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Duke Energy Carolinas and Duke Energy Progress

2017 Neighborhood Energy Saver Program Evaluation Report – Final

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1. Evaluation Summary

1.1 Program Summary

The Duke Energy Carolinas' (DEC) and Duke Energy Progress' (DEP) Neighborhood Energy Saver Program (NES) provides one-on-one energy education, on-site energy assessments, and energy conservation measures to customers in selected low-income neighborhoods. These services are offered free of charge to all active DEC/DEP account holders who are individually metered homeowners and tenants living in predetermined income-qualified communities. Qualifying neighborhoods have at least 50% of households with incomes equal to or less than 200% of the federal poverty level[1].

The program employs a neighborhood canvass approach to drive participation, while working with existing organizations in each community to maximize the number of customers benefitting from the program. Each year, program teams aim to reach approximately 4,500 customers in the DEP and 8,900 customers in the DEC service territory in several preselected communities throughout North and South Carolina.

The program period under evaluation is June 1st, 2017 through June 30th, 2018.

1.2 Evaluation Objectives

The objectives of the 2017-2018 NES Program evaluation are to:

- Review and update, as necessary, deemed savings estimates through a review of measure assumptions and calculations.
- Verify measure installation and persistence.
- Estimate program energy (kWh), summer and winter peak demand (kW) savings, and realization rates.
- If possible, discern the difference in energy savings between participating homes heated electrically from those heated with natural gas.
- Identify barriers to participation in the program and recommend strategies for addressing those barriers.
- Identify and characterize program strengths, which may include customer engagement and other non-energy benefits.
- Identify ways the DEP/DEC NES Program may be improved in the future.

1 As of January 1, 2017, qualifying neighborhoods in the DEP service territory must meet this threshold. Previously, qualifying neighborhoods were those where 50% of households had incomes equal to or less than 150% of the federal poverty level.

To achieve these objectives, Opinion Dynamics completed a number of data collection and analytic activities, including interviews with program staff, a participant survey, an analysis of survey results, an analysis of program-tracking data, a deemed savings review, and an engineering analysis.

1.3 High Level Findings

Overall, NES Program teams in DEP and DEC territories implemented the program effectively and have achieved a high penetration rate in target neighborhoods. The program team served 15,312 participants across both territories and had a 69% penetration rate. There were 11,079 participants in the DEC service territory, 124% of the DEC participant target, and 4,233 participants in the DEP service territory, 94% of the DEP participant target. In addition, the evaluation found high levels of program satisfaction; 96% of DEP and 99% of DEC participants reported they were somewhat or very satisfied with the program overall, and 99% of participants from both territories reported they were somewhat or very satisfied with the equipment they received through the program.

Impact Evaluation

In previous NES evaluations, Opinion Dynamics used a billing analysis to determine program energy savings. However, due to differences in the usage patterns of the treatment and comparison groups and large differences in weather patterns between the pre- and post-treatment periods, a billing analysis was not feasible to evaluate this program cycle (see Section 4.3 for more details). As such, the team used an engineering analysis to determine both energy and demand savings. Table 1-1 and

Table 1-2 present the total gross energy and demand savings for each measure installed through the program and the estimated individual measure contribution to the overall energy (kWh) savings from the engineering analysis. The results are presented separately for each service territory.

Table 1-1. Total Measure-Level Gross Energy Savings Results from Engineering Analysis

Measures	DEP		DEC	
	Energy (MWh)	Percent of total MWh	Energy (MWh)	Percent of total MWh
Lighting	1,412	43%	2,842	38%
Low Flow Showerhead	797	24%	1,955	26%
Infiltration Reduction	436	13%	955	13%
Efficient Aerator	334	10%	734	10%
HVAC Filters	150	5%	313	4%
Pipe Insulation (5 feet sections)	97	3%	423	6%
Water Heater Insulation Wrap	71	2%	266	4%
Total	**3,298**	**100%**	**7,449**	**100%**

Table 1-2 Total Measure-Level Gross Demand Savings Results from Engineering Analysis

Measure	DEP				DEC			
	Summer Coincident Demand		Winter Coincident Demand		Summer Coincident Demand		Winter Coincident Demand	
	kW	%	kW	%	kW	%	kW	%
Lighting	209	48%	101	24%	421	42%	204	22%
Low Flow Showerhead	37	9%	75	17%	85	9%	170	19%
Efficient Aerator	18	4%	36	8%	42	4%	84	9%
Infiltration Reduction	106	24%	155	36%	253	25%	308	34%
HVAC Filters	48	11%	43	10%	115	12%	76	8%
Pipe Insulation (5 feet sections)	11	3%	11	3%	48	5%	48	5%
Water Heater Insulation Wrap	8	2%	8	2%	30	3%	30	3%
Total	**437**	**100%**	**428**	**100%**	**994**	**100%**	**921**	**100%**

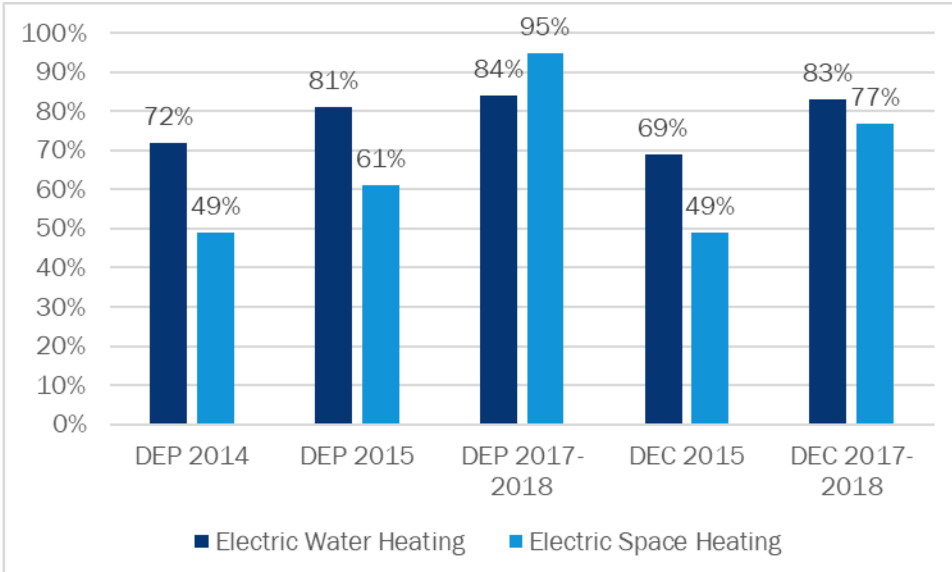
During the 2017-2018 evaluation period, DEP participants saved an average of 779 kWh and DEC participants saved an average of 676 kWh per household (see Table 1-3).

Table 1-3. Per Household Energy and Demand Savings

Service Territory	Energy Savings (kWh)	Summer Peak Demand (kW)	Winter Peak Demand (kW)
DEP	779	0.103	0.101
DEC	676	0.090	0.083

Per household energy savings for this evaluation period were substantially higher than engineering estimates from previous evaluations. Higher savings per household in the 2017-2018 evaluation period were driven, in part, by a larger share of participants with electric space and water heating (Figure 1-1). Given the mix of measures offered through the NES Program, energy savings from domestic hot water and infiltration measures represent a large portion of potential program savings. To realize electric savings from these measures at the household-level, participants need to heat their homes or hot water with electricity. As such, a higher share of participants that heat with electric fuel will yield more energy savings per household.

Figure 1-1. Share of DEP and DEC Participants with Electric Space and Water Heating



Process Evaluation

The research team focused the process evaluation on several questions related to energy education, behavior change, additional savings opportunities, NES participant satisfaction, and the overall effectiveness of the program. The full results are available in Section 4.3; key findings are summarized below.

- Program participation was strong in both service territories. Between June 1st, 2017 and June 30th, 2018, 4,233 DEP and 11,079 DEC customers participated in the NES Program. This represented 69% of households within targeted neighborhoods.
- Customer satisfaction was high in both service territories overall (96% of DEP and 99% of DEC participants were somewhat or very satisfied). Both DEP and DEC participants were also satisfied with the equipment they received (99% in both territories) and the NES Program representatives (99% and 91%, respectively).
- The majority of NES participants (91%) received in-person education and 89% thought that information helped them save energy in their homes. Additionally, participants reported that they were more knowledgeable about ways to save energy in their homes after their NES participation than they were before. As such, NES participants reported taking a range of additional energy saving actions in their homes (e.g., turning off lights more frequently, keeping doors and windows closed, washing clothing in cold water, etc.).
- Participants reported experiencing a variety of non-energy benefits after participating in the NES Program. The majority of NES participants reported noticing a decrease in their electric bill after participating (54%-DEP, 55%-DEC). Additionally, 92% of DEP and 84% of DEC participants felt that their home was less drafty, and 86% and 73%, respectively, reported noticing a change in the comfort of their home.

1.4 Evaluation Recommendations

Opinion Dynamics has the following recommendations for maintaining and improving program performance and overall savings. More details on these recommendations are included in Section 6.1 and throughout this report.

- **NES program teams should consider including space and water heating fuel types as additional criteria for identifying and selecting neighborhoods for future program years.** As the NES offers a relatively limited set of easy-to-install measures by design, domestic hot water and air infiltration measures will continue to contribute a substantial portion to total program savings. However, energy savings only manifest from those measures in households that heat their homes or their hot water with electricity. To maximize savings per participating household, NES Program staff should consider targeting neighborhoods with higher rates of electric space and water heating.

- **NES Program staff should continue to emphasize air infiltration measures.** While infiltration measures make an important contribution to overall program energy savings (14% of DEP and DEC participants), NES participants that receive those measures also report other valuable non-energy benefits. Of those that received infiltration measures, 92% of DEP and 84% of DEC participants reported that their home was less drafty and 86% and 73%, respectively, reported noticing a change in the comfort of their home. Of those who noticed a difference in home comfort, 90% of DEP and 80% of DEC felt that keeping a comfortable temperature in their home was easier after their NES participation. Air infiltration measures may be important in driving participant non-energy benefits in the future.

- **NES Program staff should continue to emphasize the in-person educational component of the program.** The majority of DEC and DEP participants (91%) receive in-person education from implementation teams and 89% find the educational component of the program useful in helping save energy in their homes. This sort of in-person education can provide a valuable touch point between program representatives and Duke Energy customers, and also encourages various different types of energy-saving behavior change (see Section 5.3.4).

2. Program Description

2.1 Program Design

The DEC and DEP NES Program offers direct-install measures and employs a neighborhood canvassing approach to drive participation. The goal is to offer persistent energy savings to income-qualified customers through the direct installation of energy-saving measures. The program also provides participating customers with information on the measures that they received and additional suggestions on ways to lower energy use. Implementation teams provide measures and services at no cost to customers and collaborates with existing neighborhood organizations to promote the program and maximize the number of customers benefitting from the receipt of energy conservation measures.

Neighborhoods can be selected to participate in the program if at least 50% of households in the neighborhood have incomes equal to or less than 200% of the federal poverty level[2]. Implementation teams aim to reach approximately 8,900 customers in the DEC service territory and 4,500 customers in the DEP service territory in several preselected communities throughout North Carolina and South Carolina. Participating households are limited to a one-time receipt of energy efficiency measures through the program.

2.2 Program Implementation

Honeywell Building Solutions (Honeywell) implemented the 2017-2018 DEC-DEP NES Program in partnership with Duke Energy program staff. The implementer performs all assessments and installations. DEC and DEP program staff are heavily involved in selecting specific neighborhoods based on program eligibility criteria.

Prior to participating in the program, residents in selected neighborhoods receive targeted mailings that provide introductory information about how to participate; the benefits of participation; and a notice that additional information from program staff will be circulated throughout their community, including additional mailings and a community launch event. The implementation team organizes at least one community launch event in each targeted neighborhood, both to make residents aware of the program and to provide demonstrations of the measures that the NES Program offers.

The implementation team records measure installation information at each premise, which Duke Energy tracks in its program-tracking database. Program representatives also record the location in which they installed lighting measures and faucet aerators (i.e., kitchen or bathroom), along with household characteristics, such as primary heating fuel type and the type of heating and cooling equipment present in each participating household. Finally, implementation teams leave behind educational materials that explain the measures that they install in each home, additional recommendations for how participants could save energy through behavioral changes, and information about other Duke Energy programs that may be of interest.

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2 As of January 1, 2017, qualifying neighborhoods in the DEP service territory must meet this threshold. Previously, qualifying neighborhoods were those where 50% of households had incomes equal to or less than 150% of the federal poverty level.

2.3 Program Performance

The program period under evaluation is June 1st, 2017 through June 30th, 2018. Over this period, the program teams served 15,312 households in 24 neighborhoods in North and South Carolina. Based on engineering estimates, participants save an average of 779 kWh per household per year in DEP territory and 676 kWh per household per year in the DEC territory. Energy and demand savings by service territory are displayed in Table 2-1.

Table 2-1. Energy Savings per Household

Per Household Savings	kWh	Summer kW	Winter kW
DEP	779	0.103	0.101
DEC	676	0.090	0.083

3. Overview of Evaluation Activities

To answer the research objectives outlined in Section 1.2, Opinion Dynamics performed a range of data collection and analytic activities, including:

- Interviews with DEP and DEC program staff;
- A review of program materials and program tracking data;
- Participant telephone survey
- An engineering analysis of deemed savings.

In Sections 4 and 4.3, we provide more details on the methods and results of the impact and process analyses, respectively. Below, we summarize the scope and approach for the staff interviews, the program materials and data review, the engineering analysis, and the participant survey. Each of these components supported either the impact or the process evaluations.

3.1 Program Staff Interviews

Opinion Dynamics conducted an in-depth interview with program staff responsible for program administration in 2017-2018. The in-depth interview allowed us to discuss implementation of the NES Program in DEP and DEC territories, including differences between the DEP/DEC program and program implementation in other Duke Energy territories. We also used this interview to identify program successes, to discuss any difficulties in administering the program, and to determine any risks for the program achieving its goals.

3.1 Program Materials and Data Review

DEC and DEP program administration staff provided Opinion Dynamics with information on the program. These data included the program marketing materials, program tracking databases, and other program documents—such as NES implementation requirements, educational procedures, and contractors' on-site auditing and direct installation procedures. Review of these materials informed development of the participant survey instrument and the engineering analysis.

Each of these materials is further described below.

- **Marketing Materials.** Opinion Dynamics reviewed the leave-behind brochure, the customer survey booklet, the pre-participation program informational brochure, the leave-behind door hanger, the energy efficiency brochure about other Duke Energy programs, the introduction letter to the NES Program and the informational session, examples of the presentation shown at the informational sessions, and postcards sent to participants with information about how to participate.
- **Program Databases.** The program staff provided Opinion Dynamics with program-tracking data from June 1st, 2017 to June 30th, 2018. The databases provided us with information on the quantities, location (in some cases), and types of measures installed in each treated household.
- **Program Documents.** The program documents that we reviewed included statements of work between Duke Energy and Honeywell as well as the NES Program guide. The guide explained the program

implementation process, including homeowner eligibility, communication, scheduling, and assessment and installation, as well as a description of installed measures.

3.2 Participant Survey

The purpose of the participant survey was to collect information to support the process evaluation and development of in-service rates. Opinion Dynamics implemented the survey as a computer-assisted telephone interviewing (CATI) survey between July 11th - August 1st, 2019. We completed a total of 140 interviews and achieved a response rate of 20.5%; the average length of the interviews was 22 minutes.

The survey sample frame consisted of 14,442 NES participants that enrolled between June 1st, 2017 and June 6th, 2018.[3] Our team removed 3,300 records that were missing phone numbers, 2,298 records that were on Duke's "Do Not Call" list, and 393 records that were duplicates. We developed a simple random sample of the remaining 8,451 records. The survey final sample frame consisted of a preliminary extract of 550 DEP and 630 DEC measure-level participant records.

To meet precision targets for measure-level installation and persistence analyses, the evaluation team set quotas for each measure. Quotas were set at 68 to ensure that analyses met the industry-standard two-tail 90/10 criterion in terms of sampling error at a measure level. This means that we would be 90% confident that our results are within 10% of the true value in the population.

3.3 Engineering Analysis

Opinion Dynamics conducted an engineering analysis to estimate energy and demand savings for the 2017-2018 evaluation period.[4] We first adjusted the per-unit savings for each measure based on the deemed savings review described in this section using the in-service rates developed through the participant survey (see Section 4.1). We then estimated total program savings by applying the adjusted per unit savings to each participant based on the package of measures they received, their heating fuel, and the presence or absence of different types of heating and cooling equipment.[5]

In previous evaluations of the NES Program, Opinion Dynamics has conducted a billing analysis to determine the net savings attributable to the NES Program during the evaluation period. While this approach has been successful in previous evaluations, we were unable to apply this method to the 2017-2018 DEC-DEP evaluation due to lack of equivalency between the treatment and comparison groups and differences in weather patterns for pre- and post-treatment years. The combination of both factors did not allow for our team to control for potential exogeneous effects that biased results. For more detail, see Section 4.3.

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[3] Opinion Dynamics conducted a survey of participants from 11 months of the evaluation period to ensure that participants would be able to report feedback as close to their participation date as possible.

[5] For participants that did not have information related to heating/hot water fuel type or heating/cooling equipment in their homes tracked in the NES Program tracking data, Opinion Dynamics applied per-unit savings for specific measures weighted by the share of each population with the appropriate equipment and fuel type.

3.3.1 Deemed Savings Review

The primary goal of the deemed savings review is to develop updated savings algorithms and input assumptions that are consistent with standard industry practice and comparable with applicable Technical Reference Manuals (TRMs).

To conduct our deemed savings review, we performed the following steps:

- Reviewed the prior evaluation report, for the 2015–2016 NES Program years;
- Analyzed program tracking data to compile household characteristics (e.g., primary heating fuel type) to be used in estimating deemed savings for individual measures;
- Reviewed all other secondary information, including the program manual and the technical specifics of efficient equipment offered through the program; and
- Reviewed the latest Illinois, Indiana, and Mid-Atlantic TRMs, along with other recently published studies where relevant, to determine if there was a need for additional updates.

Error! Reference source not found. provides more detail on the methods used in the deemed savings review and engineering analysis.

3.4 Billing Analysis

In previous evaluations of the NES Program, Opinion Dynamics has conducted a billing analysis to determine the net savings attributable to the NES Program during the evaluation period. Opinion Dynamics attempted a billing analysis using a linear fixed effects regression (LFER) model; however, after testing several different model specifications, we determined that a billing analysis was not an effective method for evaluating NES Program impacts for the 2017-2018 evaluation period. Our team tested models that attempted to control for all household factors that do not vary over time by the individual constant terms in the equation. We used participants from the second half of 2018 and first half of 2019 as a comparison group. For more detail on our approach, see Section 4.3.

4. Gross Impact Evaluation

The gross impact evaluation for the 2017-2018 DEP/DEC NES Program consisted of two distinct steps: (1) verification of measure installation and continued operation; and (2) engineering analysis, including review of deemed savings values for incented measures. This section describes the methodologies and results of both steps.

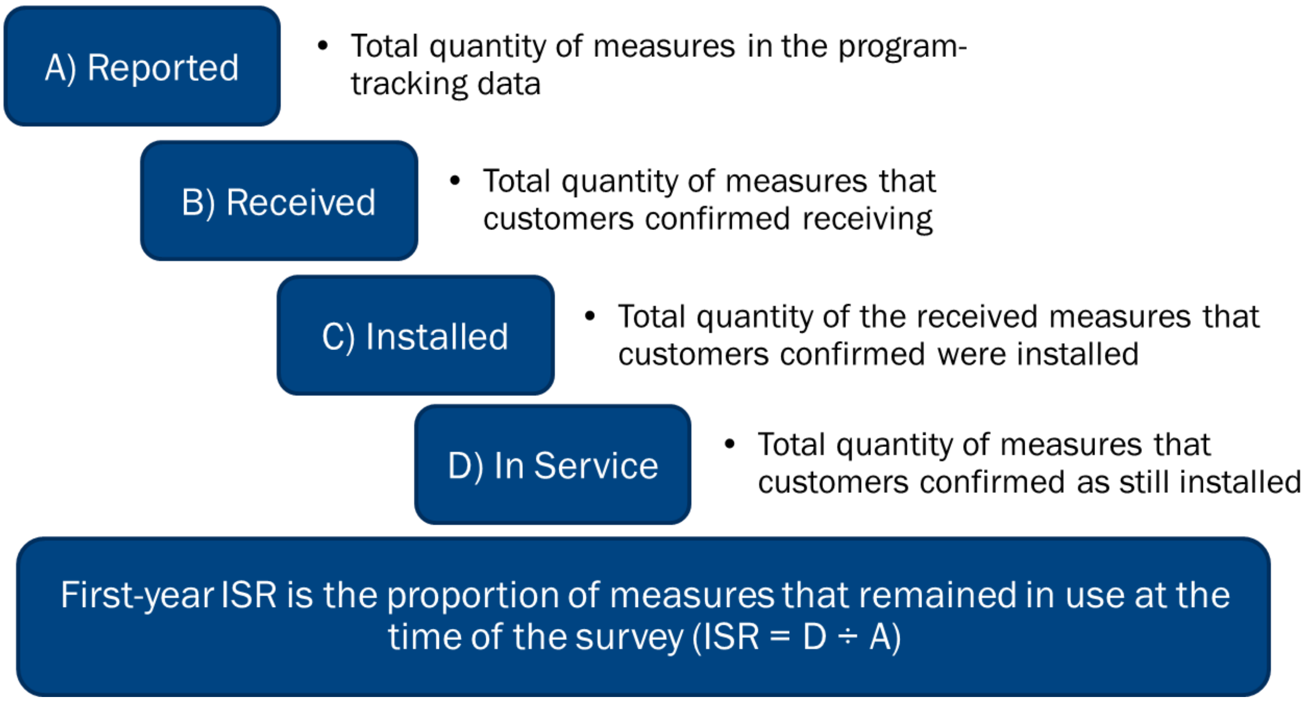
4.1 Measure Verification

4.1.1 Measure Verification Methodology

The participant survey included questions designed to verify that participants received and installed program measures and that those measures remained in place and operational. The “in-service rate” (ISR) for each measure represents the share of measures in the program-tracking data that was still in service at the time of the survey, based on 140 completed telephone interviews (70-DEP, 70-DEC).

Figure 4-1 outlines the method for deriving the ISR for each measure. During the survey, we asked participants to confirm that they received the quantity of measures recorded in Duke Energy's program-tracking data and, when necessary, to provide the correct quantity. We also asked participants to confirm the quantity of measures that were installed and remained in service at the time of the survey.

Figure 4-1 In Service Rate Components



Based on the survey responses, we calculated the verification, installation, and persistence rates, as well as the resulting ISR – using the equations shown below – for each participant and each measure they received. We then developed jurisdiction-specific averages of all four rates for each measure group (see Table 4-1).

1) $Verification\ Rate = \frac{(B)Received\ Quantity}{(A)Reported\ Quantity}$

2) $Installation\ Rate = \frac{(C)Installed\ Quantity}{(B)Received\ Quantity}$

3) $Persistence\ Rate = \frac{(D)In\ Service\ Quantity}{(C)Installed\ Quanhtity}$

$$\boldsymbol{First\ Year\ ISR = In\ Service\ Measures\ (D) \div Reported\ Measures\ (A)}$$

In previous evaluations of the NES Program, Opinion Dynamics found that participants were unable to verify certain measures (e.g., water heater temperature setbacks, water heater tank and pipe wraps). For these measures, we assumed 100% for all four rates. Additionally, for some air infiltration measures, such as caulking or glass patch tape, participants are unable to verify installation and persistence of individual measures. As such, we asked participants to verify installation of the entire package of air infiltration measures and assume 100% of those treatments remain installed. As all NES measures are installed directly by program staff and these measures specifically are difficult to remove, we feel that these assumptions are reasonable for this type of program. Finally, ISRs for HAVC filters are based on verification that participants received the filters, and changed their filters at least once per year.

4.1.2 Measure Verification Results

The results of this analysis showed high ISRs for measures in both DEC and DEP service territories, as shown in Table 4-1. Overall, both DEP and DEC participants reported that most measures were still in service at the time of the participant survey. All results are significant at the 90% confidence level with +- 10% relative precision.

Table 4-1. First Year Measure In-Service Rates

Measure Category	DEP				DEC			
	Verification Rate	Installation Rate	Persistence Rate	ISR	Verification Rate	Installation Rate	Persistence Rate	ISR
LEDs	98%	100%	93%	92%	98%	100%	96%	94%
Low Flow Showerheads	100%	100%	96%	96%	99%	100%	98%	97%
Faucet Aerators	98%	100%	98%	97%	96%	100%	99%	94%
Infiltration Measures	94%	N/A	N/A	94%	92%	N/A	N/A	92%
HVAC Filters	90%	92%	N/A	83%	89%	90%	N/A	80%

4.2 Engineering Analysis

4.2.1 Engineering Analysis Methodology

The engineering analysis for the 2017-2018 NES Program consisted of a deemed savings review of each incented program measure and application of measure-specific ISRs to develop ex post program savings.

To develop per-unit savings, we used several resources. Since neither North Carolina nor South Carolina has a statewide TRM, we relied on the IL, IN, ARK, and Mid-Atlantic TRM and secondary sources, as necessary, for algorithms and assumptions. As NES implementation teams collect characteristics of participating households, our engineering team used inputs from the DEP and DEC program-tracking data wherever possible. For more information on the algorithms and inputs that our engineering team used to develop deemed savings estimates for each measure, see **Error! Reference source not found.**.

When developing total program savings, Opinion Dynamics applied measure-specific per-unit savings estimates (excluding ISRs) to all participants who received each measure. Where savings for certain measures relied on households having specific heating/cooling equipment or fuel types, our engineering team only applied savings for those measures to participants who received them and had the appropriate mix of fuel and equipment.[6] For example, NES implementation teams provide domestic hot water measures to all participants, regardless of the fuel they use to heat water in their homes. However, as Duke Energy only provides electricity to DEP and DEC customers, when developing total program savings, our team only applied savings for domestic hot water measures to participants that received them and heated their water with electricity. Once the engineering team applied savings appropriately to the participant population, we applied measure-level ISRs to develop total program savings. We then calculated per household savings by dividing total program savings by the total number of participants.

4.2.2 Engineering Analysis Results

This remainder of this section provides gross energy and demand savings estimates for each measure offered by the NES Program, along with total program savings and per household savings estimates for the 2017-2018 evaluation period.

Ex-Post Deemed Savings Estimates

Table 4-2 provides the estimated gross per-unit energy and demand savings for all measures installed through the NES Program. As described in Section 3.3, we based the measure-level savings on secondary research and applied NES Program-specific assumptions on household characteristics, where applicable. The estimates shown below are for households with the appropriate mix of heating and cooling equipment, and electric heat or hot water. For example, savings from kitchen faucet aerators would only be realized by households with an electric water heater.

Table 4-2. Ex Post Per-Unit Deemed Savings Estimates

Measure	Energy savings (kWh)		Summer Peak Demand (kW)		Winter Peak Demand (kW)	
	DEP	DEC	DEP	DEC	DEP	DEC
Lighting						
LEDs (75W equivalent)	42	42	0.0061	0.0061	0.0030	0.0030
LEDs (60W equivalent)	33	33	0.0049	0.0049	0.0024	0.0024
LEDs (40W equivalent)	24	24	0.0035	0.0035	0.0017	0.0017
LEDs 5 W or similar - Candelabra Bulbs	21	21	0.0031	0.0031	0.0015	0.0015
LED 5 W or similar - Globes	21	21	0.0031	0.0031	0.0015	0.0015
Domestic Hot Water						
Low Flow Showerhead	226	255	0.0084	0.0081	0.0168	0.0162
Water Heater Insulation Wrap	105	96	0.0110	0.0110	0.0110	0.0110
Pipe Insulation (5 feet sections)	83	83	0.0094	0.0094	0.0094	0.0094
Kitchen Faucet Aerator	95	67	0.0035	0.0034	0.0070	0.0068
Bathroom Faucet Aerator	14	10	0.0010	0.0010	0.0020	0.0020
Air Sealing						
Infiltration Reduction	120	103	0.0295	0.0275	0.0190	0.0182
HVAC						

[6] For participants that did not have information related to heating/hot water fuel type or heating/cooling equipment in their homes tracked in the NES Program tracking data, Opinion Dynamics applied per-unit savings for specific measures weighted by the share of each population with the appropriate equipment and fuel type.

HVAC Filters	52	46	0.0147	0.0152	0.0112	0.0103

Total Program Savings

Our team calculated total program savings by applying the per-unit estimates shown in Table 4-2 to each participant that received the corresponding measure.[7] We then applied the ISRs shown in Table 4-1 and, where applicable, multiplied the per-unit estimate by the measure quantity installed in each participating household. Table 4-3 below summarizes total gross program energy and demand savings, by jurisdiction and measure, for the 2017-2018 evaluation period.

Table 4-3. Total Gross Program Savings

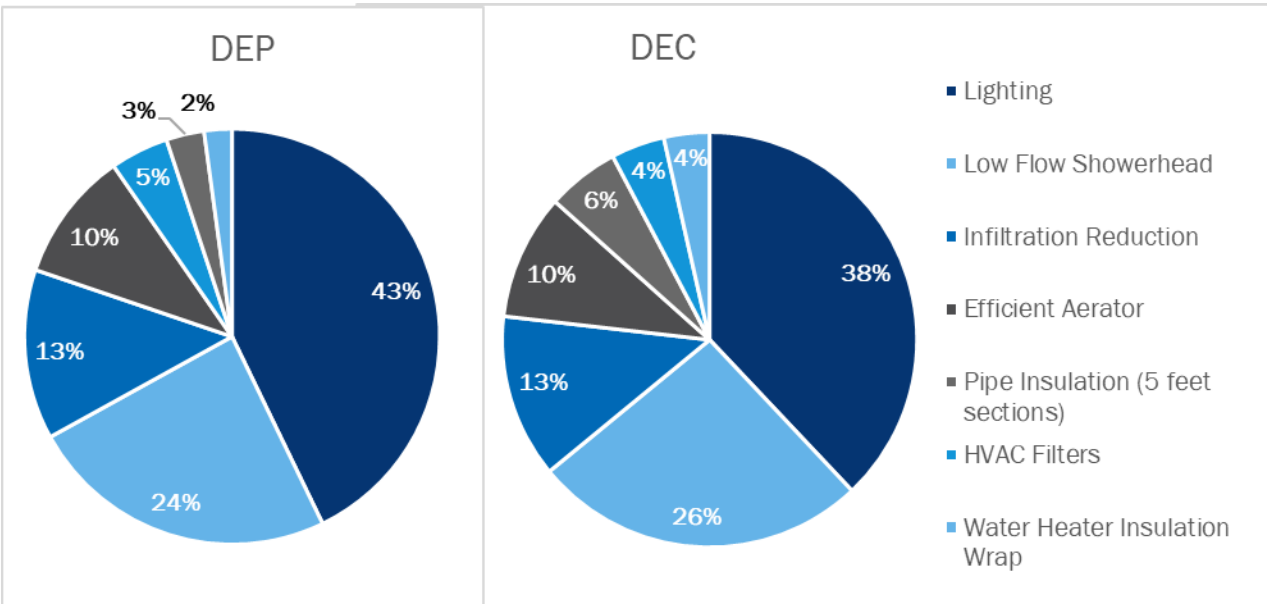
Measure	Energy savings (kWh)		Summer Peak Demand (kW)		Winter Peak Demand (kW)	
	DEP	DEC	DEP	DEC	DEP	DEC
Lighting						
LEDs (60W equivalent)	1,163,401	2,195,813	172	325	83	157
LEDs 5 W or similar - Candelabra Bulbs	140,116	354,045	20.7	52.4	10	25.3
LEDs (75W equivalent)	59,798	91,262	8.85	13.5	4	6.53
LED 5 W or similar - Globes	44,762	164,478	6.62	24.3	3	11.8
LEDs (40W equivalent)	4,067	36,989	0.602	5.47	0.3	2.65
Domestic Hot Water						
Low Flow Showerhead	797,101	1,954,742	37.4	85.0	75	170
Kitchen Faucet Aerator	280,402	622,664	12.9	31.3	26	62.5
Pipe Insulation (5 feet sections)	97,387	423,152	11.1	48.3	11	48.3
Water Heater Insulation Wrap	71,352	266,243	8.14	30.4	8	30.4
Bathroom Faucet Aerator	53,622	110,904	4.85	10.9	10	21.7
Air Sealing						
Infiltration Reduction	436,437	955,256	106	253	155	308
HVAC						
HVAC Filters	149,881	313,208	47.9	115	43	76.0
Total Program Savings	**3,298,328**	**7,488,755**	**437**	**994**	**428**	**920**
Savings per Household	**779**	**676**	**0.103**	**0.090**	**0.101**	**0.083**

Using the total gross savings values from Table 4-3 and the total number of participants, we calculated per household energy savings of 779 kWh for DEP and 676 kWh for DEC neighborhoods. The majority of these savings are attributable to lighting and low-flow showerhead installations. As shown in Figure 4-2 lighting

[7] Certain measures only generate electric savings in households with electric space or water heating, or central cooling (i.e., domestic hot water, infiltration reduction, and HVAC filters). For these measures, we only applied savings to those households with the appropriate mis of electric heating, hot water, or cooling equipment. In cases where individual participants did not have space or water heating fuel type information in the program tracking data, we weighted per-unit savings by the share of participating households with the appropriate fuel type.

accounted for 1,427 MWh (43%) of overall savings in DEP territory and 2,892 MWh (38%) of savings in DEC territory. Low-flow showerhead installations accounted for 797 MWh (24%) and 1,975 MWh (26%) of savings in DEP and DEC territories, respectively.

