the completed surveys were used to inform our program-wide assumptions as detailed in Table 3-4.

Table 3-4: Participant Data Collected and Used for Analysis

Measure	Data Collected	Assumption
1.5 GPM Showerhead 1.0 GPM Bathroom Faucet Aerator Adjustable Kitchen Faucet Aerator	Units Installed	In-Service Rate
	Units Later Removed	
	Hot Water Fuel Type	% Electric DHW
	Adjustable Aerator Flow Rate	GPM Installed
	Frequency of Showers	Hot Water Consumption
	Duration of Showers	
Insulating Pipe Tape	Pipe Tape Used	In-Service Rate
	Pipe Tape Removed	
	Hot Water Fuel Type	% Electric DHW
	Length of Insulated Pipe	Pipe Length

3.4.2 In-Service Rate

The in-service rate (ISR) represents the ratio of equipment installed and operable to the total pieces of equipment distributed and eligible for installation. For example, if 15 telephone surveys were completed for customers receiving 1 bathroom aerator each, and five customers reported to still have the aerator installed and operable, the ISR for this measure would be five out of 15 or 33%. In some instances equipment was installed but may have been removed later due to homeowner preferences. In these cases the equipment is no longer operable and therefore contributes negatively to the ISR. In-service rates for each measure from all eligible survey respondents are detailed in Table 3-5 and Table 3-6.

Table 3-5: DEP SEWKP In-Service Rates

Measure	Distributed	Installed	Removed	ISR
1.5 GPM Showerhead	232	126	11	50%
1.0 GPM Bathroom Faucet Aerator	464	137	8	28%
Adjustable Kitchen Faucet Aerator	131	64	6	44%
Insulating Pipe Tape*	131	52	1	39%

*Quantity of pipe tape packages.

Table 3-6: DEC SEWKP In-Service Rates

Measure	Distributed	Installed	Removed	ISR
1.5 GPM Showerhead	193	96	9	45%
1.0 GPM Bathroom Faucet Aerator	386	96	5	24%
Adjustable Kitchen Faucet Aerator	114	50	5	39%
Insulating Pipe Tape*	114	35	0	31%

*Quantity of pipe tape packages.

3.4.3 Faucet Aerators

The Save Energy and Water Kit contained one kitchen faucet aerator and multiple bathroom faucet aerators. Participants receiving a small kit received two bathroom faucet aerators; those qualifying for a medium kit received four bathroom faucet aerators. The equations below outline the algorithms utilized to estimate savings accrued by the faucet aerator measures with parameters defined in Table 3-7. The algorithm used to estimate aerator impacts is based on the Pennsylvania TRM [2].

Equation 3-1: Faucet Aerator Energy Savings

$$\Delta kWh = ISR \times ELEC \times \left[\frac{\Delta GPM \times T_{person/day} \times N_{persons} \times 365 \frac{days}{year} \times DF \times \Delta T \times 8.3 \frac{BTU}{gal \cdot {}^{\circ}F}}{\#_{faucets} \times 3{,}412 \frac{BTU}{kWh} \times RE} \right]$$

Equation 3-2: Faucet Aerator Demand Savings

$$\Delta kW = ETDF \times \Delta kWh$$

Table 3-7: Inputs for Faucet Aerator Measures Savings Calculations

Input	Units	DEC Value*	DEP Value*	Source
ISR	N/A	Bath: 24% Kitchen: 39%	Bath: 28% Kitchen: 44%	Survey responses
ELEC	N/A	Bath: 70% Kitchen: 80%	Bath: 81% Kitchen: 85%	Survey responses
ΔGPM	GPM	Bath: 1.2 Kitchen: 1.21		Product specification sheet and survey responses compared against federal code minimum
$T_{person/day}$	Minutes	Bath: 1.6 Kitchen: 4.5		Pennsylvania 2016 TRM
$N_{persons}$	Persons	Bath: 2.4 Kitchen: 2.5	Bath: 2.5 Kitchen: 2.5	Survey responses
DF	N/A	Bath: 90% Kitchen: 75%		Pennsylvania 2016 TRM
ΔT	°F	Bath: 19.1 Kitchen: 19.1		Mid-Atlantic 2016 TRM
$\#_{faucets}$	Units	Bath: 2.6	Bath: 3.1	Survey responses

[2] The prior evaluation conducted for DEC SEWKP relied on the Mid-Atlantic TRM. The evaluation team opted to use the Pennsylvania TRM as it provides a more comprehensive algorithm and differentiates between bathroom aerator and kitchen aerator assumptions.

Input	Units	DEC Value*	DEP Value*	Source
		Kitchen: 1.1	Kitchen: 1.1	
ETDF	N/A	Bath: 0.00053 Kitchen: 0.00053		Pennsylvania 2016 TRM
RE	N/A	98%		Mid-Atlantic 2016 TRM

*Parameter values are estimated based on participants who installed the measure. For example, the water heat saturation is representative of participants who installed the faucet aerator as opposed to the full sample of participants which would include participants who did not install a faucet aerator.

The evaluation team determined that the 2016 Pennsylvania's TRM provided the most applicable calculations by differentiating between kitchen and bathroom water use and providing more comprehensive algorithms. Where the Mid-Atlantic 2016 TRM made appropriate distinctions, the evaluation team used the Mid-Atlantic parameter assumptions due to its geographic relevance to the DEP and DEC territory. However, where the Mid-Atlantic TRM lacked granularity, the evaluation team elected to use the Pennsylvania TRM as the secondary data source for estimating savings.

3.4.4 Showerheads

The Save Energy and Water Kit contained multiple low-flow showerheads with the quantity depending on the size of the kit received. Participants receiving a small kit received one showerhead; those qualifying for a medium kit received two showerheads. The equations below outline the algorithms utilized to estimate savings accrued by the faucet aerator measures with parameters defined in Table 3-8. The algorithm used to estimate showerhead impacts is based on the Pennsylvania TRM.

Equation 3-3: Showerhead Energy Savings

$$\Delta kWh = ISR \times ELEC \times \left[\frac{\Delta GPM \times T_{person/day} \times N_{persons} \times 365 \frac{days}{year} \times N_{showers-day} \times \Delta T \times 8.3 \frac{BTU}{gal \cdot {}^{\circ}F}}{3{,}412 \frac{BTU}{kWh} \times RE} \right]$$

Equation 3-4: Showerhead Demand Savings

$$\Delta kW = ETDF \times \Delta kWh$$

Table 3-8: Inputs for Showerhead Savings Calculations

Input	Units	DEC Value*	DEP Value*	Source
ISR	N/A	45%	50%	Survey responses
ELEC	N/A	74%	83%	Survey responses
ΔGPM	GPM	1.0		Product specification sheet compared against federal code minimum
$T_{person/day}$	Minutes	7.9	9.4	Survey responses
$N_{persons}$	Persons	2.3	2.5	Survey responses

Input	Units	DEC Value*	DEP Value*	Source
$N_{showers\text{-}day}$	Persons	0.8	0.8	Survey responses
ΔT	°F	44.1		Mid-Atlantic 2016 TRM
ETDF	N/A	0.00032		Pennsylvania 2016 TRM
RE	N/A	98%		Mid-Atlantic 2016 TRM

*Parameter values are estimated based on participants who installed the measure. For example, the water heat saturation is representative of participants who installed the showerhead as opposed to the full sample of participants which would include participants who did not install a showerhead.

The evaluation team determined that the 2016 Pennsylvania's TRM provided the most applicable and rigorous algorithm. However, we did rely on the Mid-Atlantic 2016 TRM for parameter assumptions that were more geographically relevant to the DEP and DEC territory.

3.4.5 Insulating Pipe Tape

All participants received a 15 foot roll of insulating pipe tape with their kit. To estimate the impacts resulting from the installation of the pipe tape measure, the evaluation team used the algorithms presented below. The algorithm used to estimate pipe wrap impacts is based on the Mid-Atlantic TRM.

Equation 3-5: Insulating Pipe Tape Energy Savings

$$\Delta kWh = ISR \times ELEC \times \frac{\left(\frac{1}{R_{ex}} - \frac{1}{R_{new}}\right) \times L \times C \times \Delta T \times 8{,}760}{\eta DHW \times 3{,}413}$$

Equation 3-6: Insulating Pipe Tape Demand Savings

$$\Delta kW = \frac{\Delta kWh}{8{,}760}$$

Table 3-9: Inputs for Insulating Pipe Tape Savings Calculations

Input	Units	DEC Value*	DEP Value*	Source
ISR	N/A	31%	39%	Survey Responses
ELEC	N/A	74%	78%	Survey Responses
R_{ex}	N/A	1.00		Federal Code Minimum
R_{new}	N/A	3.00		Product Sheet Specification
L	Feet	5.8	5.7	Survey Responses**
C	Feet	0.20		Mid-Atlantic 2016 TRM (Average of 1/2" and 3/4" pipe)
ΔT	°F	65.0		Mid-Atlantic 2016 TRM
ηDHW	N/A	0.98		Mid-Atlantic 2016 TRM
ETDF	N/A	0.00011		Mid-Atlantic 2016 TRM (Calculated)

*Parameter values are estimated based on participants who installed the measure. For example, the water heat saturation is representative of participants who installed the pipe tape as opposed to the full sample of participants which would include participants who did not install pipe tape.
**Participant-provided estimated lengths of hot water pipe covered by the pipe tape was used to estimate verified savings.

Reported savings for this measure assumes five feet of pipe is covered.

Through a combination of participant survey responses as well as TRM and other deemed values, we estimated the parameter inputs presented above in Table 3-9.

3.5 Targeted and Achieved Confidence and Precision

We developed the SEWKP evaluation plan with the goal of achieving a target of 10% relative precision at the 90% confidence interval across both jurisdictions at the program level. Due to a high response rate from the web-based surveys, the evaluation team was able to surpass this target and achieve a high level of statistical precision for both jurisdictions. The final DEP sample yielded a relative precision of +/- 7.2% at the 90% confidence level while the DEC sample yielded a relative precision of +/- 7.7% at the 90% confidence level (Table 3-10).

Table 3-10: Targeted and Achieved Confidence and Precision

Program	Targeted Confidence/Precision	Achieved Confidence/Precision
DEP SEWKP	90/10.0	90/7.2
DEC SEWKP		90/7.7

3.6 Results

3.6.1 DEP findings

Measure-level and kit-level energy savings values for the DEP jurisdiction are detailed in Figure 3-1 and Table 3-11.

Figure 3-1: 2016 DEP Gross Verified Energy Savings

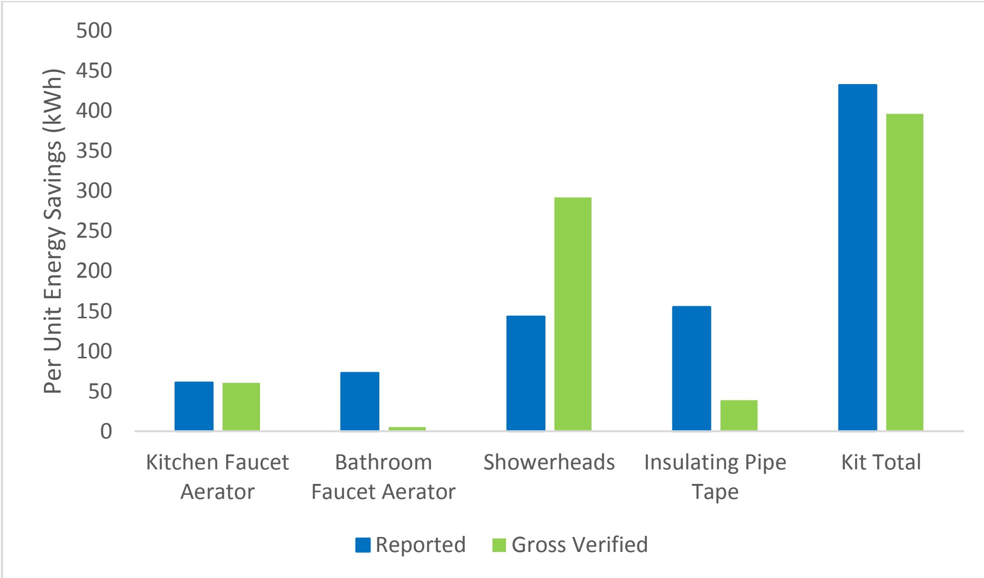


Table 3-11: DEP Measure-Level Reported and Verified Gross Energy Savings

Measure	Reported Energy Savings, per unit (kWh)	Realization Rate	Verified Gross Energy Savings, per unit (kWh)	Total Verified Gross Energy Savings (kWh)
Low-flow Showerhead (1.5 GPM)	143.0	203.9%	291.6	8,210,886
Low-flow Bathroom Aerator (1.0 GPM)	73.0	7.4%	5.4	151,412
Low-flow Kitchen Aerator (1.0 GPM)	61.0	98.8%	60.3	1,697,285
Insulating Pipe Tape*	155.0	25.1%	38.8	1,093,634
Total	**432.0**	**91.7%**	**396.1**	**11,153,216**

*Reported savings for pipe tape based on an assumed installation of five feet of tape.

Measure-level and kit-level demand savings are detailed in Table 3-12.

Table 3-12: DEP Measure-Level Reported and Verified Demand Gross Savings

Measure	Reported Demand Savings, per unit (kW)	Realization Rate	Verified Gross Demand Savings, per unit (kW)	Total Verified Gross Demand Savings (kW)
Low-flow Showerhead (1.5 GPM)	0.03	285.3%	0.093	2,632.0
Low-flow Bathroom Aerator (1.0 GPM)	0.02	17.2%	0.003	80.9
Low-flow Kitchen Aerator (1.0 GPM)	0.01	230.7%	0.032	906.8
Insulating Pipe Tape*	0.01	63.1%	0.004	124.8
Total	**0.07**	**188.6%**	**0.133**	**3,744.5**

*Reported savings for pipe tape based on an assumed installation of five feet of tape.

The impact evaluation for the 2016 program resulted in a program energy realization rate of 91.7% and a demand realization rate of 188.6% as presented in Table 3-13.

Table 3-13: 2016 DEP Energy Savings per Kit

Measurement	Reported	Realization Rate	Gross Verified
Energy (kWh)	432.0	91.7%	396.1
Demand (kW)	0.07	188.6%	0.133

Table 3-14 presents the reported and verified energy and demand savings for the 2016 program year.

Table 3-14: 2016 DEP Program Level Energy Savings

Measurement	Reported	Realization Rate	Gross Verified
Energy (kWh)	12,162,634	91.7%	11,153,216
Demand (kW)	1,985.2	188.6%	3,744.5

3.6.2 DEC findings

Measure-level and kit-level energy savings values for the DEC jurisdiction are detailed in Figure 3-2 and Table 3-15.

Figure 3-2: 2016 DEC Gross Verified Energy Savings

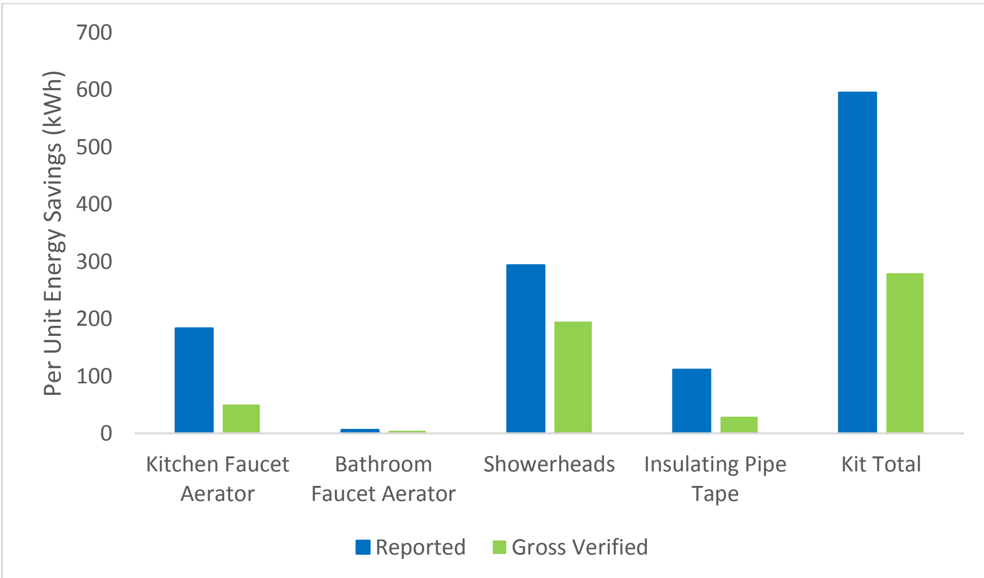


Table 3-15: DEC Measure-Level Reported and Verified Gross Energy Savings

Measure	Reported Energy Savings, per unit (kWh)	Realization Rate	Verified Gross Energy Savings, per unit (kWh)	Total Verified Gross Energy Savings (kWh)
Low-flow Showerhead (1.5 GPM)	293.9	66.5%	195.4	6,456,514
Low-flow Bathroom Aerator (1.0 GPM)	6.5	70.2%	4.5	149,610
Low-flow Kitchen Aerator (1.0 GPM)	183.4	27.4%	50.2	1,659,508
Insulating Pipe Tape*	111.5	26.4%	29.5	973,684
Total	**595.2**	**47.0%**	**279.6**	**9,239,316**

*Reported savings for pipe tape based on an assumed installation of five feet of tape.

Measure-level and kit-level demand savings are detailed in Table 3-16.

Table 3-16: DEC Measure-Level Reported and Verified Demand Gross Savings

Measure	Reported Demand Savings, per unit (kW)	Realization Rate	Verified Gross Demand Savings, per unit (kW)	Total Verified Gross Demand Savings (kW)
Low-flow Showerhead (1.5 GPM)	0.13	48.1%	0.063	2,069.6
Low-flow Bathroom Aerator (1.0 GPM)	0.00	69.3%	0.002	79.9
Low-flow Kitchen Aerator (1.0 GPM)	0.10	36.1%	0.027	886.6
Insulating Pipe Tape*	0.01	27.8%	0.003	111.2
Total	**0.25**	**38.8%**	**0.095**	**3,147.3**

*Reported savings for pipe tape based on an assumed installation of five feet of tape.

The impact evaluation for the 2016 program resulted in a program energy realization rate of 47.0% and a demand realization rate of 38.8% as presented in Table 3-17.

Table 3-17: 2016 DEC Energy and Demand Savings per Kit

Measurement	Reported	Realization Rate	Gross Verified
Energy (kWh)	595.2	47.0%	279.6
Demand (kW)	0.25	38.8%	0.095

Table 3-18 presents the reported and verified energy and demand savings for the 2016 program year.

Table 3-18: 2016 DEC Program Level Energy and Demand Savings

Measurement	Reported	Realization Rate	Gross Verified
Energy (kWh)	19,669,692	47.0%	9,239,316
Demand (kW)	8,101.2	38.8%	3,147.3

4 Net-to-Gross Methodology and Results

The evaluation team used participant survey data to calculate a net-to-gross (NTG) ratio for SEWKP. NTG reflects the effects of free ridership (FR) and spillover (SO) on gross savings. Free ridership refers to the portion of energy savings that participants would have achieved in the absence of the program through their own initiatives and expenditures (U.S. DOE, 2014).[3] Spillover refers to the program-induced adoption of additional energy-saving measures by participants who did not receive financial incentives or technical assistance for the additional measures installed (U.S. DOE, 2014). The evaluation team used the following formula to calculate the NTG ratio:

$$NTG = 1 - FR + SO$$

4.1 Free Ridership

Free ridership estimates how much the program influenced participants to install the energy-saving items included in the energy efficiency kit. Free ridership ranges from 0 to 1, 0 being no free ridership and 1 being total free ridership, with values in between representing varying degrees of partial free ridership.