Figure 4-2 Measure Contribution to Total Energy (kWh) Savings



Comparison to Previous Impact Analyses

As noted earlier, due to drastically different weather patterns and an inequivalent comparison group, Opinion Dynamics was unable to rely on a billing analysis and determined that an engineering analysis was a more reasonable approach to estimating ex post program impacts for this evaluation period. To ensure that engineering analysis results can be a reliable proxy for billing analysis results for the NES Program, we compared impact results from the two methods derived for previous DEP and DEC evaluations. Table 4-4 below provides per household energy savings estimates for both methods, based on DEP and DEC evaluations for the 2014 and 2015 program years, along with the ratio of the billing-to-engineering estimates. The results show generally good agreement of the two methods.

Table 4-4. Historical Per Household Billing-to-Engineering Savings Comparisons

Service Territory and Evaluation Year	Per Household Savings Estimates (kWh)		Ratio of Billing/Engineering
	Billing Analysis	Engineering	
DEP 2014	367	379	97%
DEP 2015	430	478	90%
DEC 2015	347	333	104%

When compared with per household savings estimates from previous years, results from the 2017-2018 evaluation period are higher (see Table 4-5). There are two main factors that may contribute to this. First, as seen in Table 4-5, participants in the 2017-2018 evaluation period had higher rates of electric water, space heating, and central air conditioning, so energy savings from domestic hot water, air infiltration, and HVAC measures applied to a larger share of participants. Also, Opinion Dynamics made updates to certain parameters used in estimating per-unit savings during the deemed savings review based on more recent editions of technical resources (see **Error! Reference source not found.**).

Table 4-5. Comparison of Per Household Savings Estimates and Characteristics

	DEP			DEC	
	2014	2015	2017-2018	2015	2017-2018
Per Household kWh Estimates (Engineering)	*379*	*478*	*779*	*333*	*676*
Share of Participants with Electric Hot Water	72%	81%	84%	69%	83%
Share of Participants with Electric Heat	49%	61%	95%	49%	77%
Share of Participants with Central AC	50%	66%	77%	64%	72%

Measure Installation

To evaluate the success of the program in providing energy-saving measures to participants, and to determine if there were missed savings opportunities or measures that were being provided less frequently than in past years, Opinion Dynamics examined the number of measures provided to each home. Table 4-6 shows the share of homes that received at least one of each measure and the average quantity installed per home. DEP and DEC territories had similar measure mixes overall, although homes in DEC territory had a fewer LEDs installed on average than homes in DEP territory (12.2 compared to 9).

Table 4-6. Measure Installation Rates from Program-Tracking Data

Measure Category	Measure	DEP		DEC	
		Percent of Projects with Measure	Average Qty Per HH	Percent of Projects with Measure	Average Qty Per HH
Lighting	LEDs (60W equivalent)	93%	9.3	85%	6.3
	LEDs 5 W or similar - Candelabra Bulbs	38%	1.8	33%	1.6
	LED 5 W or similar - Globes	14%	0.6	18%	0.8
	LEDs (75W equivalent)	5%	0.5	3%	0.2
	LEDs (40W equivalent)	1%	<0.1	2%	0.1
Hot Water	Kitchen Faucet Aerator	85%	0.9	78%	0.8
	Low Flow Showerhead	82%	1.1	71%	0.9
	Bathroom Faucet Aerator	78%	1.1	71%	0.9
	Pipe Insulation (5 feet sections)	19%	0.3	29%	0.5
	Water Heater Insulation Wrap	18%	0.2	25%	0.3
Infiltration Reduction	Caulking	77%	0.8	78%	0.8
	Weather-stripping per door	70%	1.1	73%	1.1
	Foam Insulation	53%	0.6	57%	0.6
	Door Sweep	51%	0.8	40%	0.5
	Cover for A/C	24%	0.4	26%	0.5
	Poly Tape	0.3%	<0.1	3%	<0.1
HVAC	HVAC Filters	74%	9.2	68%	8.1
Education/Other	Water Heater Temp Check	94%	1	95%	1

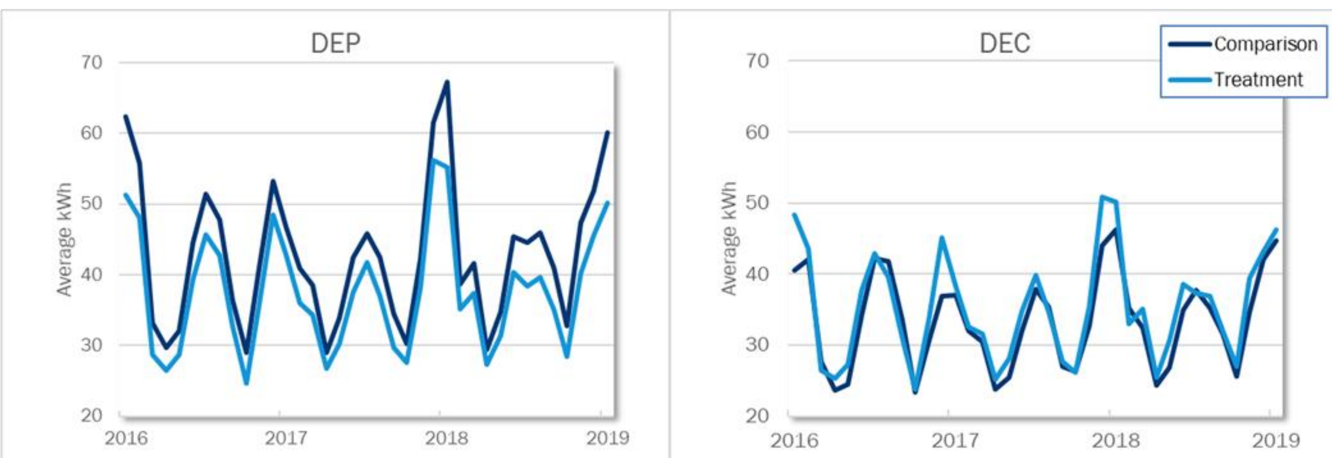
	Thermometer	97%	1.0	94%	0.9
	Refrigerator coil brush	--	--	0.1%	<0.1

4.3 Billing Analysis

In previous Duke NES evaluations, Opinion Dynamics conducted a billing analysis to determine the overall evaluated net savings of the NES Program. Billing analyses capture savings attributable to the program, including installed measures, behavioral changes, and participant spillover. In past DEP and DEC evaluations, we have compared the energy usage of the treatment group, those that participated in the NES Program during the evaluation period, with the usage of a comparison group. Comparison groups must have similar usage patterns to those in the treatment group prior to their enrollment in the program. To avoid self-selection bias, i.e. the correlation between the propensity to participate in a program and energy use, in previous DEP and DEC evaluations, we used future NES participants as the comparison group.

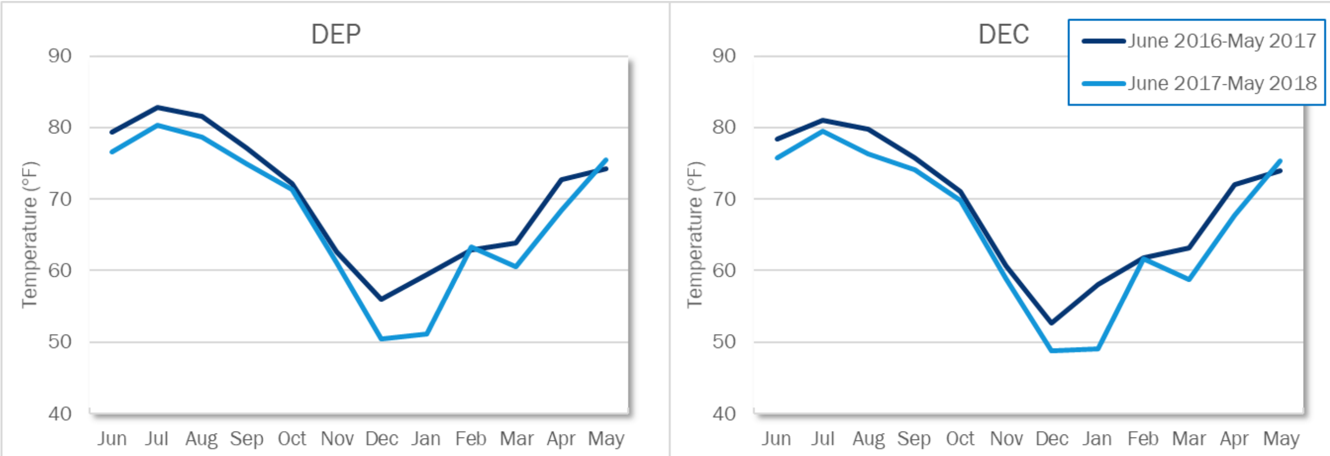
As billing analyses require a comparison between energy usage between pre- and post-treatment periods, successful analyses control for differences in weather patterns between the two periods. In cases of large weather differences between the two periods, the use of an equivalent comparison group is critical to control for other changes in behavior that may coincide with major weather differences. Figure 4-3 shows how the energy consumption differed between the treatment and comparison group from the early 2016 to early 2019. While usage patterns varied between the two groups in both service territories, DEP treatment and comparison groups were particularly incompatible in terms of energy consumption.

Figure 4-3. Treatment and Comparison Group Energy Usage



Across both service territories, the evaluation period was substantially colder than the pre-treatment period. Figure 4-4, shows the differences in average monthly temperatures between the two time periods. With inequivalent comparison groups, and substantially different weather patterns from year-to-year, models were unable to control for exogenous factors that may have influenced energy usage in NES participant households.

Figure 4-4. Average Monthly Temperature



4.3.1 Model Results

Opinion Dynamics tested several different model specifications and determined that, due to the wide variation in modeled results largely driven by the 2 factors discussed in this section, a billing analysis was not an appropriate method for evaluating the impacts for the 2017-2018 NES evaluation period. Table 4-7 below shows the parameter estimates from the final model.

Table 4-7. Results of Billing Analysis Model Parameter Estimates

Variable	DEP		DEC	
	NC	SC	NC	SC
NES Participation (i.e., treatment effect)	7.624**	-0.650	-1.910**	1.775
Cooling Degree Days (CDD)	2.084**	1.946**	1.862**	1.513**
Heating Degree Days (HDD)	1.533**	1.893**	0.995**	1.193**
Post-Participation Period CDD	-0.336**	1.432**	-0.654**	0.528**
Post-Participation Period HDD	-0.392**	0.117	0.162**	-0.122*
Constant	0.0	0.0	0.0	0.0
Observations	83,418	75,451	260,123	89,027
R-squared	0.321	0.327	0.221	0.230
Monthly Effects Included	YES			
Post-Participation Period Interacted with Months Included	YES			
Treatment Group Interacted with Months Included	YES			

* p<0.05, ** p<0.01.

5. Process Evaluation

5.1 Researchable Questions

Based on experience evaluating this program in previous years and discussions with DEC and DEP program staff, Opinion Dynamics developed the following process-related research questions:

- What are the major strengths of the program? Are there specific ways that the program could be improved to be more effective in the future?
- What are the barriers to implementing this program—that is, are there limiting factors to achieving greater participation and realizing additional program attributable savings?
- Do NES participants realize other non-energy benefits as a result of their participation, and, if so, what are the most common?
- Would NES participants benefit from, or like, additional follow-up communication from the program after their participation? What communication methods would be effective?

5.2 Methodology

The process evaluation relied on the following tasks (see Section 3 for additional detail):

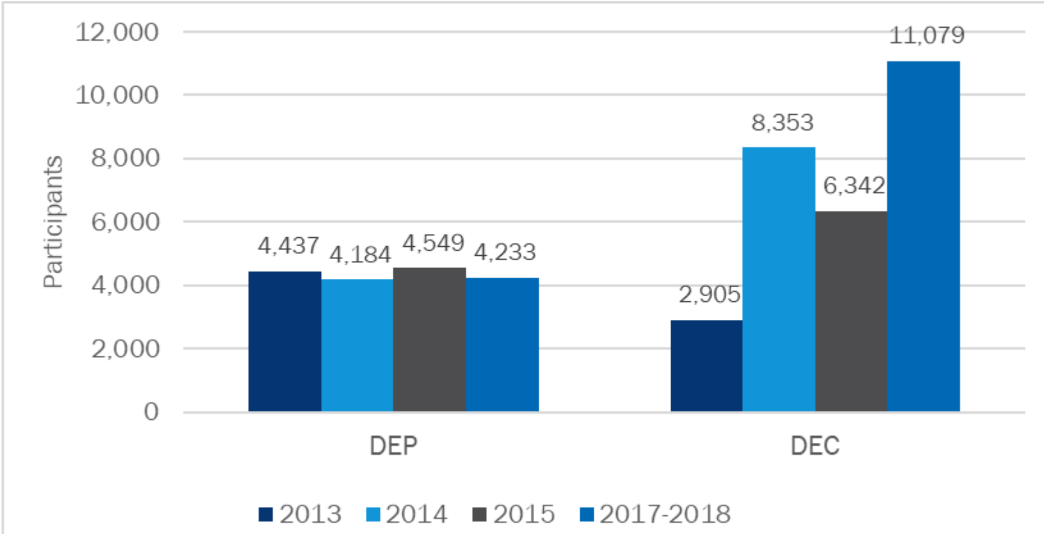
- in-depth interview with program staff at DEC and DEP;
- A review of secondary materials (i.e., Honeywell Scope of Work, NES marketing materials, NES Program guide, and program evaluations from previous years);
- Telephone survey of program participants
- An analysis of program tracking data.

5.3 Key Findings

5.3.1 Program Participation

The program years 2017 and 2018 were the eighth and ninth years of the NES Program in Duke Energy's North and South Carolina territories. Between June 1st, 2017 and June 30th, 2018, the NES Program teams served 24 neighborhoods in total, 17 in DEC territory and 7 in DEP territory. The NES Program team treated 11,079 DEC and 4,233 DEP customers, 15,312 in total. Figure 5-1 below provides a comparison of program participation over the past 4 years. Overall, staff reached 69% of customers across all neighborhoods served during the 2017-2018 evaluation period.

Figure 5-1 NES Program Participation 2013-2018



Cross Participation

There were high levels of cross participation in other Duke Energy programs among NES participants from June 1st, 2017 and June 30th, 2018. As shown in Table 5-2 below, 79% of DEP and 83% of DEC participants also participated in another Duke Energy program, most of them prior to having NES measures installed in their homes (67% and 71%, respectively).

Figure 5-2. Cross Participation Before and After NES Participation

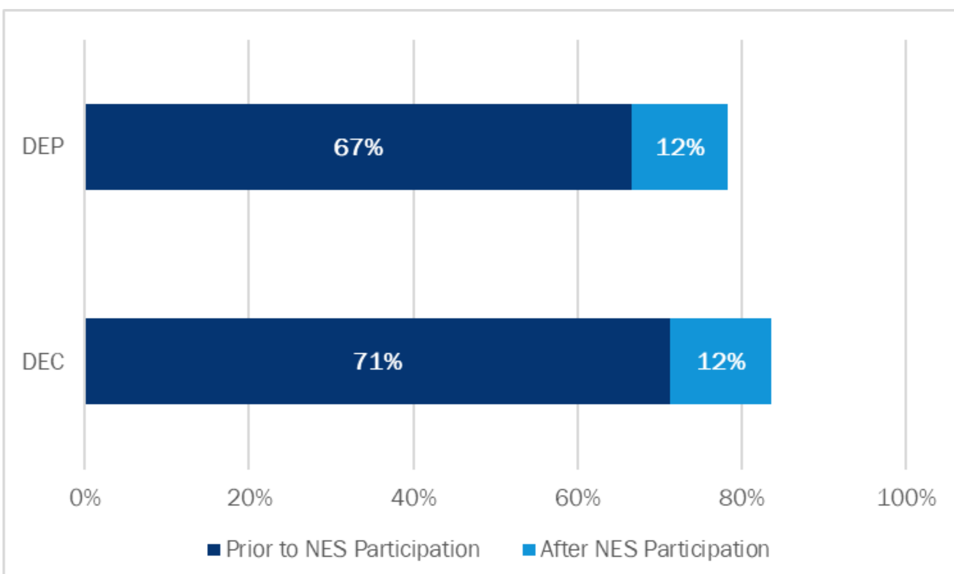


Table 5-1 shows the number of cross participants in other Duke Energy programs. The largest number of DEP cross participants also enrolled in the My Home Energy Report Program, while the largest number of DEC participants also enrolled in the Smart $aver Residential program.

Table 5-1. Count of NES Cross Participants by Program

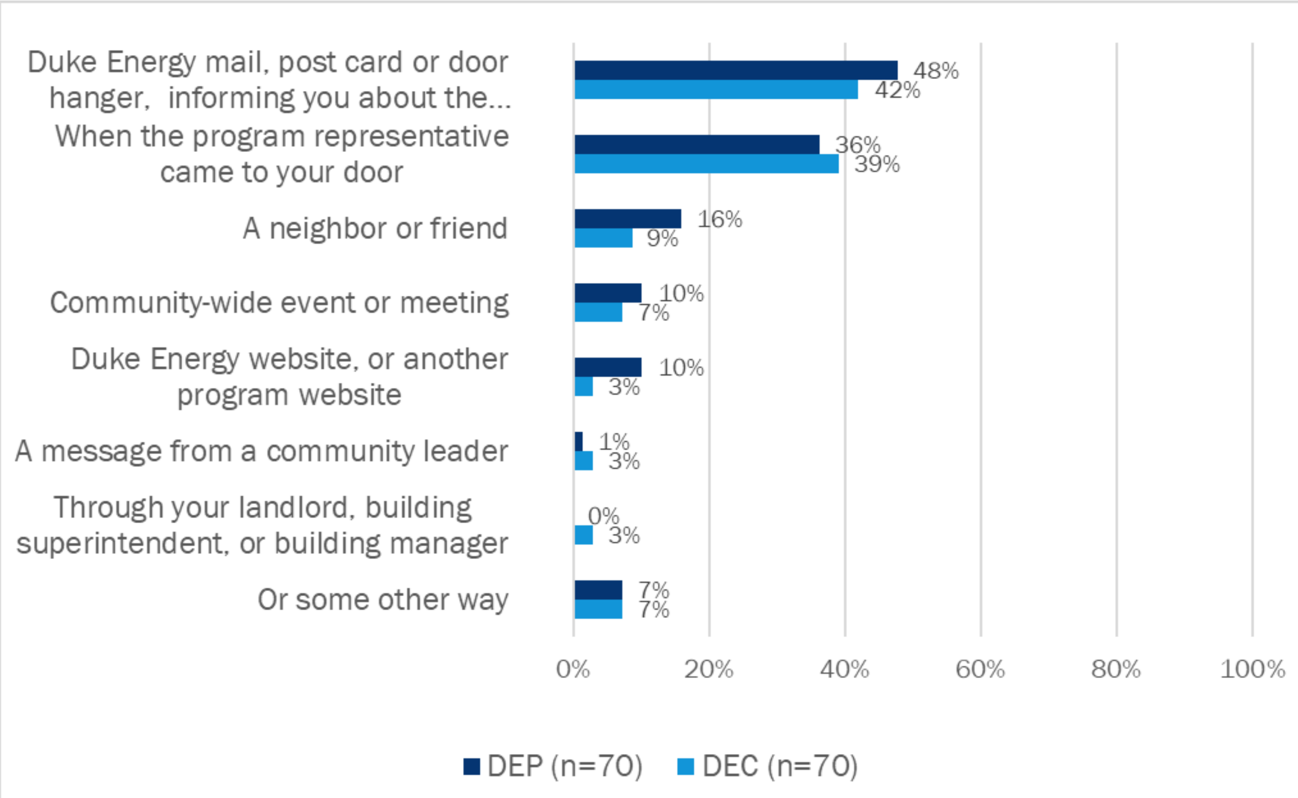
Program	DEP	DEC
My Home Energy Report	3,164	1,450
EnergyWise Home	556	0
Single Family Water Measures	320	0
Smart $aver Residential	118	8,546
Home Energy Improvement	92	0
Residential Energy Assessment	64	108
Energy Efficiency Behavior	54	0
Appliance Recycling Program	25	64
Residential EE Products & Services	6	767
Residential Demand Response	0	727
Total Unique Cross Participants	**3,315**	**9,265**

5.3.2 Marketing and Outreach

For each neighborhood, Duke program staff and implementation teams conduct both broad and targeted outreach aimed at encouraging program participation and educating communities about energy efficiency. Program teams first send customized introductory letters to neighborhood residents that provide information on the measures that the program offers, the monetary savings that participants can achieve by enrolling, and information about how to participate. The introductory letter also notes any local community organizations that program teams have partnered with and provides information about the community launch event for their neighborhood. In coordination with the implementation teams, program staff conduct a community launch event for each neighborhood, introducing the NES Program, the implementation teams, and showing residents, the types of energy efficiency measures offered through the NES Program. Program teams also send follow up postcards reminding residents about the NES Program and, for those not home when an implementation team knocks on their door, crews leave behind door hangers that provide an option to schedule an appointment to have measures installed.

Figure 5-3 shows participant responses about how they first heard about the NES Program. In both service territories, the most common way that participants heard about the program was though a direct mail or door hanger (DEP-48%, DEC-42%). The second most common method was from a program representative who visited the home (DEP-36%, DEC-39%). These responses indicate that the initial contacts made by program teams are an effective form of outreach.

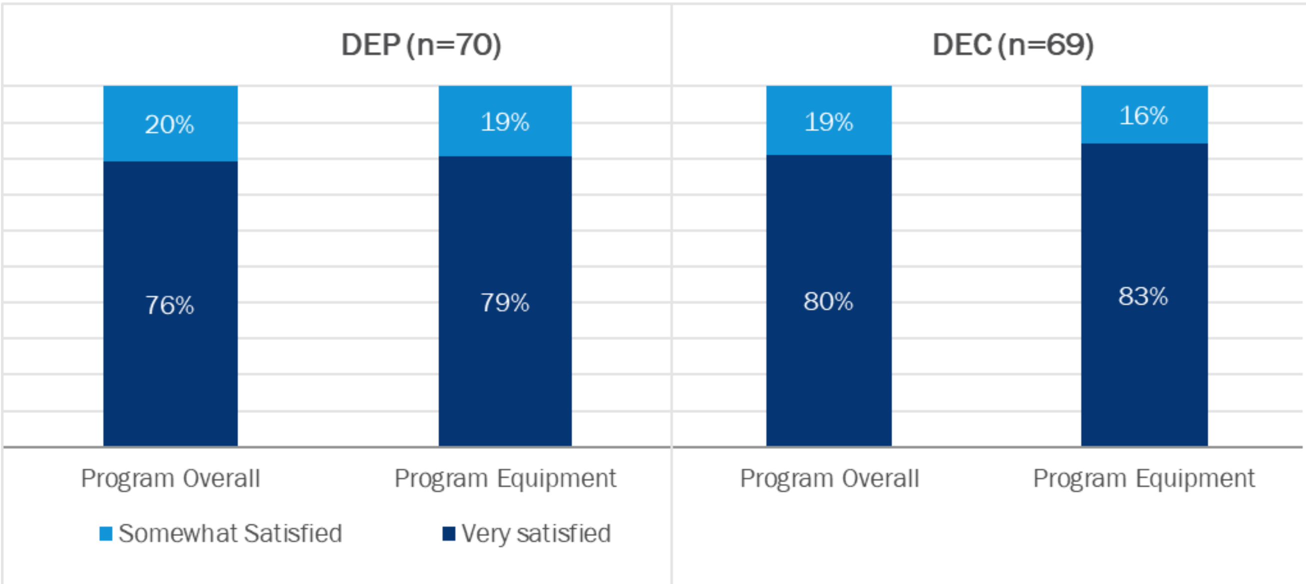
Figure 5-3. How Participants First Heard About the NES Program



5.3.3 Program Satisfaction

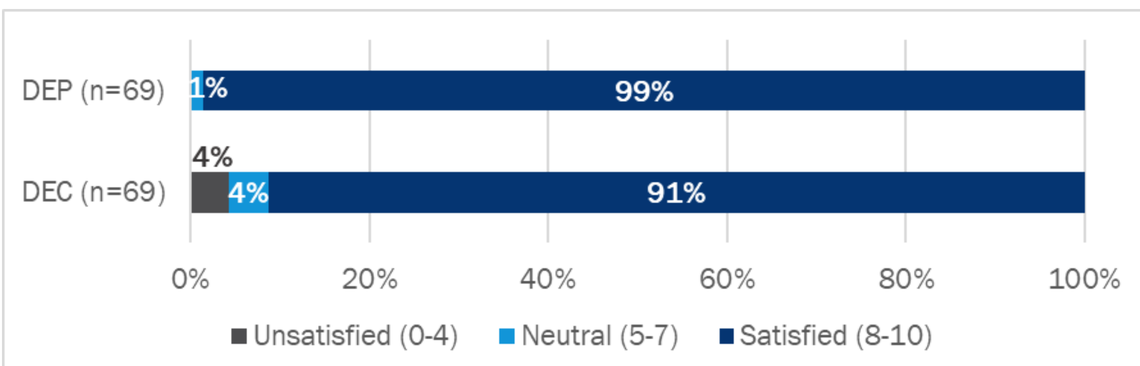
Both DEP and DEC participants are satisfied with all components of the program. As shown in Figure 5-4, 96% of DEP and 98% of DEC participants reported that they were somewhat or very satisfied with the program overall, and 99% of participants from both territories reported that they were somewhat or very satisfied with the equipment they received through the program.

Figure 5-4 Satisfaction with NES Program and Equipment



In addition, participants are very satisfied with program representatives, including implementation teams (Figure 5-5). Ninety-nine percent of DEP and 91% of DEC participants reported they were satisfied with their NES Program representatives.

Figure 5-5 Participant Satisfaction with NES Program Representatives



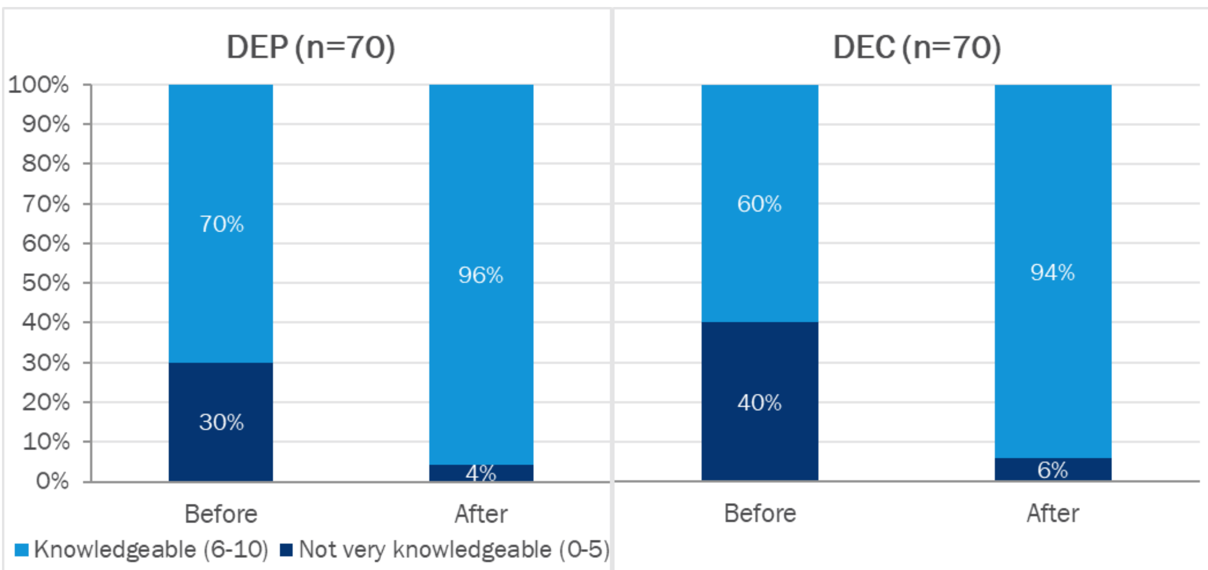
5.3.4 Additional Benefits

An important customer benefit of the NES Program is the energy education that customers receive at the time of home visits. Prior to participation, customers received some information about ways to save energy through mailings and flyers either left at their home or provided at the community launch event. Additionally, at the neighborhood launch event, program staff discuss the energy-saving measures that Duke Energy offers through the NES Program and how each measure saves energy in participants' homes. Implementation teams also provide important education to participants while on site. During measure installation, implementation teams provide more detail on energy saving measures, discuss other ways that participants might change their behavior to save more energy, and answer participant questions. Implementation teams then leave behind information to reinforce the energy education, provide other tips for saving energy in their home, and information about other Duke Energy programs that participants may be eligible for.

Eighty-nine percent of DEP and all of DEC participants reported receiving in-person recommendations or energy saving tips from implementation teams. The vast majority of those participants found that information useful in helping them save energy (DEP-94%, DEC-87%). In addition, 99% of DEP participants and 87% of DEC participants said that they received educational materials during their home visit. Of those that received these materials, most found them useful in helping save energy in their homes (DEP-88%, DEC-75%).