The evaluation team used participant survey data to estimate free ridership. The survey used several questions to identify items that a given participant installed and did not later uninstall: respondents were only asked free ridership questions about items that remained installed by the date of the survey.

The evaluation team's methodology for calculating free ridership consists of two components, free ridership change (FRC) and free ridership influence (FRI), both of which range from 0 to .5 in value.

$$FR = FRC + FRI$$

4.1.1 Free Ridership Change

FRC reflects what participants reported they would have done if the program had not provided the items in the kit. For each respondent, the survey assessed FRC for each measure that the respondent installed and did not later uninstall.

Specifically, the survey asked respondents which, if any, of the currently installed items they would have purchased and installed on their own within the next year if Duke Energy had not provided them. For respondents who installed more than one of a given measure (bathroom

[3] The U.S. Department of Energy (DOE) (2014). *The Uniform Methods Project: Methods for Determining Energy Efficiency Savings for Specific Measures. Chapter 23: Estimating Net Savings: Common Practices.* Retrieved August 29, 2016 from http://energy.gov/sites/prod/files/2015/02/f19/UMPChapter23-estimating-net-savings_0.pdf.

aerators or showerheads) that indicated they would have installed either of the multi-count measures on their own, we asked them a follow up question that determined how many of the number installed through the program that they would have installed on their own.

For each measure, the evaluation team assigned one of the FRC values shown in the Table 4-1, based on the respondents' responses. FRC values range from 0.0 to 0.5.

Table 4-1: Free Ridership Change Values

What Respondent Would Have Done Absent the Program*	FRC Value
Would ***not*** have purchased and installed the item within the next year	0.00
Would have purchased and installed the item within the next year	$\frac{\text{Count respondent said would install on their own}}{\text{Count respondent installed through program}}$
Don't know	0.25

*Survey response to: If you had not received the free efficiency items in the kit, would you have purchased and installed any of these same items within the next year?

4.1.2 Free Ridership Influence

FRI assesses how much influence the program had on a participant's decision to install (and keep installed) the items in the kit. The survey asked respondents to rate how much influence five program-related factors had on their respective decisions to install the measures, using a scale from 0 ("not at all influential") to 10 ("extremely influential"). The program-related factors included:[4]

- The fact that the items were free
- The fact that the items were mailed to their home
- Information provided by Duke Energy about how the items would save energy and water
- Other information or advertisements from Duke Energy, including its website

Asking respondents to separately rate the influence of each of the four above items had on the decision to install each measure would have been overly burdensome. Therefore, while the survey assessed FRC for each measure type, it assessed collective FRI for all measures.

FRI is based on the highest-rated item in the FRI battery. The evaluation team assigned the following FRI scores, based on that rating (Table 4-2).

[4] To reduce response fatigue, we only asked respondents to rate program influence on their decision to install the measures (as a whole). Thus, we did not collect separate influence data for each measure included in the kit.

Table 4-2: Free Ridership Influence Values

Highest Influence Rating	FRI Value
0	0.50
1	0.45
2	0.40
3	0.35
4	0.30
5	0.25
6	0.20
7	0.15
8	0.10
9	0.05
10	0.00

4.1.3 End-Use-Specific Total Free Ridership

The evaluation team calculated total free ridership by measure, by:

- First, calculating measure-specific FR scores for each respondent by summing each respondent's measure-specific FRC score with their FRI score.
- Second, calculating a weighted mean FR score for each measure from the individual measure-specific FR scores; we weighted measure-specific FR scores by the number of units installed by each respondent.

Table 4-3 presents the measure-use FR estimates.

Table 4-3: Measure-Specific Free Ridership Scores

End-use	Measure-Specific Free Ridership	
	DEP	DEC
Showerhead	0.16	0.19
Kitchen Faucet Aerator	0.13	0.13
Bathroom Faucet Aerator	0.15	0.10
Insulating Pipe Tape	0.10	0.11

4.1.4 Program-Level Free Ridership

The evaluation team estimated program-level free ridership by calculating a savings-weighted mean of the measure-specific FR scores presented in Table 4-3. Overall free ridership for the DEP kits is 15%. Overall free ridership for the DEC kits is 17%.

4.2 Spillover

Spillover estimates energy savings from additional energy improvements made by participants who are influenced by the program to do so and is used to adjust gross savings. The evaluation team used participant survey data to estimate spillover. The survey asked respondents to indicate what energy-saving measures they had implemented since participating in the program. The evaluation team then asked participants to rate the influence the program had on their decision to purchase these additional energy-saving measures on a scale of 0 to 10, where 0 means "not at all influential" and 10 means "extremely influential."

The evaluation team converted the ratings to a percentage representing the program-attributable percentage of the measure savings, from 0% to 100%. The team then applied the program-attributable percentage to the savings associated with each reported spillover measure to calculate the participant measure spillover (PMSO) for that measure. We defined the per unit energy savings for the reported spillover measures based on ENERGY STAR® calculators as well as based on algorithms and parameter assumptions listed in the 2016 Pennsylvania and Mid-Atlantic TRMs.

Lighting measures (namely, LEDs and CFLs) were commonly reported spillover measures. Since Duke Energy offered discounted lighting at participating retailers through their Energy Efficient Lighting (EEL) program as well through their online lighting store, we asked respondents to confirm they did not use Duke Energy's website to find or purchase discounted lighting. As to not double-count these savings, respondents who indicated they used Duke Energy's website to find or purchase discounted lighting did not count towards spillover estimates.

Participant measure spillover is calculated as follows:

$$PMSO = Deemed\ Measure\ Savings * Program\ Attributable\ Percentage$$

The evaluation team summed all PMSO values for each jurisdiction (Table 4-4 and Table 4-5).

Table 4-4: DEP PMSO, by Measure by Category

Measure Category	Total kWh for Category	Percent Share of kWh
LEDs	1,915.3	44%
CFLs	1,625.0	37%
Appliances	531.9	12%
Insulation	106.0	2%
HVAC	67.4	2%
Other	120.6	3%
Total	**4,366.2**	**100%**

Table 4-5: DEC PMSO, by Measure by Category

Measure Category	Total kWh for Category	Percent Share of kWh
LEDs	1,679.2	54%

Measure Category	Total kWh for Category	Percent Share of kWh
Appliances	883.9	28%
CFLs	290.9	9%
Windows	193.8	6%
HVAC	62.9	2%
Insulation	21.7	1%
Total	**3,132.4**	**100%**

The evaluation team then calculated each jurisdictional sample's gross program savings by summing the products of each measure's average per household savings and the total jurisdictional sample size (Table 4-6 and Table 4-7).

Table 4-6: DEP Sample's Gross Program Savings (n=131)

Measure	Average per Household Savings (kWh)	Verified Sample Savings (kWh)
Showerhead	291.6	38,204.8
Kitchen Faucet Aerator	60.3	7,899.3
Bathroom Faucet Aerator	5.4	707.4
Insulating Pipe Tape	38.8	5,088.6
Total	**396.1**	**51,900.1**

Table 4-7: DEC Sample's Gross Program Savings (n=114)

Measure	Average per Household Savings (kWh)	Verified Sample Savings (kWh)
Showerhead	195.4	22,272.1
Kitchen Faucet Aerator	50.2	5,724.6
Bathroom Faucet Aerator	4.5	516.1
Insulating Pipe Tape	29.5	3,358.8
Total	**279.6**	**31,871.5**

The evaluation team then divided the summed jurisdictional PMSO values by the sample's gross program savings to calculate an estimated spillover percentage for the program:

$$Program\ SO = \frac{\sum PMSO}{\sum Sample's\ Gross\ Program\ Savings}$$

$$DEP\ SO = \frac{4{,}366.2}{51{,}900.1}$$

$$DEC\ SO = \frac{3{,}132.4}{31{,}871.5}$$

These calculations produced a spillover estimate of 8% for the DEP program and 10% for the DEC program.

4.3 Net-to-Gross

Inserting the FR and SO estimates into the NTG formula (NTG = 1 – FR + SO) produces an NTG value of 0.93 for both DEP and DEC programs (Table 4-8). The evaluation team applied the NTG ratio of 0.93 to program-wide verified gross savings to calculate SEWKP kit net savings for each jurisdiction.

Table 4-8: Net-to-Gross Results

Jurisdiction	Free Ridership	Spillover	NTG
DEP	0.15	0.08	0.934
DEC	0.17	0.10	0.932

5 Process Evaluation

5.1 Summary of Data Collection Activities

The process evaluation is based on interviews and surveys with program staff, implementer staff, and households who received a kit during the program evaluation year (Table 5-1).

Table 5-1: Summary of Process Evaluation Data Collection Activities

Target Group	Method	Sample Size	Population	Confidence / Precision
Duke Energy program staff	Phone in-depth interview	1	N/A	N/A
Implementation staff: EFI	Phone in-depth interview	1	N/A	N/A
DEP participants	Mixed mode (web/phone) survey	131	28,799	90/7.2
DEC participants	Mixed mode (web/phone) survey	114	35,077	90/7.7

5.2 DEP Process Evaluation Findings

Motivations for Requesting Kit

The majority of DEP participants requested the Save Energy and Water Kit to conserve water (70%) and/or electricity (60%) (Table 5-2). More than half (53%) said they requested the kit because "it was free."

Table 5-2: DEP Participant Motivations for Requesting Kit (Multiple Responses Allowed; n=131)

Motivation	Percent Reporting
Wanted to conserve water	70%
Wanted to conserve electricity	60%
It was free	53%
It was offered by Duke Energy	34%
It was easy	33%
To save money	4%
Other	4%

Installation Rates

The majority (85%) of kit recipients installed at least one measure, installing an average of two measures from the kit. Most kit recipients initially installed at least one of the showerheads (69%) or the bathroom faucet aerators (56%), with a smaller proportion reporting installing the other measures. Of the respondents who received a medium-sized kit, 49% installed both showerheads.[5] Regardless of kit size received, participants installed one bathroom aerator and one showerhead on average.

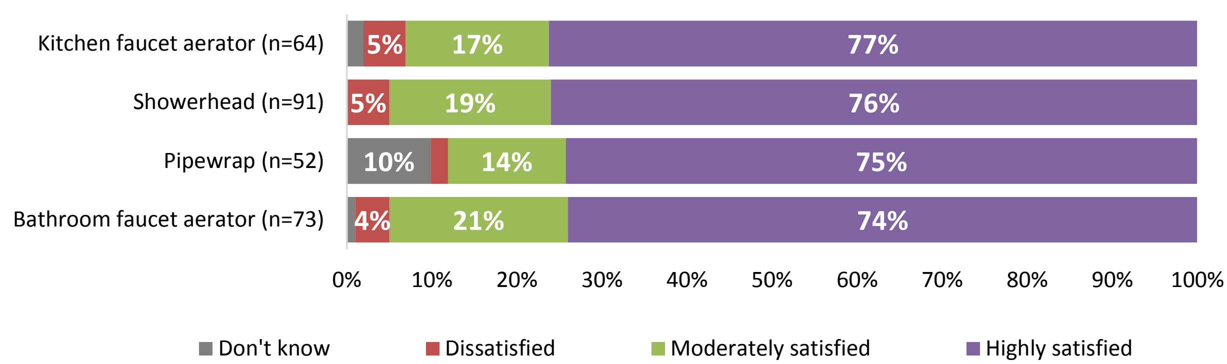
Of the respondents who installed at least one item from the kit, 15% said they later uninstalled at least one of the measures, five of whom uninstalled everything they had installed. In total, 5% of all installed measure types were later uninstalled. Showerheads and bathroom faucet aerators had the highest uninstallation rates, with about one-tenth of respondents who installed them later uninstalling them. Respondents said they uninstalled these water saving measures because they did not like how they worked, later elaborating that the water pressure provided was insufficient to their preferences.

About one-fifth (18%) of respondents reported installing all measure types. Of the respondents who did not install all measure types, 30% said they plan to install at least one of the items they had not yet installed. Respondents who indicated they don't plan to install one or more of the measures typically said they would not install the remaining items because they already had the item, they had not "gotten around to it", or the item did not fit on their fixture.

Measure Satisfaction

Nearly all kit recipients reported moderate to high satisfaction with the items they installed from their kit (Figure 5-1). To best gauge the experience with the measures, we asked respondents to rate their satisfaction with all measures they installed, including those they later uninstalled. Respondents reported similar levels of satisfaction with all four measures. Open-ended comments revealed dissatisfied respondents were displeased with the water-saving measures due to water pressure being too low.

Figure 5-1: DEP Participant Satisfaction with Installed Measures*



* Respondents rated their satisfaction with the measures on a 0 ("very dissatisfied") to 10 ("very satisfied") scale. Dissatisfied indicates 0-4 ratings, moderately satisfied indicates 5-7 ratings, and highly satisfied indicates 8-10 ratings.

Instructional Materials in the Kit

In addition to energy-saving measures, the Save Energy and Water Kit includes a detailed instructional insert booklet that provides information on how to install the provided measures.

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[5] 70% of medium kit recipients installed at least one showerhead, 49% of which installed both that came with the kit.

The majority (84%) of respondents said they read the booklet, most of whom (80%) reported they found it highly helpful.[6] Additionally, Duke Energy Progress provides how-to videos on its website that demonstrate how to install the kit items. Only 7% of kit recipients watched these online videos, though most of those who watched them (67%) considered the videos highly helpful[7].

Additional Energy Saving Actions

Over one-quarter (39 of 131, or 30%) of participants reported purchasing and installing at least one additional energy efficiency measure since receiving their kit (Table 5-3). LEDs (18 mentions) and energy efficient appliances (13 mentions) were the most common purchases reported. Seven respondents reported getting a DEP incentive for their measure, and most (25 of 39) respondents said the DEP SEWKP at least partially influenced their decision to purchase and install additional energy-saving measures.

Table 5-2: Additional Energy Saving Measures Purchased by DEP Participants (Multiple Responses Allowed; n=131)

	Count of Respondents Reporting Purchases After Receiving the Kit	Count That Received Duke Incentives for the Purchase/Measure*	Count Reporting at Least Some DEP Program Influence on Purchase
At least one measure	39	7	25
LEDs	18	4	11
Efficient appliances	13	0	9
Air sealing	11	0	9
CFLs	9	1	8
Insulation	9	0	7
Efficient heating or cooling equipment	8	2	4
Energy efficient water heater	6	0	4
Efficient windows	2	0	0
Duct sealing or insulation	2	0	2
Other	7	0	5

* Includes respondents that indicated they got their LEDs and CFLs through the DEP buy-down program.

[6] We asked respondents to rate the helpfulness of the instruction booklet on a scale from 0 (“not at all helpful”) to 10 (“very helpful”). 88 of the 110 (or 80%) respondents who reported reading the booklet gave a rating of 8 or higher.

[7] We asked respondents to rate the helpfulness of the DEP online how-to videos on a scale from 0 “not at all helpful” to 10 (“very helpful”). Six of the nine (67%) respondents who reported watching the videos gave a rating of 8 or higher.

5.3 DEC Process Evaluation Findings

Motivations for Requesting Kit

More than half of DEC participants requested the Save Energy and Water Kit to conserve water (56%) and/or electricity (55%) (Table 5-3). Less than half (41%) requested the kit because "it was free".

Table 5-3: DEC Participant Motivations for Requesting Kit (Multiple Responses Allowed; n=114)

Motivation	Percent Reporting
Wanted to conserve water	56%
Wanted to conserve electricity	55%
It was free	41%
It was offered by Duke Energy	36%
It was easy	17%
To save money	5%
Other	8%

Installation Rates

Most (76%) kit recipients installed at least one measure, installing an average of two measures from the kit. The majority of kit recipients initially installed at least one of the showerheads (62%), less than half (46%) initially installed at least one of the bathroom faucet aerators, with a smaller proportion reporting installing the other measures. Of the respondents who received a medium-sized kit, 53% installed both showerheads.[8] Regardless of kit size received, participants installed one bathroom aerator and one showerhead on average.

Of the respondents who installed at least one item from the kit, 12% said they later uninstalled at least one of the measures, but only three participants uninstalled everything they had installed. In total, 3% of all installed measure types were later uninstalled. Kitchen faucet aerators and showerheads had the highest uninstallation rates, with about one-tenth of respondents who initially installed them uninstalling them later. Respondents said they uninstalled these water saving measures because they did not like how they worked, later elaborating that the water pressure provided was insufficient to their preferences.

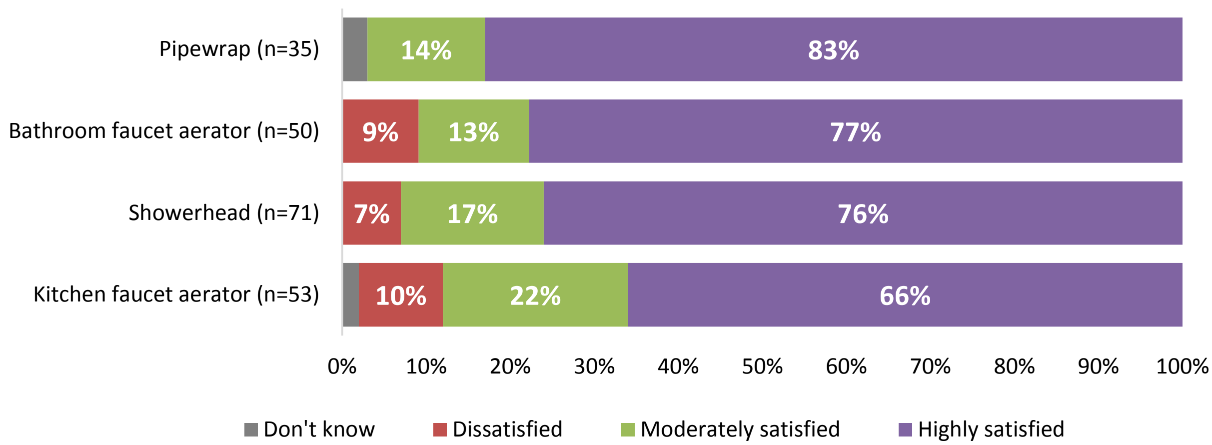
Eleven percent of respondents reported installing all measure types. Of the respondents who did not install all measure types, 43% said they plan to install at least one of the items they had not yet installed. Respondents who indicated they don't plan to install one or more of the measures typically said they would not install the remaining items because they already had the item, they had not "gotten around to it", or the item did not fit on their fixture.

[8] 59% of medium kit recipients installed at least one showerhead, 53% of which installed both that came with the kit.

Measure Satisfaction

Nearly all kit recipients reported moderate to high satisfaction with the items they installed from their kit (Figure 5-2). To best gauge the experience with the measures, we asked respondents to rate their satisfaction with all measures they installed, including those they later uninstalled. Respondents were most satisfied with the pipe tape and were least satisfied with the kitchen faucet aerator. Open-ended comments revealed respondents were dissatisfied with the water-saving measures due to water pressure being too low.

Figure 5-2: DEC Participant Satisfaction with Installed Measures*



* Respondents rated their satisfaction with the measures on a 0 (“very dissatisfied”) to 10 (“very satisfied”) scale. Dissatisfied indicates 0-4 ratings, moderately satisfied indicates 5-7 ratings, and highly satisfied indicates 8-10 ratings.

Instructional Materials in the Kit

In addition to energy-saving measures, the Save Energy and Water Kit includes a detailed instructional insert that provides information on how to install the provided measures. The majority (82%) of respondents said they read the insert, most of whom (70%) reported they found it highly helpful.[9] Additionally, Duke Energy provides how-to videos on its website that demonstrate how to install the kit items. Only 5% of kit recipients watched these online videos, though 83% of them considered the videos highly helpful.[10]

Additional Energy Saving Actions

One-third (37 of 114, or 33%) of participants reported purchasing and installing additional energy efficiency measures since receiving their kit (Table 5-4). Participants most commonly reported installing LEDs (14 respondents) or sealing air leaks in windows, walls, or doors (11 respondents). Eleven respondents reported getting a Duke Energy incentive for their measure, and most (29 of 37) respondents said DEC SEWKP at least partially influenced their decision to purchase and install additional energy-saving measures.

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[9] We asked respondents to rate the helpfulness of the instruction booklet on a scale from 0 (“not at all helpful”) to 10 (“very helpful”). Sixty-five of the 93 (or 70%) respondents who reported reading the booklet gave a rating of 8 or higher.

[10] We asked respondents to rate the helpfulness of the DEC online how-to videos on a scale from 0 “not at all helpful” to 10 (“very helpful”). Five of the six (83%) respondents who reported watching the videos gave a rating of 8 or higher.

Table 5-4: Additional Energy Saving Measures Purchased by DEC Participants (Multiple Responses Allowed; n=114)

	Count of Respondents Reporting Purchases After Receiving the Kit	Count That Received Duke Incentives for the Purchase/Measure*	Count Reporting at Least Some DEC Program Influence on Purchase
At least one measure	37	11	29
LEDs	14	5	12
Air sealing	11	0	10
CFLs	7	4	6
Efficient appliances	7	0	7
Efficient heating or cooling equipment	7	1	4
Efficient water heater	7	0	5
Insulation	6	0	6
Efficient windows	3	0	3
Duct sealing	2	0	1
Moved into ENERGY STAR home	1	0	1
Other	3	1	2

* Includes respondents that indicated they got their LEDs and CFLs through the Duke Energy buy-down program.

6 Conclusions and Recommendations

The evaluation findings, led to the following conclusions and recommendations for the program.

Conclusion 1: The program model is highly successful: it leverages low-cost measures to foster energy savings that would not have happened otherwise. Duke Energy's easy process for requesting and receiving a kit with free energy and water saving items motivated thousands of customers to request and install energy saving measures in their home. Most participants installed at least one measure from the kit and the vast majority of measures, once installed, stayed installed. Participants were highly influenced by the program to install these kit measures, as demonstrated by low free ridership rates. Further, about one-third of respondents in either jurisdiction reported spillover actions.

> **Recommendation**: Continue using SEWKP to encourage Duke Energy customers to save energy and water.

Conclusion 2: The water saving measures' low flow water pressure results in some minor satisfaction and uninstallation issues. Complaints of excessively low water pressure were the primary drivers of item dissatisfaction and uninstallation. However, only a minority of participants were dissatisfied with or uninstalled water saving items.

> **Recommendation**: Consider expanding participant-facing messaging around low-flow measures; water measure ISRs and satisfaction may increase if participants have better upfront expectations on the flow rates of the measures and better understand the energy saving benefits of low-flow fixtures.

> **Recommendation**: Consider investigating alternative products that provide the same GPM as the current aerator and showerhead offerings, but offer higher perceived water pressure.

Conclusion 3: Despite delivering a useable number of units to most homes, there may be cost- effectiveness benefits to reducing the number of items delivered. The kit size assignment algorithm works fairly well:

- Small and medium kit recipients largely got the appropriate number of kitchen and bathroom aerators, given the number of faucets in their home.
- However, more than half of small kit recipients have two or more showers in their home.

Nonetheless, many items do not get installed, especially multi-count measures:

- Recipients of either kit size installed one bathroom aerator and one showerhead on average.

- Medium kits had lower ISRs on every measure, suggesting that delivering too many items may overwhelm participants and consequently hinder installations.

Recommendation: Consider if the there is a significant enough cost-effectiveness benefit to justify reducing the number of kit sizes and multi-count units offered. Reducing the number of items included in the kit, particularly the number of bathroom aerators provided, could increase ISRs and reduce program costs as the survey data reveals there is a negative relationship with number of kit items delivered and ISRs (that is, the more items Duke Energy provides, the lower the ISRs).

Conclusion 4: A high amount of non-electric water heater customers participated in the program. In total, the evaluation found that 18% of DEP and 29% of DEC customers in the program had non-electric water heaters. These saturations are comparable to the 2013 Duke Residential Appliance Saturation Survey non-electric water heat saturation of 25%.

Recommendation: For future program recruitment, Duke Energy should continue to review and refine its customer screening techniques to better filter non-electric water heater customers from the program's solicitation.

Appendix A Summary Form

Save Energy and Water Kit Program

Completed EMV Fact Sheet

Description of program

The Duke Energy Save Energy and Water Kit Program (SEWKP) is an energy efficiency program that offers energy-efficient water fixtures and water pipe insulation to residential customers. The program is designed to reach customers who have not adopted energy-efficient water devices. The kits are provided to residents through a Direct Mail Campaign, allowing eligible customers to request to have the items shipped directly to their homes, free of charge.

Date	January 1, 2017 – September 30, 2017
Region(s)	North Carolina, South Carolina
Evaluation Period	January 1, 2016 – December 31, 2016
Annual Gross MWh Savings	DEP: 11,153; DEC: 9,239
Per Kit kWh Savings	DEP: 396.1; DEC: 279.6
Annual Gross MW Savings	DEP: 3.7; DEC: 3.2
Net-to-Gross Ratio	DEP: 0.93; DEC: 0.93
Process Evaluation	Yes
Previous Evaluation(s)	DEC SEWKP; April 12, 2016, The Cadmus Group

Evaluation Methodology

Impact Evaluation Activities

- Telephone/web surveys (DEP n=131, DEC n=114) and analysis of 4 unique measures.

Impact Evaluation Findings

- Realization rate: DEP = 91.7%; DEC = 47.0%
- Net-to-gross ratio: DEP = 0.934; DEC = 0.932

Process Evaluation Activities

- Telephone/web surveys with SEWKP participants (DEP n=131, DEC n=114) and analysis of 4 unique measures.
- 1 interview with program staff
- 1 interview with implementation staff

Process Evaluation Findings

- The SEWKP influences participants to install kit measures and adopt new behaviors.
- Participants are generally satisfied with kit items and report high satisfaction with overall program.
- Kit size assignment algorithm is fairly accurate.
- Low water pressure is a significant contributor to dissatisfaction among participants for water-saving kit items.
- Online how-to videos are viewed by a low proportion of SEWKP participants
- Pipe wrap is least popular measure; less than half of SEWKP participants installed pipe wrap.

Appendix B Measure Impact Results

Table B-1: DEP Program Year 2016 per Unit Verified Impacts by Measure – Key Measure Parameters

Measure Category	Gross Energy Savings (kWh)	Gross Demand (kW)	Realization Rate (Energy)	Free Ridership	Spillover	Net to Gross Ratio	M&V Factor (Energy) (RR x NTG)	Measure Life
1.5 GPM Showerhead	291.6	0.093	203.9%	0.15	0.08	93.4%	190.5%	9
1.0 GPM Bathroom Faucet Aerator	5.4	0.003	7.4%				6.9%	10
1.5 GPM Kitchen Faucet Aerator	60.3	0.032	98.8%				92.3%	10
Insulating Pipe Tape	38.8	0.004	25.1%				23.4%	13
Total	**396.1**	**0.133**	**91.7%**	**0.15**	**0.08**	**93.4%**	**85.7%**	**-**

Table B-2: DEC Program Year 2016 per Unit Verified Impacts by Measure – Key Measure Parameters

Measure Category	Gross Energy Savings (kWh)	Gross Demand (kW)	Realization Rate (Energy)	Free Ridership	Spillover	Net to Gross Ratio	M&V Factor (Energy) (RR x NTG)	Measure Life
1.5 GPM Showerhead	195.4	0.063	66.5%	0.17	0.10	93.2%	61.9%	9
1.0 GPM Bathroom Faucet Aerator	4.5	0.002	70.2%				65.4%	10
1.5 GPM Kitchen Faucet Aerator	50.2	0.027	27.4%				25.5%	10
Insulating Pipe Tape	29.5	0.003	26.4%				24.6%	13
Total	**279.6**	**0.095**	**47.0%**	**0.17**	**0.10**	**93.2%**	**43.8%**	**-**

Appendix C Program Performance Metrics

This appendix provides key program performance metrics, or PPIs. See Chapter 5 for the underlying results and more detailed findings.

Figure C-1: DEP Program Experience PPIs

	Participants	
Motivation PPIs	**%**	**n**
Top motivating factors to request and install items from kit		
To conserve water	70%	131
To conserve electricity	60%	131
Because it was free	53%	131
Program experience & satisfaction PPIs		
Overall satisfaction with program	85%	111
Usefulness of kit instructions	80%	110
Usefulness of online how-to videos	67%	9
Satisfaction with kit measures		
Showerhead	76%	91
Kitchen faucet aerator	77%	64
Bathroom faucet aerator	74%	73
Pipe wrap	75%	52
Program influence on behavior PPIs		
Installed at least one kit measure	85%	131
Plan to install measure[s] (of those that did not install any measures)	60%	20
Most common measure installed: *showerhead*	69%	131
Adopted new energy and water saving behaviors	60%	131
Respondents reporting program attributable spillover	15%	131
Challenges and opportunities for improvement PPIs		
Measure with lowest installation rate: *bathroom aerator*	30%	131
Measure with highest uninstallation rate: *kitchen aerator*	9%	64
Measure with highest dissatisfaction: *showerhead*	6%	91

Figure C-2: DEP Participant Demographics PPIs

Ownership Status	
Own	97%
Rent	2%

Household Size	
One to two	62%
Three	15%
Four	14%
Five+	8%

Education	
High school or less	14%
Some college	21%
Bachelors Degree	37%
Graduate Degree	23%
Refused / Don't know	5%

Income	
< $30k	11%
$30k to < $60k	24%
$60k to < $75k	7%
$75k to < $100k	12%
$100k+	20%
Refused / Don't know	27%

Figure 6-1: DEP Participant Household Characteristics PPIs

Housing Type	
Detached	87%
Attached	7%
Mobile	5%

Water Heater Fuel Type	
Electric	79%
Natural Gas	16%
Other	2%

Home Square Feet	Small Kit	Medium Kit
Less than 1,000	14%	0%
1,000-1,499	55%	24%
1,500-1,999	17%	32%
2,000-2,999	10%	31%
3,000+	3%	14%

Number of Showers	Small Kit	Medium Kit
1	30%	6%
2	57%	69%
3	13%	16%
4+	0%	9%

Number of Kitchen Faucets	Small Kit	Medium Kit
1	87%	88%
2	13%	12%
3	0%	0%

Number of Bathroom Faucets	Small Kit	Medium Kit
1-2	67%	28%
3-4	30%	53%
5+	3%	19%

Figure C-3: DEC Program Experience PPIs

	Participants %	Participants n
Motivation PPIs		
Top motivating factors to request and install items from kit		
To conserve water	56%	114
To conserve electricity	55%	114
Because it was free	41%	114
Program experience & satisfaction PPIs		
Overall satisfaction with program	85%	87
Usefulness of kit instructions	70%	93
Usefulness of online how-to videos	83%	6
Satisfaction with kit measures		
Showerhead	76%	71
Kitchen faucet aerator	66%	50
Bathroom faucet aerator	77%	53
Pipe wrap	83%	35
Program influence on behavior PPIs		
Installed at least one kit measure	76%	114
Plan to install measure[s] (of those that did not install any measures)	59%	27
Most common measure installed: *showerhead*	62%	114
Adopted new energy and water saving behaviors	67%	114
Respondents reporting program attributable spillover	13%	114
Challenges and opportunities for improvement PPIs		
Measure with lowest installation rate: *bathroom aerator*	25%	114
Measure with highest uninstallation rate: *kitchen faucet aerator*	10%	50
Measure with highest dissatisfaction: *kitchen faucet aerator*	10%	50

Figure 6-2: DEC Participant Demographics PPIs

Ownership Status	
Own	94%
Rent	6%

Household Size	
One to two	60%
Three	18%
Four	8%
Five +	5%

Education	
High school or less	20%
Some college	32%
Bachelor's degree	19%
Graduate degree	16%
Refused	13%

Income	
<$30k	20%
$30k to <$60k	26%
$60k to <$75k	5%
$75k to <$100k	9%
$100k+	11%
Refused	28%

Figure 6-3: DEC Participant Household Characteristics PPIs

Housing Type	
Detached	81%
Attached	4%
Mobile	13%

Water Heater Fuel Type	
Electric	70%
Natural Gas	28%

Home Square Feet	Small Kit	Medium Kit
Less than 1,000	23%	4%
1,000-1,499	52%	25%
1,500-1,999	16%	28%
2,000-2,999	10%	33%
3,000+	0%	10%

Number of Showers	Small Kit	Medium Kit
1	46%	11%
2	54%	72%
3	0%	15%
4+	0%	1%

Number of Kitchen Faucets	Small Kit	Medium Kit
1	97%	89%
2	3%	10%
3	0%	1%

Number of Bathroom Faucets	Small Kit	Medium Kit
1-2	80%	41%
3-4	20%	49%
5+	0%	10%

Appendix D Instruments

D.1 Program Staff In-Depth Interview Guide

Introduction

Today, we'll be discussing your role in the SEWKP or water kit program. We would like to learn about your experiences in administering this program.

Your comments are confidential. If I ask you about areas you don't know about, please feel free to tell me that and we will move on. Also, if you want to refer me to specific documents to answer any of my questions, that's great – I'm happy to look things up if I know where to get the information.

I would like to record this interview for my note-taking purposes. Do I have your permission?

Roles & Responsibilities

Q1. Please describe your position at Duke Energy and your role in the water kit program.

Q2. How long have you been in this role?

Program Delivery

Next, I'd like to learn more about how this program was delivered since your involvement. If the program implementation is different in 2017, please let me know.

Q3. How is Duke Energy targeting households to participate in this program? Does this vary by jurisdiction?

[*IF NEEDED*:]

1. What marketing and outreach activities did Duke Energy conduct in the 2016 program year? [*Interviewer: we know they market the program through direct-mail campaign. Probe to inquire if they market the program in any other way.*]
2. In 2016, what proportion requested a kit among those targeted by the direct mail campaign? Are you satisfied with this response rate? If not, why not?
3. In terms of marketing, what is planned for 2017? [*If not mentioned:* Do you all plan to have a customer facing website for the program? If yes, when and what would it entail? If not, why not?]

Q4. What feedback, if any, did you receive from kit recipients on why they decided to request a kit?

Q5. Please describe the kit distribution process, including the responsibilities of your vendors: Relationship 1 (R1) and EFI.

[*IF NEEDED*:]

1. Can the kit form be submitted online? If not, is Duke considering this option?
2. Who checks whether customers who submitted the kit form are eligible for the program? What is the eligibility criteria?
3. How do you identify customers who have an electric water heating? [*Interviewer: Prior evaluation states that customers with electric water heating are eligible for this program.*]
4. Who tracks kit processing and distribution?
5. How are kits customized? [*IF NEEDED:*] Can you describe what is included in the small, medium, and large kit? (Confirm kit contents as seen below)

Kit 1 (small)	bath aerator	2
	kitchen aerator	1
	shower head	1
	pipe tape	5
Kit 2 (medium)	bath aerator	4
	kitchen aerator	1
	shower head	2
	pipe tape	5
Kit 3 (large)	bath aerator	5
	kitchen aerator	1
	shower head	3
	pipe tape	5

6. [*If not mentioned*] Are large kits still offered to customers? (If so, does this vary by jurisdiction?)
7. Prior to January 2016, documentation shows the kitchen aerator to have 1.0 GPM, but according to a Duke staff person, the aerator is now rated at 1.5 GPM. Can you please confirm the current GPM for kitchen aerators, and when that changed over (if at all)?
8. What energy saving educational materials are included in the kit?

Q6. What type of feedback have you received from kit recipients about the measures in the kit? [*IF ANY ISSUES REPORTED:*] How have you addressed those issues?

Program Goals

Q7. In 2016 and 2017 program year, what were/are Duke Energy targets in terms of:

1. Number of water kits distributed in Carolinas, Progress, Ohio, Indiana, and Kentucky
2. Number of kits distributed by customer segments – if applicable

3. Cost of distributing the kits [*Probe: Does this vary by jurisdiction?*]
4. Anything else?

Q8. How were those targets set, and by whom?

Q9. Compared to the previous program years, have these targets been the same or have they changed? [*If changed:*] Why have they changed?

Q10. Were/are you on track to meet 2016/2017 targets? [*If not on track, probe why not on track and how far behind are they in meeting their targets.*]

1. Number of water kits distributed in each jurisdiction
2. Number of kits distributed by customer segments – if applicable
3. Cost of distributing the kits
4. Anything else?

Q11. How about savings targets? Are you on track to meet the savings targets in Carolinas, Progress, Ohio, Indiana, and Kentucky? If not, why not?

Q12. Does the program have any process or non-impact goals? *(Probe: low-income, renter, or non-English speaking population targeting, increased kit recipient knowledge of how to save energy, etc.)*

[*IF YES:*]

1. How are these goals established?
2. How are they measured?

Communication

Q13. Can you describe how your vendors communicate about the program with Duke Energy? Who do you communicate with, how often, and what about? Does this vary by jurisdiction?

Q14. How often do you or vendors have to resolve an issue with kits? What types of issues come up?

Data Tracking of Kits

Let's talk about the kits a little bit.

Q15. Were there any changes to the items in the small, medium, or large kit during 2016 and 2017 program year? Any changes for 2018 program year? Are these changes for all jurisdictions?

Q16. We heard that customers must complete a short survey/form to receive a kit. Would it be possible to receive/see this survey data?

Q17. From the moment a customer requests a kit, how long does it take to receive a kit? Is this time frame typical in terms of how long it takes to receive a kit? [*IF NOT TYPICAL, PROBE to get more information on this topic.*] Does it vary by jurisdiction?

Q18. Can you tell us how your vendor reports the number of kits sent out to customers to Duke Energy? Is there information on kit distribution that you need but are not getting? What?

We are almost done. I have a few more questions.

Tape Up

Q19. What would you say are the greatest strengths of this program?

Q20. What would you say is the biggest challenge in administering this program?

Q21. How can this program be improved?

Q22. Is there anything else about the program that we have not discussed that you feel should be mentioned?

Q23. What would you like to learn from the program evaluation?

Those are all of my questions. Thank you very much for your time.

D.2 Implementer Staff In-Depth Interview Guide

Introduction

[*Note: Research Into Action staff will schedule calls ahead of time through email contact.*]

[*If needed:*] We are conducting an evaluation of Duke Energy Save Energy and Water Kit Program (SEWKP). Because your organization is involved with this program, we would like to get your perspective on how the program works to help guide us in our efforts.

I would like to record this interview for my note-taking purposes. Do I have your permission?

Roles & Responsibilities

Q1. Can you describe your role in the SEWKP or water kit program?

Q2. Can you describe your program processes? (From receipt of kit forms to notifying EFI to send kits)

Q3. We have been told that your organization processes kit submission forms for Duke Energy water kit program. Do you provide any other services to Duke Energy?

1. Do you provide these services in all jurisdictions where this program is offered: Progress, Carolinas, Ohio, Indiana, and Kentucky?

Program Goals

Q4. In jurisdictions where you are providing services to Duke Energy, do you know what are Duke Energy targets in terms of:

1. Number of water kits distributed
2. Cost of the kits
3. Education goals
4. Anything else?

Q5. Do you know if Duke Energy is on track to achieve those targets? If so, how do you know?