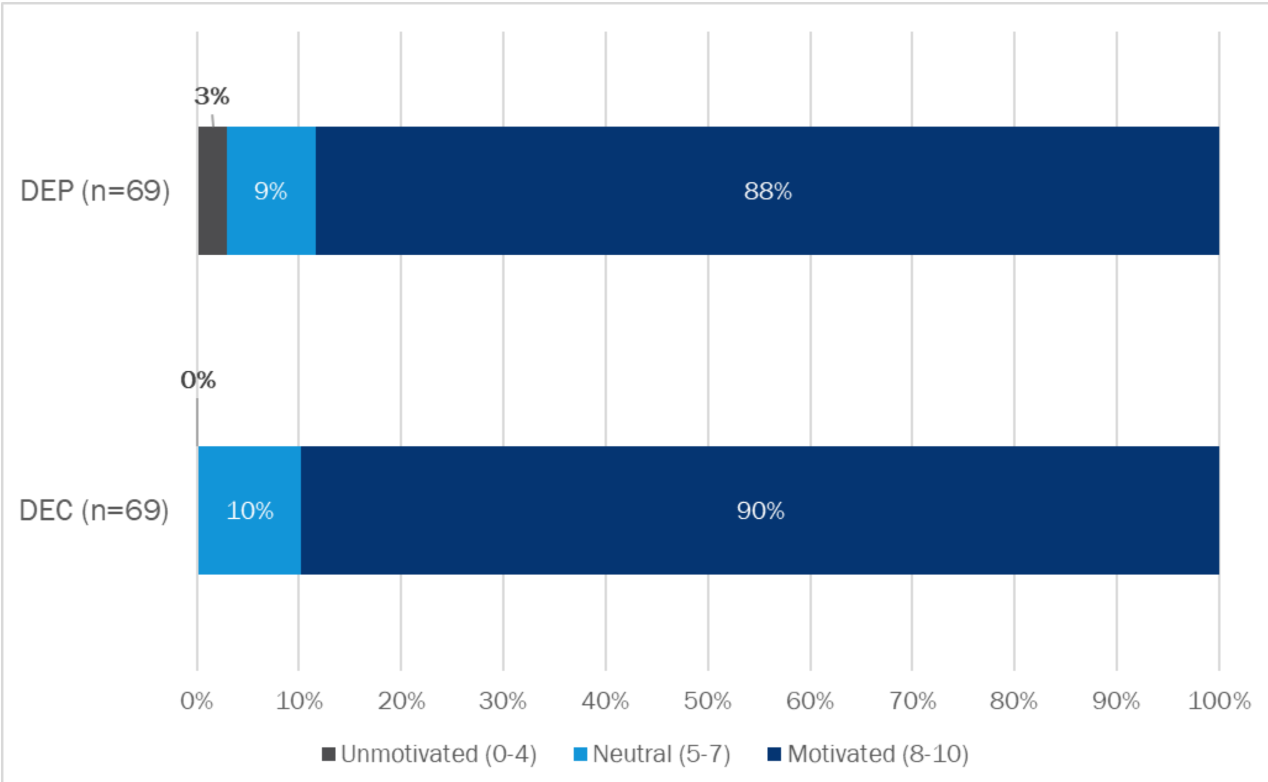
Participants across both service territories reported that their knowledge increased after their enrollment in the NES Program. Prior to participation, 70% of DEP participants and 60% of DEC participants reported that they were knowledgeable about ways to save energy in their homes, providing a mean rating of 6.6 (DEP) and 6.5 (DEC) on a scale of 0 to 10, where 0 means "not at all knowledgeable" and 10 means "very knowledgeable." After participation, 96% of DEP participants and 94% of DEC participants reported that they were knowledgeable, providing a mean rating of 9.0 and 8.4, respectively (Figure 5-6).

Figure 5-6 Participant Knowledge of Ways to Save Energy



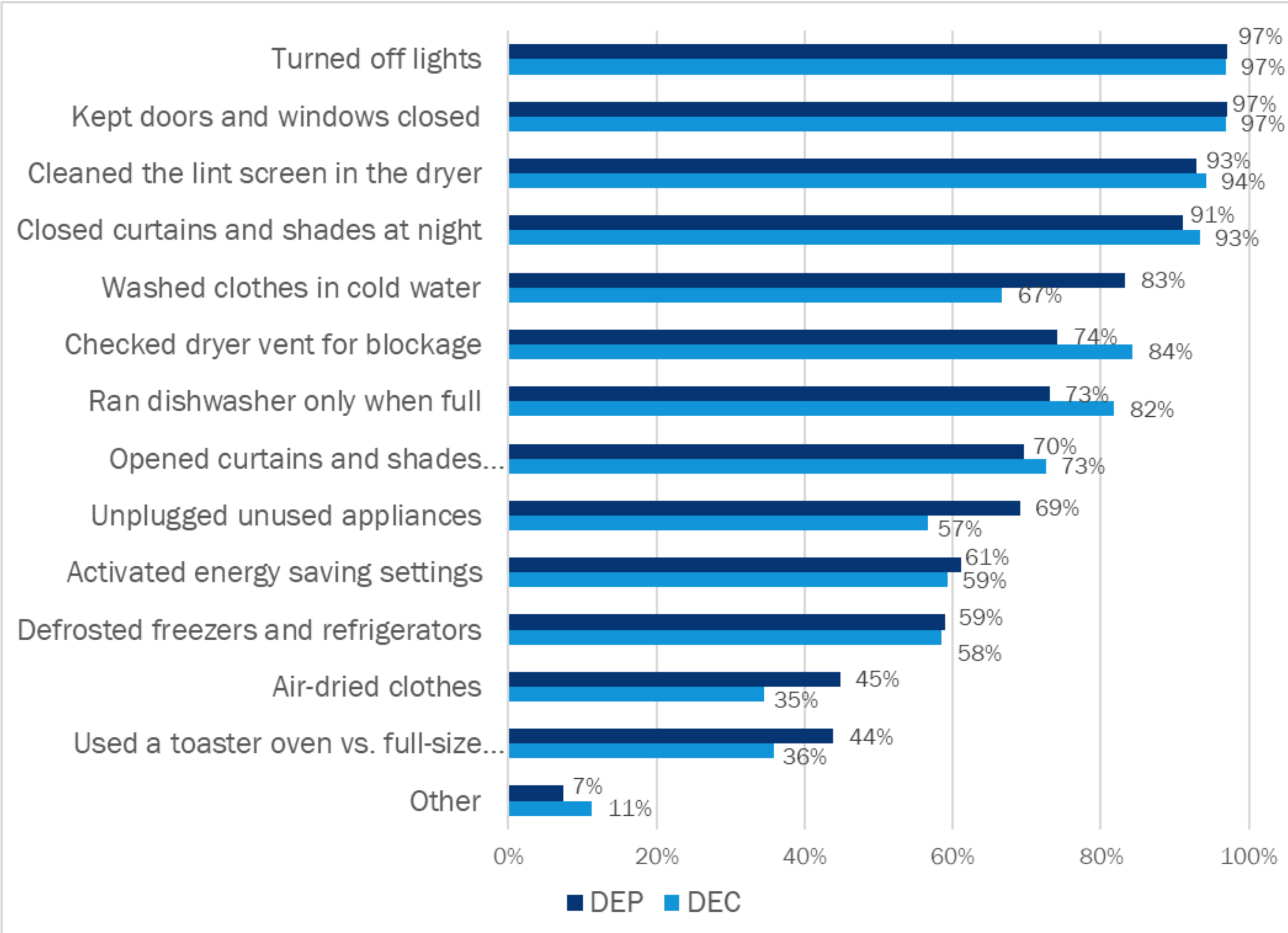
Both DEP and DEC participants are motivated to reduce their energy use. Eighty-eight percent of DEP and 90% of DEC participants were motivated to reduce their energy use after participating in the NES Program (Figure 5-7).

Figure 5-7 Motivation to Reduce Energy Use after NES Program Participation



Participants that received the leave behind materials take other actions to save energy in their home. Most frequently, participants reported turning lights off more frequently, keeping doors and windows closed, cleaning their dryer's lint screen, and closing curtains and shades at night (Figure 5-8).

Figure 5-8 Energy Saving Actions Taken (multiple responses)



Over half of participants in both service territories reported noticing a decrease in their electric bill since participating in the NES Program (DEP-58%, DEC-57%). Additionally, participants report several non-energy benefits. Notably, 92% of DEP and 84% of DEC participants felt that their home was less drafty, and 86% and 73%, respectively, reported noticing a change in the comfort of their home. Of those who noticed a difference in home comfort, 90% and 80% of DEP and DEC participants, respectively, felt that keeping a comfortable temperature in their home was easier after their NES participation. Table 5-2 lists additional non-energy benefits, and the share of DEP and DEC participants that experienced each.

Table 5-2 Non-Energy Benefits Reported by Participants

Non-Energy Benefit	DEP		DEC	
	Percent of Participants	n	Percent of Participants	n
I like the light level better in my home	90%	69	86%	64
I feel like I'm doing something good for the environment	95%	65	93%	68
My home is less drafty	92%	64	84%	64
My home is quieter; I hear less noise from the outside	61%	67	51%	63
I have fewer maintenance costs	81%	62	68%	57

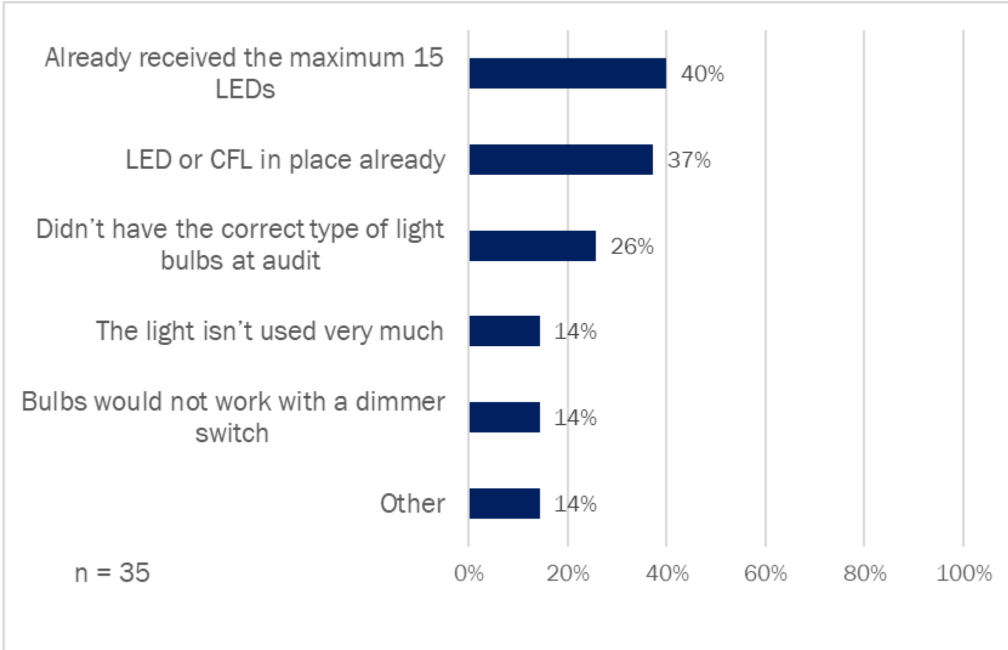
5.3.5 Additional Opportunities for Program Savings

One objective of the process evaluation was to determine if there are opportunities for increasing program savings. For example, some income-qualified programs provide energy-efficient replacements for older, inefficient appliances. Further, with the increasing efficiency of existing standard lighting, some programs are offering LEDs and other specialty lighting options.

Lighting

There is limited opportunity for additional savings from lighting measures beyond the LEDs already offered through the NES Program. Twenty-five percent of participants reported that some bulbs were not replaced during their NES installation visit. Figure 5-9 several reasons that participants gave for not having all of their bulbs replaced with program LEDs. Most commonly, participants reported that they had already received the maximum number of LEDs (40%) or that an efficient bulb was already in place (37%). This suggests that, while lighting remains an important component of the NES Program, the potential for additional savings from lighting in the future may be limited as LEDs become more common in the residential market.

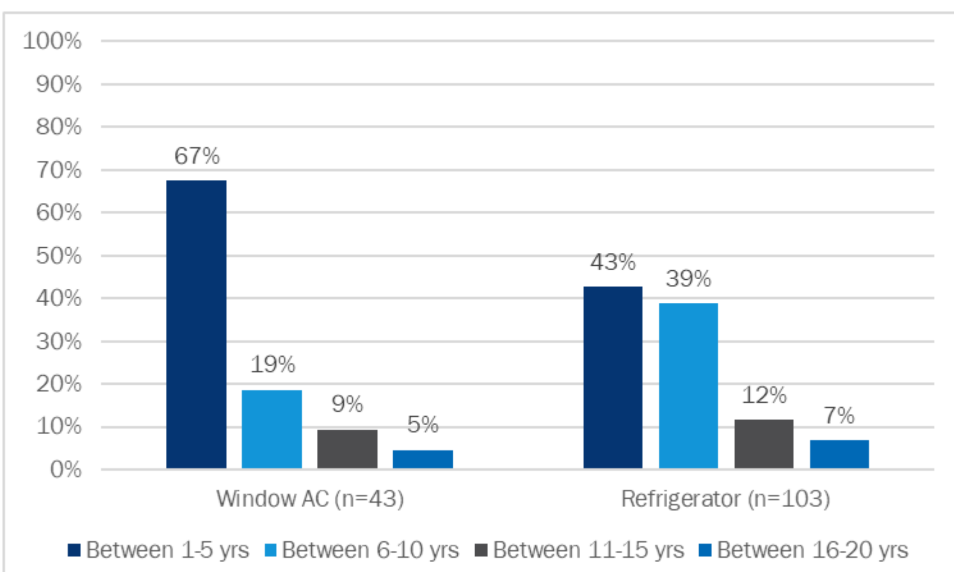
Figure 5-9. Reasons for Not Replacing Bulbs with Program LEDs



Air Conditioning and Refrigeration

There is also limited opportunity for additional savings from replacing old window air conditioner units and refrigerators. Forty-one percent of participants reported having window air conditioning units in their home, and the majority (67%) were between 1 and 5 years old. Additionally, 43% of participants reported their refrigerator was between 1 and 5 years old. Figure 5-10 shows the age distribution of both appliances in participating households.

Figure 5-10. Window AC and Refrigerator Age Distribution



6. Conclusions and Recommendations

Opinion Dynamics conducted an engineering analysis to estimate gross energy and demand savings for the DEP and DEC NES Programs from June 1st, 2017 through June 30th, 2018. Table 6-1 presents both per household ex post impacts and total program savings.

Table 6-1 Comparison of 2017 Engineering Savings Estimates

Service Territory	Gross Annual Savings per Household			Gross Program Savings		
	Energy (kWh)	Summer Coincident Demand (kW)	Winter Coincident Demand (kW)	Energy (MWh)	Summer Coincident Demand (MW)	Winter Coincident Demand (MW)
DEP	779	0.103	0.101	3,298	0.437	0.428
DEC	676	0.090	0.083	7,449	0.994	0.921

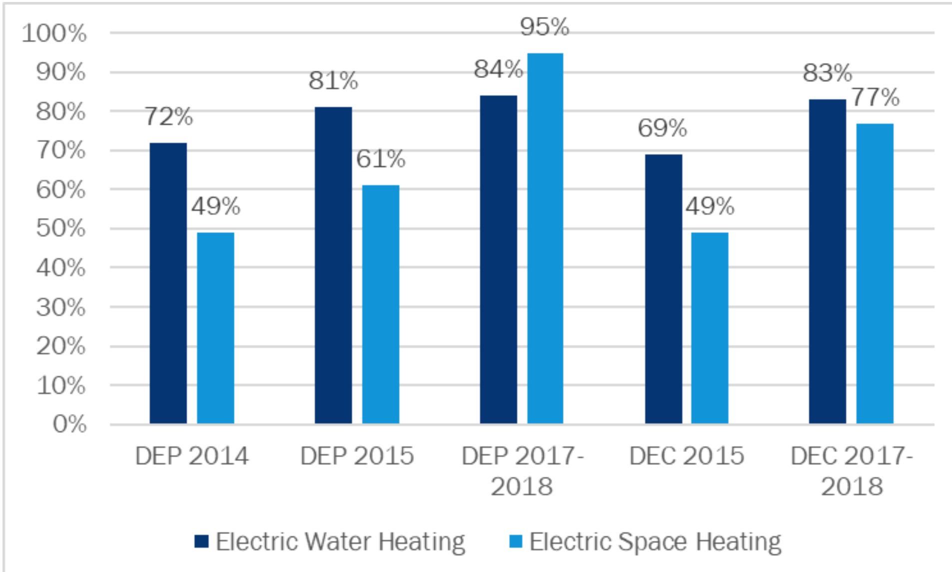
Key findings, which we discuss below, include:

- Per household savings increased for both service territories when compared to engineering estimates in past DEP and DEC evaluations;
- NES participation was strong for this evaluation period and participants are highly satisfied with the program;
- The educational component of the NES Program is effective, and the majority of participants are engaged with the implementation teams during the measure installation visit; and
- NES participants experienced additional non-energy benefits, such as lower energy bills and increased comfort.

Per Household Savings

During this evaluation period, DEP participants saved 779 kWh and DEC participants saved 676 kWh per household, as determined by our engineering analysis. Per household energy savings for this evaluation period were substantially higher than engineering estimates from previous DEP and DEC impact evaluations. Higher savings per household in the 2017-2018 evaluation period were driven, in part, by a larger share of participants with electric space and water heating (Figure 6-1). Given the mix of measures offered through the NES Program, energy savings from domestic hot water and infiltration measures represent a large portion of potential program savings. To realize electric savings from these measures at the household-level, participants need to heat their homes or hot water with electricity. As such, a higher share of participants that heat with electric fuel will yield more energy savings per household.

Figure 6-1. Share of DEP and DEC Participants with Electric Space and Water Heating



Program Participation and Satisfaction

The program teams achieved strong participation during the 2017-2018 evaluation period. DEP program teams reached 4,233 households (94% of the annual target) and 11,079 DEC households (124% of the annual target). Additionally, across both service territories, program teams reached 69% of households within targeted neighborhoods.

Satisfaction with the NES Program is also very high amongst participants. Seventy-six percent of DEP and 79% of DEC participants were very satisfied with the NES Program, and 80% of DEP and 83% of DEC participants were very satisfied with the equipment they received.

Energy Education

The vast majority (91%) of participants received in-person education and 89% thought that information helped them save energy in their homes. Additionally, participants reported that they were more knowledgeable about ways to save energy in their homes after their NES participation than they were before (70%-DEP and 60% DEC before compared with 96%-DEP and 94% DEC after). As such, NES participants reported taking a range of additional energy saving actions in their homes (e.g., turning off lights more frequently, keeping doors and windows closed, washing clothing in cold water, etc.). See section 5.3.4 for additional details.

Non-Energy Benefits

NES participants reported several non-energy benefits; including less drafty homes (92%-DEP, 84%-DEC), increased comfort (86%-DEP, 73% DEC), and the ability to more easily keep their homes at a comfortable temperature (90%-DEP, 80%-DEC). Additionally, 54% of DEP and 55% of DEC participants reported that their electric bill had gone down after participating in the NES Program.

6.1 Recommendations

- **NES program teams should consider including space and water heating fuel types as additional criteria for identifying and selecting neighborhoods for future program years.** As the NES offers a relatively limited set of easy-to-install measures by design, domestic hot water and air infiltration measures will continue to contribute a substantial portion to total program savings. However, energy savings only manifest from those measures in households that heat their homes or their hot water with electricity. To maximize savings per participating household, NES Program staff should consider targeting neighborhoods with higher rates of electric space and water heating.

- **NES Program staff should continue to emphasize air infiltration measures.** While infiltration measures make an important contribution to overall program energy savings (14% of DEP and DEC participants), NES participants that receive those measures also report other valuable non-energy benefits. Of those that received infiltration measures, 92% of DEP and 84% of DEC participants reported that their home was less drafty and 86% and 73%, respectively, reported noticing a change in the comfort of their home. Of those who noticed a difference in home comfort, 90% of DEP and 80% of DEC felt that keeping a comfortable temperature in their home was easier after their NES participation. Air infiltration measures may be important in driving participant non-energy benefits in the future.

- **NES Program staff should continue to emphasize the in-person educational component of the program.** The majority of DEC and DEP participants (91%) receive in-person education from implementation teams and 89% find the educational component of the program useful in helping save energy in their homes.. This sort of in-person education can provide a valuable touch point between program representatives and Duke Energy customers, and also encourages various different types of energy-saving behavior change (see Section 5.3.4).

7. DEP Summary Form

Neighborhood Energy Saver Program

Completed EMV Fact Sheet

The Neighborhood Energy Saver (NES) program provides a home energy assessment free of cost and installs energy-saving measures in the homes of income-qualified customers living in DEP service territory. During the assessment, program representatives discuss what was installed and provide additional recommendations on ways participants can save energy in their homes.

Date	December 6th, 2019
Region(s)	Duke Energy Progress, North Carolina and South Carolina
Evaluation Period	June 1st, 2017- June 30th, 2018
MWh Savings	3,298
Coincident MW Impact	0.437 (Summer) 0.428 (Winter)
Per Participant kWh Savings	779
Measure Life	Not evaluated, so remains unchanged at 7 years
Net-to-Gross Ratio	N/A
Process Evaluation	Yes
Previous Evaluation(s)	January 2017, January 2016

Evaluation Methodology

The evaluation team performed an engineering analysis to estimate ex-pot energy and demand savings. The consisted of (1) a review of deemed savings estimates using an engineering analysis of savings assumptions and calculations and (2) verification of measure installation and persistence through a participant survey. To determine total program savings, the evaluation team applied (1) measure-specific per-unit savings estimates to participants who both received each measure and had the appropriate mix of fuel and equipment and (2) measure-specific ISRs.

Impact Evaluation Details

- Neighborhoods in DEP service territory where at least 50% of residential customers are at or below 200% of the federal poverty guidelines are eligible to participate in the NES Program.
- The engineering team developed updated deemed savings values for individual measures.
- The evaluation team developed measure-specific in-service rates and made adjustments to per-unit savings based on the share of measure in operation at the time of the survey.
- Applied adjusted per-unit savings to each participant and multiplied by the quantity received. The team only applied savings for measure dependent on certain fuel types or other parameters (i.e., domestic hot water, air infiltration, and HVAC filters) to the applicable households.

8. DEC Summary Form

Neighborhood Energy Saver Program

Completed EMV Fact Sheet

The Neighborhood Energy Saver (NES) program provides a home energy assessment free of cost and installs energy-saving measures in the homes of income-qualified customers living in DEC service territory. During the assessment, program representatives discuss what was installed and provide additional recommendations on ways participants can save energy in their homes.

Date	December 6th, 2019
Region(s)	Duke Energy Carolinas, North Carolina and South Carolina
Evaluation Period	June 1st, 2017- June 30th, 2018
MWh Savings	7,489
Coincident MW Impact	0.994 (Summer) 0.921 (Winter)
Per Participant kWh Savings	676
Measure Life	Not evaluated, so remains unchanged at 7 years
Net-to-Gross Ratio	N/A
Process Evaluation	Yes
Previous Evaluation(s)	December 2016

Evaluation Methodology

The evaluation team performed an engineering analysis to estimate ex-pot energy and demand savings. The consisted of (1) a review of deemed savings estimates using an engineering analysis of savings assumptions and calculations and (2) verification of measure installation and persistence through a participant survey. To determine total program savings, the evaluation team applied (1) measure-specific per-unit savings estimates to participants who both received each measure and had the appropriate mix of fuel and equipment and (2) measure-specific ISRs.

Impact Evaluation Details

- Neighborhoods in DEC service territory where at least 50% of residential customers are at or below 200% of the federal poverty guidelines are eligible to participate in the NES Program.
- The engineering team developed updated deemed savings values for individual measures.
- The evaluation team developed measure-specific in-service rates and made adjustments to per-unit savings based on the share of measure in operation at the time of the survey.

Applied adjusted per-unit savings to each participant and multiplied by the quantity received. The team only applied savings for measure dependent on certain fuel types or other parameters (i.e., domestic hot water, air infiltration, and HVAC filters) to the applicable households.

9. DSMore Table

The embedded Excel spreadsheet below contains inputs for Duke Energy Analytics. Per-household savings values in the spreadsheet are based on the engineering estimates reported above.

DSMore_DEP-DEC NES Program.xlsx

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REPORT

Reimagine tomorrow.

My Home Energy Report Program Evaluation

Submitted to Duke Energy

July 10, 2019

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1 Executive Summary

1.1 Program Summary

This report describes process and impact findings for the Duke Energy Carolinas and 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. 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.[1] MyHER motivates customers to reduce their energy consumption by:

- Showing customers a comparison of their household electricity consumption to that of similar homes;
- Presenting a month-ahead forecast of electricity consumption disaggregated by end-use category;
- 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; and
- Encouraging active management of their home's energy consumption.

1.2 Evaluation Objectives and High Level Findings

Nexant estimated the energy impacts associated with MyHER delivery for the period June 2017 to May 2018. This report also presents measurements of customer satisfaction and engagement for MyHER participants. The MyHER program is implemented as a randomized controlled trial (RCT). Customers are randomly assigned to either "treatment" or "control" groups for the purpose of measuring energy savings. Treatment customers are MyHER recipients (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.

The energy savings generated by the DEC MyHER program are presented in Table 1-1, showing that the evaluated impacts of the program are 248 kWh per household. The energy savings generated by the DEP MyHER program are presented in Table 1-2, showing that the evaluated impacts of the program are 201 kWh per household. These evaluated energy savings for the MyHER program are net of additional energy savings achieved through increased

[1] Homes are grouped by characteristics such as location, size, vintage, and heating fuel. Energy use is compared on groups of similar homes.

participation by the MyHER treatment group in other Duke Energy programs. Additional information concerning the evaluation period is shown in Table 1-3.

Table 1-1: DEC Deemed and Evaluated Energy Impacts per Participating Household

	Energy (kWh)	Confidence/Precision
Evaluated Impacts	248	90/6
Deemed Impacts	230	N/A

*MyHER is an opt-out program. As such, all impacts are considered net impacts; Nexant also calculated the impacts of the MyHER program by removing savings achieved by MyHER participants via other Duke Energy Programs.

Table 1-2: DEP Deemed and Evaluated Energy Impacts per Participating Household

	Energy (kWh)	Confidence/Precision
Evaluated Impacts	201	90/9
Deemed Impacts	148	N/A

*MyHER is an opt-out program. As such, all impacts are considered net impacts; Nexant also calculated the impacts of the MyHER program by removing savings achieved by MyHER participants via other Duke Energy Programs.

Table 1-3: Sample Period Start and End Dates

Evaluation Component	Start	End
Impact Evaluation Period	June 2017	May 2018
Customer Survey Period	January 2019	March 2019

1.3 Evaluation Recommendations

This evaluation finds the DEC MyHER program realized 137% of its claimed impacts and the DEP MyHER program realized 108% of its claimed impacts. The MyHER program remains fully deployed at these two Duke Energy jurisdictions, due to semiannual introductions of newly eligible customers to the treatment and control program populations. The continual addition of new customers to the program means that there will always be a mix of participants with respect to the duration of the customers' exposure to the treatment. Impacts delivered by behavioral programs such as MyHER have been shown in many evaluations of behavioral programs to vary depending on the length of that exposure, reaching maturity after 1-2 years of exposure to the program. As such, Duke Energy should generally expect that the newest cohorts of MyHER treatment customers will deliver lower energy savings than the established cohorts. In the case of DEC, some cohorts are attaining an age of 8 years.

Duke Energy undertakes substantial work in partnership with their implementation contractor, Tendril, Inc., in planning and coordinating the delivery of MyHER reports to more than 1.1 million customers in the Carolinas and more than 680,000 customers at Duke Energy Progress. Duke Energy has developed a production process that allows for the customization of MyHER messages, tips, and promotions on the basis of customer information and exposure to Duke Energy's demand-side management programs. Since the prior MyHER evaluation[2], Tendril has implemented a number of improvements that have resulted in increased product quality, as evidenced by improved performance in Duke Energy's quality checks that take place before each batch of reports is sent to participants. The process evaluation finds that MyHER is successful in achieving its goal of enhancing customer motivation, awareness, and attention to saving energy in most areas probed by customer surveys.

Nexant has the following specific recommendations for enhancing Duke Energy's MyHER program:

- **Continue the commitment to simultaneous control and treatment assignment.** New assignments to treatment and control groups must be simultaneous and Tendril and Duke Energy should work to add all newly assigned treatment and control groups to their respective status in a single billing month, to the extent that is technically feasible.
- **Continue the practice of making assignments of new accounts to MyHER treatment and control groups once a year, or at most, twice a year.** The numbers of Duke Energy customers becoming eligible for the program each year do not facilitate more frequent assignments. This is due to the fact that sufficient numbers of customers must be set aside for the control group each time a group of customers is assigned to treatment in order for the evaluator to be able to measure the energy savings delivered by the new cohort.
- **Increase MyHER participant awareness of Interactive.** The process evaluation finds that current awareness of Interactive among DEP and DEC MyHER participants is very low; another program objective above increasing aware customers' engagement with Interactive is to more effectively get the word out about its existence and increase the number of aware customers.
- **Continue to drive engagement with the Interactive Portal.** MyHER Interactive's ability to deliver measurable energy savings is on the rise, as shown by this evaluation in comparison to the prior DEC evaluation, as well as the MyHER evaluations for other Duke Energy jurisdictions completed in the past year. We recommend that Duke Energy continue to drive more MyHER participants to the portal.
- **Continue to operate MyHER with an eye towards change management**. MyHER's implementer Tendril has made great strides in improving quality control performance since the prior DEC and DEP evaluations in the automation of quality control processes. Effective change management and stable staffing have been notable contributors to these improvements and they should continue to be emphasized in MyHER program

[2] DEC was previously evaluated in February 2016. DEP was previously evaluated in July 2017.

operations, especially as Tendril's new HER production platform, HOMERS (the Home Energy Reporting Service), is rolled out and its implementation is optimized.

- **Continue to prioritize the structuring of the processes and schedules for program elements**. Improved organization of tasks for elements such as the FFT report module has been a significant success in the operations of the MyHER program and has made reactive responses to impending deadlines and emergent challenges that characterized these operations in the past much less common. Program staff should seek out additional opportunities for the optimization of program schedules, tasks, and long term goals in this manner.

2 Introduction and Program Description

This section presents a brief description of the My Home Energy Report (MyHER) program as it is operated in the DEC and DEP service territories during the evaluation timeframe. 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.

2.1 Program Description

The MyHER program is a Duke Energy Carolinas and 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, and 12 times a year by email to customers that have provided Duke Energy with their email address.[3] 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 as well as homes considered to be energy-efficient. Reports include seasonal and household-appropriate energy savings tips and information on energy efficiency programs offered by Duke Energy. Many tips include low cost suggestions such as behavioral changes. An additional feature presents a month-ahead forecast of energy usage disaggregated by end-use type. Duke Energy contracts with Tendril Inc. for the management and delivery of its MyHER product.

Duke Energy also launched the MyHER Interactive Portal[4] in March 2015. 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 known to Duke Energy about their home and electricity consumption. Customers who have registered to use MyHER Interactive are also sent weekly energy management tips and conservation challenges via email. The general strategy of MyHER Interactive 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 in Duke Energy Carolinas and Duke Energy Progress territories in North Carolina and South Carolina. 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. Customers who receive both paper and email

[3] For clarity: MyHERs are only sent to customers randomly assigned to the treatment group. All of the customers in the treatment group receive paper MyHERs 8 times a year. Duke Energy has email contact information for some of the treatment customers – those email customers also receive email MyHERs 12 times a year. Therefore, the email customers receive both an email and paper MyHER 8 months of the year and only an email report 4 months of the year.