Data Tracking of Kits and Eligibility

Q6. Based on what we heard, households must complete a short survey/form to receive a kit. Do you track the information that is on the survey form in a database? If so, what exactly do you track?

1. Do you track the same information for each jurisdiction?

2. How do you report this information to Duke Energy?
3. [*If not addressed:*] Do you maintain a dashboard that tracks number of kits and possibly other information. If so, can you send us a screen shot of that dashboard so we can see what is tracked on that dashboard?
4. Could you provide us with one of the forms so we can see what participants are filling out?

Q7. Can you describe to us who is eligible to receive the kit – that is, eligibility criteria? Do eligibility criteria vary by jurisdiction?

Q8. Can you tell us what proportion of households who sent in a kit survey form were ineligible to receive a kit in 2016 in each jurisdiction? What are the most common reasons as to why customers are ineligible? Do you think the proportion of ineligible applications will increase in 2017? If so, why?

Q9. From the moment households request a kit, do you know how long it takes to receive a kit? Is this time frame typical in terms of how long it takes to receive a kit? [*IF NOT TYPICAL, PROBE to get more information on this topic.*]

Q10. What challenges have you encountered with processing of the kit forms? [*Probe about missing information or other errors.*] [*If challenges:*] What could be done to address these challenges? Any suggestions on how to change the form? Are some of these challenges more prevalent in certain jurisdictions? If so, why?

Q11. How many forms, on average, do you process per week or annually?

Q12. [*If not addressed:*] What demographic data do you collect from households that request the kits? Which demographic segments are more likely to request the kits? Does this vary by jurisdiction?

Communication

Q13. Can you describe how you communicate with Duke Energy about the kit form submissions or anything else? Who do you communicate with, how often, and what about?

Q14. Have there been any challenges in your interactions with Duke Energy? If so, what were they? How did you address them? Were they resolved? If not, what do you think might resolve them?

Tape Up

I have only a couple of more questions left.

Q15. What would you say is the biggest challenge in processing kit submission forms and distributing kits? What could be done to improve this process?

Q16. Is there anything else about the program that we have not discussed that you feel should be mentioned?

Those are all of my questions. Thank you very much for your time.

D.3 Participant Survey

Introduction/ Screening

[READ IF MODE=PHONE]

Q1. Hi, I'm _____, calling on behalf of Duke Energy. We are calling about the Save Energy and Water Kit you got from Duke Energy.

This kit included faucet aerators, one or two showerheads, and pipe tape that can help you save water and energy in your home. Do you recall receiving this kit?

1. Yes
2. No [If no: Can I speak with someone who may know something about this kit?]
98. Don't know [If DK: Can I speak with someone who may know something about this kit?]

[INTERVIEWER INSTRUCTIONS: *If no adults are able to speak about the kit, thank and terminate.*]

Q2. [DISPLAY IF MODE=WEB]

We are conducting surveys about the Save Energy and Water Kit you got from Duke Energy. This kit included faucet aerators, one or two showerheads, and pipe tape that can help you save water and energy in your home.

Do you recall receiving this kit?

1. Yes
2. No [TERMINATE]
98. Don't know [TERMINATE]

Motivation and Collateral

Q3. What motivated you to request a free Save Energy and Water Kit from Duke Energy?

[MULTIPLE RESPONSE]

1. Wanted to conserve electricity
2. Wanted to conserve water
3. It was free
4. It was easy
5. It was offered by Duke Energy
6. Other – please specify: [OPEN-ENDED RESPONSE]
98. Don't know [*EXCLUSIVE ANSWER*]

Q4. Did you read the included instructions on how to install the items that came in the kit?

1. Yes
2. No
98. Don't remember

[ASK IF Q4 = 1]

Q5. On a scale from 0 to 10, where 0 is not at all helpful and 10 is very helpful, how helpful were the instructions on how to install the items that came in the kit?

0. Not at all helpful
1.
2.
3.
4.
5.
6.
7.
8.
9.
10. Very helpful
98. Don't know

[ASK IF Q5<7]

Q6. What might have made the instructions more helpful?

[RECORD VERBATIM ANSWER]

Q7. Did you watch any of Duke Energy's online how-to videos on how to install the items that came in the kit?

1. Yes
2. No
98. Don't remember

[ASK IF Q7 = 1]

Q8. On a scale from 0 to 10, where 0 is not at all helpful and 10 is very helpful, how helpful were Duke Energy's online how-to videos on how to install the items that came in the kit?

0. Not at all helpful
1.
2.

3.
4.
5.
6.
7.
8.
9.
10. Very helpful
98. Don't know

[ASK IF Q8<7]

Q9. What might have made the instructional videos more helpful?

[RECORD VERBATIM ANSWER]

Assessing Measure Installation

[DISPLAY IF KIT_SIZE=SMALL]

We'd like to ask you about the energy and water saving items included in your kit. The kit contained a showerhead, faucet aerators for the bathroom and kitchen, and pipe tape.

[DISPLAY IF KIT_SIZE=MEDIUM]

We'd like to ask you about the energy and water saving items included in your kit. The kit contained two showerheads, faucet aerators for the bathroom and kitchen, and pipe tape.

Q10. Have you or anyone else installed any of those items in your home, even if they were taken out later?
[*Interviewer: Throughout interview, remind respondent as needed to report whether someone else in the home installed or uninstalled any items.*]

[SINGLE RESPONSE]

1. Yes
2. No [→ Q23]
98. Don't know [→ TERMINATE]

[ASK IF Q10 = 1]

Q11. Which of the items did you install, even if they were taken out later?

[MULTIPLE RESPONSE]
[*Interviewer: Record each response, then prompt with the list items.*]

Item

a.	Showerhead
b.	Kitchen faucet aerator
c.	Bathroom faucet aerator
d.	Pipe tape
e.	I don't remember which items were installed [→ TERMINATE]

[ASK IF Q11A = 1 AND KIT_SIZE=MEDIUM]

Q12. Your kit contained two showerheads. Did you install one or both of the showerheads in the kit, even if one or both were taken out later?

[SINGLE RESPONSE]

1. I installed both
2. I only installed one showerhead
98. Don't know

[ASK IF Q11C = 1]

Q13. How many of the bathroom faucet aerators from the kit did you install in your home, even if one or more were taken out later?

[SINGLE RESPONSE]

1. One
2. Two
3. Three [*DISPLAY IF KIT_SIZE=MEDIUM*]
4. Four [*DISPLAY IF KIT_SIZE=MEDIUM*]
98. Don't know

[ASK IF Q11D = 1]

Q14. Did you install all of the pipe insulation that was included with the kit?

[SINGLE RESPONSE]

1. Yes
2. No
98. Don't know

[ASK IF Q14 IS DISPLAYED]

Q15. About how many feet of the pipe extruding from your water heater did you tape with the insulation **that came in the kit**? Please go over to your water heater if you need to check.

[SINGLE RESPONSE]

1. About three feet or less
2. About five feet
3. About ten feet
4. About fifteen feet or more
98. Don't know

[ASK IF ANY PART OF Q11 = 1]

Q16. Overall, how satisfied are you with the item[s] you installed?
[DISPLAY IF MODE=PHONE] Please use a 0 to 10 scale, where 0 is very dissatisfied and 10 is very satisfied. How satisfied are you with...

DISPLAY IF	Item	Rating
Q11a = 1	a. Showerhead	0-10 with DK
Q11b = 1	b. Kitchen faucet aerator	0-10 with DK
Q11c = 1	c. Bathroom faucet aerator	0-10 with DK
Q11d = 1	d. Pipe tape	0-10 with DK

[ASK IF ANY ITEMS IN Q16<7]

Q16a. Can you please explain any dissatisfaction you had with [DISPLAY ALL ITEMS IN Q16 THAT ARE <7]?

[OPEN END: RECORD VERBATIM]

Q17. Overall, how satisfied are you with Duke Energy's Save Energy and Water Kit Program?

[DISPLAY IF MODE=PHONE] [IF NEEDED: Please use that same 0 to 10 scale, where 0 is very dissatisfied and 10 is very satisfied.]

0.	0. Very dissatisfied
1.	1.
2.	2
3.	3
4.	4
5.	5.
6.	6.
7.	7.
8.	8.
9.	9.
10.	10. Very satisfied
98.	Don't Know

[ASK IF ANY PART OF Q11 = 1]

Q18. Have you (or anyone in your home) uninstalled any of the items from the kit that you had previously installed?

[SINGLE RESPONSE]

1. Yes
2. No
98. Don't know

[ASK IF Q18 = 1]

Q19. Which of the items did you uninstall?
[*Interviewer: Record the response, then prompt with the list items.*]

[MULTIPLE RESPONSE]

1. [DISPLAY IF Q11a = 1] Showerhead[s]
2. [DISPLAY IF Q11b = 1] Kitchen faucet aerator
3. [DISPLAY IF Q11c = 1] Bathroom faucet aerator[s]
4. [DISPLAY IF Q11d = 1] Pipe tape
98. Don't know [*EXCLUSIVE ANSWER*]

[ASK IF Q19.1 = 1 AND Q12 = 1]

Q20. Did you uninstall one or both of the showerheads you had previously installed?

[SINGLE RESPONSE]

1. I uninstalled both
2. I only uninstalled one of the showerheads
98. Don't know

[ASK IF Q19.3 = 1 AND Q13 = 2-4]

Q21. How many bathroom faucet aerators did you uninstall?

[SINGLE RESPONSE]

1. One [*DISPLAY IF Q13 = 1-4*]
2. Two [*DISPLAY IF Q13 = 2-4*]
3. Three [*DISPLAY IF Q13 = 3-4*]
4. Four [*DISPLAY IF Q13 = 4*]

98. Don't know

[ASK IF ANY OF Q19.1-4 IS SELECTED]

Q22. Why were those items uninstalled?
[READ IF MODE=PHONE] Let's start with…
[*Interviewer: Read each item*]

[MULTIPLE RESPONSE]

DISPLAY ONLY THOSE 1-6 ITEMS THAT WERE SELECTED IN Q19	Item	Reason
	a. Showerhead	1. It was broken 2. I didn't like how it worked 3. I didn't like how it looked, or 96. Some other reason (specify: ______) 98. Don't know
	b. Kitchen faucet aerator	Repeat reason options
	c. Bathroom faucet aerator	Repeat reason options
	d. Pipe tape	Repeat reason options

[ASK IF ANY ITEMS NOT SELECTED IN Q11, OR Q10 = 2]

Q23. You said you haven't installed the following items. Which of the following do you plan to install in the next three months?
[*Interviewer: Record the response, then prompt with the list items.*]

[MULTIPLE RESPONSE] [DISPLAY ALL IF Q10 = 2]

1. [DISPLAY IF NOT SELECTED IN Q11] Showerhead
2. [DISPLAY IF NOT SELECTED IN Q11] Kitchen faucet aerator
3. [DISPLAY IF NOT SELECTED IN Q11] Bathroom faucet aerator
4. [DISPLAY IF NOT SELECTED IN Q11] Pipe tape
5. I'm not planning on installing any of these in the next three months [*EXCLUSIVE ANSWER*]
98. Don't know [*EXCLUSIVE ANSWER*]

[ASK IF ANY 1-6 OPTIONS WERE NOT SELECTED IN Q23 OR OPTION "NONE" WAS SELECTED]

Q24. What's preventing you from installing those items? Let's start with….
[*Interviewer: Read items*]

[MULTIPLE RESPONSE]

DISPLAY IF	Item	Reason
Q23a was not selected	a. Showerhead	Use multiple response options below
Q23b was not selected	b. Kitchen faucet aerator	Use multiple response options below

Q23c was not selected	c. Bathroom faucet aerator	Use multiple response options below
Q23d was not selected	d. Pipe tape	Use multiple response options below

[MULTIPLE RESPONSE OPTIONS FOR Q24]

[PHONE CALLERS: DO NOT READ, CODE VERBATIM RESPONSES]

1. Didn't know what that was
2. Tried it, didn't fit [*DOES NOT DISPLAY FOR PIPE WRAP*]
3. Tried it, didn't work as intended (Please specify: ______________________________)
4. Haven't gotten around to it
5. Current one is still working [*DOES NOT DISPLAY FOR PIPE WRAP*]
6. Takes too much time to install it/No time/Too busy
7. Too difficult to install it, don't know how to do it
8. Don't have the tools I need
9. Don't have the items any longer (threw away, gave away)
10. [DISPLAY IF Q23.1 was displayed but not selected] Already have efficient showerhead
    [DISPLAY IF Q23.2 was displayed but not selected] Already have efficient kitchen faucet aerator
    [DISPLAY IF Q23.3 was displayed but not selected] Already have efficient bathroom faucet aerators
    [DISPLAY IF Q23.4 was displayed but not selected] Already have pipe tape on my hot water pipe

96. Other, please specify: [OPEN-ENDED RESPONSE]
98. Don't know [*EXCLUSIVE ANSWER*]

[ASK IF Q11b = 1 AND Q19 KITCHEN FAUCET AERATOR OPTION WAS NOT SELECTED]

Q25. Your efficient kitchen faucet aerator has three settings to adjust the flow of water. Have you adjusted this setting?

1. Yes
2. No
3. Don't know

Q26. [If Q25= Yes] What flow setting is the kitchen faucet aerator currently set at? Please go over to your kitchen sink if you need to check.

1. 0.5 GPM (lowest flow setting – "soaping mode")
2. 1.0 GPM (middle flow setting – "ecofriendly mode")

3. 1.5 GPM (highest flow setting – "power rinse mode")

4. Don't Know

Q27. [If Q26 = 1,2, or 3] How often do you use that flow setting?

1. Not very often
2. About half the time
3. Most of the time
4. All the time
98. Don't Know

Q28. [If Q27= 1 or 2] What flow setting do you use most regularly?

1. 0.5 GPM (lowest flow setting – "soaping mode")
2. 1.0 GPM (middle flow setting – "ecofriendly mode")
3. 1.5 GPM (highest flow setting – "power rinse mode")
98. Don't Know

[ASK IF Q11a = 1 AND AT LEAST ONE SHOWERHEAD STILL INSTALLED]

Q29. On average, what is the typical shower length in your household?

[SINGLE RESPONSE]

1. One minute or less
2. Two to four minutes
3. Five to eight minutes
4. Nine to twelve minutes
5. Thirteen to fifteen minutes
6. Sixteen to twenty minutes
7. Twenty-one to thirty minutes
8. More than thirty minutes
98. Don't know

[ASK IF AT LEAST ONE SHOWERHEAD STILL INSTALLED]

Q30. [DISPLAY IF TWO SHOWERHEADS STILL INSTALLED: Thinking of the efficient showerhead you installed that gets the most usage…]
[DISPLAY IF ONE SHOWERHEAD STILL INSTALLED: Thinking of the efficient showerhead currently installed in your home…]
On average, how many showers per day are taken in this shower?

[SINGLE RESPONSE]

1. Less than one
2. One
3. Two

4. Three
5. Four
6. Five
7. Six
8. Seven
9. Eight or more
98. Don't know

[ASK IF TWO SHOWERHEADS STILL INSTALLED]

Q31. Thinking of the other efficient showerhead you installed…
On average, how many showers per day are taken in this shower?

[SINGLE RESPONSE]

1. Less than one
2. One
3. Two
4. Three
5. Four
6. Five
7. Six
8. Seven
9. Eight or more
98. Don't know

Q32. [This question was moved to demographics section – but not renumbered for programming purposes]

NTG

[IF ANY PART OF Q11 = 1 AND IT'S NOT THE CASE THAT ALL PARTS OF Q19=SELECTED (THAT IS, THEY INSTALLED ANYTHING AND DID NOT UNINSTALL EVERYTHING THEY INSTALLED)]

Q33. If you had not received the free efficiency items in the kit, would you have purchased and installed any of these same items within the next year?

1. Yes
2. No
98. Don't know

[If Q33 = 1]

Q34. What items would you have purchased and installed within the next year?

[MULTIPLE RESPONSES]

1. [IF AT LEAST ONE SHOWERHEAD IS STILL INSTALLED] Energy-efficient showerhead[s]
2. [IF Q11b = 1 AND Q19.2 NOT SELECTED] Energy-efficient kitchen faucet aerator
3. [IF AT LEAST ONE BATHROOM AERATOR IS STILL INSTALLED] Energy-efficient bathroom faucet aerator[s]
4. [IF Q11d = 1 AND Q19.4 NOT SELECTED] Pipe tape
98. Don't know [EXCLUSIVE ANSWER]

[ASK IF Q34.1=1 AND TWO SHOWERHEADS ARE STILL INSTALLED]

Q35. If you had not received them in your free kit, how many energy-efficient showerheads would you have purchased and installed within the next year?

[SINGLE RESPONSE]

1. One
2. Two
98. Don't know

[ASK Q34.3=1 AND IF MORE THAN ONE BATHROOM AERATOR IS STILL INSTALLED]

Q36. If you had not received them in your free kit, how many energy-efficient bathroom aerators would you have purchased and installed within the next year?

[SINGLE RESPONSE]

1. One
2. Two
3. Three [*DISPLAY IF AT LEAST THREE BATHROOM AERATORS ARE STILL INSTALLED*]
4. Four [*DISPLAY IF FOUR BATHROOM AERATORS ARE STILL INSTALLED*]
98. Don't know

[IF Q33 WAS DISPLAYED]

Q37. Now, thinking about the energy and water savings items that were provided in the kit - using a scale from 0 to 10, where 0 means “not at all influential” and 10 means “extremely influential,” how influential were the following factors on your decision to install the items from the kit? How influential was…

[*Interviewer: If respondent says, “Not applicable - I didn’t get/use that,” then follow up with: “So would you say it was “not at all influential?” and probe to code.*]

[MATRIX QUESTION: SCALE]

Elements	Responses
The fact that the items were free	0-10 scale with DK
The fact that the items were mailed to your house	0-10 scale with DK
Information provided by Duke Energy about how the items would save energy and water	0-10 scale with DK
Other information or advertisements from Duke Energy, including its website	0-10 scale with DK

Q38. Since receiving your kit from Duke Energy, what **new** behaviors has your household adopted to help save energy at home? Please only consider new **behaviors** that your household has adopted since receiving the kit.
[MULTIPLE RESPONSE] [*Interviewer: Do not read list. After each response ask, "Anything else?"*]

1. Not applicable - no new behaviors since receiving kit [EXCLUSIVE ANSWER]
2. Turn off lights when not in a room
3. Turn off furnace when not home
4. Turn off air conditioning when not home
5. Changed thermostat settings to use less energy
6. Used fans instead of air conditioning
7. Turn off electronics when we are not using them
8. Take shorter showers
9. Turned water heat thermostat down
10. Turn off water when brushing teeth
11. Other (specify: ____________)
98. Don't know [EXCLUSIVE ANSWER]

Q39. On a scale of 0 to 10, where 0 means "not at all influential" and 10 means "extremely influential," how much influence did Duke Energy's kit and materials on saving energy have on your decision to [LIST ALL RESPONSES FROM Q38].

0 – Not at all influential	1	2	3	4	5	6	7	8	9	10 – Extremely influential	98 Don't know

Q40. Since receiving your kit from Duke Energy, have you purchased and installed any other products or made any improvements to your home to help save energy?