[4] We refer to the MyHER Interactive Portal simply as "Interactive" in the remainder of this report.

MyHERs may also opt out of the report format of their choice (i.e., elect to only receive MyHERs by email, or only receive them by U.S. Mail).

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; and
3. Promoting other energy efficiency and demand response program options to residential customers.

2.2 Implementation

MyHER is implemented by Tendril Inc., a behavioral science and analytics contractor that prepares and distributes the MyHER reports according to a pre-determined annual calendar. Tendril also generates and disseminates the MyHER Interactive Portal content and email reports, 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 MyHER program targets residential customers living in single-family, single meter, non-commercial homes with at least thirteen months of electricity consumption history. Approximately 1,174,000 DEC and 695,000 DEP residential customers met those requirements as of May 2018 and are assigned to the MyHER treatment groups. Accounts could still be excluded from the program for reasons such as the following: 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 2% of assigned DEC customers and 1% of assigned DEP customers have been deemed ineligible for the program after having been assigned. Nexant addresses this topic by applying an intention-to-treat analysis (ITT); refer to Section 3.1.2.

2.3 Key Research Objectives

The section describes our 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. What is the impact of MyHER on the uptake of other Duke Energy programs (downstream and upstream) in the market?
3. What net energy savings are attributable solely to MyHER reports after removing savings already claimed by Duke Energy's other energy efficiency programs?
4. 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. What elements of the reports are useful to recipients?
6. How satisfied are recipients with MyHER reports?
7. To what extent does receiving MyHER increase customer engagement in energy saving behaviors and upgrades?
8. Do participants hold more favorable opinions of Duke Energy as a result of receiving the reports?
9. What encourages or prevents households from acting upon information or tips provided by MyHER?
10. To what degree are recipients aware of, and making use of, MyHER Interactive?
11. 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

A key objective of the MyHER impact evaluation is to measure 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", which quantifies the savings associated with increased participation by treatment homes in other DEC or 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. Nexant provided a data request for the necessary information in July 2018. Key data elements include the following:

- **Participant List** – a table listing each of the homes assigned to the MyHER program since its 2010 inception in DEC and its 2014 inception in DEP. 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 Acxiom 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.
- **MyHER Report History** – a record of the approximate 'drop date' of each MyHER report sent to the treatment group accounts, the messaging included, and the recommended actions. This dataset also contained a supplemental table of treatment group accounts omitted from each MyHER mailing during the evaluation period, and the associated reason for omission.

- **Participation Tracking Data for Other Energy Efficiency Programs offered by Duke Energy** – a table of the Duke 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.

In preparation for the impact analysis, Nexant combined and cleaned the participation and billing data provided by the MyHER program staff and then combined with the cleaned dataset from Nexant's prior MyHER impact evaluation for that jurisdiction.[5] The combined billing dataset includes 1,652,515 distinct DEC accounts and 1,011,440 distinct DEP accounts (the actual number varies by month). A number of treatment and control accounts in this dataset have closed prior to the start of this evaluation period (May 2016) and they have been dropped from the analysis dataset. For DEC, there were 306,131 such treatment customers and 126,142 such control customers. For DEP, there were 86,346 such treatment customers and 12,722 such control customers.

Nexant also removed the following accounts or data points from the analysis (total for DEC and DEP):

- 7,459 accounts that had a negative value for billed kWh;
- 710 records with unrealistically high usage: any month with greater than six times the 99th 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. Since the interval between meter reads vary by customer and by month, the evaluation team "calendarized" the usage data to reflect each calendar month, so that all accounts represent usage on a uniform basis. The calendarization process includes expanding usage data to daily usage, splitting the billing month's usage uniformly among the days between reads. The average daily usage for each calendar month is then calculated by taking the average of daily usage within the calendar month.

3.1.2 Intention to Treat

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. Several 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:

[5] Rather than re-requesting all of the data necessary for this evaluation (pre-treatment and posttreatment usage data for all treatment and control customers), Nexant omitted any data that we already had from the first evaluation – the pre-treatment data for cohorts included in our prior evaluation is still necessary for this current evaluation.

- **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 or PO Box or has another issue, the home will not receive the MyHER.
- **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.
- **No Bill Received** – if Tendril does not receive usage data for an account from Duke 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 do not impose these filters on the impact evaluation analysis dataset. 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. Instead, Nexant employed an "intention-to-treat" (ITT) analysis. In the ITT framework, the average energy savings per home *assigned* to the treatment is calculated via billing analysis. This impact estimate is then divided by the proportion of the treatment group homes analyzed that were active MyHER participants. The underlying assumption of this approach is all of the observed energy savings are being generated by the participating accounts.

Nexant relied on Duke Energy's monthly participation counts for the numerator of the proportion treated calculation. MyHER program staff calculates participation monthly according to the business rules and eligibility criteria in place at the time. The denominator of the proportion treated is the number of treatment group homes with billed kWh usage for the bill month. This calculation is presented by month in Table 3-1 and Table 3-2 for the study period. The average proportion of assigned accounts that were treated during the period of June 2017 to May 2018 was 98% for both DEC and DEP.

Table 3-1: DEC Calculation of Treatment Percentage by Bill Month

Month	Treatment Homes Analyzed	DEC Participant Count	% Treated
06/2017	1,231,705	1,197,462	97%
07/2017	1,218,640	1,198,133	98%
08/2017	1,207,107	1,171,813	97%
09/2017	1,195,242	1,172,053	98%
10/2017	1,185,902	1,172,053	99%
11/2017	1,225,916	1,195,285	98%
12/2017	1,216,916	1,191,881	98%
01/2018	1,208,915	1,193,353	99%
02/2018	1,200,827	1,178,403	98%
03/2018	1,192,681	1,177,960	99%
04/2018	1,183,803	1,157,514	98%
05/2018	1,173,821	1,151,896	98%
12-month Average Proportion			**98%**

Table 3-2: DEP Calculation of Treatment Percentage by Bill Month

Month	Treatment Homes Analyzed	DEP Participant Count	% Treated
06/2017	727,455	682,040	94%
07/2017	719,693	713,994	99%
08/2017	712,653	701,172	98%
09/2017	705,487	700,125	99%
10/2017	699,920	700,125	100%
11/2017	726,344	710,313	98%
12/2017	720,920	707,899	98%
01/2018	715,954	708,355	99%
02/2018	711,221	697,726	98%
03/2018	706,614	698,443	99%
04/2018	701,195	693,815	99%
05/2018	695,352	689,886	99%
12-month Average Proportion			**98%**

The monthly participation counts shown in Table 3-1 and Table 3-2 were also used by Nexant to estimate the aggregate impacts of the MyHER. Per-home kWh savings estimates for each bill month are multiplied by the number of participating homes to arrive at the aggregate MWh 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 because of the program. Nexant's analysis methodology relies on a census analysis of the homes in both groups so the resulting impact estimates are free of sampling error. However, 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 group size increases, the uncertainty introduced by randomization decreases, and the precision of the estimates improves.

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 consumption.

The two following statements about the MyHER impact analysis reflect absolute precision:

- DEC MyHER saved an average of 247.7 kWh per home during the 12-month period June 2017 to May 2018, ± 16.0 kWh. Homes in the treatment group reduced electric consumption by an average of 1.69%, ± 0.11%.
- DEP MyHER saved an average of 201.2 kWh per home during the 12-month period June 2017 to May 2018, ± 18.9 kWh. Homes in the treatment group reduced electric consumption by an average of 1.25%, ± 0.12%.

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 examples:

- The average treatment effect of DEC MyHER during the 12-month period June 2017 to May 2018 is 247.7 kWh with a relative precision of ± 6.4%. In this case, ± 6.4% is determined by dividing the absolute margin of error by the impact estimate: 16.0÷247.7 = 0.064 = 6.4%.
- The average treatment effect of DEP MyHER during the 12-month period June 2017 to May 2018 is 201.2 kWh with a relative precision of ± 9.4%. In this case, ± 9.4% is determined by dividing the absolute margin of error by the impact estimate: 18.9÷201.2 = 0.094 = 9.4%.

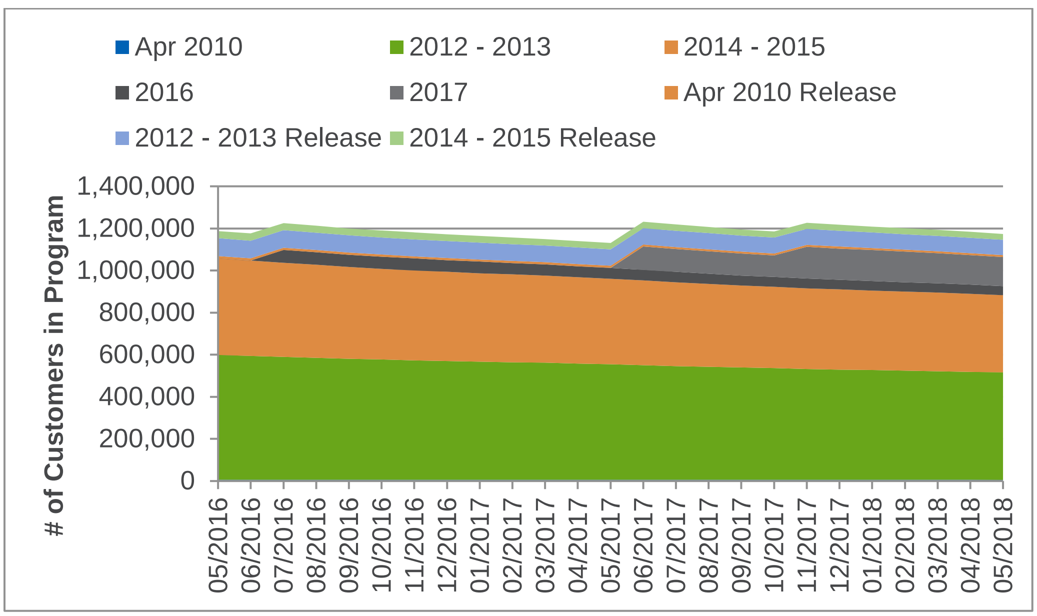
All of the precision estimates in this report are presented at the 90% confidence level and assume a two-tailed distribution.

3.1.4 Assignment Cohorts and Equivalence Testing

The DEC and DEP MyHER program has been growing over time since its DEC launch in 2010 and DEP launch in 2014. Nexant mapped the DEC MyHER population into eight cohorts and DEP MyHER population into six cohorts. The cohort groupings are defined on a temporal basis, generally following the major periods when customers were assigned to treatment and control groups. Cohorts that had been defined in prior evaluations of the DEC and DEP programs were maintained for consistency.

Figure 3-1 shows the timeline of DEC program expansion by cohort since May 2016. The original pilot cohort started the program in April 2010 which was followed by a large expansion of customers who were added in 2012 and 2013, mainly in September 2012. A second large cohort was added in 2014 and 2015, mainly in December 2014. The program has continued to expand since 2015, in more modest increments relative to the 2012 - 2013 and 2014 - 2015 expansions, as newer customers met the program's eligibility criteria. In October 2015, Duke Energy also released a small number of DEC customers originally assigned to the control group into treatment from the April 2010, 2012 - 2013, and 2014 – 2015 cohorts. These cohorts are denoted with "Release" in Figure 3-1.[6] These customers were released into treatment starting in October 2015, and began producing impacts in November 2015.

Figure 3-1: History of Cohort Assignments for DEC MyHER Program

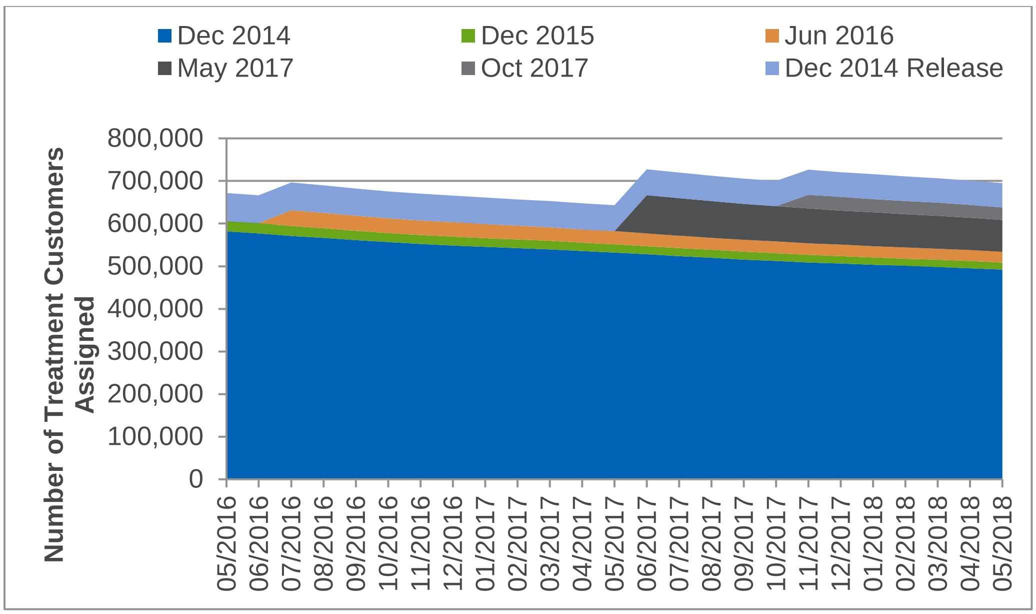


[6] Duke Energy commissioned a review of the MyHER control groups in 2015 to assess whether or not there were any control groups that were larger than necessary for the purpose of EM&V. Four relatively small releases (approximately 110,000 customers total) from the DEC jurisdiction was recommended by that review. Consequently, about 110,000 control group customers from the April 2010, September 2012, December 2014, and January 2015 cohorts were randomly selected for release into treatment.

Approximately 26% of DEC MyHER treatment customers were not assigned to the program simultaneously with a control group, and were bundled into cohorts with treatment customers assigned around the same time, consistent with the prior DEC evaluations. Nexant has advised Duke Energy to continue a simultaneous assignment protocol and to make assignments on an annual or biennial basis. Doing so will minimize any potential sources of bias that could occur due to a lack of simultaneous assignment to treatment and control.

Figure 3-2 shows the timeline of DEP program expansion by cohort since May 2016. A large original cohort started the program in December 2014. The program has continued to expand since 2014, in more modest increments relative to the original cohort, as newer customers met the program's eligibility criteria. In October 2015, Duke Energy also released a small number of DEP customers originally assigned to the control group into treatment from the December 2014 cohort. This cohort is denoted with "Release" in Figure 3-2.[7] These customers were released into treatment starting in October 2015, and began producing impacts in November 2015.

Figure 3-2: History of Cohort Assignments for DEP MyHER Program



Approximately 8% of DEP MyHER treatment customers were not assigned to the program simultaneously with a control group, and were bundled into cohorts with treatment customers assigned around the same time. These cohort definitions are consistent with those used in the previous evaluation. Simultaneous assignment will minimize any potential sources of bias that could occur due to a lack of simultaneous assignment to treatment and control.

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

[7] Duke Energy commissioned a review of the MyHER control groups in 2015 to assess whether or not there were any control groups that were larger than necessary for the purpose of EM&V. A release of 60,000 customers from the DEP jurisdiction was recommended by that review. Consequently, about 60,000 control group customers from the December 2014 cohort were randomly selected for release into treatment.

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 simply 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.

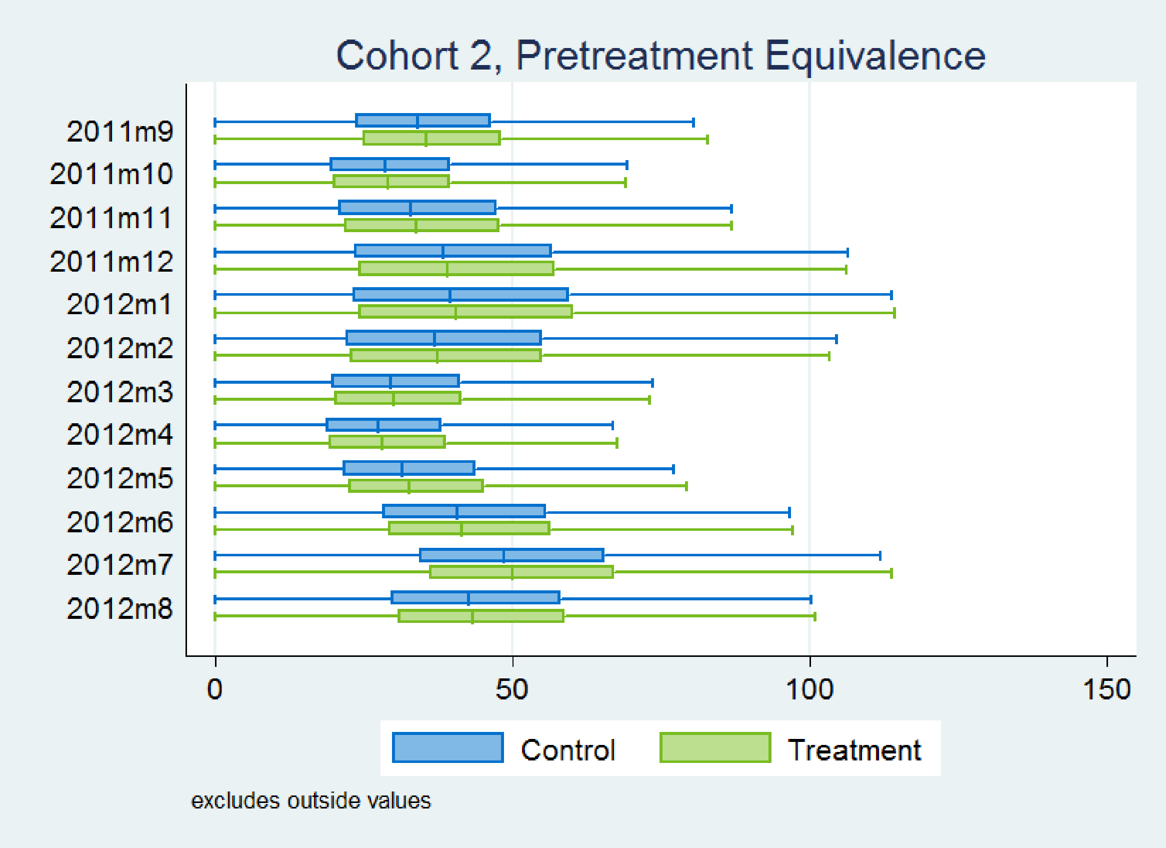
Table 3-3 presents summary information for each of the eight cohorts included in Nexant's DEC analysis, comparing the average annual kWh usage of each cohort's treatment and control group for the 12 months prior to the beginning of assignment. On an annual basis, the pre-assignment usage is relatively balanced between groups for each of these cohorts, where the largest difference occurs in Cohort 5 ("2017").

Table 3-3: DEC MyHER Cohort Summary Statistics

Cohort		Pretreatment Period		# Homes		Annual kWh in Pretreatment Period	
		Start	End	Control	Treatment	Control	Treatment
1	Apr 2010	04/2009	03/2010	9,535	6,173	17,871	17,893
2	2012 - 2013	09/2011	08/2012	30,566	527,684	14,392	14,528
3	2014 - 2015	12/2013	11/2014	26,376	383,024	14,782	14,684
4	2016	06/2015	05/2016	19,848	61,332	13,324	13,402
5	2017	05/2016	04/2017	27,388	161,317	13,204	13,554
6	Apr 2010 Release	04/2009	03/2010	9,535	10,689	17,871	17,732
7	2012 - 2013 Release	09/2011	08/2012	30,566	85,505	14,392	14,486
8	2014 - 2015 Release	12/2013	11/2014	26,376	35,809	14,782	14,660

Since MyHER is evaluated on a month basis, the more important equivalency check is on month-to-month comparability between treatment and control groups. Figure 3-3 is a box-and-whisker plot of the average pre-treatment consumption for the treatment and control groups of DEC Cohort 2 ("2012 - 2013"), the largest treatment cohort of the DEC MyHER program. The figure depicts the distribution of monthly average consumption from September 2011 to August 2012, the time period prior to the launch of the cohort. This figure represents usage of all accounts assigned to treatment and control in this cohort. The plot illustrates that usage patterns of the treatment and control customers are grossly similar, however t-tests on the mean consumption for treatment and control groups reveals statistically significant differences between treatment and control customers during much of the pretreatment period. For example, the cohort shown in Figure 3-3 has statistically significant differences between treatment and control groups in 11 of 12 months in the year immediately prior to the onset of treatment. Across all eight DEC cohorts, the number of pretreatment months that show statistically different differences between treatment and control customers ranges from 0 to 12. These differences will need to be addressed by the estimation procedure, as we describe later in this section.

Figure 3-3: DEC Difference in Average Pre-treatment Billed Consumption (kWh)



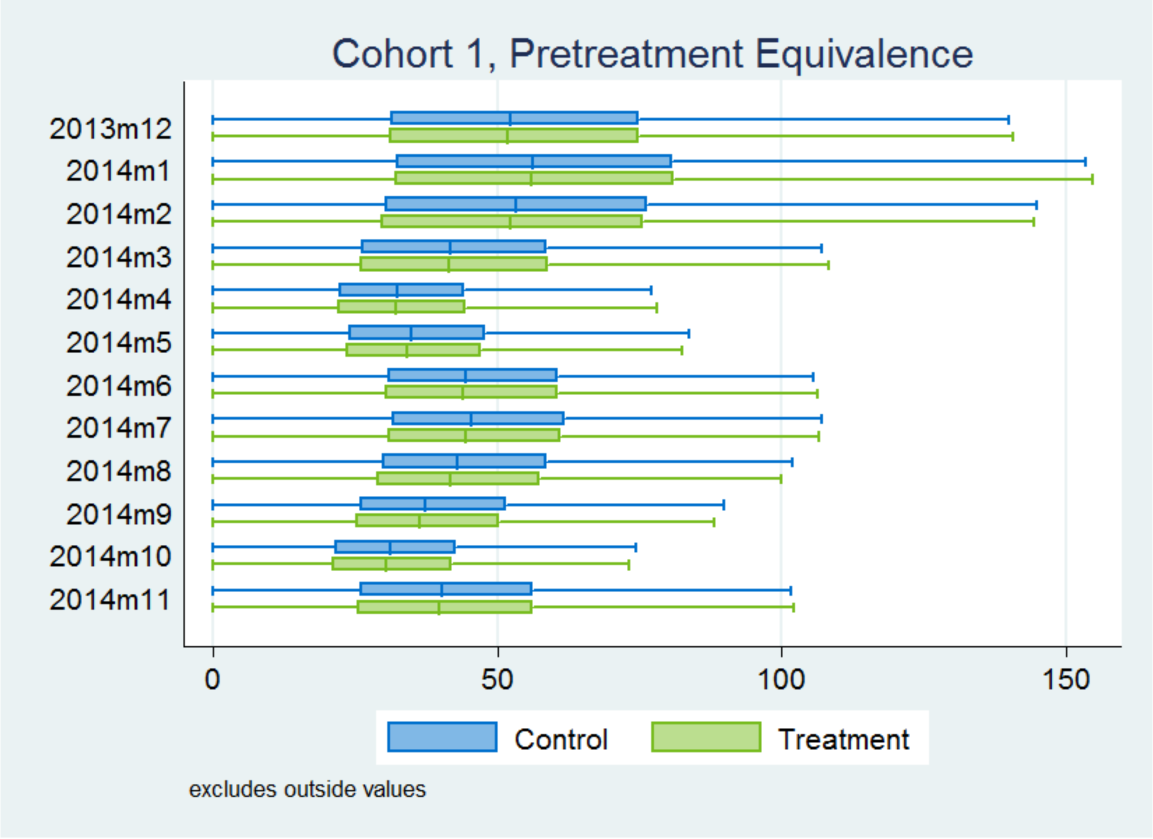
Considering the DEP program, Table 3-4 presents summary information for each of the six cohorts included in Nexant's analysis, comparing the average annual kWh usage of each cohort's treatment and control group for the 12 months prior to the beginning of assignment. Here as in DEC, on an annual basis, the pre-assignment usage is relatively balanced between groups for each of these cohorts, where the largest difference occurs in Cohort 5 ("October 2017") which is the smallest cohort in terms of the number of both treatment and control customers.

Table 3-4: DEP MyHER Cohort Summary Statistics

Cohort		Pre-Period		# Homes		Annual kWh in Pre-Period	
		Start	End	Control	Treatment	Control	Treatment
1	Dec 2014	12/2013	11/2014	72,590	565,291	16,852	16,773
2	Dec 2015	12/2014	11/2015	8,086	24,482	14,826	14,628
3	Jun 2016	06/2015	05/2016	16,579	37,011	13,765	13,860
4	May 2017	05/2016	04/2017	7,102	94,947	15,121	15,060
5	Oct 2017	10/2016	09/2017	12,401	33,879	13,636	13,838
6	Dec 2014 Release	12/2013	11/2014	72,590	65,869	16,852	16,847

On a month-to-month basis, DEP's cohorts perform similarly to DEC's cohorts in terms of equivalence in treatment and control group usage. Figure 3-4 is a box-and-whisker plot of the average pre-treatment consumption for the treatment and control groups of DEP Cohort 1 ("December 2014"), the largest treatment cohort of the DEP MyHER program. The figure depicts the distribution of monthly average consumption from December 2013 to November 2014, the time period prior to the launch of the cohort. This figure represents usage of all accounts assigned to treatment and control in this cohort. As was the case for DEC, this largest of DEP cohorts grossly demonstrates monthly equivalence of treatment and control group usage, but the differences in mean monthly consumption are actually statistically significant for all 12 months of the year immediately preceding the onset of treatment. Across the six DEP cohorts, the number of months of the year immediately prior to the onset of treatment that treatment and control group usage is statistically different ranges from 0 to 12. These differences will need to be taken into account during estimation.

Figure 3-4: DEP Difference in Average Pre-treatment Billed Consumption (kWh)



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, as discussed above, there are still small, but significant, 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 the month-to-month differences in electricity usage observed in the pre-treatment period between the treatment and control groups. The basic form of the LFER model is shown in Equation 3-1. 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

$$\mathrm{kWh}_{ity} = \mathrm{customer}_i * \beta_i + \sum_{t=1}^{12}\sum_{y=2009}^{2018} \mathrm{I}_{ty} * \beta_{ty} + \sum_{t=1}^{12}\sum_{y=2009}^{2018} \mathrm{I}_{ty} * \tau_{ty} * \mathrm{treatment}_{ity} + \varepsilon_{ity}$$

Table 3-5 provides additional information about the terms and coefficients in Equation 3-1.

Table 3-5: 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 customers' 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 randomized cohorts included in the analysis for each jurisdiction. Detailed regression outputs can be found in Appendix A. 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 month.

Table 3-6 illustrates the calculation of monthly impact estimates from the regression model coefficients for homes in the DEC 2012 - 2013 cohort (DEC Cohort 2). The monthly savings shown in Table 3-6 are the unweighted point estimates for that cohort. Each month's average treatment effect is multiplied by an assumed number of days in the month equal to 365.25/12 = 30.4375.

Table 3-6: Impact Calculation Example – DEC Cohort 2

Month	Daily Treatment Coefficient (τ)	Monthly Impact (kWh)
06/2017	-0.2310	-7.0
07/2017	0.1645	5.0
08/2017	0.1487	4.5
09/2017	-0.5932	-18.1
10/2017	-0.4416	-13.4
11/2017	-1.1360	-34.6
12/2017	-1.9676	-59.9
01/2018	-1.0220	-31.1
02/2018	-1.2419	-37.8
03/2018	-1.2941	-39.4
04/2018	-1.0254	-31.2
05/2018	-0.6825	-20.8
12-month Total		**-283.7**

Impact estimates by cohort were combined for each month using a weighted average where the weighting factor is 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). These estimates of the average MyHER impact per assigned home were then divided by the proportion of customers treated, as shown in Table 3-1 and Table 3-2, to estimate the average treatment effect per participating home.

3.1.6 Dual Participation Analysis

The regression model outputs and subsequent intention-to-treat adjustments 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 energy efficiency offerings at Duke Energy 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 dataset of non-MyHER program participation records for the MyHER treatment and control group homes dating back to January 2015. This dataset included nearly 439,000 records of efficient measure installations by the MyHER treatment and control group and formed the basis of Nexant's dual participation analysis.

Table 3-7 and Table 3-8 shows the distribution of participation and savings during the 12-month period June 2017 to May 2018 across DEC and DEP's residential portfolio, respectively.

Table 3-7: DEC Total EE Program Participation among MyHER Customers

Program Name	Number of Records	Net MWh/year	Net kW/year
DE Residential EE Products & Services	181,353	36,612	12,092
DE Smart Saver Residential	243,630	152,553	31,754
Residential Energy Assessments	13,584	15,457	2,530
Total	**438,567**	**204,622**	**46,376**

Table 3-8: DEP Total EE Program Participation among MyHER Customers

Program Name	Number of Records	Net MWh/year	Net kW/year
DEP Home Energy Improvement	17,585	5,435	1,429
DEP Neighborhood Energy Saver	2,534	1,144	174
DEP New Construction Program	30	1	1
DEP ResEE Multi-Family	4,739	1,172	118
DEP Residential Energy Assessment	10,494	11,758	1,955
DEP Single Family Water Measures	115,504	30,605	10,199
DEP Smart Saver Residential	8,672	11,021	4,297
Total	**159,558**	**61,137**	**18,173**

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

Table 3-9 shows the dual participation calculations, by bill month, for homes in the DEC 2012 – 2013 Cohort (DEC Cohort 2). Savings from energy efficiency measures climb steadily over time in both groups as additional efficient technologies are installed through Duke Energy's residential energy efficiency portfolio. The treatment group's impacts increase at a slightly greater rate, so the incremental energy savings subtracted from the MyHER treatment effect generally grows as a cohort's duration of exposure lengthens.

Table 3-9: Incremental Energy Efficiency Savings Calculation Example – DEC Cohort 2

Month	Mean Daily EE kWh Impact (Control)	Mean Daily EE kWh Impact (Treatment)	Incremental Daily kWh from EE (Treatment – Control)	Uplift %	Incremental kWh Savings
06/2017	0.354	0.381	0.027	7.6%	0.82
07/2017	0.369	0.395	0.026	7.2%	0.80
08/2017	0.384	0.412	0.028	7.3%	0.85
09/2017	0.406	0.435	0.029	7.1%	0.88
10/2017	0.428	0.459	0.031	7.2%	0.94
11/2017	0.445	0.476	0.031	7.0%	0.95
12/2017	0.459	0.492	0.033	7.2%	1.01
01/2018	0.477	0.511	0.034	7.2%	1.04
02/2018	0.488	0.523	0.035	7.1%	1.06
03/2018	0.506	0.540	0.034	6.7%	1.04
04/2018	0.527	0.561	0.034	6.5%	1.05
05/2018	0.541	0.576	0.035	6.5%	1.06
12-month Total					**11.51**

While the incremental participation rate of the treatment group in other EE programs is modest when considered in total, increased uptake of measures immediately following promotional messaging within MyHER mailers could be much more dramatic. Each MyHER issued has space for one product promotion message that is used to market other Duke Energy programs or initiatives. Duke Energy provided Nexant with records of the exact messages received by each home. Table 3-10 and Table 3-11 show the number of homes that received each combination of messages for the DEC and DEP MyHER cycles from this evaluation period.