1. Yes
2. No
98. Don't know

[If Q40 = 1]

Q41. What **products** have you purchased and installed to help save energy in your home? [*Do not read list. After each response, ask, "Anything else?"*] [MULTIPLE RESPONSE]

1. Bought energy efficient appliances
2. Moved into an ENERGY STAR home
3. Bought efficient heating or cooling equipment
4. Bought efficient windows
5. Added insulation
6. Sealed air leaks in windows, walls, or doors
7. Sealed or insulated ducts
8. Bought LEDs
9. Bought CFLs
10. Installed an energy efficient water heater
11. None – no other actions taken
96. Other, please specify: ____________________
98. Don't know [EXCLUSIVE ANSWER]

[If Q41 = 2]

Q42. Is Duke Energy still your gas or electricity utility?

1. Yes
2. No
98. Don't know

[ASK IF Q41<>11, 98, OR 99]

Q43. Did you get a rebate from Duke Energy for any of those products or services? If so, which ones? Please select all products and services for which you received Duke Energy rebates. [MULTIPLE RESPONSE]

[LOGIC] Item
[IF Q41.1 IS SELECTED] 1. Bought energy efficient appliances
[IF Q41.2 IS SELECTED] 2. Moved into an ENERGY STAR home
[IF Q41.3 IS SELECTED] 3. Bought efficient heating or cooling equipment
[IF Q41.4 IS SELECTED] 4. Bought efficient windows
[IF Q41.5 IS SELECTED] 5. Added insulation
[IF Q41.6 IS SELECTED] 6. Sealed air leaks in windows, walls, or doors
[IF Q41.7 IS SELECTED] 7. Sealed or insulated ducts
[IF Q41.8 IS SELECTED] 8. Bought LEDs
[IF Q41.9 IS SELECTED] 9. Bought CFLs
IF Q41.10 IS SELECTED] 10. Installed an energy efficient water heater
[IF Q41.96 IS SELECTED] [**Q41 open ended response**]
I did not get any Duke rebates [*EXCLUSIVE ANSWER*]
Don't know [*EXCLUSIVE ANSWER*]

[IF Q41.8 IS SELECTED]

Q44. Duke Energy's website has a tool that helps you find discounted LEDs in your area. Duke Energy's website also has an online store where you can purchase discounted LEDs and have them shipped directly to your home. Did you use either of these Duke Energy services to acquire your LEDs?

1. Yes
2. No
98. Don't know

[IF Q41.9 IS SELECTED]

Q45. Duke Energy's website has a tool that helps you find discounted CFLs in your area. Duke Energy's website also has an online store where you can purchase discounted CFLs and have them shipped to your home. Did you use either of these Duke Energy services to acquire your CFLs?

1. Yes
2. No
98. Don't know

[ASK IF ANY ITEM IN Q41 WAS SELECTED]

Q46. On a scale of 0 to 10, where 0 means "not at all influential" and 10 means "extremely influential", how much influence did the Duke Energy Save Energy and Water Kit Program have on your decision to…

[MATRIX QUESTION: SCALE]

[LOGIC] Item	Response
[IF Q41.1 IS SELECTED] 1. Buy energy efficient appliances	0-10 scale with DK
[IF Q41.2 IS SELECTED] 2. Move into an ENERGY STAR home	0-10 scale with DK
[IF Q41.3 IS SELECTED] 3. Buy efficient heating or cooling equipment	0-10 scale with DK
[IF Q41.4 IS SELECTED] 4. Buy efficient windows	0-10 scale with DK
[IF Q41.5 IS SELECTED] 5. Add insulation	0-10 scale with DK
[IF Q41.6 IS SELECTED] 6. Seal air leaks in windows, walls, or doors	0-10 scale with DK
[IF Q41.7 IS SELECTED] 7. Seal or insulate ducts	0-10 scale with DK
[IF Q41.8 IS SELECTED] 8. Buy LEDs	0-10 scale with DK
[IF Q41.9 IS SELECTED] 9. Buy CFLs	0-10 scale with DK
IF Q41.10 IS SELECTED] 10. Install an energy efficient water heater	0-10 scale with DK
[IF Q41.96 IS SELECTED] [**Q41 open ended response**]	0-10 scale with DK

[ASK IF Q41.1 IS SELECTED AND Q46.1 <> 0]

Q47. What kinds of appliance(s) did you buy?

[*Do not read list*] [MULTIPLE RESPONSE]

1. Refrigerator
2. Stand-alone Freezer
3. Dishwasher
4. Clothes washer
5. Clothes dryer
6. Oven
7. Microwave
96. Other, please specify: ____________
98. Don't know
99. Refused

[ASK IF Q47 = 1-96]

Q48. Was the [INSERT Q47 RESPONSE] an ENERGY STAR or high-efficiency model?

[SINGLE RESPONSE]

1. Yes
2. No
98. Don't know
99. Refused

[REPEAT THIS QUESTION FOR EACH ITEM MENTIONED IN Q47]

[ASK IF Q47 = 5]

Q49. Does the new clothes dryer use natural gas?

1. Yes - it uses natural gas
2. No – does not use natural gas
98. Don't know
99. Refused

[ASK IF Q41.3 IS SELECTED AND Q46.3 > 0]

Q50. What type of heating or cooling equipment did you buy?
[*Do not read list*] [MULTIPLE RESPONSE]

1. Central air conditioner
2. Window/room air conditioner unit
3. Wall air conditioner unit
4. Air source heat pump
5. Geothermal heat pump

6. Boiler
7. Furnace
8. Wifi-enabled thermostat
96. Other, please specify: _______________
98. Don't know
99. Refused

[ASK IF Q50= 6-7]

Q51. Does the new [INSERT Q50 RESPONSE] use natural gas?

1. Yes - it uses natural gas
2. No – does not use natural gas
98. Don't know
99. Refused

[ASK IF Q50= 1-7, 96]

Q52. Was the [INSERT Q50 RESPONSE] an ENERGY STAR or high-efficiency model?

[SINGLE RESPONSE]

1. Yes
2. No
98. Don't know
99. Refused

[REPEAT THIS QUESTION FOR EACH ITEM MENTIONED IN Q50, EXCLUDING wifi-enabled thermostat]

[ASK IF Q41.4 IS SELECTED AND Q46.4 > 0]

Q53. Do you know how many windows you installed??

1. Yes [*please specify how many you installed in the box below:* _______________]
2. No

[ASK IF Q41.5 IS SELECTED AND Q46.5 > 0]

Q54. Please let us know what spaces you added insulation to. Also, let us know the proportion of each space you added insulation to (for example, if you added insulation that covered your entire attic space, you would type in 100%).

	Check here for each space you added insulation to	Use these boxes to type in the approximate proportion of each space you added insulation to

Attic		
Walls		
Below the floor		

[ASK IF Q41.8 IS SELECTED AND Q46.8 > 0]

Q55. Do you know how many LEDs you installed at your property?

1. Yes [*please specify how many you installed in the box below:* ________________]
2. No

[ASK IF Q41.9 IS SELECTED AND Q46.9 > 0]

Q56. Do you know how many CFLs you installed at your property?

1. Yes [*please specify how many you installed in the box below:* ________________]
2. No

[ASK IF Q41.10 IS SELECTED AND Q46.10 > 0]

Q57. Does the new water heater use natural gas?

1. Yes - it uses natural gas
2. No – does not use natural gas
98. Don't know
99. Refused

[ASK IF Q41.10 IS SELECTED AND Q46.10 > 0]

Q58. Which of the following water heaters did you purchase?

1. A traditional water heater with a large tank that holds the hot water
2. A tankless water heater that provides hot water on demand
3. A solar water heater
4. Other, please specify: ________________
98. Don't know
99. Refused

[ASK IF Q41.10 IS SELECTED AND Q46.10 > 0]

Q59. Is the new water heater an ENERGY STAR model?

[SINGLE RESPONSE]

1. Yes
2. No
98. Don't know

99. Refused

Demographics

Lastly, we have some basic demographic questions for you. Please be assured that your responses are confidential and are for statistical purposes only.

Q60. Which of the following types of housing units would you say best describes your home? It is . . .?

1. Single-family detached house
2. Single-family attached home (such as a townhouse or condo)
3. Duplex, triplex or four-plex
4. Apartment or condominium with 5 units or more
5. Manufactured or mobile home
6. Other _______________
98. Don't know
99. Prefer not to say

Q61. How many showers are in your home? Please include both stand-up showers and bathtubs with showerheads.

1. One
2. Two
3. Three
4. Four
5. Five or more
98. Don't know

Q62. How many bathroom sink faucets are in your home? (Keep in mind that some bathrooms may have multiple bathroom sink faucets in them)

1. One
2. Two
3. Three
4. Four

5. Five
6. Six
7. Seven
8. Eight or more
98. Don't know

Q63. How many kitchen faucets are in your home?

1. One
2. Two
3. Three
4. Four or more
98. Don't know

[Q32] What fuel type does your water heater use?

5. Electric
6. Natural Gas
7. Other, please specify: [OPEN-ENDED RESPONSE]
98. Don't know

Q64. How many square feet of living space are there in your residence, including bathrooms, foyers and hallways (exclude garages, unfinished basements, and unheated porches)?

1. Less than 500 square feet
2. 500 to under 1,000 square feet
3. 1,000 to under 1,500 square feet
4. 1,500 to under 2,000 square feet
5. 2,000 to under 2,500 square feet
6. 2,500 to under 3,000 square feet
7. Greater than 3,000 square feet
98. Don't know
99. Prefer not to say

Q65. Do you or members of your household own your home, or do you rent it?

1. Own / buying
2. Rent / lease
3. Occupy rent-free
98. Don't know
99. Prefer not to say

Q66. Including yourself, how many people currently live in your home year-round?

1. I live by myself
2. Two people
3. Three people
4. Four people
5. Five people
6. Six people
7. Seven people
8. Eight or more people
98. Don't know

99. Prefer not to say

Q67. What was your total annual household income for 2016, before taxes?

1. Under $20,000
2. 20 to under $30,000
3. 30 to under $40,000
4. 40 to under $50,000
5. 50 to under $60,000
6. 60 to under $75,000
7. 75 to under $100,000
8. 100 to under $150,000
9. 150 to under $200,000
10. $200,000 or more
98. Don't know
99. Prefer not to say

Q68. What is the highest level of education achieved among those living in your household?

1. Less than high school
2. Some high school
3. High school graduate or equivalent (such as GED)
4. Trade or technical school
5. Some college (including Associate degree)
6. College degree (Bachelor’s degree)
7. Some graduate school
8. Graduate degree, professional degree
9. Doctorate
98. Don't know
99. Prefer not to say

Appendix E DEP Participant Survey Results

This section reports the results from each question in the DEP participant survey. Since the results reported in this appendix represent the "raw" data (that is, none of the open-ended responses have been coded and none of the scale questions have been binned), some values may be different from those reported in the Process Evaluation Findings chapter (particularly: percentages in tables with "Other" categories and scale response questions). Only respondents who completed the survey are included in the following results.

Q1. [Read if mode = phone] Hi, I'm _______ , calling on behalf of Duke Energy. We are calling about the Save Energy and Water Kit you got from Duke Energy.

This kit included faucet aerators, one or two showerheads, and pipe tape that can help you save water and energy in your home. Do you recall receiving this kit?

Response Option	Percent (n=94)
Yes	100%
No	0%
Don't know	0%

Q2. [Display if mode = web] We are conducting surveys about the Save Energy and Water Kit you got from Duke Energy. This kit included faucet aerators, one or two showerheads, and pipe tape that can help you save water and energy in your home.

Do you recall receiving this kit?

Response Option	Percent (n=37)
Yes	100%
No	0%
Don't know	0%

Q3. What motivated you to request a free Save Energy and Water Kit from Duke Energy?

Response Option	Percent (n=131)*
Wanted to conserve water	70%
Wanted to conserve electricity	60%
It was free	53%
It was offered by Duke Energy	34%
It was easy	33%
Other	7%
Don't know	0%

*Multiple responses were allowed for this question

Verbatim Response	Count (n=9)
The bill kept going up	1
To save money	1
savings	1

The tone of the letter was "you need to do this right now"	1
Needed a new shower head-thank you	1
Needed to update things, old house	1
Save money	1
money	1
My husband wanted to try it out	1

Q4. Did you read the included instructions on how to install the items that came in the kit?

Response Option	Percent (n=131)
Yes	84%
No	12%
Don't remember	4%

Q5. [Ask if Q4 = YES] On a scale from 0 to 10, where 0 is not at all helpful and 10 is very helpful, how helpful were the instructions on how to install the items that came in the kit?

Response Option	Percent (n=110)
0- Not at all helpful	0%
1	0%
2	0%
3	0%
4	0%
5	4%
6	2%
7	11%
8	17%
9	16%
10 - Very helpful	47%
Don't Know	3%

Q6. [Ask if Q5<7] What might have made the instructions more helpful?

Verbatim Response	Count (n=6)
Can't remember	1
comparison information to understand if the items included in the kit were superior/inferior to existing fixtures	1
its hard to say. I had a plumber install the shower head	1
More pictures on how to install	1
n/a	1
Specific applications	1

Q7. Did you watch any of Duke Energy's online how-to videos on how to install the items that came in the kit?

Response Option	Percent (n=131)

Yes	7%
No	92%
Don't know	1%

Q8. [Ask if Q7 = YES] On a scale from 0 to 10, where 0 is not at all helpful and 10 is very helpful, how helpful were Duke Energy's online how-to videos on how to install the items that came in the kit?

Response Option	Percent (n=9)
0- Not at all helpful	0%
1	0%
2	0%
3	0%
4	0%
5	22%
6	11%
7	0%
8	0%
9	11%
10 - Very helpful	56%
Don't know	0%

Q9. [Ask if Q8<7] What might have made the instructional videos more helpful?

Verbatim Response	Count (n=3)
I'm not good with computers.	1
shorter	1
They were ok	1

Q10. Have you or anyone else installed any of those items in your home, even if they were taken out later?

Response Option	Percent (n=131)
Yes	85%
No	15%
Don't Know	0%

Q11. [Ask if Q10 = YES] Which of the items did you install, even if they were taken out later?

Response Option	Percent (n=111)*
Showerhead	82%
Bathroom faucet aerator	66%
Kitchen faucet aerator	58%
Pipe tape	47%

I don’t remember	0%

*Multiple responses were allowed for this question

Q12. [Ask if Q11 = SHOWERHEAD AND KIT_SIZE= MEDIUM] Your kit contained two showerheads. Did you install one or both of the showerheads in the kit, even if one or both were taken out later?

Response Option	Percent (n=71)
I installed both	49%
I only installed one showerhead	49%
Don't know	2%

Q13. [Ask if Q11 = BATHROOM FAUCET AERATOR] How many of the bathroom faucet aerators from the kit did you install in your home, even if one or more were taken out later?

Response Option	Percent (n=73)
One	30%
Two	56%
Three	10%
Four	4%
Don’t know	0%

Q14. [Ask if Q11 = PIPEWRAP] Did you install all of the pipe insulation that was included with the kit?

Response Option	Percent (n=52)
Yes	81%
No	13%
Don't know	6%

Q15. [Ask if Q14 is displayed] About how many feet of the pipe extruding from your water heater did you tape with the insulation **that came in the kit**? Please go over to your water heater if you need to check.

Response Option	Percent (n=52)
About three feet or less	42%
About five feet	15%
About ten feet	8%
About fifteen feet or more	0%
Don't know	35%

Q16. [Ask if any part of Q11 = YES] Overall, how satisfied are you with the item[s] you installed?

Showerhead

Response Option	Percent (n=91)
0 - Very dissatisfied	2%
1	0%
2	2%
3	0%
4	1%
5	8%
6	2%
7	9%
8	21%
9	8%
10 - Very satisfied	47%
Don’t know	0%

Kitchen Faucet Aerator

Response Option	Percent (n= 64)
0 – Very dissatisfied	0%
1	0%
2	0%
3	5%
4	0%
5	5%
6	5%
7	8%
8	19%
9	16%
10 - Very satisfied	42%
Don't know	2%

Bathroom Faucet Aerator

Response Option	Percent (n= 73)
0 – Very dissatisfied	1%
1	0%
2	0%
3	0%
4	3%
5	4%
6	4%
7	12%
8	15%
9	16%
10 - Very satisfied	43%
Don't know	1%

Pipe Tape

Response Option	Percent (n= 52)

0 – Very dissatisfied	0%
1	0%
2	0%
3	0%
4	2%
5	6%
6	4%
7	4%
8	15%
9	4%
10 - Very satisfied	56%
Don't know	10%

Q16a. Can you please explain any dissatisfaction you had with [DISPLAY ALL ITEMS IN Q16 THAT ARE <7]?

Showerhead

Verbatim Response	Count (n=14)
could not get any water pressure	1
Has not really changed anything	1
I have kids and we really needed to switch back to the shower head that has a hose and handle in order to get their hair rinsed well.	1
I realize it's there to save water. It just doesnt have much pressure.	1
I wasn't really dissatisfied, I had to adjust to a different amount of water pressure.	1
Insufficient pressure when installed.	1
It takes time to get hot water	1
None	1
pressure not strong enough	1
The head itself is nice... I just prefer having the handheld on a hose type.	1
The water pressure is much too low. And due to that it takes even longer than usual to get hot. I'm probably wasting more water as a result.	1
There is nothing wrong with the shower head it's just that the flow/amount of water we get in the shower is substantially less. While it does conserve water it makes showering a lot less enjoyable.	1
Very basic showerhead	1
We have a Rinnai water heater. This shower head did not have enough power to activate the hot water consistently. The shower would suddenly go ice cold. After 2 months we put back our plain 10 years old shower head. This did not work for us. Very disapponted.	1

Kitchen Faucet Aerator

Verbatim Response	Count (n=9)
It didn't match the metal finish on my faucet and it made it look bad, plus we have a spray hose already so it was not really an improvement	1
It doesn't have enough pressure. It cuts the pressure a lot in the water.	1

It is very splashy on the higher settings. On the lower setting it's okay, but it's harder to wash dishes on either setting.	1
On the lowest setting it doesn't produce a lot of water and turning it to a higher setting gets water everywhere when washing off the dishes.	1
pressure not strong enough	1
They all work pretty well...All in all I have no complaints.	1
Very low flow/pressure so unable to create soap for washing dishes.	1
Water pressure not strong enough	1
Water splashed everywhere	1

Bathroom Faucet Aerator

Verbatim Response	Count (n=8)
As I said, all in all, I really have no complaints.	1
Flow was too slow	1
it didn't work that well, leaking	1
It made the flow too weak...	1
Not enough water pressure.	1
pressure not strong enough	1
Same low pressure so took out in master bathroom, left in children bathroom.	1
Terribly thin and slow flow.	1

Pipe Tape

Verbatim Response	Count (n=6)
did not use it all	1
didn't see any difference	1
does not stay on	1
none	1
None	1
The pipe tape seemed to be of good quality, but it was hard for me to install in tight quarters. The split foam rubber type insulation that comes in long sections would have been easier to put in, but maybe harder to ship	1

Q17. Overall, how satisfied are you with Duke Energy's Save Energy and Water Kit Program?

Response Options	Percent (n=111)
0 - Very dissatisfied	2%
1	0%
2	0%
3	1%
4	2%
5	1%
6	5%
7	5%
8	15%
9	16%
10 - Very satisfied	53%

Don’t know	0%

Q18. [Ask if any part of Q11 = YES] Have you (or anyone in your home) uninstalled any of the items from the kit that you had previously installed?

Response Option	Percent (n=111)
Yes	15%
No	82%
Don't know	3%

Q19. [Ask if Q18 = YES] Which of the items did you uninstall?

Response Option	Count (n=17)*
Showerhead	9
Kitchen faucet aerator	6
Bathroom faucet aerator	7
Pipe tape	1
Don't know	0

*Multiple responses were allowed for this question

Q20. [Ask if Q19 = SHOWERHEAD and Q12 = INSTALLED BOTH] Did you uninstall one or both of the showerheads you had previously installed?

Response Option	Percent (n=3)
I uninstalled both	67%
I only uninstalled one of the showerheads	33%
Don’t know	0%

Q21. [Ask if Q19 = BATHROOM FAUCET AERATOR and Q13 = 2-4] How many bathroom faucet aerators did you uninstall?

Response Option	Percent (n=3)
One	67%
Two	33%
Three	0%
Four	0%
Don’t know	0%

Q22. [Ask if any item of Q19 is selected] Why were those items uninstalled?

Showerhead

Response Option	Percent (n=9)*
It was broken	11%
Didn't like how it worked	78%

Didn't like how it looked	0%
Other	44%
Don't know	0%

*Multiple responses were allowed for this question

Verbatim "Other" Responses	Count (n=4)
Didn't work with our Rinnai water heater. Not enough pressure to keep the hot water working. Suddenly ice cold showers.	1
didnt like lack of water pressure	1
I just prefer the handheld type on the hose.	1
It did not have enough water pressure.	1

Kitchen faucet aerator

Response Options	Percent (n=6)*
It was broken	0%
Didn't like how it worked	100%
Didn't like how it looked	17%
Other	0%
Don't know	0%

*Multiple responses were allowed for this question

Bathroom faucet aerator

Response Options	Percent (n=7)*
It was broken	0%
Didn't like how it worked	86%
Didn't like how it looked	0%
Other	14%
Don't know	14%

*Multiple responses were allowed for this question

Verbatim "Other" Response	Count (n=1)
Extremely restricted flow	1

Pipe Tape

Response Options	Percent (n=1)*
It was broken	0%
Didn't like how it worked	0%
Didn't like how it looked	100%
Other	100%
Don't know	0%

*Multiple responses were allowed for this question

Verbatim "Other" Response	Count (n=1)
Kept falling off	1

Q23. [Ask if any items not selected in Q11 or Q10 = NO] You said you haven't installed the following items. Which of the following do you plan to install in the next three months?

Response Option	Percent (total n=131)*
Showerhead	35%
Kitchen faucet aerator	18%
Bathroom faucet aerator	31%
Pipe tape	20%
I'm not planning on installing any of these in the next three months	44%
Don't know	26%

*Multiple responses were allowed for this question

Q24. [Ask if any 1-6 options were not selected in Q23 or option "none" was selected] What's preventing you from installing those items?

Showerhead

Response Option	Percent (n=26)*
Already have an efficient showerhead	46%
Current one is still working	42%
Too difficult to install it, don't know how to do it	4%
Tried it, didn't fit	4%
Takes too much time to install it / No time / Too busy	4%
Tried it, didn't work as intended (please explain in the box below)	0%
Don't have the items any longer (threw away, gave away)	0%
Haven't gotten around to it	0%
Don't have the tools I need	0%
Didn't know what that was	0%
Other	19%
Don't know	4%

*Multiple responses were allowed for this question

Verbatim "Other" Response	Count (n=5)
use handheld	1
I have a removable shower head with hose so it doesn't work	1
I have a hand held shower	1
I like the shower head I have better than this one	1
Expect to be moving in the next 6 months	1

Kitchen faucet aerator

Response Option	Percent (n=55)*

Tried it, didn’t fit	31%
Current one is still working	27%
Already have an efficient kitchen faucet aerator	16%
Haven’t gotten around to it	7%
Too difficult to install it, don’t know how to do it	7%
Tried it, didn’t work as intended (please explain in the box below)	4%
Didn’t know what that was	2%
Takes too much time to install it / No time / Too busy	2%
Don’t have the items any longer (threw away, gave away)	0%
Don’t have the tools I need	0%
Other	18%
Don’t know	0%

*Multiple responses were allowed for this question

Verbatim “Other” Response	Count (n=10)
since the shower didnt work, we figured the facuets	1
did not receive one	1
Just purchased a new kitchen and used a facet that did the same or better.	1
I have a counter water filter system	1
purchased a new faucet for kitchen	1
It is not designed for my new faucet	1
Expect to be moving in the next 6 months	1
Wrong size-they were too large for my 3 faucets	1
already have a good aerator	1
I just remember getting the shower head, not the others	1

Bathroom Faucet Aerator

Response Option	Percent(n=40)*
Tried it, didn’t fit	38%
Current one is still working	23%
Already have an efficient bathroom faucet aerator	18%
Haven’t gotten around to it	10%
Too difficult to install it, don’t know how to do it	10%
Takes too much time to install it / No time / Too busy	3%
Don’t have the items any longer (threw away, gave away)	0%
Don’t have the tools I need	0%
Tried it, didn’t work as intended (please explain in the box below)	0%
Didn’t know what that was	0%
Other	20%
Don’t know	0%

*Multiple responses were allowed for this question

Verbatim “Other” Response	Count (n=7)
same as before	1
Husband did it; he has passed away	1
too low flow	1
Expect to be moving in the next 6 months	1
would not adapt to mine	1
wrong metal finish and stuck out too far	1
Don't remember receiving	1

Pipe Tape

Response Option	Percent (n=63)*
Already have pipetape	44%
Haven’t gotten around to it	19%
Too difficult to install it, don’t know how to do it	8%
Didn’t know what that was	8%
Tried it, didn’t work as intended (please explain in the box below)	0%
Takes too much time to install it / No time / Too busy	2%
Don’t have the tools I need	2%
Don’t have the items any longer (threw away, gave away)	0%
Other	16%
Don’t know	6%

*Multiple responses were allowed for this question

Verbatim “Other” Response	Count (n=7)
Not sure that I need it	1
Didn't know which pipe to put it on	1
not necessary at the time	1
dont want tape on water heater	1
Really don't think it will make a difference given my house and current insulation, etc.	1
Expect to be moving in the next 6 months	1
water heater is inside	1
wont work in space needed - require more tape	1
Don't remember receiving	1
Hot water heater is inside hpuse	1

Q25. [Ask if Q11 = SHOWERHEAD and Q19 KITCHEN FAUCET AERATOR option was not selected] Your efficient kitchen faucet aerator has three settings to adjust the flow of water. Have you adjusted this setting?

Response Option	Percent (n=58)
Yes	60%
No	35%
Don't know	5%

Q26. [Ask if Q25 = Yes] What flow setting is the kitchen faucet aerator currently set at? Please go over to your kitchen sink if you need to check.

Response Option	Percent (n=35)
0.5 GPM (lowest flow setting – "soaping mode")	26%
1.0 GPM (middle flow setting – "eco friendly mode")	46%
1.5 GPM (highest flow setting – "power rinse mode")	14%
Don't Know	14%

Q27. [Ask if Q26 = 0.5, 1.0, or 1.5 GPM] How often do you use that flow setting?

Response Option	Percent (n=30)
Not very often	10%
About half the time	10%
Most of the time	57%
All the time	23%
Don't know	0%

Q28. [If Q27 = NOT VERY OFTEN or ABOUT HALF THE TIME] What flow setting do you use most regularly?

Response Option	Percent (n=6)
0.5 GPM (lowest flow setting – "soaping mode")	33%
1.0 GPM (middle flow setting – "eco friendly mode")	50%
1.5 GPM (highest flow setting – "power rinse mode")	17%
Don't know	0%

Q29. [Ask if Q11 = SHOWERHEAD and at least one showerhead is still installed] On average, what is the typical shower length in your household?

Response Option	Percent (n=82)
One minute or less	1%
Two to four minutes	11%
Five to eight minutes	38%
Nine to twelve minutes	34%
Thirteen to fifteen minutes	6%
Sixteen to twenty minutes	4%
Twenty-one to thirty minutes	4%
More than thirty minutes	1%
Don't know	1%

Q30. [DISPLAY IF TWO SHOWERHEADS STILL INSTALLED: Thinking of the efficient showerhead you installed that gets the most usage…]

[DISPLAY IF ONE SHOWERHEAD STILL INSTALLED: Thinking of the efficient showerhead currently installed in your home…]

On average, how many showers per day are taken in this shower?

Response Option	Percent (n=82)
Less than one	0%
One	11%
Two	32%
Three	35%
Four	13%
Six	9%
Seven	0%
Eight or more	0%
Don’t know	0%

Q31. [Ask if two showerheads still installed] Thinking of the other efficient showerhead you installed…

On average, how many showers per day are taken in this shower?

Response Option	Percent (n=31)
Less than one	28%
One	31%
Two	34%
Three	3%
Four	3%
Five	0%
Six	0%
Seven	0%
Eight or more	0%
Don't know	0%

Q32. What fuel type does your water heater use?

Response Option	Percent (n=131)
Electric	79%
Natural gas	16%
Other (please specify in the box below)	2%
Don't know	3%

Verbatim “Other” Response	Count (n=2)
geo thermal	1
LP gas	1

Q33. [Ask if any item was selected in Q11 and it's not the case that all parts of Q19=selected (that is, they installed anything and did not uninstall everything they installed)] If you had not received the free efficiency items in the kit, would you have purchased and installed any of these same items within the next year?

Response Option	Percent (n=108)
Yes	19%
No	55%
Don't know	26%

Q34. [Ask if Q33 = YES] What items would you have purchased and installed within the next year?

Response Option	Count (n=21)*
Showerhead	16
Kitchen faucet aerator	4
Bathroom faucet aerator	10
Pipe tape	1
Don't know	2

*Multiple responses were allowed for this question

Q35. [Ask if Q34 = SHOWERHEAD and two showerheads are still installed] If you had not received them in your free kit, how many energy-efficient showerheads would you have purchased and installed within the next year?

Response Option	Percent (n=3)
One	33%
Two	33%
Don't know	33%

Q36. [Ask if Q34 = BATHROOM FAUCET AERATOR and if more than one bathroom aerator is still installed] If you had not received them in your free kit, how many energy-efficient bathroom aerators would you have purchased and installed within the next year?

Response Option	Percent (n=7)
One	0%
Two	43%
Three	0%
Four	14%
Don't know	43%

Q37. [If Q33 was displayed] Now, thinking about the energy and water savings items that were provided in the kit - using a scale from 0 to 10, where 0 means "not at all influential" and 10 means "extremely influential," how influential were the following factors on your decision to install the items from the kit? *How influential was…*

The fact that the items were free

Response Option	Percent (n=108)
0- Not at all influential	0%
1	0%

2	1%
3	0%
4	1%
5	2%
6	1%
7	4%
8	9%
9	11%
10 - Extremely influential	70%
Don't know	1%

The fact that the items were mailed to your home

Response Option	Percent (n=108)
0- Not at all influential	2%
1	0%
2	0%
3	0%
4	0%
5	3%
6	1%
7	4%
8	12%
9	11%
10 - Extremely influential	66%
Don't know	2%

Information provided by Duke Energy about how the items would save energy and water

Response Option	Percent (n=108)
0- Not at all influential	0%
1	0%
2	1%
3	1%
4	0%
5	7%
6	7%
7	7%
8	15%
9	19%
10 - Extremely influential	39%
Don't know	4%

Other information or advertisements from Duke Energy, including its website

Response Option	Percent (n=108)
0- Not at all influential	9%
1	1%
2	5%

3	2%
4	5%
5	11%
6	8%
7	8%
8	13%
9	8%
10 - Extremely influential	23%
Don't know	7%

Q38. Since receiving your kit from Duke Energy, what **new** behaviors has your household adopted to help save energy at home? Please only consider new **behaviors** that your household has adopted since receiving the kit.

Response Option	Percent (n=131)*
Not applicable - no new behaviors since receiving kit	33%
Turn off lights when not in a room	33%
Turn off furnace when not home	6%
Turn off air conditioning when not home	11%
Changed thermostat settings to use less energy	28%
Used fans instead of air conditioning	14%
Turn off electronics when we are not using them	18%
Take shorter showers	23%
Turned water heat thermostat down	8%
Turn off water when brushing teeth	32%
Other	11%
Don't know	3%

*Multiple responses were allowed for this question

Verbatim "Other" Response	Count (n=15)
led lighting	1
We already had these behaviors prior to receiving kit	1
I none	1
Limit the flow at kitchen faucet unless necessary.	1
Unplugging items so no "ghost" current	1
Wait til midnight to do the laundry	1
buy led lights	1
We are already extremely energy conscious so have not adopted any new behaviors.	1
Already do all these things.	1
Replacing lightbulbs with LEDs	1
We did most of these already	1
I would have turned my water heater down but it is tapeped up and controls not accessible	1

wash dishes more than using dishwasher	1
save water	1
I did these already	1

Q39. [Ask if Q38 <> DON'T KNOW or NOT APPLICABLE]. On a scale of 0 to 10, where 0 means "not at all influential" and 10 means "extremely influential," how much influence did Duke Energy's kit and materials on saving energy have on your decision to [LIST ALL RESPONSES FROM Q38].

Response Option	Percent (n=84)
0 – Not at all influential	6%
1	2%
2	4%
3	1%
4	5%
5	8%
6	7%
7	13%
8	20%
9	11%
10 - Extremely influential	21%
Don't know	1%

Q40. Since receiving your kit from Duke Energy, have you purchased and installed any other **products** or made any improvements to your home to help save energy?

Response Option	Percent (n=131)
Yes	30%
No	68%
Don't know	2%

Q41. [If Q40 = YES] What **products** have you purchased and installed to help save energy in your home?

Response Option	Percent (n=39)*
Bought energy efficient appliances	33%
Moved into an ENERGY STAR home	0%
Bought efficient heating or cooling equipment	21%
Bought efficient windows	3%
Added insulation	23%
Sealed air leaks in windows, walls, or doors	28%
Sealed or insulated ducts	5%
Bought LEDs	46%
Bought CFLs	23%

Installed an energy efficient water heater	15%
None – no other actions taken	0%
Other	18%
Don't know	0%

*Multiple responses were allowed for this question

Verbatim "Other" Response	Count (n=7)
automated thermostats, lights with alexa.	1
siding, windows	1
more pipe insulation	1
received free lightbulbs from Duke	1
new faucet in bathroom and kitchen	1
Improved well liner and water purification system	1
Installed solar attic fans and solar tube in bathroom with solar nightlight	1

Q42. [If Q41 = MOVED INTO AN ENERGY STAR HOME] Is Duke Energy still your gas or electricity utility?

Response Option	Percent (n=131)
Not asked	100%

Q43. [Ask if Q41<> NONE, DON'T KNOW, or REFUSED] Did you get a rebate from Duke Energy for any of those products or services? If so, which ones? Please select all products and services for which you received Duke Energy rebates.

Response Option	Count (n=39)*
Bought energy efficient appliances	0
Moved into an ENERGY STAR home	0
Bought efficient heating or cooling equipment	2
Bought efficient windows	0
Added insulation	0
Sealed air leaks in windows, walls, or doors	0
Sealed or insulated ducts	0
Bought LEDs	1
Bought CFLs	0
Installed an energy efficient water heater	0
I did not get any Duke Rebates	34
Other	0
Don't know	2

*Multiple responses were allowed for this question.

Q44. [Ask if Q41 = BOUGHT LEDS] Duke Energy's website has a tool that helps you find discounted LEDs in your area. Duke Energy's website also has an online store where you can purchase discounted LEDs and have them shipped directly to your home. Did you use either of these Duke Energy services to acquire your LEDs?

Response Option	Percent (n=18)
Yes	17%
No	72%
Don't know	11%

Q45. [Ask if Q41 = BOUGHT CFLS] Duke Energy's website has a tool that helps you find discounted CFLs in your area. Duke Energy's website also has an online store where you can purchase discounted CFLs and have them shipped to your home. Did you use either of these Duke Energy services to acquire your CFLs?

Response Option	Percent (n=9)
Yes	11%
No	89%
Don't know	0

Q46. [Ask if any item in Q41 was selected] On a scale of 0 to 10, where 0 means "not at all influential" and 10 means "extremely influential", how much influence did the Duke Energy Save Energy and Water Kit Program have on your decision to…

Response Option	0	1	2	3	4	5	6	7	8	9	10	Don't Know	Total (n)
Buy energy efficient appliances	31%	0%	8%	0%	0%	15%	8%	0%	0%	0%	39%	0%	13
Move into an ENERGY STAR home	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0
Buy efficient heating or cooling equipment	43%	14%	0%	0%	0%	0%	0%	0%	0%	29%	14%	0%	7
Buy efficient windows	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	1
Add insulation	22%	11%	0%	0%	11%	11%	0%	%	11%	11%	22%	0%	9
Seal air leaks	9%	9%	9%	0%	9%	9%	0%	9%	0%	9%	27%	9%	11
Seal ducts	0%	0%	0%	0%	50%	0%	0%	50%	0%	0%	0%	0%	2
Buy LEDs	28%	6%	11%	0%	6%	6%	6%	0%	6%	0%	22%	11%	18
Buy CFLs	11%	0%	11%	11%	11%	11%	11%	0%	11%	11%	11%	0%	9
Install an energy efficient water heater	33%	0%	0%	17%	0%	0%	0%	0%	0%	0%	50%	0%	6
Other	29%	0%	0%	0%	14%	0%	14%	14%	14%	0%	14%	0%	7

Q47. [Ask if Q41 = BOUGHT ENERGY EFFICIENT APPLIANCES and Q46_BUY ENERGY EFFICIENT APPLIANCES <> 0] What kinds of appliance(s) did you buy?

Response Option	Percent (n=9)*
Refrigerator	56%
Stand-alone freezer	0%
Dishwasher	22%
Clothes washer	44%
Clothes dryer	33%
Oven	33%
Microwave	33%
Other	11%
Don’t know	0%
Refused	0%

*Multiple responses were allowed for this question

Q48. [Ask if Q47 <> DON’T KNOW OR REFUSED] Was the [INSERT Q47 RESPONSE] an ENERGY STAR or high-efficiency model?

Response Option	Microwave	Refrigerator	Stand-alone Freezer	Dishwasher	Clothes washer	Clothes dryer	Oven	Other
Yes	1	5	0	2	4	3	3	1
No	0	0	0	0	0	0	0	0
Don't know	2	0	0	0	0	0	0	0
Total	3	5	0	2	4	3	3	1

Q49. [Ask if Q47 = CLOTHES DRYER] Does the new clothes dryer use natural gas?

Response Option	Percent (n=3)
Yes	67%
No	33%
Don’t know	0%
Refused	0%

Q50. [Ask if Q41 = BOUGHT EFFICIENT HEATING OR COOLING EQUIPMENT and Q46_BUY EFFICIENT HEATING OR COOLING EQUIPMENT > 0] What type of heating or cooling equipment did you buy?

Response Option	Percent (n=4)*
Central air conditioner	50%
Window/room air conditioner unit	25%
Wall air conditioner unit	0%
Air source heat pump	0%
Geothermal heat pump	0%
Boiler	0%
Furnace	25%
Wifi thermostat	25%
Other	25%
Don't know	0%
Refused	0%

*Multiple responses were allowed for this question

Verbatim "Other" Response	Count (n=1)
Blanket/Tape for hot water heater	1

Q51. [Ask if Q50 = BOILER OR FURNACE] Does the new [INSERT Q50 RESPONSE] use natural gas?

Response Option	Percent (n=1)
Yes	100%
No	0%
Don't know	0%
Refused	0%

Q52. [Ask if Q50 <> WIFI-ENABLED THERMOSTAT, DON'T KNOW, OR REFUSED] Was the [INSERT Q50 RESPONSE] an ENERGY STAR or high-efficiency model?