Table 3-10: DEC MyHER Promotional Messaging by Month

Source Month	Message 1 - Details	Message 2 - Details	Number of Homes
06/2017	Fire Up The Grill	Think Thermostat	207,609
06/2017	HEHC	Think Thermostat	291,650
06/2017	NC Greenpower	Think Thermostat	674,093
07/2017	Discover Ways To Save	Full Not Too Full	87
07/2017	Duke Energy Delivers	Full Not Too Full	1,153,123
07/2017	Safety First	Full Not Too Full	6,172
08/2017	Laundry Savings	Automate Energy Use	1,148,835
10/2017	Share The Warmth	To Preheat Or Not	1,171,806
11/2017	Great Escape	Unblock The Heat	96,953
11/2017	Weatherstrip	Unblock The Heat	447,864
12/2017	Share The Warmth	Think At The Sink	1,116,808
01/2018	Great Escape	Safety And Savings	273,800
01/2018	Let The Sun Shine	Safety And Savings	856,846
02/2018	Insulate And Seal	Caulk	428,407
02/2018	Johns Manville Ad (Intelligent)	None	44,173
02/2018	Johns Manville Ad (Traditional)	None	38,854
02/2018	Johns Manville eHER only Ad (Intelligent)	None	20,459
02/2018	Johns Manville eHER only Ad (Traditional)	None	20,267
03/2018	Equal Payment Plan	Interactive	446,161
03/2018	Power Manager 32	Interactive	443,381
03/2018	Ecobee Ad (Intelligent)	None	87,843
03/2018	Ecobee Ad (Traditional)	None	78,410
03/2018	Ecobee eHER only Ad (Intelligent)	None	20,442
03/2018	Ecobee eHER only Ad (Traditional)	None	20,329
04/2018	Find It Duke	Cool Off On Counter	425,744
04/2018	Lighting DEC Ad (Intelligent)	None	60,356
04/2018	Lighting DEC Ad (Traditional)	None	60,395
05/2018	Find It Duke	Let LEDs Lower Bills	952,111
05/2018	Online Store - May Lighting Ad A	None	99,426
05/2018	Online Store - May Lighting Ad B	None	99,070

Table 3-11: DEP MyHER Promotional Messaging by Month

Source Month	Message 1 - Details	Message 2 - Details	Number of Homes
06/2017	Fire Up The Grill	Think Thermostat	16,901
06/2017	HEHC	Think Thermostat	527,037
06/2017	NC Greenpower	Think Thermostat	145,351
07/2017	Discover Ways To Save	Full Not Too Full	38
07/2017	Don't Forget The Bulbs	Full Not Too Full	678,448
07/2017	Safety First	Full Not Too Full	15
08/2017	Laundry Savings	Automate Energy Use	680,829
10/2017	It Takes More DEP	To Preheat Or Not	691,761
11/2017	Great Escape	Unblock The Heat	233,084
11/2017	Weatherstrip	Unblock The Heat	72,702
11/2017	Weatherstrip MF	Unblock The Heat MF	1,559
12/2017	It Takes More DEP	Think At The Sink	626,155
01/2018	Great Escape	Safety And Savings	494,476
01/2018	Let The Sun Shine	Safety And Savings	171,651
02/2018	Insulate And Seal	Caulk	196,546
02/2018	Johns Manville Ad (Intelligent)	None	23,627
02/2018	Johns Manville Ad (Traditional)	None	20,684
02/2018	Johns Manville eHER only Ad (Intelligent)	None	39,638
02/2018	Johns Manville eHER only Ad (Traditional)	None	39,871
03/2018	Energy Wise DEP	Interactive	269,480
03/2018	Equal Payment Plan	Interactive	2,417
03/2018	Equal Payment Plan DEP	Interactive	220,991
03/2018	Ecobee Ad (Intelligent)	None	39,307
03/2018	Ecobee Ad (Traditional)	None	35,126
03/2018	Ecobee eHER only Ad (Intelligent)	None	40,113
03/2018	Ecobee eHER only Ad (Traditional)	None	40,239
04/2018	Find It Duke	Cool Off On Counter	184,896
04/2018	Lighting DEP Ad (Intelligent)	None	62,604
04/2018	Lighting DEP Ad (Traditional)	None	54,374
05/2018	Find It Duke	Let LEDs Lower Bills	532,453
05/2018	Retail Lighting - May Lighting DEP Ad A	None	70,712
05/2018	Retail Lighting - May Lighting DEP Ad B	None	79,863

3.2 Impact Findings

3.2.1 Per-home kWh and Percent Impacts

Nexant estimates the average participating DEC MyHER home saved 247.7 kWh of electricity from June 2017 to May 2018. This represents a 1.69% reduction in total electricity consumption compared to the control group over the same period. The average DEP MyHER home saved 201.2 kWh of electricity from June 2017 to May 2018, which represents a 1.25% reduction in electricity consumption. These estimates reflect an upward adjustment to account for the intention-to-treat methodology and a downward adjustment to prevent double-counting of savings attributable to incremental participation of treatment groups in Duke Energy's energy efficiency programs.

Table 3-12 and Table 3-13 show the impact estimates in each bill month for the average home assigned to treatment in DEC and DEP, respectively. The table also shows the subsequent adjustment to account for the fact that only a subset of homes assigned to treatment was actively participating in MyHER during the study period.

Table 3-12: DEC MyHER Impact Estimates with ITT Adjustment, before EE Overlap Adjustment

Month	Treatment Homes Analyzed	DEC Participant Count	kWh impact in Assigned Homes	% Treated	kWh Impact in Treated Homes
06/2017	1,231,705	1,197,462	8.7	97%	9.0
07/2017	1,218,640	1,198,133	3.6	98%	3.7
08/2017	1,207,107	1,171,813	4.0	97%	4.1
09/2017	1,195,242	1,172,053	14.5	98%	14.7
10/2017	1,185,902	1,172,053	15.3	99%	15.5
11/2017	1,225,916	1,195,285	27.0	98%	27.6
12/2017	1,216,916	1,191,881	36.8	98%	37.6
01/2018	1,208,915	1,193,353	30.4	99%	30.7
02/2018	1,200,827	1,178,403	30.1	98%	30.7
03/2018	1,192,681	1,177,960	31.9	99%	32.3
04/2018	1,183,803	1,157,514	26.1	98%	26.7
05/2018	1,173,821	1,151,896	20.5	98%	20.9
12-month Total			**248.9**	**98%**	**253.6**

Table 3-13: DEP MyHER Impact Estimates with ITT Adjustment, before EE Overlap Adjustment

Month	Treatment Homes Analyzed	DEP Participant Count	kWh impact in Assigned Homes	% Treated	kWh Impact in Treated Homes
06/2017	727,455	682,040	18.3	94%	19.5
07/2017	719,693	713,994	17.2	99%	17.4
08/2017	712,653	701,172	19.5	98%	19.8
09/2017	705,487	700,125	4.1	99%	4.1
10/2017	699,920	700,125	-6.1	100%	-6.1
11/2017	726,344	710,313	19.3	98%	19.7
12/2017	720,920	707,899	31.2	98%	31.8
01/2018	715,954	708,355	29.2	99%	29.5
02/2018	711,221	697,726	21.4	98%	21.8
03/2018	706,614	698,443	15.5	99%	15.6
04/2018	701,195	693,815	16.3	99%	16.5
05/2018	695,352	689,886	17.4	99%	17.6
12-month Total			**203.3**	**98%**	**207.2**

An adjustment factor of 5.95 kWh per home for DEC and 6.02 kWh per home for DEP is applied to MyHER impact estimates in Table 3-14 to arrive at the final net verified program impact per home. Section 3.2.6 provides additional detail on the calculation of the adjustment for overlapping participation in other Duke EE programs.

Table 3-14: MyHER Impact Estimates Net of EE Overlap

Jurisdiction	Time Period	kWh Savings in Treated Homes	Incremental kWh from EE Programs	Net MyHER Impact Estimate	Control Group Usage (kWh)	Percent Reduction
DEC	June 2017 - May 2018	253.6	5.95	247.7	14,658	1.69%
DEP	June 2017 - May 2018	207.2	6.02	201.2	16,137	1.25%

3.2.2 Aggregate Impacts

The total impact of the MyHER program in each service territory is calculated by multiplying the per-home impacts (adjusted for ITT and incremental EE participation) for each bill month by the number of participating homes. Over the 12-month period June 2017 to May 2018, DEC MyHER participants conserved 292.2 GWh of electricity, while DEP MyHER participants conserved 141.1 GWh. The aggregate impacts presented in Table 3-15 and Table 3-16 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 3-15: DEC MyHER Aggregate Impacts

Month	DEC Participant Count	kWh Net Impact	GWh Net Impact
06/2017	1,197,462	8.5	10.2
07/2017	1,198,133	3.2	3.8
08/2017	1,171,813	3.6	4.2
09/2017	1,172,053	14.1	16.6
10/2017	1,172,053	14.8	17.4
11/2017	1,195,285	27.3	32.6
12/2017	1,191,881	37.2	44.3
01/2018	1,193,353	30.3	36.2
02/2018	1,178,403	30.2	35.6
03/2018	1,177,960	31.9	37.6
04/2018	1,157,514	26.2	30.3
05/2018	1,151,896	20.4	23.5
12-month Total		**247.7**	**292.2**

Table 3-16: DEP MyHER Aggregate Impacts

Month	DEP Participant Count	kWh Net Impact	GWh Net Impact
06/2017	682,040	19.1	13.0
07/2017	713,994	16.9	12.1
08/2017	701,172	19.3	13.6
09/2017	700,125	3.6	2.5
10/2017	700,125	-6.6	-4.6
11/2017	710,313	19.2	13.6
12/2017	707,899	31.3	22.1
01/2018	708,355	29.0	20.5
02/2018	697,726	21.3	14.9
03/2018	698,443	15.1	10.6
04/2018	693,815	16.0	11.1
05/2018	689,886	17.1	11.8
12-month Total		**201.2**	**141.1**

3.2.3 Precision of Findings

The margin of error of the per-home impact estimate is ± 16.0 kWh for DEC and ± 18.9 kWh for DEP 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 3-17 and Table 3-18).

Table 3-17: 90% Confidence Intervals Associated with DEC MyHER Impact Estimates

Parameter	Lower Bound (90%)	Point Estimate	Upper Bound (90%)
Evaluation Period Savings per Home (kWh)	231.7	247.7	263.6
Percent Reduction	1.58%	1.69%	1.80%
Aggregate Impact (GWh)	273.4	292.2	311.0

Table 3-18: 90% Confidence Intervals Associated with DEP MyHER Impact Estimates

Parameter	Lower Bound (90%)	Point Estimate	Upper Bound (90%)
Evaluation Period Savings per Home (kWh)	182.3	201.2	220.1
Percent Reduction	1.13%	1.25%	1.36%
Aggregate Impact (GWh)	127.9	141.1	154.3

For DEC, the absolute precision of the result is ± 0.11% and the relative precision of ± 6.4% at the 90% confidence level. For DEP, the absolute precision of the result is ± 0.12% and the relative precision of ± 9.4% at the 90% confidence level.

3.2.4 Impact Estimates by Cohort

The per-home impact estimates shown in Table 3-15 and Table 3-16 reflect a weighted average impact across the eight cohorts of DEC MyHER customers analyzed and the six cohorts of DEP MyHER customers analyzed. The impact estimates for the individual cohorts varied across the study period. Table 3-19 and Table 3-20 show point estimates for each cohort during the period June 2017 to May 2018 for DEC and DEP, respectively. Three released cohorts for DEC and one release cohort for DEP were added to treatment in October 2015 and began producing impacts in November 2015.

Table 3-19: DEC Annual kWh Impact Estimates by Cohort

Month	Monthly Average Impact							
	Apr 2010	2012 - 2013	2014 - 2015	2016	2017	Apr 2010 Release	2012 - 2013 Release	2014 - 2015 Release
06/2017	-22.6	-7.0	-8.7	-7.0	-15.7	-6.4	-11.1	-10.1
07/2017	-22.0	5.0	-7.4	-5.0	-21.3	-9.6	-15.3	-8.8
08/2017	-23.5	4.5	-9.8	-3.9	-15.4	-12.6	-12.4	-13.8
09/2017	-29.4	-18.1	-11.4	-3.7	-14.6	-12.4	-10.1	-15.5
10/2017	-22.1	-13.4	-22.1	-8.5	-8.6	-10.7	-6.9	-15.6
11/2017	-19.8	-34.6	-28.3	-18.2	-12.2	-17.0	-8.4	-13.7
12/2017	-19.6	-59.9	-27.4	-23.9	-1.2	-19.0	-12.3	-18.3
01/2018	-24.9	-31.1	-45.7	-21.2	0.0	-26.9	-15.8	-23.4
02/2018	-23.5	-37.8	-33.5	-19.8	-10.3	-15.9	-11.5	-17.6
03/2018	-24.1	-39.4	-36.7	-19.5	-12.1	-20.9	-9.5	-16.4
04/2018	-20.2	-31.2	-26.7	-14.6	-21.7	-13.5	-8.3	-15.0
05/2018	-23.1	-20.8	-17.4	-11.9	-36.9	-15.2	-8.8	-19.0
12 Month Total	**-274.8**	**-283.7**	**-275.0**	**-157.1**	**-169.9**	**-180.1**	**-130.3**	**-187.2**

Table 3-20: DEP Annual kWh Impact Estimates by Cohort

Month	Monthly Average Impact					
	Dec 2014	Dec 2015	Jun 2016	May 2017	Oct 2017	Dec 2014 Release
06/2017	-22.3	-5.7	-15.3	-8.6	0.0	-3.0
07/2017	-21.0	-10.5	-19.2	-5.5	0.0	-2.6
08/2017	-24.3	-11.0	-16.2	-4.0	0.0	-4.0
09/2017	-2.8	-10.9	-16.8	-5.1	0.0	-5.8
10/2017	10.6	-5.8	-17.4	-2.7	0.0	-6.6
11/2017	-24.4	-9.1	-10.8	-8.6	10.0	-12.6
12/2017	-40.8	-18.9	-2.0	-14.8	30.2	-21.3
01/2018	-38.1	-24.4	-2.2	-13.4	32.6	-19.8
02/2018	-26.6	-8.4	-15.3	-13.0	14.9	-13.2
03/2018	-18.7	-5.4	-14.5	-9.0	11.1	-14.0
04/2018	-19.2	-1.1	-20.0	-6.4	-5.9	-12.2
05/2018	-21.1	-6.8	-22.1	-0.9	-17.9	-8.3
12 Month Total	**-248.8**	**-118.1**	**-171.8**	**-92.1**	**74.9**	**-123.4**

For DEC, cohorts 1, 2, and 3 (April 2010, 2012 - 2013, and 2014 - 2015) show the greatest impacts and are also the oldest cohorts. Cohort 2 is the largest cohort and contains roughly 44% of analyzed treatment customers. For DEP, cohorts 1 and 3 (December 2014 and June 2016) show the greatest impacts. Cohort 1 is the largest cohort in DEP and contains about 71% of analyzed treatment customers.

Table 3-21 and Table 3-22 show the margin of error at the 90% confidence level for each cohort's annual impact estimate for DEC and DEP, respectively. 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 3-21: DEC 90% Confidence Intervals Associated with Cohort Savings Estimates

Cohort	Margin of Error in kWh at 90% Confidence Level		Lower Bound (kWh)	Point Estimate (kWh)	Upper Bound (kWh)
Apr 2010	±	194	-468	-275	-81
2012 - 2013	±	72	-356	-284	-212
2014 - 2015	±	65	-340	-275	-210
2016	±	86	-243	-157	-71
2017	±	67	-237	-170	-102
Apr 2010 Release	±	166	-346	-180	-15
2012 - 2013 Release	±	83	-213	-130	-48
2014 - 2015 Release	±	94	-281	-187	-93

Table 3-22: DEP 90% Confidence Intervals Associated with Cohort Savings Estimates

Cohort	Margin of Error in kWh at 90% Confidence Level		Lower Bound (kWh)	Point Estimate (kWh)	Upper Bound (kWh)
Dec 2014	±	49	-298	-249	-199
Dec 2015	±	148	-266	-118	30
Jun 2016	±	105	-277	-172	-67
May 2017	±	144	-236	-92	52
Oct 2017	±	70	5	75	145
Dec 2014 Release	±	67	-191	-123	-56

3.2.5 Seasonal Trends

There is a clear seasonal pattern to the DEC and DEP MyHER savings profiles. DEC and DEP customers both consistently experience the greatest reductions in winter and the smallest, sometimes negative, reductions in summer. The green series in Figure 3-5 and Figure 3-6 show the average estimated monthly treatment effect for the program in each bill month from May 2016 to May 2018. The blue series in Figure 3-5 and Figure 3-6 show the average control customer's load during the same period of time. Even though annual electricity consumption for customers in both service territories is clearly bimodal (with peaks in both the summer and winter), MyHER impacts are not.

Figure 3-5: DEC Average kWh Savings by Month

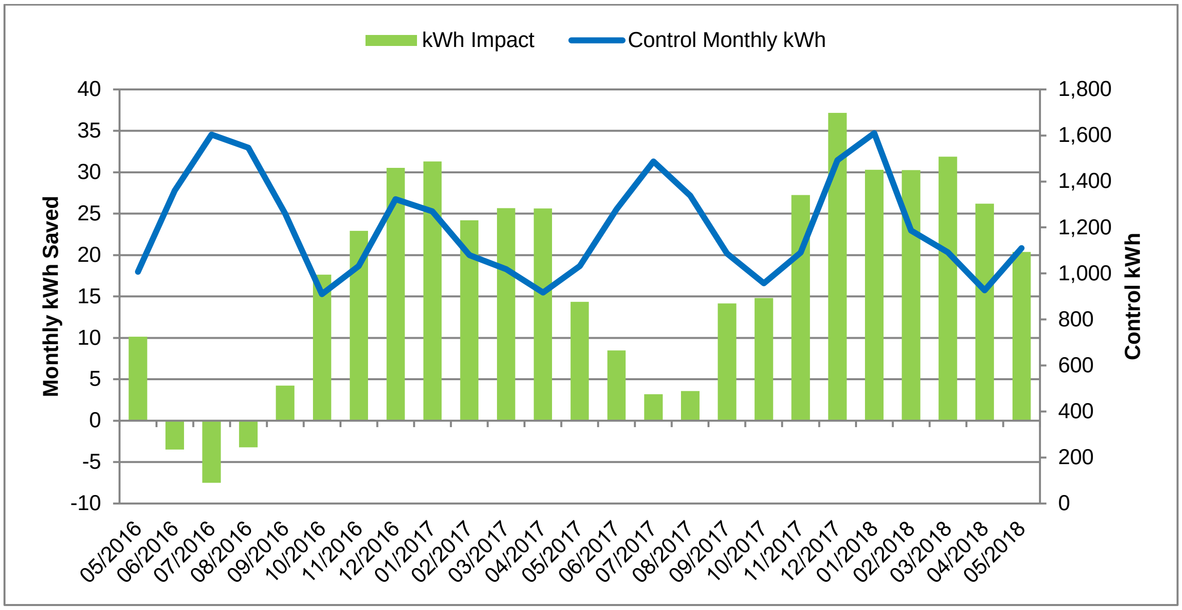
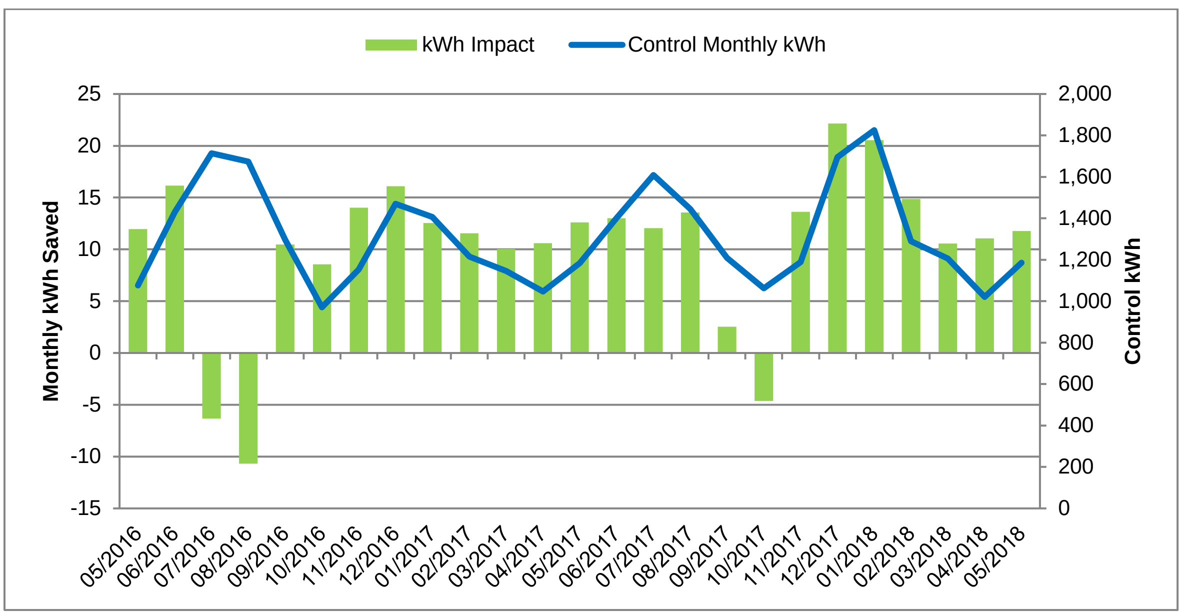


Figure 3-6: DEP Average kWh Savings by Month



Based on the observed savings trends, MyHER is realizing the greatest impacts in the winter and shoulder months, with the lowest impacts in the summer months. Seasonal trends in

MyHER average treatment effects likely reflect customers' differing abilities to respond by season. For example, winter heating demand can be mitigated by dressing more warmly, using more blankets in the home, or shutting off lights more often (there are fewer hours of daylight in the winter than the summer). The summer impacts still occur but the conservation options, and potentially willingness to conserve on cooling, options available to customers are fewer.

3.2.6 Uplift in Other Duke Energy Programs

Section 3.1.6 outlined the methodology Nexant used to calculate the annual kWh savings attributable to increased participation in other Duke Energy programs. Table 3-23 presents the downward adjustment per home that was applied to impacts in order to avoid double-counting savings from June 2017 to May 2018. For DEC, the uplift was determined to be 5.95 kWh per home, or 7.0 GWh in aggregate. For DEP, the uplift was determined to be 6.02 kWh per home, or 4.2 GWh in aggregate.

Table 3-23: Monthly Adjustment for Overlapping Participation in Other EE Programs

Month	DEC Incremental kWh from Other EE Programs	DEP Incremental kWh from Other EE Programs
06/2017	0.52	0.46
07/2017	0.52	0.48
08/2017	0.56	0.49
09/2017	0.60	0.53
10/2017	0.64	0.56
11/2017	0.40	0.52
12/2017	0.43	0.49
01/2018	0.45	0.49
02/2018	0.45	0.50
03/2018	0.45	0.50
04/2018	0.46	0.50
05/2018	0.46	0.50
12 Month Total	**5.95**	**6.02**

Although these additional savings must be subtracted from the MyHER effect to prevent double-counting, the MyHERs clearly played an important role in harvesting these savings.

Table 3-24 and Table 3-25 show the average daily energy savings attributable to tracked energy efficiency measures as of May 2018 by cohort and calculates an uplift percentage. In nearly every case the treatment group showed a higher propensity to adopt measures through Duke Energy programs than the control group.

Table 3-24: DEC Uplift Percentage by Cohort

Cohort		Monthly Net kWh Savings from EE (Treatment Group)	Monthly Net kWh Savings from EE (Control Group)	Uplift Percentage
1	Apr 2010	18.7	17.7	6.2%
2	2012 - 2013	14.6	13.7	7.0%
3	2014 - 2015	15.2	14.6	3.9%
4	2016	28.1	27.3	2.9%
5	2017	18.1	19.4	-6.4%
6	Apr 2010 Release	17.9	17.7	1.6%
7	2012 - 2013 Release	14.0	13.7	2.3%
8	2014 - 2015 Release	13.8	14.6	-5.3%

Table 3-25: DEP Uplift Percentage by Cohort

Cohort		Monthly Net kWh Savings from EE (Treatment Group)	Monthly Net kWh Savings from EE (Control Group)	Uplift Percentage
1	Dec 2014	9.3	8.7	6.76%
2	Dec 2015	9.2	8.0	13.98%
3	Jun 2016	9.8	9.1	7.64%
4	May 2017	7.8	7.8	0.14%
5	Oct 2017	6.9	7.2	-4.90%
6	Dec 2014 Release	9.1	8.7	4.93%

3.2.7 Duration of Exposure

Home energy report evaluations in North America consistently find a trend of increasing savings with length of treatment. Since the prior evaluation, Nexant has estimated impacts for three new cohorts in both service territories. The bulk of the cohorts were added to the DEC and DEP programs in June 2016, May 2017, and October 2017. In DEC, the newest cohorts (Cohorts 4 and 5) make up 15% of the treatment population by May 2018. In DEP, the newest cohorts (3, 4, and 5) make up 19% of the treatment population by May 2018. Figure 3-7 and Figure 3-8 compare the overall results with the results of the average customer who is not in one of the three newest cohorts for DEC and DEP, respectively. The older cohorts consistently realize higher impacts than their newer counterparts.

Figure 3-7: DEC Comparison of Average Customer Savings to the Savings of the Older Program Participants

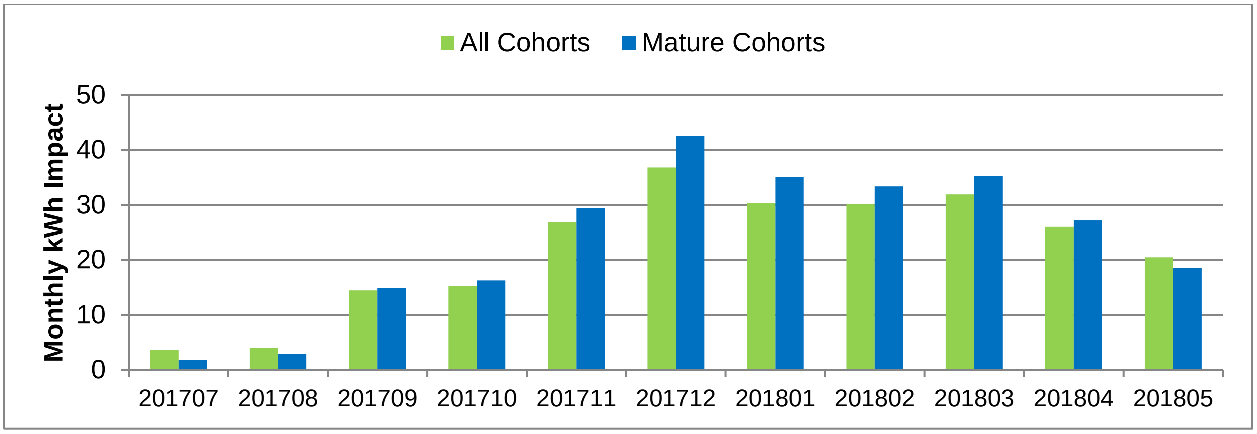


Figure 3-8: DEP Comparison of Average Customer Savings to the Savings of the Older Program Participants

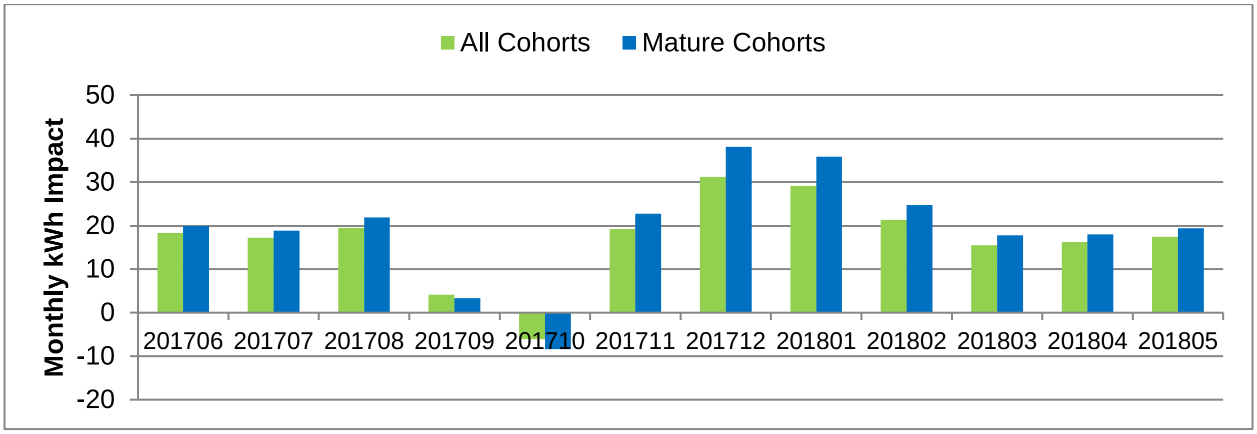
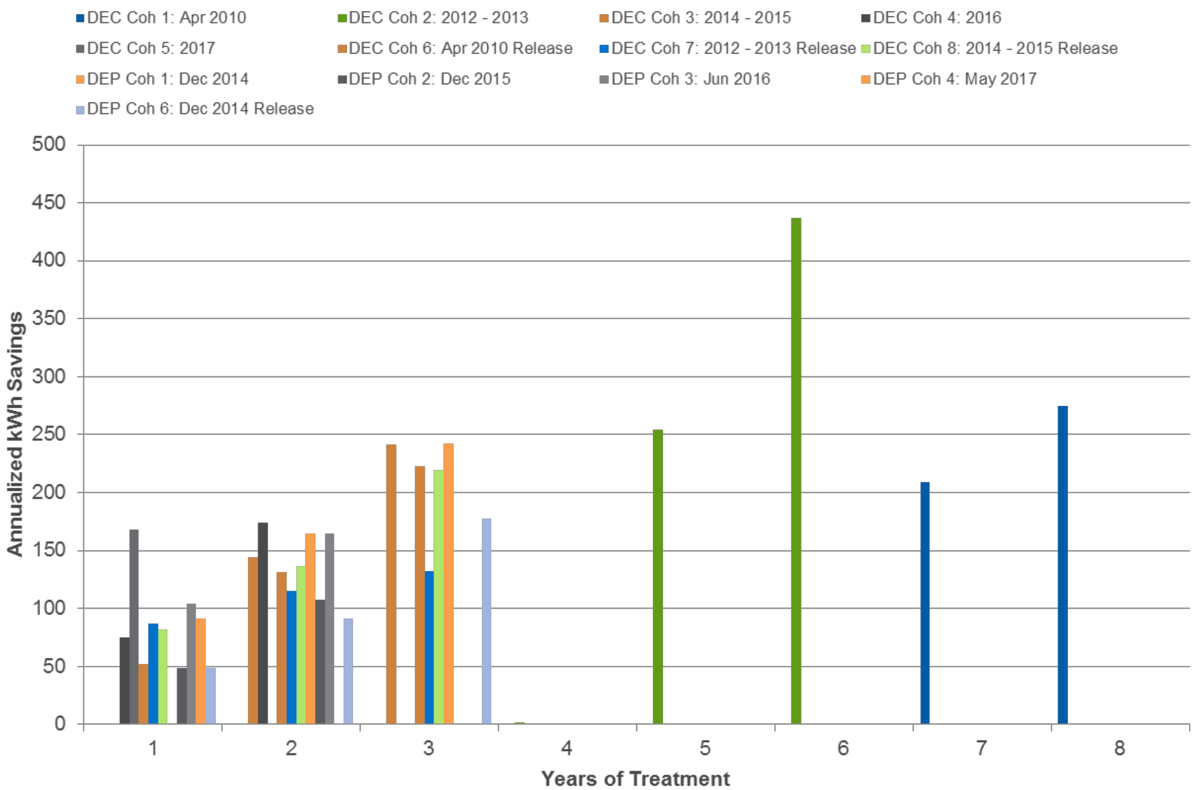


Figure 3-9 displays the annual savings by the number of years a cohort has been in the program. A general upward trend of savings occurs with longer exposure to treatment, however some exceptions are visible. The oldest cohort, which has been in treatment since 2010, shows lower impacts than those in earlier years of treatment. It should be noted that there are few program implementations of home energy report programs with durations in excess of five years and there is less information about what should be expected from implementations of that vintage. Additionally, with less than 6,000 treatment customers in this cohort, it is now one of the smallest cohorts in DEC. It is reasonable to expect the newer cohorts' impacts to increase with maturation of the cohorts, however the 2010 cohort's performance may be indicative of the existence of a point peak maturation after which mature impacts cannot be sustained. A literature review of home energy report programs in North America with participants exposed to treatment for eight years or more would be valuable to benchmark the performance of Duke Energy's oldest MyHER cohorts.