Response Option	Other	Central air conditioner	Window / room air conditioner unit	Wall air conditioner unit	Air source heat pump	Geothermal heat pump	Boiler	Furnace
Yes	0	2	1	0	0	0	0	1
No	0	0	0	0	0	0	0	0
Don't know	1	0	0	0	0	0	0	0
Total	1	2	1	0	0	0	0	1

Q53. [Ask if Q41= BOUGHT EFFICIENT WINDOWS and Q46_BUY EFFICIENT WINDOWS >0] Do you know how many windows you installed?

Response Option	Percent (n=131)
Yes	0%
No	0%
Don't know	0%
Not asked	100%

Q54. [Ask if Q41 = ADDED INSULATION and Q46_ADD INSULATION > 0] Please let us know what spaces you added insulation to. Also, let us know the proportion of each space you added insulation to (for example, if you added insulation that covered your entire attic space, you would type in 100%).

Response Option	Percent (n=7)*
Attic	71%
Walls	14%
Below the floor	29%

*Multiple responses were allowed for this question

Attic

Verbatim Response	Count (n=4)

100	3
1530	1

Walls

Verbatim Response	Count (n=1)
75	1

Below the floor

Verbatim Response	Count (n=2)
10	1
1530	1

Q55. [Ask if Q41 = BOUGHT LEDS and Q46_BUY LEDS > 0] Do you know how many LEDs you installed at your property?

Response Option	Percent (n=13)
Yes	100%
No	0%

[Please specify how many you installed in the box below:]

Verbatim Response	Count (n=13)
15	2
2	1
25	2
30	1
4	1
5	1
6	2
8	1
9	2

Q56. [Ask if Q41 = BOUGHT CFLS and Q46_BUY CFLS > 0] Do you know how many CFLs you installed at your property?

Response Option	Percent (n=8)
Yes	100%
No	0%

[Please specify how many you installed in the box below:]

Verbatim Response	Count (n=8)
10	1
12	1
15	1
16	2
5	1

6	1
8	1

Q57. [Ask if Q41 = INSTALLED AN ENERGY EFFICIENT WATER HEATER and Q46_INSTALL AN ENERGY EFFICIENT WATER HEATER > 0] Does the new water heater use natural gas?

Response Option	Percent (n=4)
Yes	50%
No	50%
Don't know	0%
Refused	0%

Q58. [Ask if Q41 = INSTALLED AN ENERGY EFFICIENT WATER HEATER and Q46_INSTALL AN ENERGY EFFICIENT WATER HEATER > 0] Which of the following water heaters did you purchase?

Response Option	Percent (n=4)
A traditional water heater with a large tank that holds the hot water	75%
A tankless water heater that provides hot water on demand	25%
A solar water heater	0%
Other	0%
Don’t know	0%
Refused	0%

Q59. [Ask if Q41 = INSTALLED AN ENERGY EFFICIENT WATER HEATER and Q46_INSTALL AN ENERGY EFFICIENT WATER HEATER > 0] Is the new water heater an ENERGY STAR model?

Response Option	Percent (n=4)
Yes	100%
No	0%
Don't know	0%
Refused	0%

Q60. Which of the following types of housing units would you say best describes your home? It is . . .?

Response Option	Percent (n=131)
Single-family detached house	87%
Single-family attached home (such as a townhouse or condo)	7%
Duplex, triplex or four-plex	1%
Apartment or condo with 5 units or more	0%
Manufactured or mobile home	5%
Other	0%
Prefer not to say	0%
Don't know	1%

Q61. How many showers are in your home? Please include both stand-up showers and bathtubs with showerheads.

Response Option	Percent (n=131)
One	12%
Two	66%
Three	15%
Four	7%
Five or more	0%
Don't know	0%

Q62. How many bathroom sink faucets are in your home? (Keep in mind that some bathrooms may have multiple bathroom sink faucets in them)

Response Option	Percent (n=131)
One	5%
Two	32%
Three	34%
Four	15%
Five	10%
Six	5%
Seven	1%
Eight or more	0%
Don't know	0%

Q63. How many kitchen faucets are in your home?

Response Option	Percent (n=131)
One	88%
Two	12%
Three	0%
Four or more	0%
Don't know	0%

Q64. How many square feet of living space are there in your residence, including bathrooms, foyers and hallways (exclude garages, unfinished basements, and unheated porches)?

Response Option	Percent (n=131)
500 to under 1,000 square feet	3%
1,000 to under 1,500 square feet	30%
1,500 to under 2,000 square feet	27%
2,000 to under 2,500 square feet	14%
2,500 to under 3,000 square feet	11%
Greater than 3,000 square feet	11%
Prefer not to say	1%
Don't know	5%

Q65. Do you or members of your household own your home, or do you rent it?

Response Option	Percent (n=131)
Own / buying	97%
Rent / lease	2%
Occupy rent-free	0%
Prefer not to say	1%
Don't know	1%

Q66. Including yourself, how many people currently live in your home year-round?

Response Option	Percent (n=131)
I live by myself	18%
Two people	44%
Three people	15%
Four people	14%
Five people	5%
Six people	2%
Seven people	1%
Eight or more people	0%
Prefer not to say	1%
Don't know	0%

Q67. What was your total annual household income for 2016, before taxes?

Response Option	Percent (n=131)
Under $20,000	8%
$20,000 to under $30,000	3%
$30,000 to under $40,000	6%
$40,000 to under $50,000	12%
$50,000 to under $60,000	6%
$60,000 to under $75,000	7%
$75,000 to under $100,000	12%
$100,000 to under $150,000	12%
$150,000 to under $200,000	5%
$200,000 or more	3%
Prefer not to say	21%
Don't know	5%

Q68. What is the highest level of education achieved among those living in your household?

Response Option	Percent (n=131)
Less than high school	0%
Some high school	1%
High school graduate or equivalent (such as GED)	13%
Trade or technical school	5%
Some college (including Associate degree)	17%
College degree (Bachelor's degree)	32%
Some graduate school	5%
Graduate degree, professional degree	21%

Doctorate	2%
Prefer not to say	5%
Don’t know	1%

Appendix F DEC Participant Survey Results

This section reports the results from each question in the DEC participant survey. Since the results reported in this appendix represent the "raw" data (that is, none of the open-ended responses have been coded and none of the scale questions have been binned), some values may be different from those reported in the Process Evaluation Findings chapter (particularly: percentages in tables with "Other" categories and scale response questions). Only respondents who completed the survey are included in the following results.

Q69. [Read if mode = phone] Hi, I'm ______ , calling on behalf of Duke Energy. We are calling about the Save Energy and Water Kit you got from Duke Energy.

This kit included faucet aerators, one or two showerheads, and pipe tape that can help you save water and energy in your home. Do you recall receiving this kit?

Response Option	Percent (n=34)
Yes	100%
No	0%
Don't know	0%

Q70. [Display if mode = web] We are conducting surveys about the Save Energy and Water Kit you got from Duke Energy. This kit included faucet aerators, one or two showerheads, and pipe tape that can help you save water and energy in your home.

Do you recall receiving this kit?

Response Option	Percent (n=80)
Yes	100%
No	0
Don't know	0

Q71. What motivated you to request a free Save Energy and Water Kit from Duke Energy?

Response Option	Percent (n=114)*
Wanted to conserve water	56%
Wanted to conserve electricity	55%
It was free	41%
It was offered by Duke Energy	36%
It was easy	17%
Other	13%
Don't know	1%

*Multiple responses were allowed for this question

Verbatim Other Responses	Count (n=13)

We already had one and it was beginning to stop up on us.	1
Wanted to save money	1
Saw it in a flyer	1
Save money	1
Save money	1
said something about 20x21 filters, but never got them	1
My Sister got one and it helped on her power bill	1
my bill is high	1
It was my daughter that did that.	1
Hip was broken, decided when I get that I can get to use the shower head, I thought i'd correct it.	1
cut expenses	1
brochure, save energy	1
a fresh pair of eyes looking at ways to improve our home	1

Q72. Did you read the included instructions on how to install the items that came in the kit?

Response Option	Percent (n=114)
Yes	82%
No	13%
Don't remember	4%

Q73. [Ask if Q4 = YES] On a scale from 0 to 10, where 0 is not at all helpful and 10 is very helpful, how helpful were the instructions on how to install the items that came in the kit?

Response Option	Percent (n=93)
1- Not at all helpful	1%
1	1%
2	1%
3	0%
4	1%
5	7%
6	3%
7	10%
8	15%
9	8%
10 - Very helpful	47%
Don't Know	5%

Q74. [Ask if Q5<7] What might have made the instructions more helpful?

Verbatim Response	Count (n=10)
Didn't fit	1
I cant think of anything.	1
If the aerators would fit my faucets they would have worked	1
it it good	1
My son installed the shower head for me and I love it.	1
No product was fine for one of the sinks would not fit the others	1
nothing	2

Nothing it was common sense instalation	1
The instructions were helpful	1

Q75. Did you watch any of Duke Energy's online how-to videos on how to install the items that came in the kit?

Response Option	Percent (n=114)
Yes	5%
No	93%
Don't remember	2%

Q76. [Ask if Q7 = YES] On a scale from 0 to 10, where 0 is not at all helpful and 10 is very helpful, how helpful were Duke Energy's online how-to videos on how to install the items that came in the kit?

Response Option	Percent (n=6)
1- Not at all helpful	0%
1	0%
2	0%
3	0%
4	0%
5	0%
6	17%
7	0%
8	33%
9	0%
10 - Very helpful	50%
Don't know	0%

Q77. [Ask if Q8<7] What might have made the instructional videos more helpful?

Verbatim Response	Count (n=1)
More detail	1

Q1. Have you or anyone else installed any of those items in your home, even if they were taken out later?

Response Option	Percent (n=114)
Yes	76%
No	24%
Don't Know	0%

Q2. [Ask if Q10 = YES] Which of the items did you install, even if they were taken out later?

Response Option	Percent (n=87)*
Showerhead	82%

Kitchen faucet aerator	57%
Bathroom faucet aerator	61%
Pipe tape	40%
I don't remember	0%

*Multiple responses were allowed for this question

Q3. [Ask if Q11 = SHOWERHEAD AND KIT_SIZE= MEDIUM] Your kit contained two showerheads. Did you install one or both of the showerheads in the kit, even if one or both were taken out later?

Response Option	Percent (n=47)
I installed both	53%
I only installed one showerhead	47%
Don't know	2%

Q4. [Ask if Q11 = BATHROOM FAUCET AERATOR] How many of the bathroom faucet aerators from the kit did you install in your home, even if one or more were taken out later?

Response Option	Percent (n=53)
One	42%
Two	42%
Three	11%
Four	5%
Don't know	0%

Q5. [Ask if Q11 = PIPEWRAP] Did you install all of the pipe insulation that was included with the kit?

Response Option	Percent (n=35)
Yes	66%
No	26%
Don't know	8%

Q6. [Ask if Q14 is displayed] About how many feet of the pipe extruding from your water heater did you tape with the insulation **that came in the kit**? Please go over to your water heater if you need to check.

Response Option	Percent(n=35)
About three feet or less	37%
About five feet	20%
About ten feet	20%
Don't know	23%

Q7. [Ask if any part of Q11 = YES] Overall, how satisfied are you with the item[s] you installed?

Showerhead

Response Option	Percent (n=71)
0 - Very dissatisfied	3%
1	0%
2	1%
3	1%
4	1%
5	1%
6	7%
7	9%
8	16%
9	10%
10 - Very satisfied	51%
Don’t know	0%

Kitchen Faucet Aerator

Response Option	Percent (n=50)
0 – Very dissatisfied	6%
1	0%
2	2%
3	0%
4	2%
5	6%
6	2%
7	14%
8	8%
9	14%
10 - Very satisfied	44%
Don't know	2%

Bathroom Faucet Aerator

Response Option	Percent (n= 53)
0 – Very dissatisfied	4%
1	0%
2	0%
3	4%
4	2%
5	6%
6	2%
7	6%
8	8%
9	23%
10 - Very satisfied	47%
Don't know	0%

Pipe Tape

Response Option	Percent (n= 35)
0 – Very dissatisfied	0%
1	0%
2	0%
3	0%
4	0%
5	3%
6	6%
7	6%
8	11%
9	11%
10 - Very satisfied	60%
Don't know	3%

Q16a. Can you please explain any dissatisfaction you had with [DISPLAY ALL ITEMS IN Q16 THAT ARE <7]?

Showerhead

Verbatim Response	Count (n=10)
Did not allow enough water pressure	1
It was very cheap made	1
Leaked	1
My son complains it doesn't wet his hair evenly.	1
No pressure	1
No water pressure	1
not enough water coming out, adjusted it every way, just not enough water	1
Pressure is low	1
Water source is much weaker	1
Water to slow	1

Kitchen Faucet Aerator

Verbatim Response	Count (n=8)
Could not tell much difference from what was there. Not necessarily dissatisfied.	1
It was good	1
It's just that I'm accustom to quite a bit more pressure coming out of my kitchen faucet.	1
kitchen aerator did not fit	1
No pressure	1
No water pressure	1
Splashed too much water because of the force.	1
worked for a couple weeks and then cracked down the side of it. had to go buy one for 11.00	1

Bathroom Faucet Aerator

Verbatim Response	Count (n=9)
I never got this one	1
It restricted the pressure far too much than the previously installed aerators. I have thus far left them.	1
Low pressure	1
No pressure	1
Same as kitchen. I am on a well and have low water pressure.	1
The pressure was way too low. I ended up taking them off because I am listing my house for sale and don't want people to think there is an issue here with water pressure.	1
The same didn't help	1
the water just does not seem to flow right anymore	1
Very little water pressure but we still have these on	1

Pipe tape

Verbatim Response	Count (n=3)
Can't tell a difference	1
Don't see any differenence	1
No dissatisfaction just needed more	1

Q8. Overall, how satisfied are you with Duke Energy's Save Energy and Water Kit Program?

Response Options	DEP (n=87)
0 - Very dissatisfied	0%
1	0%
2	0%
3	0%
4	2%
5	2%
6	2%
7	6%
8	20%
9	12%
10 - Very satisfied	54%
Don't know	2%

Q9. [Ask if any part of Q11 = YES] Have you (or anyone in your home) uninstalled any of the items from the kit that you had previously installed?

Response Option	DEP (n=87)
Yes	12%
No	85%
Don't know	3%

Q10. [Ask if Q18 = YES] Which of the items did you uninstall?

Response Option	Count (n= 10)*

Showerhead	6
Kitchen faucet aerator	5
Bathroom faucet aerator	4
Pipe tape	0
Don't know	1

*Multiple responses were allowed for this question

Q11. [Ask if Q19 = SHOWERHEAD and Q12 = INSTALLED BOTH] Did you uninstall one or both of the showerheads you had previously installed?

Response Option	Percent (n=3)
I uninstalled both	100%
I only uninstalled one of the showerheads	0%
Don't know	0%

Q12. [Ask if Q19 = BATHROOM FAUCET AERATOR and Q13 = 2-4] How many bathroom faucet aerators did you uninstall?

Response Option	Percent (n=1)
One	0%
Two	0%
Three	0%
Four	100%
Don't know	0%

Q13. [Ask if any item of Q19 is selected] Why were those items uninstalled?

Showerhead

Response Option	Percent (n=6)*
It was broken	0%
Didn't like how it worked	83%
Didn't like how it looked	17%
Other	33%
Don't know	0%

*Multiple responses were allowed for this question

Verbatim "Other" Responses	Count (n=2)
not enough water coming out	1
Put the Moen brand back on as I am selling the house.	1

Kitchen faucet aerator

Response Options	Percent (n=5)*
It was broken	20%

Didn't like how it worked	60%
Didn't like how it looked	0%
Other	20%
Don’t know	0%

*Multiple responses were allowed for this question

Verbatim “Other” Response	Count (n=1)
We replaced our kitchen faucet with a faucet that was too big for the aerator.	1

Bathroom faucet aerator

Response Options	Percent (n=2)*
It was broken	0%
Didn't like how it worked	100%
Didn't like how it looked	0%
Other	0%
Don’t know	0%

*Multiple responses were allowed for this question

Pipe tape

Response Options	Percent (n=0)*
It was broken	0%
Didn't like how it worked	0%
Didn't like how it looked	0%
Other	0%
Don’t know	0%

*Multiple responses were allowed for this question

Q14. [Ask if any items not selected in Q11 or Q10 = NO] You said you haven’t installed the following items. Which of the following do you plan to install in the next three months?

Response Option	Percent (n=114)*
Showerhead	33%
Kitchen faucet aerator	28%
Bathroom faucet aerator	31%
Pipe tape	24%
I'm not planning on installing any of these in the next three months	32%
Don't know	25%

*Multiple responses were allowed for this question

Q15. [Ask if any 1-6 options were not selected in Q23 or option “none” was selected] What’s preventing you from installing those items?

Showerhead

Response Option	Percent (n=29)*

Already have an efficient showerhead	28%
Current one is still working	24%
Tried it, didn't fit	14%
Too difficult to install it, don't know how to do it	7%
Takes too much time to install it / No time / Too busy	3%
Tried it, didn't work as intended (please explain in the box below)	3%
Don't have the items any longer (threw away, gave away)	3%
Haven't gotten around to it	3%
Don't have the tools I need	0%
Didn't know what that was	0%
Other	21%
Don't know	0%

*Multiple responses were allowed for this question

Verbatim "Other" Response	Count (n=6)
Doesn't match our plumbing which is brushed nickel.	1
My shower head is a detachable one and this would just not help.	1
My husband likes the one we now have. He is very particular. I plan to give the showerhead to my son who just purchased a house.	1
The significant restriction on the bathroom aerator dissuaded me.... thus far.	1
I use a handheld showerhead.	1
health problems	1

Kitchen faucet aerator

Response Option	Percent (n=46)*
Tried it, didn't fit	26%
Current one is still working	20%
Already have an efficient kitchen faucet aerator	15%
Haven't gotten around to it	13%
Didn't know what that was	7%
Tried it, didn't work as intended (please explain in the box below)	4%
Too difficult to install it, don't know how to do it	2%
Takes too much time to install it / No time / Too busy	2%
Don't have the items any longer (threw away, gave away)	2%
Don't have the tools I need	0%
Other	17%
Don't know	0%

*Multiple responses were allowed for this question

Verbatim "Other" Response	Count (n=8)
Already have aerators plus didn't match faucets.	1
will not work with my current faucet	1

Lazy	1
need to include adapter, did not fit my faucet	1
didnt see this	1
Did not work with the faucet I have.	1
health problems	1
Dont recall receiving it	1

Bathroom Faucet Aerator

Response Option	Percent (n=42)*
Tried it, didn't fit	29%
Haven't gotten around to it	26%
Current one is still working	17%
Already have an efficient bathroom faucet aerator	14%
Didn't know what that was	5%
Takes too much time to install it / No time / Too busy	2%
Don't have the items any longer (threw away, gave away)	2%
Too difficult to install it, don't know how to do it	2%
Tried it, didn't work as intended (please explain in the box below)	2%
Don't have the tools I need	0%
Other	14%
Don't know	2%

*Multiple responses were allowed for this question

Verbatim "Other" Response	Count (n=6)
i will put it on	1
need to include adapter, did not fit my faucet	1
didnt recall getting one of those	1
health problems	1
n/a	1
n/a	1

Pipe Tape

Response Option	Percent (n=60)*
Haven't gotten around to it	35%
Already have pipetape	25%
Didn't know what that was	13%
Too difficult to install it, don't know how to do it	10%
Takes too much time to install it / No time / Too busy	3%
Don't have the items any longer (threw away, gave away)	2%
Tried it, didn't work as intended (please explain in the box below)	2%
Don't have the tools I need	0%
Other	20%

Don’t know	5%

*Multiple responses were allowed for this question

Verbatim “Other” Response	Count (n=12)
Pipes are inside the wall.	1
just like i said, lazy	1
I dont know if it would do any good to install it. I dont know if it would benefit me if I do install it. I dont know if it would cover all the pipes I have.	1
You're planning on installing a bath tub in the next little while and may install the pip tape then.	1
Bad back and crawl space install is difficult	1
Want to use it for my rental property	1
didnt recall getting this	1
health problems	1
Don't need it	1
just gave it away	1
Don't remember receiving pipe tape	1
because it is in the basement, dont need it	1

Q16. [Ask if Q11 = SHOWERHEAD and Q19 kitchen faucet aerator option was not selected] Your efficient kitchen faucet aerator has three settings to adjust the flow of water. Have you adjusted this setting?

Response Option	Percent (n=45)
Yes	64%
No	27%
Don't know	9%

Q17. [Ask if Q25 = Yes] What flow setting is the kitchen faucet aerator currently set at? Please go over to your kitchen sink if you need to check.

Response Option	Percent (n=29)
0.5 GPM (lowest flow setting – “soaping mode”)	10%
1.0 GPM (middle flow setting – “eco friendly mode”)	83%
1.5 GPM (highest flow setting – “power rinse mode”)	3%
Don’t Know	3%

Q18. [Ask if Q26 = 0.5, 1.0, or 1.5 GPM] How often do you use that flow setting?

Response Option	Percent (n=28)
Not very often	14%
About half the time	11%
Most of the time	46%
All the time	25%
Don't know	3%

Q19. [If Q27 = NOT VERY OFTEN or ABOUT HALF THE TIME] What flow setting do you use most regularly?

Response Option	Percent (n=7)
0.5 GPM (lowest flow setting – "soaping mode")	14%
1.0 GPM (middle flow setting – "eco friendly mode")	86%
1.5 GPM (highest flow setting – "power rinse mode")	0%
Don't know	0%

Q20. [Ask if Q11 = SHOWERHEAD and at least one showerhead is still installed] On average, what is the typical shower length in your household?

Response Option	Percent (n=65)
One minute or less	0%
Two to four minutes	11%
Five to eight minutes	49%
Nine to twelve minutes	29%
Thirteen to fifteen minutes	5%
Sixteen to twenty minutes	2%
Twenty-one to thirty minutes	0%
More than thirty minutes	0%
Don't know	5%

Q21. [DISPLAY IF TWO SHOWERHEADS STILL INSTALLED: Thinking of the efficient showerhead you installed that gets the most usage…]

[DISPLAY IF ONE SHOWERHEAD STILL INSTALLED: Thinking of the efficient showerhead currently installed in your home…]

On average, how many showers per day are taken in this shower?

Response Option	Percent (n=65)
Less than one	5%
One	29%
Two	49%
Three	9%
Four	3%
Six	2%
Seven	2%
Eight or more	0%
Don't know	2%

Q22. [Ask if two showerheads still installed] Thinking of the other efficient showerhead you installed…

On average, how many showers per day are taken in this shower?

Response Option	Percent (n=22)
Less than one	23%
One	36%
Two	27%
Three	0%
Four	5%
Five	0%
Six	0%
Seven	0%
Eight or more	0%
Don't know	9%

Q23. What fuel type does your water heater use?

Response Option	Percent (n=114)
Electric	70%
Natural gas	28%
Other (please specify in the box below)	0%
Don't know	2%

Q24. [Ask if any item was selected in Q11 and it's not the case that all parts of Q19 are selected (that is, they installed anything and did not uninstall everything they installed)] If you had not received the free efficiency items in the kit, would you have purchased and installed any of these same items within the next year?

Response Option	Percent (n=84)
Yes	34%
No	50%
Don't know	16%

Q25. [Ask if Q33 = YES] What items would you have purchased and installed within the next year?

Response Option	Count (n=29)*
Showerhead	20
Kitchen faucet aerator	6
Bathroom faucet aerator	5
Pipe tape	3
Don't know	2

*Multiple responses were allowed for this question

Q26. [Ask if Q34 = SHOWERHEAD and two showerheads are still installed] If you had not received them in your free kit, how many energy-efficient showerheads would you have purchased and installed within the next year?

Response Option	Percent (n=7)

One	57%
Two	43%
Don't know	0%

Q27. [Ask if Q34 = BATHROOM FAUCET AERATOR and if more than one bathroom aerator is still installed] If you had not received them in your free kit, how many energy-efficient bathroom aerators would you have purchased and installed within the next year?

Response Option	Percent (n=5)
One	20%
Two	20%
Three	20%
Four	0%
Don't know	40%

Q28. [If Q33 was displayed] Now, thinking about the energy and water savings items that were provided in the kit - using a scale from 0 to 10, where 0 means "not at all influential" and 10 means "extremely influential," how influential were the following factors on your decision to install the items from the kit? *How influential was…*

The fact that the items were free

Response Option	Percent (n=84)
1- Not at all influential	1%
1	0%
2	0%
3	0%
4	0%
5	2%
6	2%
7	1%
8	10%
9	12%
10 - Extremely influential	71%
Don't know	0%

The fact that the items were mailed to your home

Response Option	Percent (n=84)
0- Not at all influential	1%
1	0%
2	0%
3	0%
4	0%
5	4%
6	2%
7	2%
8	5%
9	18%
10 - Extremely influential	68%

Don't know	0%

Information provided by Duke Energy about how the items would save energy and water

Response Option	Percent (n=84)
0- Not at all influential	2%
1	0%
2	0%
3	0%
4	0%
5	8%
6	2%
7	7%
8	12%
9	16%
10 - Extremely influential	51%
Don't know	1%

Other information or advertisements from Duke Energy, including its website

Response Option	Percent (n=84)
0- Not at all influential	10%
1	0%
2	0%
3	0%
4	0%
5	7%
6	6%
7	6%
8	21%
9	14%
10 - Extremely influential	31%
Don't know	5%

Q29. Since receiving your kit from Duke Energy, what **new** behaviors has your household adopted to help save energy at home? Please only consider new **behaviors** that your household has adopted since receiving the kit.

Response Option	Percent (n=114)*
Not applicable - no new behaviors since receiving kit	28%
Turn off lights when not in a room	46%
Turn off furnace when not home	9%
Turn off air conditioning when not home	17%
Changed thermostat settings to use less energy	42%
Used fans instead of air conditioning	25%
Turn off electronics when we are not using them	35%
Take shorter showers	23%
Turned water heat thermostat down	9%

Turn off water when brushing teeth	32%
Other	5%
Don't know	4%

*Multiple responses were allowed for this question

Verbatim “Other” Response	Count (n=6)
only used pipe tape	1
agree with duke enegy save energy	1
Installed new hi eff pool pump	1
replaced water lines with pvc	1
We are energy conscious so this probably made little difference........slight if any.	1
Shades, front and back, depending on time of day and season	1

Q30. [Ask if Q38 <> DON’T KNOW or NOT APPLICABLE]. On a scale of 0 to 10, where 0 means “not at all influential” and 10 means “extremely influential,” how much influence did Duke Energy’s kit and materials on saving energy have on your decision to [LIST ALL RESPONSES FROM Q38].

Response Option	Percent (n=78)
0 – Not at all influential	5%
1	3%
2	4%
3	1%
4	0%
5	8%
6	12%
7	15%
8	13%
9	5%
10 - Extremely influential	33%
Don't know	1%

Q31. Since receiving your kit from Duke Energy, have you purchased and installed any other **products** or made any improvements to your home to help save energy?

Response Option	Percent (n=114)
Yes	33%
No	62%
Don't know	5%

Q32. [If Q40 = YES] What **products** have you purchased and installed to help save energy in your home?

Response Option	Percent (n=37)*
Bought energy efficient appliances	19%
Moved into an ENERGY STAR home	3%
Bought efficient heating or cooling equipment	16%
Bought efficient windows	8%

Added insulation	16%
Sealed air leaks in windows, walls, or doors	30%
Sealed or insulated ducts	5%
Bought LEDs	38%
Bought CFLs	19%
Installed an energy efficient water heater	19%
None – no other actions taken	3%
Other	11%
Don't know	0%

*Multiple responses were allowed for this question

Verbatim Other Responses	Count (n=4)
Aerators and shower head	1
New thermostat, cut down on my furnace running so long . Really helped.	1
Kitchen Faucet	1
generator	1

Q33. [If Q41 = MOVED INTO AN ENERGY STAR HOME] Is Duke Energy still your gas or electricity utility?

Response Option	Count (n=114)
Yes	1
Not asked	113

Q34. [Ask if Q41<> NONE, DON'T KNOW, or REFUSED] Did you get a rebate from Duke Energy for any of those products or services? If so, which ones? Please select all products and services for which you received Duke Energy rebates.

Response Option	Count (n=36)*
Bought energy efficient appliances	0
Moved into an ENERGY STAR home	0
Bought efficient heating or cooling equipment	1
Bought efficient windows	0
Added insulation	0
Sealed air leaks in windows, walls, or doors	0
Sealed or insulated ducts	0
Bought LEDs	1
Bought CFLs	2
Installed an energy efficient water heater	0
I did not get any Duke Rebates	29
Other	1
Don't know	2

*Multiple responses were allowed for this question.

Q35. [Ask if Q41 = BOUGHT LEDS] Duke Energy's website has a tool that helps you find discounted LEDs in your area. Duke Energy's website also has an online store where you can purchase discounted LEDs and have them shipped directly to your home. Did you use either of these Duke Energy services to acquire your LEDs?

Response Option	Percent (n=14)
Yes	36%
No	64%
Don't know	0%

Q36. [Ask if Q41 = BOUGHT CFLS] Duke Energy’s website has a tool that helps you find discounted CFLs in your area. Duke Energy’s website also has an online store where you can purchase discounted CFLs and have them shipped to your home. Did you use either of these Duke Energy services to acquire your CFLs?

Response Option	Percent (n=7)
Yes	43%
No	57%
Don’t know	0%

Q37. [Ask if any item in Q41 was selected] On a scale of 0 to 10, where 0 means “not at all influential” and 10 means “extremely influential”, how much influence did the Duke Energy Save Energy and Water Kit Program have on your decision to…

	0	1	2	3	4	5	6	7	8	9	10	Don’t Know	Total (n)
Buy energy efficient appliances	0%	14%	0%	0%	0%	0%	0%	29%	57%	0%	0%	0%	7
Move into an ENERGY STAR home	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	1
Buy efficient heating or cooling equipment	17%	0%	0%	0%	0%	0%	17%	17%	0%	0%	33%	17%	6
Buy efficient windows	0%	0%	0%	0%	0%	0%	0%	33%	33%	0%	33%	0%	3
Add insulation	0%	0%	0%	0%	0%	0%	17%	33%	33%	0%	17%	0%	6
Seal air leaks	9%	0%	0%	0%	0%	18%	9%	9%	9%	0%	45%	0%	11
Seal ducts	50%	0%	0%	0%	0%	50%	0%	0%	0%	0%	0%	0%	2
Buy LEDs	14%	0%	0%	0%	0%	7%	0%	14%	29%	7%	29%	0%	14
Buy CFLs	14%	0%	0%	0%	0%	0%	14%	14%	14%	14%	29%	0%	7

Install an energy efficient water heater	29%	0%	0%	0%	0%	0%	0%	14%	0%	14%	43%	0%	7
Other	50%	0%	0%	0%	0%	0%	0%	0%	25%	0%	25%	0%	4

Q38. [Ask if Q41 = BOUGHT ENERGY EFFICIENT APPLIANCES and Q46_BUY ENERGY EFFICIENT APPLIANCES <> 0] What kinds of appliance(s) did you buy?

Response Option	Percent (n=7)*
Refrigerator	57%
Stand-alone freezer	0%
Dishwasher	29%
Clothes washer	86%
Clothes dryer	71%
Oven	29%
Microwave	29%
Other	0%
Don’t know	0%
Refused	0%

*Multiple responses were allowed for this question

Q39. [Ask if Q47 <> DON’T KNOW OR REFUSED] Was the [INSERT Q47 RESPONSE] an ENERGY STAR or high-efficiency model?

Response Option	Microwave	Refrigerator	Stand-alone Freezer	Dishwasher	Clothes washer	Clothes dryer	Oven	Other
Yes	2	2	0	2	5	4	1	0
No	0	0	0	0	0	0	0	0
Don't know	0	2	0	0	1	1	0	0
Total	2	4	0	2	6	5	2	0

Q40. [Ask if Q47 = CLOTHES DRYER] Does the new clothes dryer use natural gas?

Response Option	Percent (n=5)
Yes	0%
No	100%
Don’t know	0%
Refused	0%

Q41. [Ask if Q41 = BOUGHT EFFICIENT HEATING OR COOLING EQUIPMENT and Q46_BUY EFFICIENT HEATING OR COOLING EQUIPMENT > 0] What type of heating or cooling equipment did you buy?

Response Option	Percent (n=5)*
Central air conditioner	60%
Window/room air conditioner unit	0%
Wall air conditioner unit	0%

Air source heat pump	20%
Geothermal heat pump	0%
Boiler	0%
Furnace	20%
Wifi thermostat	20%
Other	0%
Don't know	0%
Refused	0%

*Multiple responses were allowed for this question

Q42. [Ask if Q50 = BOILER OR FURNACE] Does the new [INSERT Q50 RESPONSE] use natural gas?

Response Option	Percent (n=1)
Yes	0%
No	100%
Don't know	0%
Refused	0%

Q43. [Ask if Q50 <> WIFI-ENABLED THERMOSTAT, DON'T KNOW, OR REFUSED] Was the [INSERT Q50 RESPONSE] an ENERGY STAR or high-efficiency model?

Response Option	Other	Central air conditioner	Window / room air conditioner unit	Wall air conditioner unit	Air source heat pump	Geothermal heat pump	Boiler	Furnace
Yes	0	2	0	0	1	0	0	1
No	0	0	0	0	0	0	0	0
Don't know	0	1	0	0	0	0	0	0
Total	0	3	0	0	1	0	0	1

Q44. [Ask if Q41= BOUGHT EFFICIENT WINDOWS and Q46_BUY EFFICIENT WINDOWS >0] Do you know how many windows you installed?

Response Option	Percent (n=114)
Yes	1%
No	2%
Don't know	0%
Not asked	97%

Please specify how many you installed:

Verbatim Response	Percent (n=1)
11	100%

Q45. [Ask if Q41 = ADDED INSULATION and Q46_ADD INSULATION > 0] Please let us know what spaces you added insulation to. Also, let us know the proportion of each space you added insulation to (for example, if you added insulation that covered your entire attic space, you would type in 100%).

Response Option	Percent (n=6)*
Attic	100%
Walls	17%
Below the floor	17%

*Multiple responses were allowed for this question

Attic

Verbatim Response	Count (n=2)
20	1
75	1

Q46. [Ask if Q41 = BOUGHT LEDS and Q46_BUY LEDS > 0] Do you know how many LEDs you installed at your property?

Response Option	Percent (n=12)
Yes	100%
No	0%

[Please specify how many you installed in the box below:]

Verbatim Response	Count (n=12)
12	3
15	1
2	1
4	1
5	2
6	2
8	1
9	1

Q47. [Ask if Q41 = BOUGHT CFLS and Q46_BUY CFLS > 0] Do you know how many CFLs you installed at your property?

Response Option	Percent (n=6)
Yes	83%
No	17%

[Please specify how many you installed in the box below:]

Verbatim Response	Count (n=5)
11	1
25	1
3	1
8	2

Q48. [Ask if Q41 = INSTALLED AN ENERGY EFFICIENT WATER HEATER and Q46_INSTALL AN ENERGY EFFICIENT WATER HEATER > 0] Does the new water heater use natural gas?

Response Option	Percent (n=5)
Yes	20%
No	80%
Don't know	0%
Refused	0%

Q49. [Ask if Q41 = INSTALLED AN ENERGY EFFICIENT WATER HEATER and Q46_INSTALL AN ENERGY EFFICIENT WATER HEATER > 0] Which of the following water heaters did you purchase?

Response Option	Percent (n=5)
A traditional water heater with a large tank that holds the hot water	40%
A tankless water heater that provides hot water on demand	60%
A solar water heater	0%
Other	0%
Don’t know	0%
Refused	0%

Q50. [Ask if Q41 = INSTALLED AN ENERGY EFFICIENT WATER HEATER and Q46_INSTALL AN ENERGY EFFICIENT WATER HEATER > 0] Is the new water heater an ENERGY STAR model?

Response Option	Percent (n=5)
Yes	80%
No	0%
Don't know	20%
Refused	0%

Q51. Which of the following types of housing units would you say best describes your home? It is . . .?

Response Option	Percent (n=114)
Single-family detached house	81%
Single-family attached home (such as a townhouse or condo)	4%
Duplex, triplex or four-plex	0%
Apartment or condo with 5 units or more	0%
Manufactured or mobile home	13%
Other	1%
Prefer not to say	0%
Don't know	1%

Verbatim Other Response	Count (n=1)
Tri level house	1

Q52. How many showers are in your home? Please include both stand-up showers and bathtubs with showerheads.

Response Option	Percent (n=114)
One	22%
Two	67%
Three	11%
Four	1%
Five or more	0%
Don't know	0%

Q53. How many bathroom sink faucets are in your home? (Keep in mind that some bathrooms may have multiple bathroom sink faucets in them)

Response Option	Percent (n=114)
One	14%
Two	39%
Three	31%
Four	10%
Five	4%
Six	1%
Seven	2%
Eight or more	0%
Don't know	0%

Q54. How many kitchen faucets are in your home?

Response Option	Percent (n=114)
One	91%
Two	8%
Three	1%
Four or more	0%
Don't know	0%

Q55. How many square feet of living space are there in your residence, including bathrooms, foyers and hallways (exclude garages, unfinished basements, and unheated porches)?

Response Option	Percent (n=114)
500 to under 1,000 square feet	9%
1,000 to under 1,500 square feet	30%
1,500 to under 2,000 square feet	22%
2,000 to under 2,500 square feet	18%
2,500 to under 3,000 square feet	6%
Greater than 3,000 square feet	6%
Prefer not to say	1%
Don't know	9%

Q56. Do you or members of your household own your home, or do you rent it?

Response Option	Percent (n=114)

Own / buying	94%
Rent / lease	6%
Occupy rent-free	0%
Prefer not to say	0%
Don't know	0%

Q57. Including yourself, how many people currently live in your home year-round?

Response Option	Percent (n=114)
I live by myself	15%
Two people	45%
Three people	18%
Four people	8%
Five people	3%
Six people	1%
Seven people	1%
Eight or more people	0%
Prefer not to say	10%
Don't know	0%

Q58. What was your total annual household income for 2016, before taxes?

Response Option	Percent (n=114)
Under $20,000	7%
$20,000 to under $30,000	13%
$30,000 to under $40,000	7%
$40,000 to under $50,000	8%
$50,000 to under $60,000	11%
$60,000 to under $75,000	5%
$75,000 to under $100,000	9%
$100,000 to under $150,000	6%
$150,000 to under $200,000	0%
$200,000 or more	1%
Prefer not to say	28%
Don't know	4%

Q59. What is the highest level of education achieved among those living in your household?

Response Option	Percent (n=114)
Less than high school	1%
Some high school	3%
High school graduate or equivalent (such as GED)	17%
Trade or technical school	10%
Some college (including Associate degree)	22%
College degree (Bachelor's degree)	17%
Some graduate school	3%
Graduate degree, professional degree	11%
Doctorate	4%

Prefer not to say	13%
Don’t know	0%