Figure 3-9: Annual Savings by Duration of Exposure



3.3 MyHER Interactive Portal

Nexant also evaluated the incremental energy savings generated by Duke Energy's enhancement to the standard MyHER 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 MyHER's classification of each customer.

The portal provides additional custom tips based on updated data provided by the customer. MyHER Interactive also sends weekly email challenges that seek to engage customers in active energy management, additional efficiency upgrades, and conservation behaviors. Nexant evaluated the impacts of the MyHER Interactive Portal using a matched comparison group because MyHER Interactive is 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. In using a matched comparison group to estimate energy savings due to exposure to MyHER Interactive, the same statistical modeling approach is used to estimate energy savings impacts as was used for estimating energy savings for the program overall (i.e., with linear fixed effects regression (LFER) estimation).

Duke Energy provided Nexant with MyHER participant enrollment information for the Interactive portal. A total of 38,190 DEC and 19,510 DEP MyHER treatment customers signed up to use the portal. For DEC, 13,523 of the 38,190 Interactive users signed into the portal more than once, and 6,880 signed in more than twice between December 2014 and May 2018. For DEP, 6,983 of the 19,510 Interactive users signed into the portal more than once, and 3,575 signed in more than twice between March 2015 and May 2018. The average DEC and DEP MyHER Interactive user has logged in to Interactive 2.6 times.

In order for the LFER regression model to generate monthly energy savings attributable to Interactive, the customer data that the regression model uses to make the estimates must use a year of exposure to MyHER reports prior to enrolling in Interactive. For DEC, 11,101 of the Interactive users (29%) had sufficient data available for the LFER analysis before their Interactive enrollment. 4,286 Interactive users (22%) in DEP had sufficient data to be included in the LFER analysis. Figure 3-10 and Figure 3-11 plot the total number of customers enrolled in MyHER Interactive as well as the subset in the analysis for each month of the 12-month period June 2017 to May 2018 for DEC and DEP, respectively.

Figure 3-10: DEC MyHER Interactive Portal Enrollment

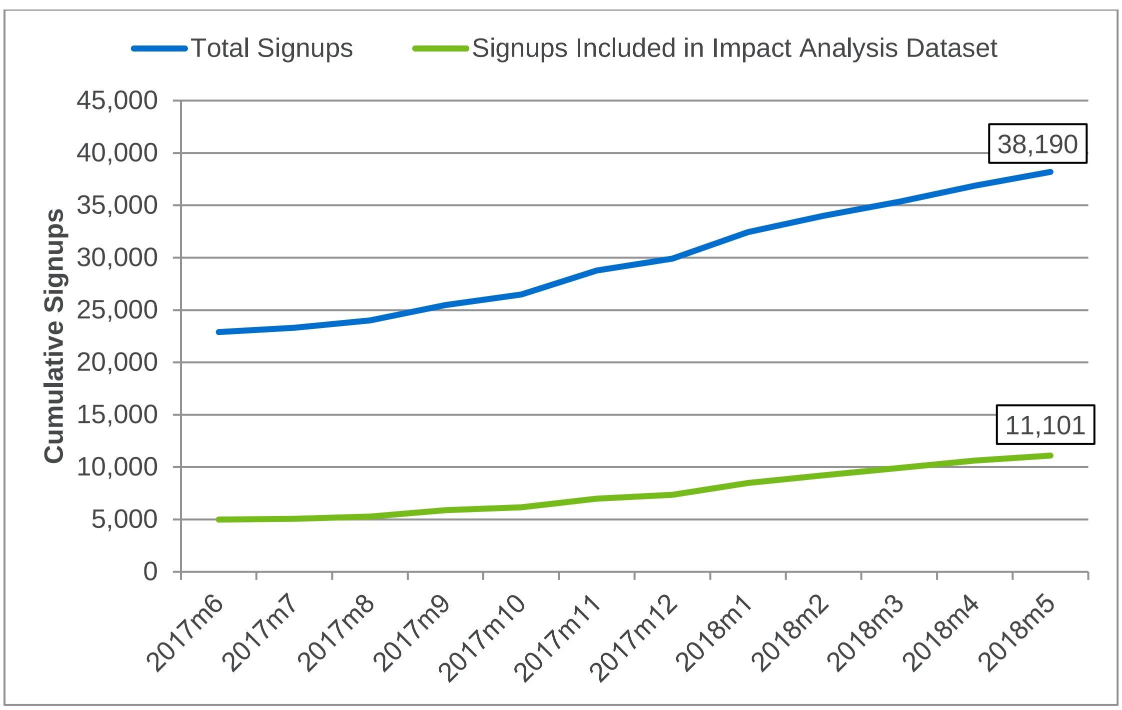
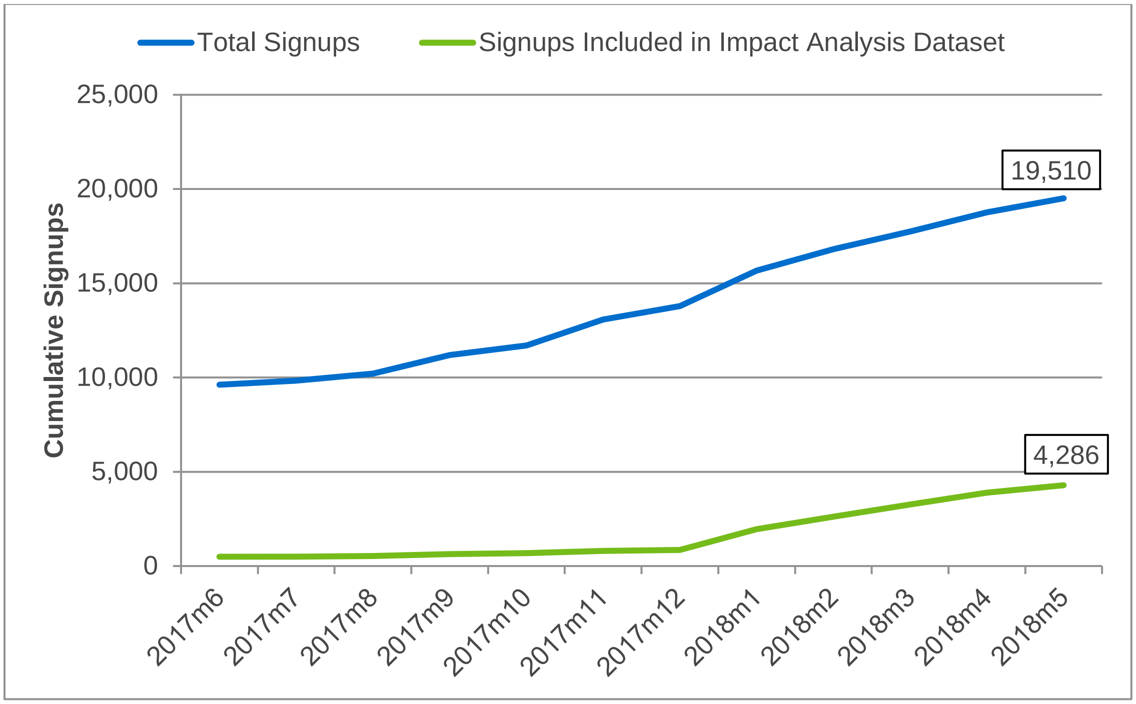
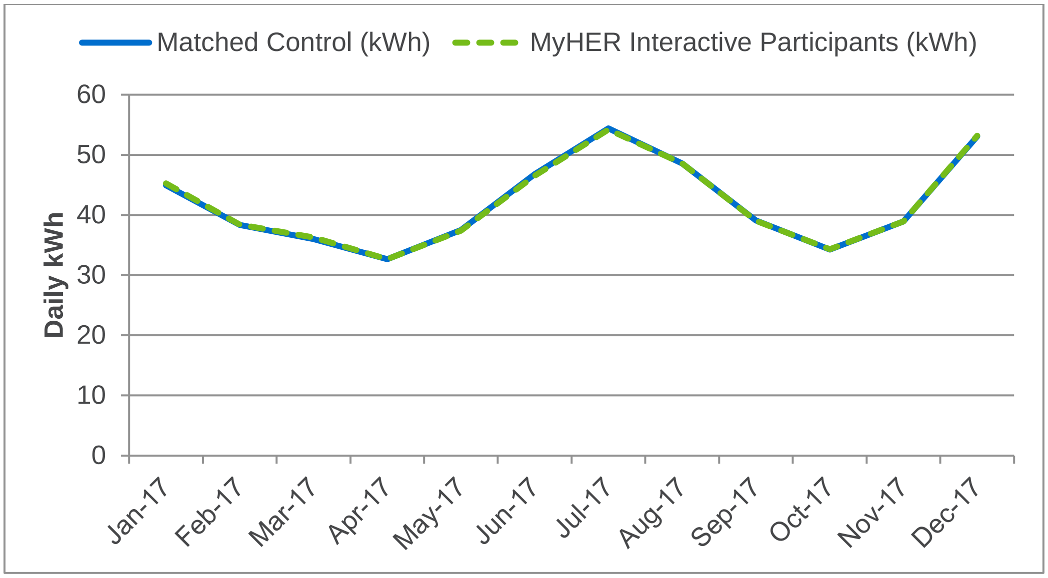


Figure 3-11: DEP MyHER Interactive Portal Enrollment



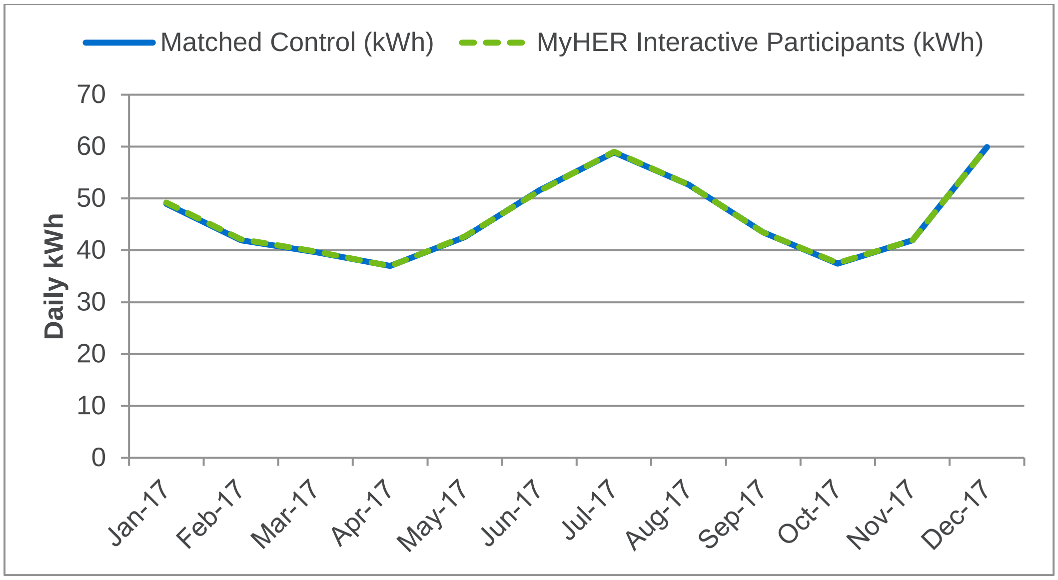
For DEC, many of the Interactive customers used in the estimation analysis were matched on their 2017 billing usage, but some customers who enrolled in Interactive at earlier points in time were matched on their 2014, 2015, or 2016 usage. Figure 3-12 presents the pre-treatment consumption for MyHER Interactive customers and a matched comparison group comprised of MyHER customers that have not enrolled in Interactive for the DEC customers matched on 2017 usage. The matching approach generates two groups with nearly identical consumption patterns over the time period prior to customers' enrollment in MyHER Interactive. On average, the difference in monthly usage between the matched control group and the DEC Interactive treatment group is -0.6% for the 2014 match, 0.4% for the 2015 match, 0.1% for the 2016 match, and 0.0% for the 2017 match. The fixed effects model specification Nexant applies controls for these pre-treatment differences, as discussed earlier in Section 3.1.5.

Figure 3-12: DEC MyHER Interactive Portal Customers and Matched Comparison Group – 2017 Pre-Interactive Enrollment Periods



For DEP, most of the Interactive customers used in the estimation analysis were matched on their 2017 billing usage, but some customers who enrolled in Interactive earlier were matched on their 2015 or 2016 usage. Figure 3-13 presents the pre-treatment consumption for MyHER Interactive customers and a matched comparison group comprised of MyHER customers that have not enrolled in Interactive for the DEP customers matched on 2017 usage. The matching approach generates two groups with nearly identical consumption patterns over the time period prior to customers' enrollment in MyHER Interactive. On average, the difference in monthly usage between the matched control group and the DEP Interactive treatment group is 0.3% for the 2015 match, -0.2% for the 2016 match, and 0.1% for the 2017 match. The fixed effects model specification Nexant applies controls for these pre-treatment differences, as discussed earlier in Section 3.1.5.

Figure 3-13: DEP MyHER Interactive Portal Customers and Matched Comparison Group – 2017 Pre-Interactive Enrollment Periods



3.3.2 Results and Precision

For DEC, the average monthly impact across the 12-month period June 2017 to May 2018 was 21.3 kWh or 255.1 kWh annually per customer, representing the uplift in savings that MyHER Interactive produces over and above the savings produced by the paper MyHER, and this impact is significant at the 90% level of confidence. In aggregate, the DEC MyHER Interactive Portal resulted in 7.38 GWh of annual savings, incremental to the MyHER reports. These high-level findings are summarized in Table 3-26.

Table 3-26: 90% Confidence Intervals Associated with DEC MyHER Interactive Impact Estimates

Parameter	Lower Bound (90%)	Point Estimate	Upper Bound (90%)
Evaluation Period Savings per Home (kWh)	41.4	255.1	468.8
Percent Reduction	0.27%	1.65%	3.02%
Aggregate Impact (GWh)	0.99	7.38	13.77

On a month-to-month basis, energy impacts were statistically significant during the months of April, May, June, August, September, October, November, and December and range from 0.6% to 2.6%, or from 9 to 36 kWh on an absolute basis.

Figure 3-14 illustrates average monthly energy usage for the DEC MyHER Interactive users (the blue line) and the same for the matched control group (the green line), along with the estimated impact and 90% confidence band (the orange lines and orange dashed lines) by month. Also shown as blue bars are counts of Interactive sign-ups.

Figure 3-14: DEC MyHER Interactive Portal Energy Impacts

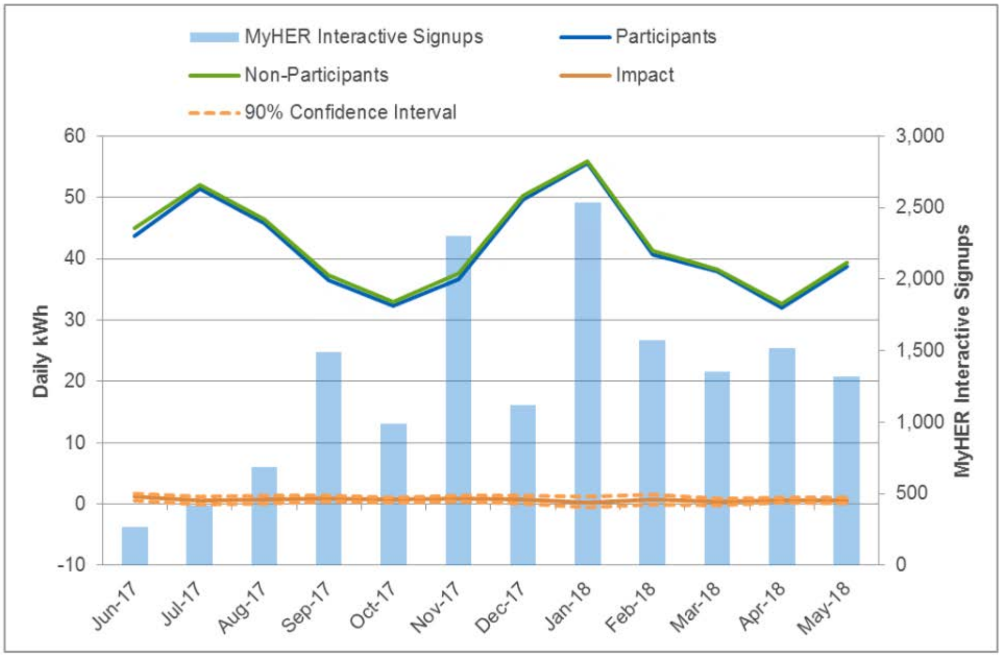


Table 3-27 provides impact model results for DEC, along with the margin of error for estimated impacts. The column at the right side of the table shows asterisks for those months where the energy savings are statistically significant at the 90% level of confidence.

Table 3-27: DEC MyHER Interactive Monthly Energy Savings

Month	Number of Participants Analyzed	MyHER Interactive Signups	Daily kWh			90% Conf. Interval		% Impact	
			Non-Participants	Participants	Impact				
Jun-17	4,993	270	44.9	43.8	1.2	0.6	1.8	2.6%	*
Jul-17	5,075	420	52.1	51.5	0.6	0.0	1.3	1.2%	
Aug-17	5,288	684	46.5	45.7	0.7	0.1	1.3	1.6%	*
Sep-17	5,880	1,490	37.3	36.5	0.9	0.4	1.3	2.3%	*
Oct-17	6,157	990	33.0	32.4	0.7	0.3	1.1	2.0%	*
Nov-17	6,976	2,301	37.6	36.7	0.9	0.5	1.4	2.5%	*
Dec-17	7,356	1,119	50.3	49.6	0.7	0.1	1.4	1.5%	*
Jan-18	8,491	2,537	56.0	55.6	0.3	-0.6	1.2	0.6%	
Feb-18	9,219	1,571	41.3	40.7	0.7	-0.1	1.5	1.6%	
Mar-18	9,910	1,351	38.3	37.9	0.4	-0.2	1.0	1.0%	
Apr-18	10,628	1,515	32.7	32.1	0.6	0.2	1.1	2.0%	*
May-18	11,101	1,316	39.4	38.8	0.6	0.1	1.1	1.6%	*
Average	**7,590**	**1,297**	**42.5**	**41.8**	**0.7**	**0.5**	**0.9**	**1.6%**	*

For DEP, the average monthly impact across the 12-month period June 2017 to May 2018 was 8.7 kWh, representing the uplift in savings that MyHER Interactive produces over and above the savings produced by the paper MyHER, but this estimate is not statistically significant at the 90% level of confidence. On a month-to-month basis, energy impacts were statistically significant only during June, which represented an impact of 4.2%, or 60 kWh on an absolute basis.

Figure 3-15 illustrates average monthly energy usage for the DEP MyHER Interactive users (the blue line) and the same for the matched control group (the green line), along with the estimated impact and 90% confidence band (the orange lines and orange dashed lines) by month. Also shown as blue bars are counts of Interactive sign-ups.

Table 3-28 provides impact model results for DEP, along with the margin of error for estimated impacts. The column at the right side of the table shows asterisks for those months where the energy savings are statistically significant at the 90% level of confidence. Impacts for DEP were only significant for June 2016, but not for the remaining months or for the year June 2017 through May 2018 overall.

Figure 3-15: DEP MyHER Interactive Portal Energy Impacts

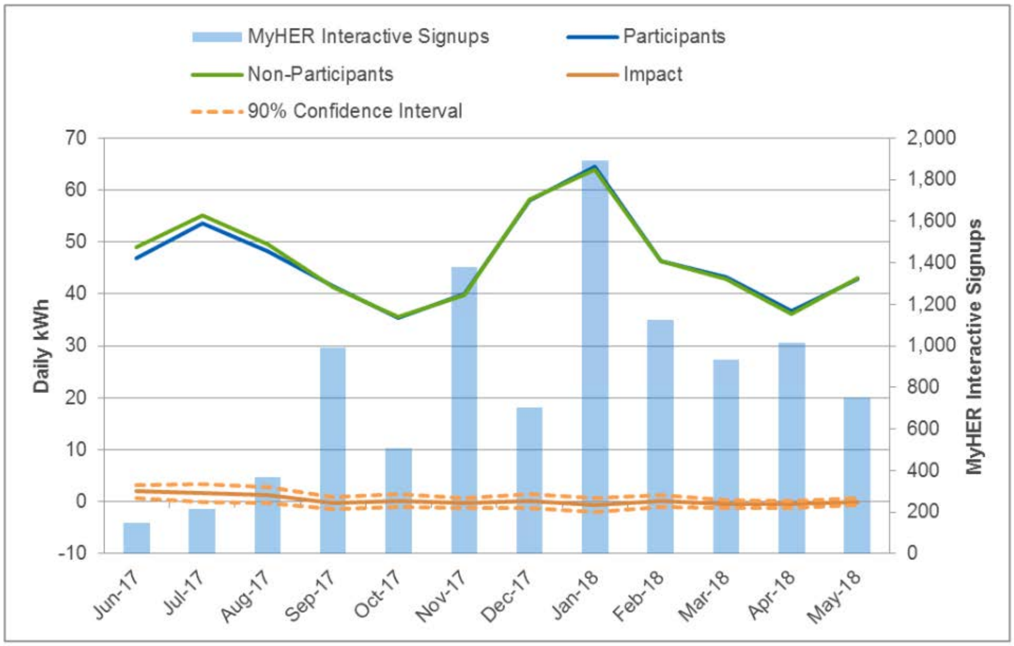


Table 3-28: DEP MyHER Interactive Monthly Energy Savings

Month	Number of Participants Analyzed	MyHER Interactive Signups	Daily kWh			90% Conf. Interval		% Impact
			Non-Participants	Participants	Impact			
Jun-17	494	150	48.9	46.9	2.0	0.8	3.3	4.2% *
Jul-17	505	213	55.2	53.5	1.6	-0.1	3.4	3.0%
Aug-17	535	369	49.6	48.3	1.3	-0.2	2.8	2.6%
Sep-17	631	992	41.3	41.5	-0.2	-1.3	0.9	-0.5%
Oct-17	677	508	35.6	35.5	0.2	-1.1	1.4	0.5%
Nov-17	800	1,381	39.8	40.0	-0.2	-1.2	0.8	-0.5%
Dec-17	853	703	58.2	58.1	0.2	-1.2	1.5	0.3%
Jan-18	1,960	1,894	63.9	64.5	-0.6	-2.0	0.7	-1.0%
Feb-18	2,625	1,127	46.3	46.2	0.1	-1.1	1.2	0.2%
Mar-18	3,262	934	42.8	43.3	-0.4	-1.2	0.3	-1.0%
Apr-18	3,900	1,015	36.3	36.8	-0.5	-1.1	0.1	-1.4%
May-18	4,286	754	43.0	43.0	0.0	-0.6	0.7	0.0%
Average	**1,711**	**837**	**46.7**	**46.5**	**0.3**	**-0.6**	**1.1**	**0.6%**

Nexant concludes that the DEC MyHER Interactive portal succeeded in generating additional statistically significant savings during much of the evaluation period from June 2017 to May

2018. The DEP MyHER Interactive portal only achieved additional statistically significant savings in the evaluation period during June 2017.

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.

MyHER programs also demonstrate an apparent maturation effect, typically on the order of 1-2 years. If Duke Energy continues to consistently introduce new cohorts to the program, program management should generally expect the newest cohorts to underperform relative to the established cohorts. Currently, 15% of DEC and 19% of DEP program participants should be considered as not fully mature.

Additionally, the findings from this evaluation suggest that savings of fully mature cohorts may eventually plateau or degrade over time – the oldest DEC cohort is in its 8th year on the program and displays impacts comparable to other cohorts that are in their second or third year on the program.

We find that MyHER also causes an uplift in participation in other energy efficiency programs. We have deducted the energy savings associated with that uplift so that Duke Energy does not claim the delivery of energy reductions associated with that uplift twice – those energy savings have already been claimed by those energy efficiency programs. This uplift in energy efficiency program participation means that MyHER is delivering on its secondary goal to encourage participation in other programs. We also find that the Interactive web portal has begun to show statistically significant energy savings in DEC, but not yet in DEP.

Nexant provides the following recommendations for Duke Energy's consideration:

- **Continue the commitment to simultaneous control and treatment assignment.** New assignments to treatment and control groups must be simultaneous and Tendril and Duke Energy should work to add all newly assigned treatment and control groups to their respective statuses in a single billing month, to the extent that is technically feasible.
- **Continue the practice of making assignments of new accounts to MyHER treatment and control groups once a year, or at most, twice a year.** The numbers of Duke Energy customers becoming eligible for the program each year do not facilitate more frequent assignments. This is due to the fact that sufficient numbers of customers must be set aside for the control group each time a group of customers is assigned to treatment in order for the evaluator to be able to measure the energy savings delivered by the new cohort.
- **Continue to drive engagement with the Interactive Portal.** MyHER Interactive's ability to deliver measurable energy savings is on the rise, as shown by this evaluation in comparison to the prior DEC evaluation, as well as the MyHER evaluations for other Duke Energy jurisdictions completed in the past year. We recommend that Duke Energy continue to drive more MyHER participants to the portal.

4 Process Evaluation

This section presents the results of process evaluation activities including in-depth interviews with Duke Energy and implementation staff and surveys 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 given to MyHER recipients 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, their use of MyHER Interactive, 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 of a random sample of households selected to receive MyHER reports as well as surveys of a random sample of control group households.

Nexant deployed the household surveys using a mixed-mode survey measurement protocol, the activities associated with which are summarized in Table 4-1 and Table 4-2. In this protocol, customers were contacted by letter on Duke Energy stationery (to assure recipients of the legitimacy 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 two 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 a toll-free telephone number to complete the survey by telephone. Table 4-1 shows that 337[8] DEC treatment customers and 211 DEC control customers completed the survey, totaling 548 responses from DEC recipients. Two samples of

[8] 337 total DEC treatment respondents is the sum of 153 and 184 DEC completes by treatment sample.

treatment customers were used to accommodate an expanded set of questions used for comparison with control customers. A treatment-only survey was sent to a second sample of treatment customers that only contained questions specific to the MyHER experience. This approach to using a second treatment-only instrument was taken to prevent the treatment version of the survey from becoming too long. Among the 337 DEC treatment customers that completed the survey, 153 were in the sample that received the treatment-only survey and 184 were in the sample that received the primary instrument designed to compare the responses of treatment and control customers. A total of 211 DEC control customers completed the survey. By state, 420 DEC respondents are located in North Carolina and 128 DEC respondents are located in South Carolina.

Table 4-1: Summary of Process Evaluation Activities - DEC

Population	Approach	Population	Sample		Confidence/Precision	
			Expected	**Actual**	**Expected**	**Actual**
Program management and implementation	In-depth interviews	~10	2-5	4	Not Applicable	Not Applicable
Treatment group households; Treatment only instrument	Mixed-mode; mail, web, and phone	~1.4 M	188	153	90/6	90/6.7
Treatment group households; Primary instrument	Mixed-mode; mail, web, and phone	~1.4 M	188	184	90/6	90/6.0
Control group households; Primary instrument	Mixed-mode; mail, web, and phone	~133,000	188	211	90/6	90/5.7
Total Responses			**564**	**548**		

Table 4-2 shows that a total of 539 DEP customers responded to the survey. The DEP survey design was identical to that of DEC, with two treatment samples receiving surveys; one sample received surveys with only treatment-related questions, and the other sample of treatment customers received another survey with questions designed to compare the responses of treatment and control customers. A total of 192 DEP control customers completed the survey, while 171 DEP treatment customers completed the treatment-only survey, and 176 DEP treatment customers completed the primary comparison survey. By state, 473 DEP respondents reside in North Carolina and 29 DEP respondents reside in South Carolina.

Table 4-2: Summary of Process Evaluation Activities - DEP

Population	Approach	Population	Sample		Confidence/Precision	
			Expected	Actual	Expected	Actual
Program management and implementation	In-depth interviews	~10	2-5	4	Not Applicable	Not Applicable
Treatment group households; Treatment only instrument	Mixed-mode; mail, web, and phone	~842,000	186	171	90/06	90/6.3
Treatment group households; Primary instrument	Mixed-mode; mail, web, and phone	~842,000	186	176	90/06	90/6.2
Control group households; Primary instrument	Mixed-mode; mail, web, and phone	~117,000	186	192	90/06	90/5.9
Total Responses			**558**	**539**		

Nexant's survey instruments included demographic questions to support comparisons of the treatment and control respondents as well as to support overall comparisons to the jurisdiction's territory. We present summaries of the responses to the demographic questions in Section 4.2, after the summaries of the responses to the survey questions on customer attitudes, energy usage behaviors, energy-savings actions and purchases/investments, and experience with the MyHER program.

4.1.1.1 Interviews

Nexant conducted interviews with key contacts at Duke Energy and Tendril. The interviews built upon information obtained during previous evaluations of the Duke Energy MyHER program in multiple jurisdictions. The central objectives of the interviews were to understand program operations and the main activities required to develop and distribute the MyHER reports to DEP and DEC customers, as well as to understand any developments or enhancements in program delivery.

4.1.1.2 Household Surveys

Both treatment and control groups were surveyed. Treatment households were surveyed as two groups that received different surveys: The first group's survey included questions about the respondents' 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 second treatment group and control group surveys were identical, and excluded questions about the information and utility of the MyHER reports, but included identical questions on the other aspects to facilitate comparison with each other, as well as to the first 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 communications, service, and efficiency options;
- Barriers to energy saving behaviors and purchases; 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 - DEC

We mailed 553 letters to randomly selected residential customers in the treatment group and 553 letters to the randomly selected residential customers in the control group for the primary survey. We also mailed 553 letters to the treatment customers for the treatment-only survey. The surveys were completed by a total of 337 treatment households (across both surveys) and 211 control households, representing a an overall treatment group response rate of 30% for DEC and a control group response rate of 38%. More than half (69% of the treatment group and 66% of the control group) of the surveys were completed online. Table 4-3 summarizes the treatment and control group survey dispositions in DEC.

Table 4-3: Survey Disposition - DEC

Mode	Treatment		Control	
	Count	Percent	Count	Percent
Completes by Mode				
Web-based Survey	232	69%	140	66%
Mail/Paper Survey	88	26%	58	27%
Inbound Phone Survey	17	5%	13	6%
Total Completes	**337**	**100%**	**211**	**100%**

Table 4-4 presents DEC response rates by state. Higher response rates are observed in both North and South Carolina for control customers relative to treatment customers. In North Carolina, 30% of treatment customers invited to take the survey completed it, as compared to a

36% response rate for control customers in North Carolina. South Carolina response rates were a bit higher: 31% of treatment customers in South Carolina and 45% of control customers in South Carolina completed the survey.

Table 4-4: Response Rates by State and Treatment Condition - DEC

State	Treatment			Control		
	Sampled	Completed	Response Rate	Sampled	Completed	Response Rate
North Carolina	866	262	30%	435	158	36%
South Carolina	240	75	31%	118	53	45%
Total	**1,106**	**337**	**30%**	**553**	**211**	**38%**

Survey Disposition - DEP

We mailed 552 letters to randomly selected residential customers in the treatment group and 552 letters to the randomly selected residential customers in the control group for the primary survey. We also mailed 552 letters to the treatment customers for the treatment-only survey. The surveys were completed by 347 treatment households (across both surveys) and 192 control households, representing a treatment group response rate of 31% and a control group response rate of 35%. More than half (63% of the treatment group and 61% of the control group) of the DEP surveys were completed online. Table 4-5 outlines the treatment and control group survey dispositions in DEP.

Table 4-5: Survey Disposition - DEP

Mode	Treatment		Control	
	Count	Percent	Count	Percent
Completes by Mode				
Web-based Survey	220	63%	117	61%
Mail/Paper Survey	104	30%	67	35%
Inbound Phone Survey	23	7%	8	4%
Total Completes	**347**	**100%**	**192**	**100%**

Table 4-6 summarizes DEP response rates by state and treatment condition. In North Carolina, 32% of treatment customers invited to take the survey completed it, as compared to a 35% response rate for control customers in North Carolina. South Carolina DEP response rates were on the whole a bit lower: 29% of treatment customers in South Carolina and 32% of control customers in South Carolina completed the survey.

Table 4-6: Response Rates by State and Treatment Condition - DEP

State	Treatment			Control		
	Sampled	Completed	Response Rate	Sampled	Completed	Response Rate
North Carolina	976	310	32%	462	163	35%
South Carolina	128	37	29%	90	29	32%
Total	**1,104**	**347**	**31%**	**552**	**192**	**35%**

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

As in other Duke Energy jurisdictions, MyHER at DEP and DEC is managed primarily through a core team of three Duke Energy staff members: a Manager of Behavioral Programs with oversight of residential behavioral programs, a Program Manager in charge of the day-to-day operations of the MyHER program, and a Data Analyst that is responsible for the substantial data tracking and cleaning tasks required to support the contracted implementation team, as well as internal program reporting to Duke Energy management.

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, a Quality Control Engineer, an "Ask-the-Expert" technical writer, 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, and the timing of when reports are mailed. Tendril's key performance indicators (KPIs) include in-home dates for each batch as well as the percentage of treatment customers actually treated.

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's demand response and energy efficiency 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 as soon as possible after billing data is received, 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 each month of the year.

4.2.1.1 MyHER Production

During the period of time under study by this evaluation, MyHERs were mailed out to DEP and DEC customers on paper through the U.S. Mail service about eight times a year, where the mailing gaps generally occurred in January, April, September, and December. During the eight U.S. Mail treatment months, the reports are generated twice per week, a cadence that is designed to facilitate meeting one of Tendril's key performance indicators: that MyHERs arrive at the customers' homes at the cycle's mid-point (though, ideally, as soon as possible after the bill), so as to make the information presentment as useful and timely as possible. Additionally, any customer that has provided Duke Energy with their email address also receives their report by email, and in fact, MyHER reports are generated and emailed to those customers monthly, 12 times a year, while they continue to receive paper reports 8 times a year.[9]

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 each afternoon, five times a week, to Tendril. Once the data has been received, production proceeds according to the following process, twice a week[10]: Tendril runs report production and conducts quality control checks. Then a flat file containing all the data from the reports in addition to drafts of every report (in PDF format) are sent to Duke Energy for an independent 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, Tendril emails eHERs on the specified day, and then commences the process of reporting the printing, mailing, and emailing to Duke Energy. There have been issues, however, in the iterative process of reconciling customer email addresses between Duke Energy and Tendril that has resulted in the loss of updated customer emails. There is interest in automating the email update process, but in the meantime in order to avoid further problems, Duke Energy is simply sending Tendril updates quarterly.

This production chain moves quickly: once Tendril generates a batch of reports, the time elapsed until transfer to the printhouse is generally 3-4 hours when all processes are completed according to plan. This timeframe has become the norm, but when quality control problems emerge, that elapsed time can increase significantly. 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 something that takes dedicated effort to achieve.

Prior MyHER process evaluations in other Duke Energy jurisdictions where MyHER is also implemented found that this fast-moving process has seen improvements over time through the adoption of various changes: recently, these have been best characterized by an increased attention to developing procedures and schedules for a number of elements of the MyHER production process. These elements include the Duke Energy product request list, new quality

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[9] Duke Energy will cease delivery of paper MyHER reports, and only send email reports, if the customer requests them to do so.

[10] During the months where only eHERs are produced, reports are generated in one batch per week, rather than two.

control processes at Tendril, and free form text (FFT) content development, as examples. These changes continue to deliver improvements in the number of problems found during report batch quality control checks, though Tendril continues to have some difficulty dealing with last minute requests from Duke Energy. Additionally, Tendril has implemented a number of back office process enhancements in the past year, such as migrating their computational platform to Amazon Web Services (AWS), providing a pre-promotion (i.e., draft) platform to enable Duke Energy staff to review draft PDF reports prior to promoting or finalizing them, and converting their email HER reports to Hypertext Markup Language (HTML) format which provides greater responsiveness and flexibility to Tendril operational staff.

4.2.1.2 Quality Control

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. 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.

In the past, these checks have proven to be crucial as they occasionally revealed significant production problems, which were subsequently reviewed in Tendril's governance sessions with Duke Energy. This visibility has typically resulted in issue resolution on a going-forward basis.

Both Duke Energy and Tendril staff report that the incidence of significant production problems has also been dramatically reduced since Tendril implemented quality control automation. Issues that surfaced during this evaluation period were small in scope, and infrequent. In 6 months, roughly 20 incidents were identified by Duke Energy that required Tendril to remove errors it had missed in their initial round of quality control. Tendril's automated quality control process is described as follows, recalling that customer data is transferred to Tendril daily:

- Tendril pulls the Duke Energy billing data into a database (Amazon Redshift; part of the AWS suite) and organizes it in a way that allows it to be fed into the HERs. The HERs are then generated and rendered;
- The QC protocol, which is a set of SQL queries against the data, then runs. This process produces output (presented in Amazon S3; another part of the AWS suite) that reports the results of the checks, indicating the reports that were incorrectly created. Postfiltering is then done for the incorrect reports;
- Tendril staff execute visual checks to be sure nothing noticeable or significant has slipped through to final report presentment; and
- An approved file is then sent to Duke Energy, along with about 100 samples of both paper and electronic HERs.

This automated process has the added benefit of being able to be managed by one person, which has significantly reduced the problems that the “all hands on deck” approach to executing report production and quality control presented in the past.

Prior evaluations of MyHER revealed that some program processes could benefit from improved quality control performance. Improved quality control in these areas can reduce the risk associated with running a program with processes that too often fail quality control checks. Such issues present timing risks (reports may not be sent out on time), customer service risk (reports may be sent out with problems if problems someday are missed), and risk to the overall success of the program (if the QC process is overburdened with detecting too many problems, it can become an overly-leveraged component of program operations). Interviews for this evaluation revealed continued improvement since the prior DEC and DEP evaluations in terms of frequency and significance of issues detected by Duke Energy’s quality control processes.

Tendril is currently implementing a new production platform, the Home Energy Reporting Service (HOMERS), that will allow for the production of reports for multiple billing cycles at once, which will dramatically improve the production process by, notably, eliminating what are referred to as “Batch 1” problems, which are related to the relatively large number of reports produced for the first cycle of the month. Data transfers to Duke will contain much smaller and consistent batch sizes. Additionally, this new platform allows for the continuous importation of customer usage data and production of reports. This will make preventing problems easier because it allows the QC software to be programmed in a way that can verify the proper execution of customer segmentation protocols, as well as larger scale descriptive analyses at a frequency chosen by Tendril, as opposed to having to wait for the entire batch run, as is the case with the legacy system. The development of this new platform is currently near completion at Tendril, and is expected to not only detect emergent problems, but also help prevent detected errors from recurring.

The improvements described above are likely a function of the continuation of Duke Energy and Tendril’s collaborative activities for program success. Duke Energy and Tendril staff join for weekly status meetings, monthly operations meetings, and quarterly governance meetings. These meetings provide a venue for shared brainstorming and roadmapping activities and the ongoing maintenance of a product request list for Tendril. Tendril has additionally commissioned an internal HER Improvement Team with the mandate to make consistent progress on the product request list. This team meets quarterly to reassess the feasibility of each of the list’s items (currently numbering about 25) and reprioritize these items, as needed, based on the priorities Duke Energy has expressed in collaborative meetings. Making progress on this list, for which Tendril produces quarterly reports, has been made a priority by Duke Energy and has resulted in the above described attention in meetings. In general, this prioritization has resulted in 3 items on this list being accomplished in the last quarter.

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 production problems, when they occur, usually occur following changes to the report or report cycle process. However, our interviewees also recognized that a strength of Tendril lies in their willingness to dive deep into details and processes to solve problems that may only affect a relatively few number of customers, and to go the extra mile to help address problems that in fact may have originated on the Duke Energy side. Interviews for this evaluation additionally reveal that the Tendril operations team has stabilized in terms of staffing, and that Tendril has added a quality control engineer to program staff. Tendril has also implemented a “Batch 0” strategy where the first batch of reports following any changes to the report is produced not for distribution, but only for quality control purposes, which is reviewed prior to the production of any live batches of reports. This procedural innovation allows Tendril to support Duke Energy’s interest in fine-tuning any new features or changes to reports and to facilitate early detection of unexpected problems. Generally, both Duke Energy and Tendril staff continue to speak highly of the collaborative partnership shared by Duke Energy and Tendril in running the MyHER program and of the open lines of communication that exist and function very well at all levels of program and corporate management.

4.2.1.3 MyHER Components

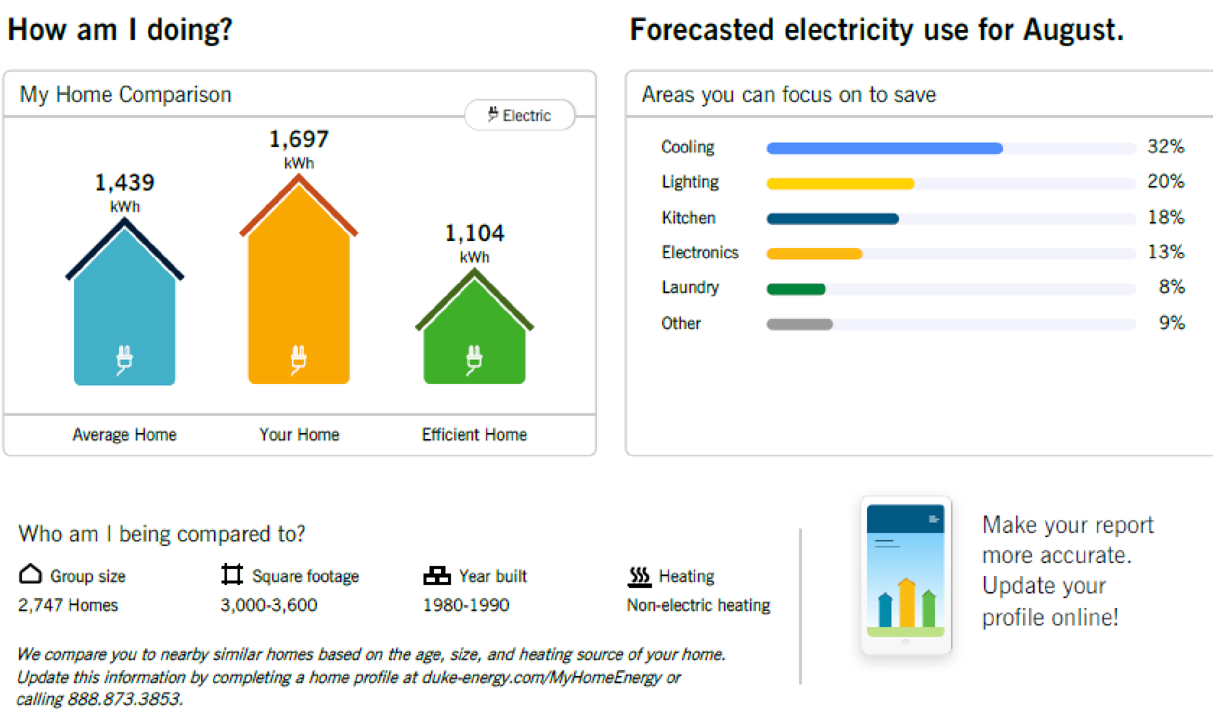
MyHER reports include several key elements that are customized each month: bar charts, tips, a trend chart, and messages. Duke Energy and Tendril implemented a general refresh of the MyHER report template in 2017, designed to improve readability and to keep the presentation fresh in the eyes of recipients. Graphics were updated and images were added to some modules (described below) that were previously text-only. A new module (also described below) was added that presents usage disaggregated by end use type. Overall, recipient response to this redesign was positive, though program staff did note some difficulty recipients had with interpreting the disaggregated end use presentation.

The front page includes two bar chart graphics. The first chart is a vertical bar chart (stylized in the shape of homes) comparing the subject home to the average and most efficient homes for an assigned cluster or “neighborhood” of similar homes. 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; 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).

An infographic beneath the bar charts provides the size of the group of comparison homes, the assumed heating type, the approximate square footage, and the approximate age of the similar homes to which the customer’s home is being compared. According to MyHER staff, a common reason for customer phone calls relating to MyHERs is simply the customer’s desire to correct 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 has assigned a home to 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.

To the right of the vertical bar chart is a horizontal bar chart that illustrates Tendril's forecast for subject home's electricity usage in the next month, disaggregated by end use type. This chart is intended to provide actionable insights to each customer as to where they might direct their energy savings efforts to make the greatest impact in their energy usage in the month ahead. Tendril staff continues to fine-tune the disaggregation in these forecasts, as a response to customer concerns about the accuracy of this component of the report. To help improve their accuracy, Duke Energy and Tendril continue to push customers to the Interactive portal where they are able to further customize or correct information about their homes that may impact the accuracy of the disaggregated usage forecasts.

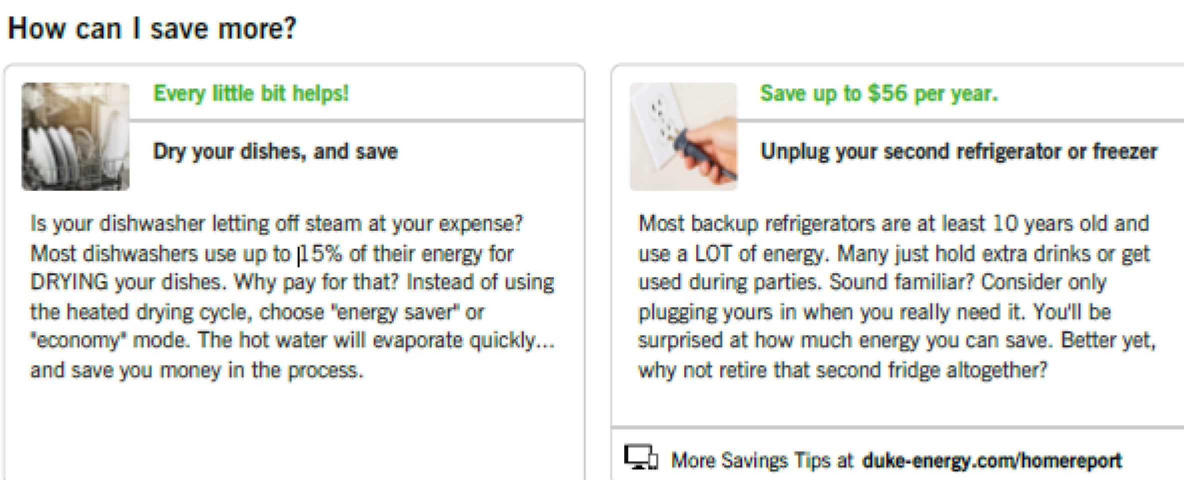
Figure 4-1: MyHER Electricity Usage Comparison and Forecasted Energy Use Bar Charts



In addition to the comparison graph, each MyHER includes a set of customized action tips under the heading "How can I save more?" (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. These tips often are presented with monetary values (appropriately scaled to each customer receiving the tip) that estimate the bill savings that the customer might expect to realize by implementing the action tip.

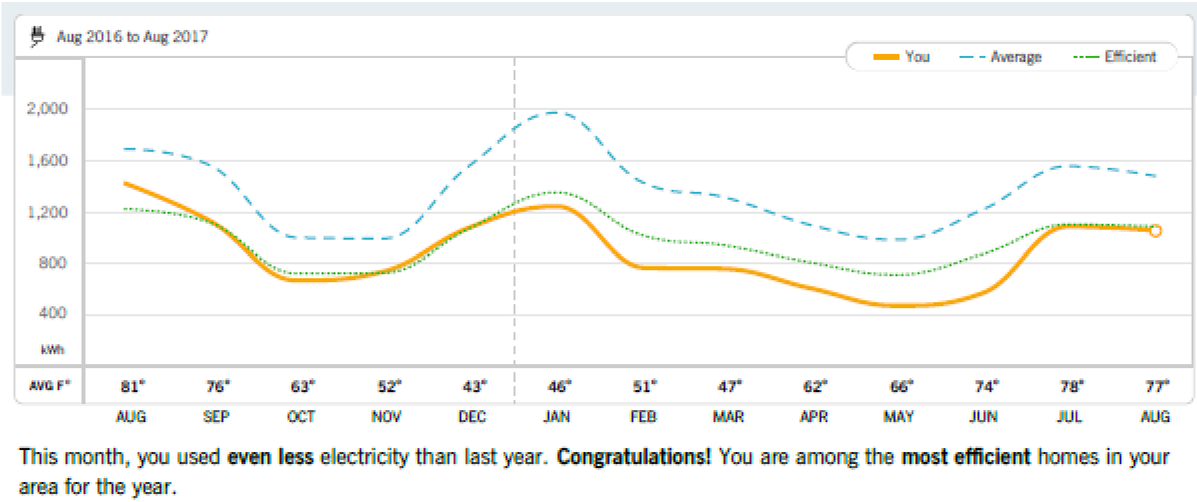
The Duke Energy MyHER program has a large library of action tips, numbering between 80 and 90. Half of them were initially developed internally at Duke Energy, and Tendril's "Ask the Expert" technical writer has continued to add to them over time. The large library has enabled the program to avoid any repeats to customers over lengthy periods of time (up to 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, and this management sometimes results in the removal of tips that staff no longer deem relevant. Duke Energy validates the monetary values estimated by Tendril for each tip action for reasonableness. Duke Energy and Tendril have identified an opportunity for improvement with action tips in developing additional targeting algorithms for tip display. For example, more sophisticated targeting could be developed that cross-references age of home with relevancy for certain actions (e.g., only display a tip to install new windows to customers with older homes). This targeting of tips in this section are developing into “smart actions”, and have been established as a priority at both Duke Energy and Tendril. Tendril has made progress on, converting about 20% of all action tips to smart actions—that is, they are targeted to the appropriate audience. However, not all of the actions and tips in this section are amenable to being used in this fashion, as there is significant variability in their applicability: some tips are only applicable to a few segments, while others have broader customer applicability and have lower capacity to be used as a “targeted” action.

Figure 4-2: MyHER Tips on Saving Money and Energy



The back page of the MyHER reports 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 13-month Trend Chart



The back page of the MyHER report also reserves space for Duke Energy to include seasonal and programmatic messaging, referred to by program staff as free form text (FFT), that reflects Duke Energy-specific communication objectives. Ensuring that FFT messages are relevant and do not conflict with the actions or tips provided on the front page requires ongoing coordination and monitoring. Broad targeting efforts taking advantage of seasonal relevance, program eligibility, and the presence of end uses 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. Occasionally the action text on the front page will be disabled to accommodate FFT messaging.

FFT messages are developed by the MyHER team in cooperation with Duke Energy's marketing and communications group. 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).

Establishing an FFT calendar early in each year and attempting to avoid last-minute changes to the messages each month has been challenging to implement. Last minute changes have been common due to changes during the course of the year to Duke Energy program promotions and incentive levels. 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. This feature of MyHER is relatively resource-intensive with a lengthy revision-review-approval process with numerous stakeholders accompanying most changes to FFT messages.

To help prevent last minute changes that characterized FFT production in the past, there was renewed focus and energy on prioritizing it as much as possible in 2018 at both Tendril and

Duke Energy. A product of this renewed energy is an FFT tool under development at Tendril. It will allow for faster and more accurate rendering of FFT messaging, as well as the ability for Duke Energy stakeholders to participate directly in the FFT creation and review process; it is being built as a “self-serve” tool. The implementation of such a tool, due for launch in early 2019, is expected to streamline the FFT process significantly.

Finally, the back page of the reports also provides contact information for the MyHER program at Duke Energy. 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 0.5% of MyHER treatment customers contact Duke Energy to opt-out. The rigorous quality control efforts described earlier have kept quality-related issues from ever reaching customers.

4.2.1.4 MyHER Interactive

Enrollment in MyHER Interactive is still relatively low. The most reliably successful enrollment generators are email campaigns, sweepstakes, and cross-promotion with the High Bill Alerts program. Envelope messaging has also been used, but is less successful. Email campaigns are a very successful enrollment generator because they can use personalized uniform resource locator PURLs (to enable clicking through to the Interactive screen where the customers’ account number is auto-populated in the registration process). Program staff revamped the content and graphics of the email campaign in 2018.

Duke Energy continues to prioritize enrollment in Interactive. However, enrollment in MyHER Interactive was not as strong as was hoped, so Tendril is developing a marketing plan to increase enrollments in 2019.

Additionally, Duke Energy has 6 product requests in with Tendril for the “User Profile” section of MyHER Interactive, so as to improve the quality of customer-provided data and in turn, improve clustering models, load disaggregation, the applicability of targeted tips, and other applications that use the data. Duke Energy also continues to roll out AMI meters to customers in the DEC and DEP service territories. With the completion of the AMI deployment, the granularity of customer data will increase, which will directly benefit those who enroll in MyHER Interactive. Currently, about 57% of Interactive customers have AMI meters. For these customers, their usage data is available on MyHER Interactive. However, there have been problems with the transfer of this data to Tendril, which has caused some customer data displays to be erroneous. To remedy this, Tendril is in the process of upgrading their data ingester[11]. Duke Energy and Tendril are considering ways to effectively utilize and meaningfully leverage AMI data.

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[11] Data ingestion refers to the process of importing, cleaning, and organizing large or complex sets of data for storage and/or analysis. Tendril’s upgraded data ingester will process AMI data from Duke Energy in a faster, more effective manner.

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. The bulk of quality control for Interactive is carried out by Tendril.

One opportunity for improvement exists in MyHER Interactive's limitation such that a Duke Energy account can only be associated with one email, and only one email may be associated with any account. Currently, Tendril is evaluating the feasibility of a number of solutions to this problem, which has caused issues for customers attempting to enroll. First, they are attempting to shorten the time it takes to archive emails of customers who leave the program (to disassociate the email from the account). Secondly, they are exploring the possibility of allowing more than one email to be associated with an account. Lastly, they may disable the requirement that login ID's be email addresses. These solutions should open up eligibility to accounts associated with homes in ownership transition, rental transition, and will allow those who own more than one home to have all of their homes associated with their Interactive account.

4.2.1.5 Other MyHER Plans to Further Improve Program Operations

Looking forward, Duke Energy and Tendril are also contemplating other program enhancements that are anticipated to further improve program performance and the customer experience with the program:

- Developing new content specific to shoulder month email MyHERs;
- The full HOMERS rollout;
- Revised service-level agreements (SLAs);
- Duke Energy app; and
- Self-comparisons of energy usage (as opposed to "neighborhood" comparisons).

4.2.2 Customer Surveys - DEC

The customer surveys included questions focused specifically on the experience of and satisfaction with the information provided in MyHERs and awareness of MyHER Interactive—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 Duke Energy, and services Duke Energy provides to help households manage their energy use;
- Levels of awareness of and interest in household energy use; motivations and perceived importance;
- Reported behavioral or equipment-based upgrades; and

- Barriers that prevent customers from undertaking energy savings actions.

4.2.2.1 Comparing Treatment and Control Responses - DEC

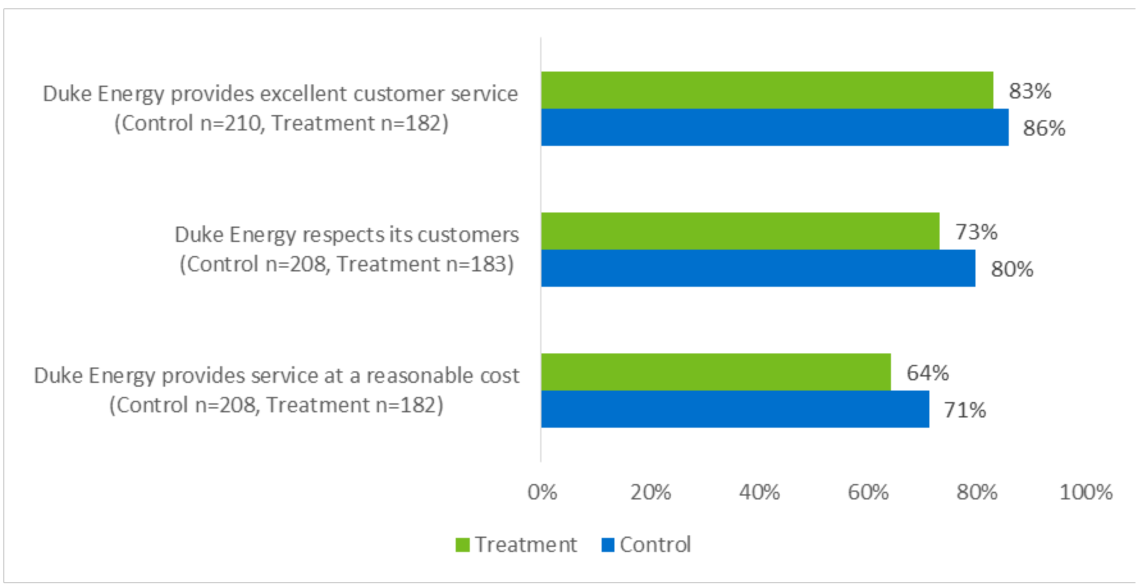
This section presents the results of survey questions asked of both treatment and control households in DEC and compares the response patterns. Statistically significant differences between treatment and control households are noted.

Duke Energy Customer Satisfaction

Both treatment and control groups' overall satisfaction with Duke Energy are high. Seventy-three percent of treatment customers and 78% of control customers are satisfied or very satisfied with Duke Energy as their electric supplier (rated 8 or higher on a 0-10 point scale); the difference is not statistically significant at the 90% level of confidence.

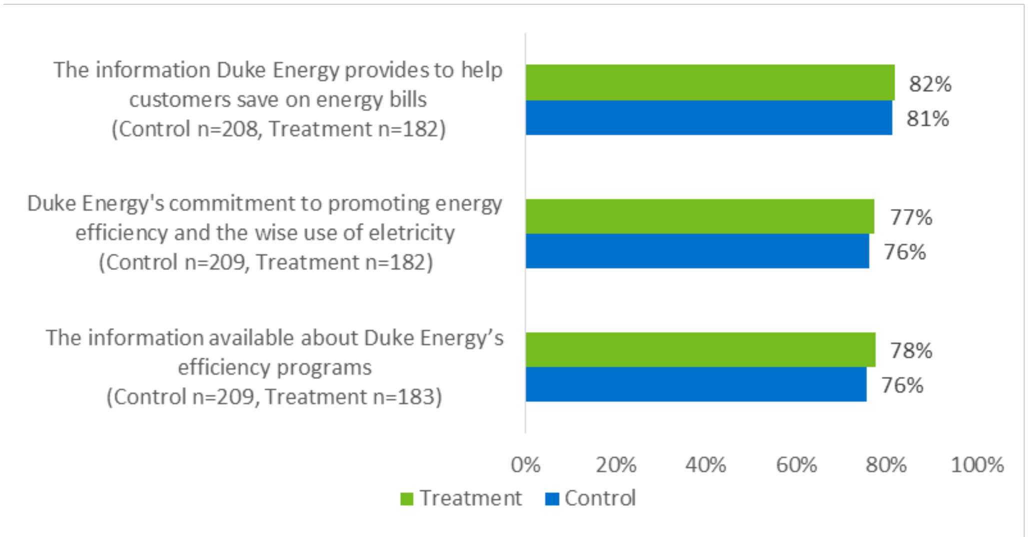
Control households rated Duke Energy higher on providing excellent customer service, respecting its customers, and providing service at a reasonable cost than treatment households. The differences between the control and treatment group are not statistically significant (Figure 4-4). MyHER does not result in a measurable change in stated customer satisfaction with Duke Energy in DEC.

Figure 4-4: Satisfaction with Various Aspects of Customer Service - DEC



Additionally, the differences between treatment and control customers with respect to satisfaction with the information available about Duke Energy's efficiency programs, the information Duke Energy provides to help customers save on energy bills, and Duke Energy's commitment to promoting energy efficiency and the wise use of electricity are not statistically significant (Figure 4-5), thus MyHER has not measurably changed customers' satisfaction with Duke Energy's promotion of energy efficiency at DEC.

Figure 4-5: Satisfaction with Energy Efficiency Offerings and Information - DEC



Engagement with Duke Energy's Website

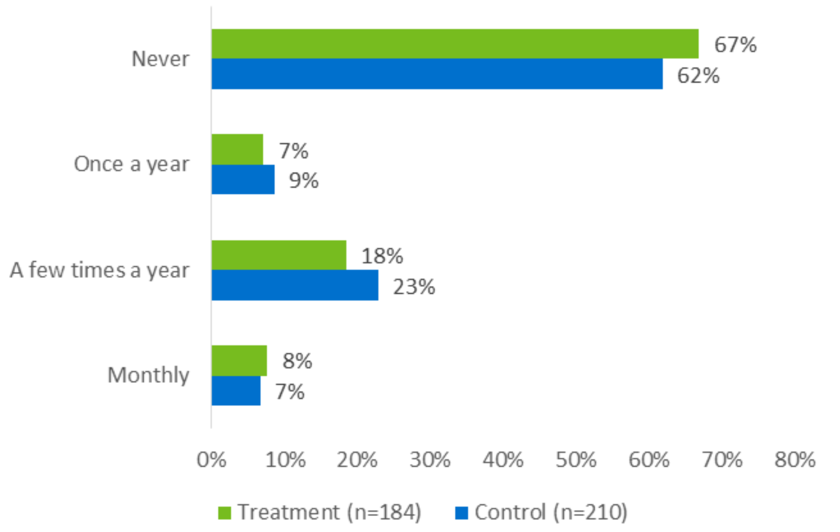
Both groups answered several questions about their use of the Duke Energy website, a proxy for overall engagement with information provided by the utility on energy efficiency and household energy use, and the results showed no significant differences. Table 4-5 shows that 36% of the treatment group and 37% of the control group reported they had never logged in to their Duke Energy accounts. Among those that had logged in, the most commonly reported purpose was to pay their bill.

Table 4-7: Use of Duke Energy Online Account - DEC

Online Account Activity	Treatment Group (n=180)	Control Group (n=204)
Never logged in	36%	37%
Pay my bill	36%	37%
Look for energy efficiency opportunities or ideas	16%	16%

As shown in Figure 4-6, control group households were more likely to report that they accessed the Duke Energy website to search for information about rebate programs, energy efficient products, or ways 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.

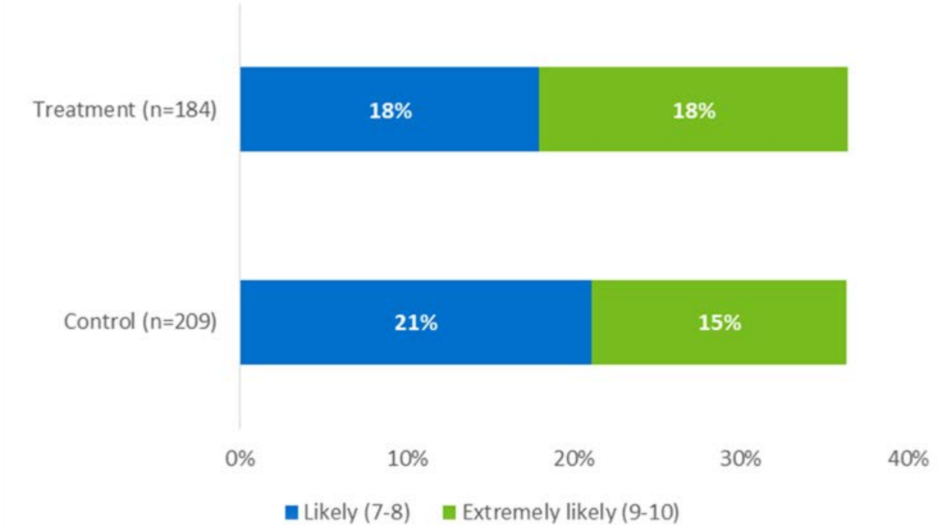
Figure 4-6: Frequency Accessing the Duke Energy Website to Search for Other Information - DEC



Thirty-six percent of control group and treatment group customers, respectively, reported they would be likely to check the Duke Energy website for information before purchasing major household equipment. The portion of respondents rating their likelihood a "7" or higher on an 11-point scale of likelihood is plotted in Figure 4-7. Overall, MyHER has not produced a measurable change in customer engagement with Duke Energy's standard online offerings (distinct from the online MyHER Interactive offering).

While we observe no effect on customer engagement with Duke Energy online resources attributable to MyHER, the survey responses across both treatment and control customers should be placed into context with their demographics. All survey respondents reside in single-family homes, since the MyHER program is only available to customers in single-family homes, so we should expect that the respondents of this survey should skew towards respondents who have attained a greater age than that might be expected of the general Duke Energy customer base. As we indeed show later in this section, the average age of respondents of this survey is older than what would be expected relative to U.S. Census estimates of the age distribution of the population in North and South Carolinas. About 43% of DEC treatment respondents are 65 years of age or older. About 47% of DEC control customers are included in that age bracket as well. This is in comparison to U.S. Census estimates that 16% of the population of the Carolinas falls into the same age bracket. Therefore, Duke Energy should interpret the responses of this survey as representing an older group of customers than their customer base overall. Residents of multi-family homes would expected to be younger, on average, and would be hypothesized to report higher rates of engagement with Duke Energy's online content.

Figure 4-7: Portion Likely to Check Duke Energy Website prior to Purchasing Major Home Equipment - DEC

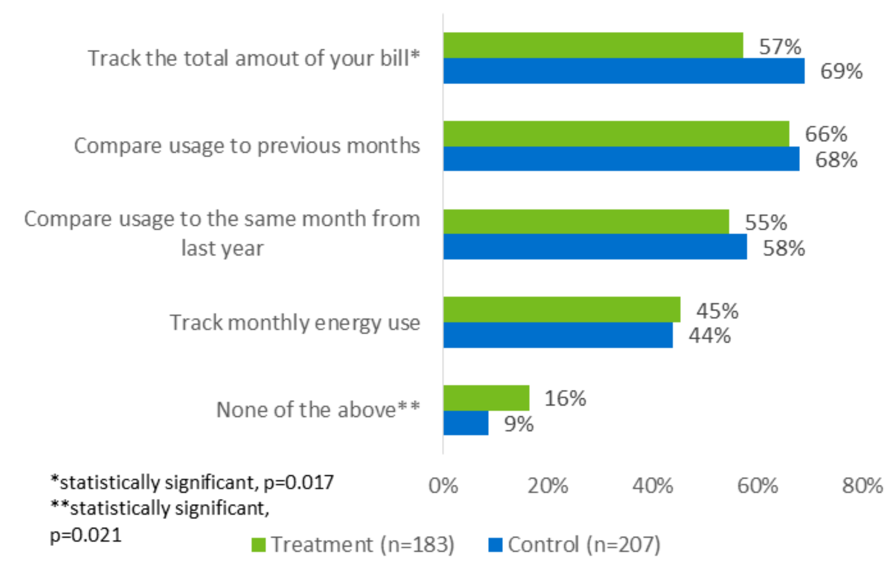


Reported Energy Saving Behaviors

Treatment customers were much more likely than control customers to report having undertaken behaviors to reduce household energy use or having made energy efficiency improvements to their home (73% to 63%; $p = .013$). Treatment and control customers track information (bills and usage) related to their household's energy usage in the following ways (Figure 4-8):

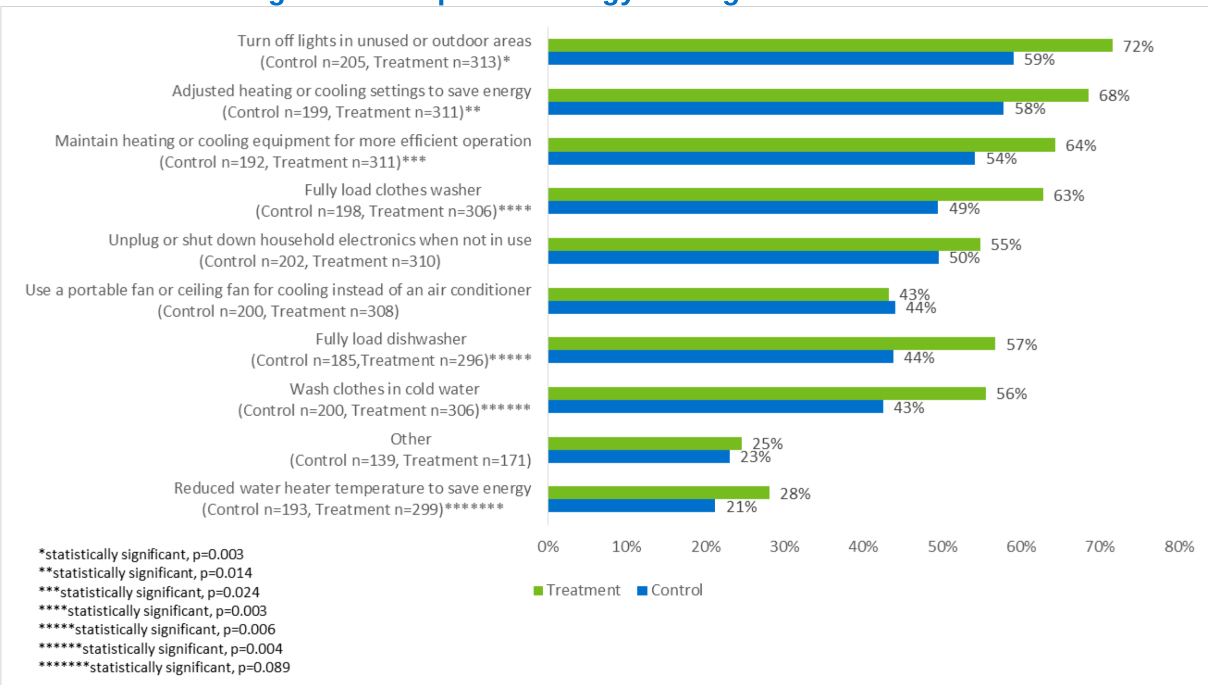
- Fifty-seven percent of the treatment customers and 69% of the control customers reported tracking the total amount of the bill. The difference is statistically significant at the 90% level of confidence.
- About two-thirds of respondents compared usage to previous months. The difference between the treatment and control groups is not statistically significant.
- More than half of respondents compare usage to the same month from last year, but the difference in responses here between treatment and control groups is not statistically significant at the 90% level of confidence.

Figure 4-8: "Which of the Following Do you Do with Regard to Your Household's Energy Use?" - DEC



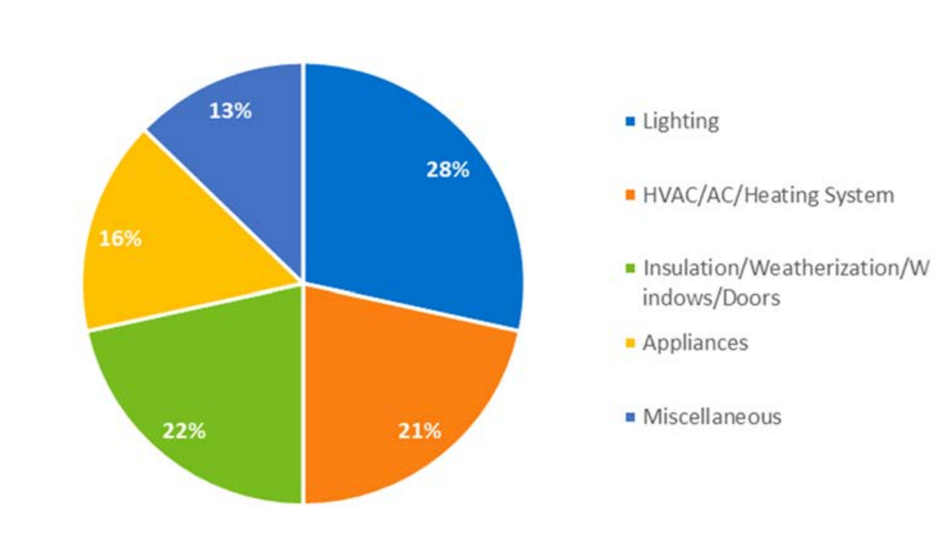
Treatment group respondents were significantly more likely to turn off lights in unused or outdoor areas, adjust heating or cooling setting to save energy, maintain heating or cooling equipment for more efficient operation, fully load clothes washer, fully load dishwasher, wash clothes in cold water, and reduce water heater temperature to save energy than the control group, as shown in Figure 4-9. These differences are statistically significant at the 90% level of confidence.

Figure 4-9: Reported Energy Saving Behaviors - DEC



Ninety-six respondents (treatment and control customers in total) reported other energy savings actions. Nexant categorized these actions and the results are shown in Figure 4-10. The most commonly reported action, mentioned by 29 respondents, pertains to lighting, such as switching to LED bulbs, etc.

Figure 4-10: Distribution of Other Energy Savings Behaviors - DEC



Reported Energy Efficiency Improvements Made

Respondents were provided with a list of energy efficiency improvements and asked if they had done each in the past year. The treatment group had a significantly higher percentage of customers reported having installed lighting with more energy efficient types than the control customers did (Table 4-8). None of the other differences were statistically significant at the 90% level of confidence.

Table 4-8: Portion Indicating They Had Made Each Energy Efficiency Upgrade - DEC

Upgrade	Control	Treatment
Install energy-efficient lighting (Control n=198, Treatment n=311)*	52%	60%
Purchase ENERGY STAR certified home electronic equipment (a television, for example) (Control n=187, Treatment n=298)	39%	43%
Install energy-efficient kitchen or laundry appliances (Control n=196, Treatment n=306)	34%	39%
Install energy-efficient heating/cooling equipment (Control n=196, Treatment n=302)	33%	34%
Install programmable thermostat or "smart" thermostat (Control n=197, Treatment n=307)	32%	34%
Caulk or weatherstrip (windows or doors) (Control n=194, Treatment n=307)	29%	36%
Install energy-efficient water heater (Control n=195, Treatment n=301)	26%	29%
Add insulation to attic, walls, or floors (Control n=197, Treatment n=301)	23%	23%
Replace windows or doors with more energy-efficient types (Control n=199, Treatment n=308)	20%	26%

*statistically significant, p=0.084

Behavior and Upgrade Category Variables

To examine broader patterns within the survey responses that cover many specific cases of energy saving behavior and upgrades, participant responses to the behavior and upgrade questions were combined into behavior vs. upgrade categories and were also combined into end-use categories. As shown in (Table 4-9), treatment group respondents were significantly more likely to engage in energy efficiency behaviors and improvements generally, and also undertook significantly more energy efficiency behaviors.

Table 4-9: Percent of Households That Have Undertaken Energy Efficiency Actions - DEC

Behaviors/Improvements	Treatment Group	Control Group
Any Energy Efficiency Behavior (Treatment n=314, Control n=206)*	73%	62%
Average Number of Behaviors**	5.13	4.24
Any Energy Efficiency Improvements (Treatment n=314, Control n=203)***	69%	61%
Average Number of Improvements	3.15	2.77

*statistically significant, p=0.009
**statistically significant, p=0.004
***statistically significant, p=0.046

Additionally, Table 4-10 shows the proportion of respondents that had undertaken at least one behavior or upgrade in each end use category. In six of the nine categories, treatment group members were significantly more likely to have undertaken at least one of these activities.

These results demonstrate that MyHERs have increased energy efficiency behaviors in treatment customers.

Table 4-10: Percent of Households That Had Undertaken Energy Efficiency Actions, by End Use Category - DEC

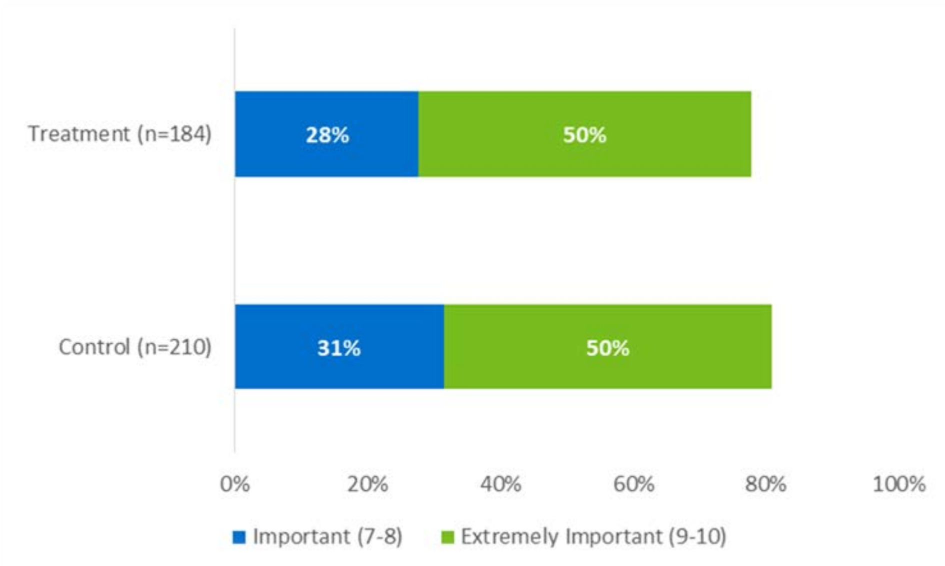
Behaviors/Improvements	Treatment Group	Control Group
Water Heating Behaviors and Upgrades (Treatment n=314, Control n=206)*	71%	61%
Water Heating Behaviors (Treatment n=314, Control n=204)**	71%	59%
Space Heating Behaviors and Upgrades (Treatment n=314, Control n=205)***	72%	62%
Space Heating Behaviors (Treatment n=314, Control n=205)****	72%	61%
Space Heating Upgrades (Treatment n=310, Control n=202)	45%	46%
Lighting Behaviors and Upgrades (Treatment n=314, Control n=206)*****	73%	61%
Electronics and Appliances Behaviors and Upgrades (Treatment n=314, Control n=205)******	68%	59%
Electronics and Appliances Upgrades (Treatment n=312, Control n=199)	52%	48%
Sealing and Insulation Behaviors and Upgrades (Treatment n=312, Control n=200)	47%	43%

*statistically significant, p=0.024
**statistically significant, p=0.007
***statistically significant, p=0.013
****statistically significant, p=0.009
*****statistically significant, p=0.005
******statistically significant, p=0.025

Customer Motivation and Awareness

The control group and treatment groups report similar levels of motivation for saving energy. Eighty-one percent of control customers indicated that knowing they are using energy wisely is “important” or “extremely important”, compared to 78% of treatment customers. This difference is not statistically significant (Figure 4-11).

Figure 4-11: "How Important Is It for You to Know if Your Household is Using Energy Wisely?" - DEC



Customers were asked to rate, on a scale of 0 to 10, the importance of various reasons 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 89% of treatment respondents and 89% of control respondents reported that saving money on their energy bills was "important" or "extremely important". Eighty-seven percent of control respondents and treatment respondents respectively indicated that "avoiding waste" was "important" or "extremely important" to them. Eighty-six percent of treatment customers and 83% of control customers reported that "conserving energy resources" was "important" or "extremely important". Eighty percent of treatment customers and control customers respectively reported that "helping the environment" was "important" or "extremely important". None of the differences between treatment and control groups are statistically significant. Figure 4-12 contains the frequency of responses to this question, shown as a percentage for both treatment and control groups.

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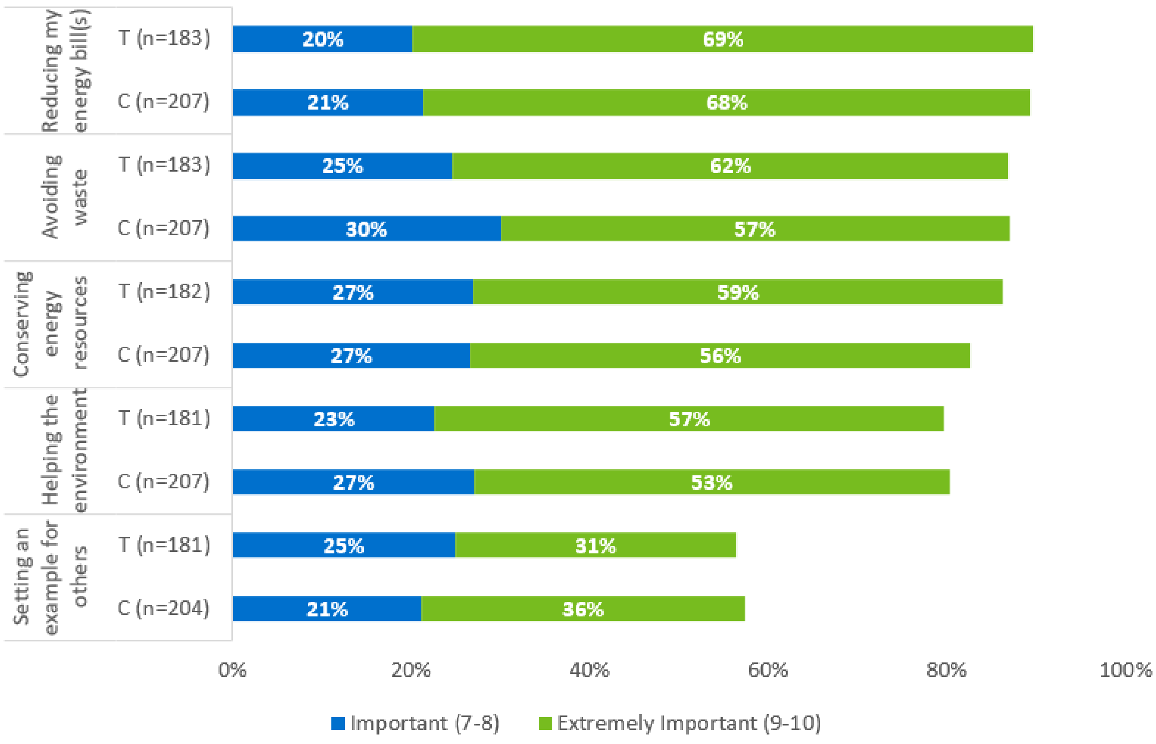
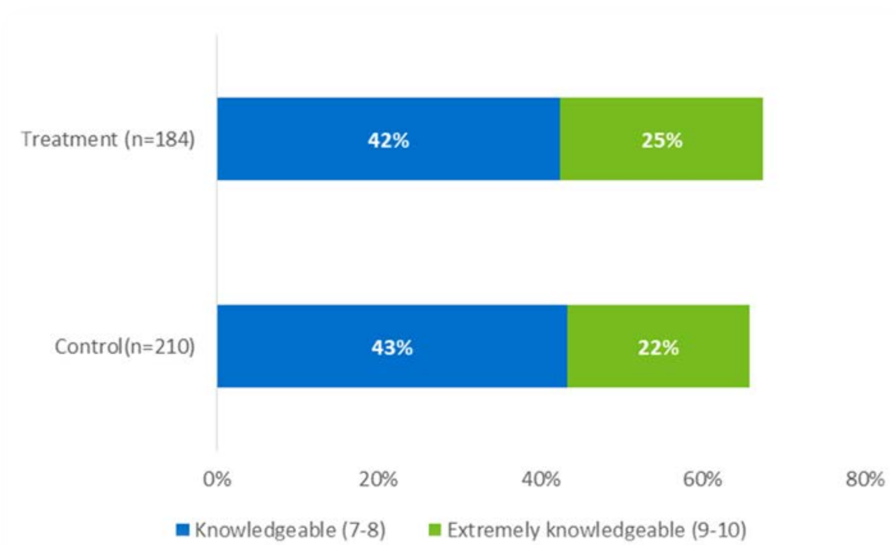
Figure 4-12: "Please Indicate How Important Each Statement Is to You" - DEC



As indicated by Figure 4-13, among treatment customers, 67% rated themselves above a seven on a 0-10 point scale of knowledgeability of ways to save energy, while 65% of control group customers rated themselves this way. The difference is not statistically significant at the 90% level of confidence.

Figure 4-13: "How Would You Rate Your Knowledge of the Different Ways You Can Save Energy in Your Home?" - DEC



Treatment respondents that took the treatment-only survey were asked how useful each MyHER feature was to their homes. A similar question was asked of both control group and treatment group respondents who took the primary survey rephrased to ask them how useful they *might expect* that information to be. Table 4-11 presents results of the portion rating each item a "7" or higher on an 11-point scale of the hypothetical usefulness from the control and treatment customers who took the primary survey, and Table 4-12 presents the comparison results between the actual usefulness of each item rated by treatment customers (treatment-only survey) and the hypothetical usefulness rated by control customers in the primary survey).[12]

The results from the hypothetical usefulness rating (Table 4-11) did not find statistically significant differences in expected usefulness of information that is found on MyHER reports. Comparisons between the responses of customers in the treatment-only survey and control customers in the primary survey show that treatment customers respond differently to questions about information presented in MyHERs if the questions are asked in the context of the actual MyHER reports, however the response patterns overall are similar – not much is seen by way of a significant separation between treatment and control customers in terms of usefulness of report content. However, there is one exception: Table 4-12 shows that control customers were significantly more likely to think that "Information about services and offers from Duke Energy" might be useful than treatment customers actually thought they were. This finding suggests that there may be an opportunity to improve the presentment of information in MyHERs about Duke Energy's services and offerings.

Table 4-11: Hypothetical Usefulness of HER Features Treatment and Control - DEC

HER Feature	Control Group_Primary Survey	Treatment Group_Primary Survey
Graphs that display your home's energy use over time	71% (n=204)	66% (n=181)
Information about services and offers from Duke Energy	67% (n=205)	65% (n=181)
Tips to help you save money and energy	67% (n=205)	72% (n=183)
Examples of the energy use associated with common household items	67% (n=203)	66% (n=182)
Your home's energy use compared to that of similar homes	57% (n=202)	60% (n=181)
Customized suggestions for your home	56% (n=200)	63% (n=180)

[12] The implementation of a treatment-only survey, in addition to a primary survey provided to both treatment and control customers, afforded an opportunity to test the responses of treatment customers to a question asking about a MyHER feature they have actually seen vs. asking generally about how useful the information is (outside of the context of MyHER). This test leads us to the conclusion that the way customers are asked about this question matters and we recommend that in future surveys, MyHER treatment customers see questions about report content placed specifically in the context of them having seen the content in their reports, as opposed to in the hypothetical.

Table 4-12: Actual Usefulness versus Hypothetical Usefulness of HER Features Treatment and Control - DEC

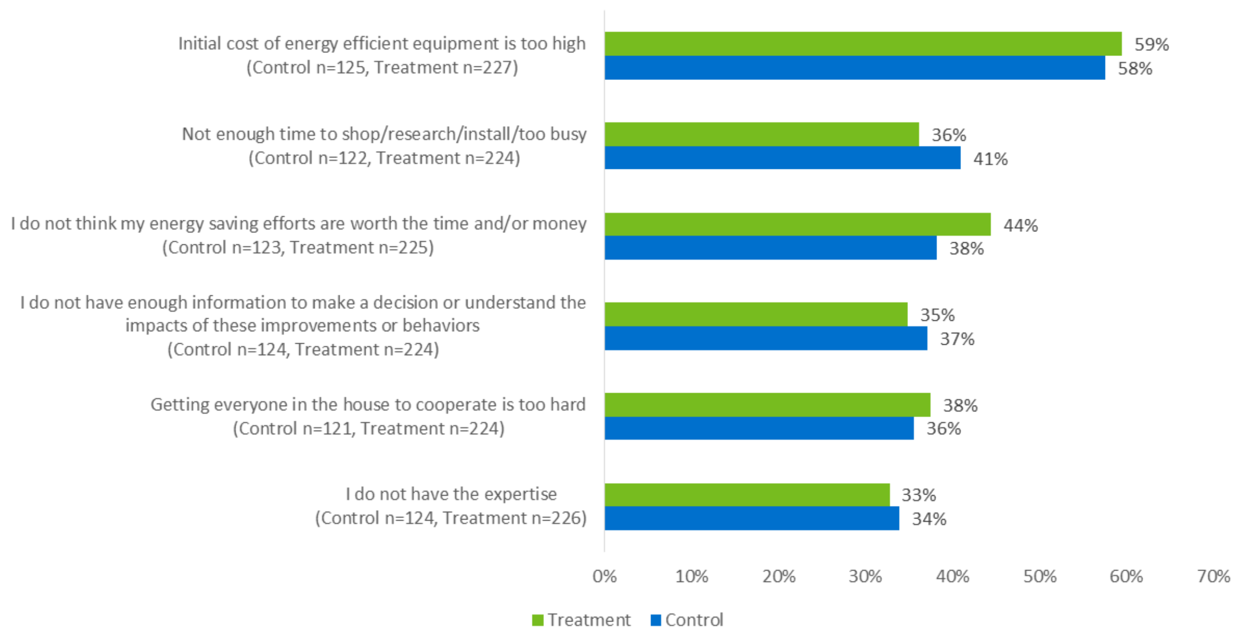
HER Feature	Control Group_Primary Survey	Treatment Group_Treatment Only Survey
Graphs that display your home's energy use over time	71% (n=204)	76% (n=135)
Information about services and offers from Duke Energy*	67% (n=205)	58% (n=134)
Tips to help you save money and energy	67% (n=205)	66% (n=135)
Examples of the energy use associated with common household items	67% (n=203)	64% (n=135)
Comparison to similar homes	57% (n=202)	53% (n=135)
Customized suggestions for your home	56% (n=200)	59% (n=134)

*statistically significant, p=0.089

Barriers to Customers Undertaking Energy Savings Actions

When asked the reasons why customers might not be able to save as much as energy as they would like, there were no statistically different response patterns between treatment and control customers, which indicates that MyHER is not making a measurable change in the potential barriers mentioned in this survey. The most commonly reported barrier is “the initial cost of energy efficient equipment is too high” (Figure 4-14): 59% of treatment respondents reported this as a barrier and 58% of control respondents did so as well. The least-commonly cited barrier was lack of expertise: 33% of treatment customers cited lack of expertise as a barrier as did 36% of control customers.

Figure 4-14: Barriers to Customers Undertaking Energy Savings Actions - DEC



Suggestions about Duke Energy Improving Service Offerings

The survey provided an open-ended question to elicit suggestions about Duke Energy improving its service offerings to help customers reduce energy use. Only 22% (119 of 548, treatment and control customers in total) offered suggestions, including sixteen who offered only appreciative comments. Among those offering suggestions for improvement, the most common request, mentioned by 42 of the 119 with suggestions, reflected a desire for more energy savings information, programs, free light bulbs, and more incentives:

- "*I would love to have a visit/walk through with someone who could look at our home and make suggestions*"
- "*Send free light bulbs"*
- *"Give rebates on appliances"*
- "*Continue to supply usage statistics*"
- "*Provide a smart device at the breaker box that would connect to your smartphone to tell you your energy consumption. Something real-time would be helpful. Then you would / could modify your daily activities real-time based on what you are seeing*"

Other comments centered on other suggestions, such as better communication and reducing price/providing senior and disability discounts. Nexant categorized these suggestions on the general basis of their content; the results are presented in Table 4-13.

Table 4-13: Suggestions about Duke Energy Improving Service Offerings - DEC

Suggestion	Count	Percent of Respondents Mentioning (n=119)	Percent of Total Mentions (n=130)
Provide more energy savings information, programs, free light bulbs and more incentives	42	35%	32%
Better communication	23	19%	18%
Reduce price/provide senior and disability discounts	22	18%	17%
Appreciation	16	13%	12%
Miscellaneous	7	6%	5%
Reduce power outages	6	5%	5%
Improve website	4	3%	3%
Provide more detailed info in MyHER/offer MyHER to Townhomes/do more survey	5	4%	4%
Expressed Frustration	5	4%	4%

Evidence of MyHER Effects

As noted above, while formal statistical testing found a number of 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. Table 4-14 presents 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 4-14: Survey Response Pattern Index - DEC

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	2	5	40%
Customers' Reported Energy-saving Behaviors	10	11	91%
Customer's Reported Energy Efficiency Improvements Made	9	9	100%
Customer Motivation, Engagement & Awareness of Energy Efficiency	4	11	36%
Barriers to Customer Undertaking Energy Savings Actions	3	6	50%
Customer Satisfaction with Duke Energy	0	4	0%
Total	**31**	**49**	**63%**

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 – there are seven topic areas and 49 questions;
- Note any item for which the treatment group outperformed the control group – the treatment group outperformed the control group in 31 questions, or 63% of the total questions;
- Since this value is more than 50% we can conclude that MyHER had wide-ranging enhancing effects across all the various engagement and attitudinal areas probed by the survey.
- Calculate the probability that the difference in response patterns is due to chance, rather than an underlying difference in populations – 2% (p-value = 0.021). Since this probability is less than 10%, we reject the null hypothesis (that the number of positive responses for treatment and control customers are equal) at the 90% level of confidence.

Because this analysis compares the response patterns between the treatment and control group, 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 G.

We call out the survey area covering general customer satisfaction with Duke Energy as an area of particular note: treatment customers reported lower satisfaction scores than control customers for all four general satisfaction questions. Nexant recommends that the MyHER program staff coordinate with any internal customer satisfaction data collection efforts to cross-reference these findings with any learnings on DEC customer satisfaction. The lower satisfaction scores for DEC treatment customers may indicate an opportunity for new MyHER messaging or content in DEC.

Respondent Demographics

Nearly all respondents—93% of treatment group customers and 94% of control group customers—own their residence. More than half of households surveyed have two or fewer residents, but about 19% of treatment households and 20% of control households have four or more residents. There are no statistically significant differences in the distribution of ownership or age of homes assigned to the treatment and control groups (Figure 4-15) (chi-squared test).

Figure 4-15: “In What Year Was Your Home Built?” - DEC

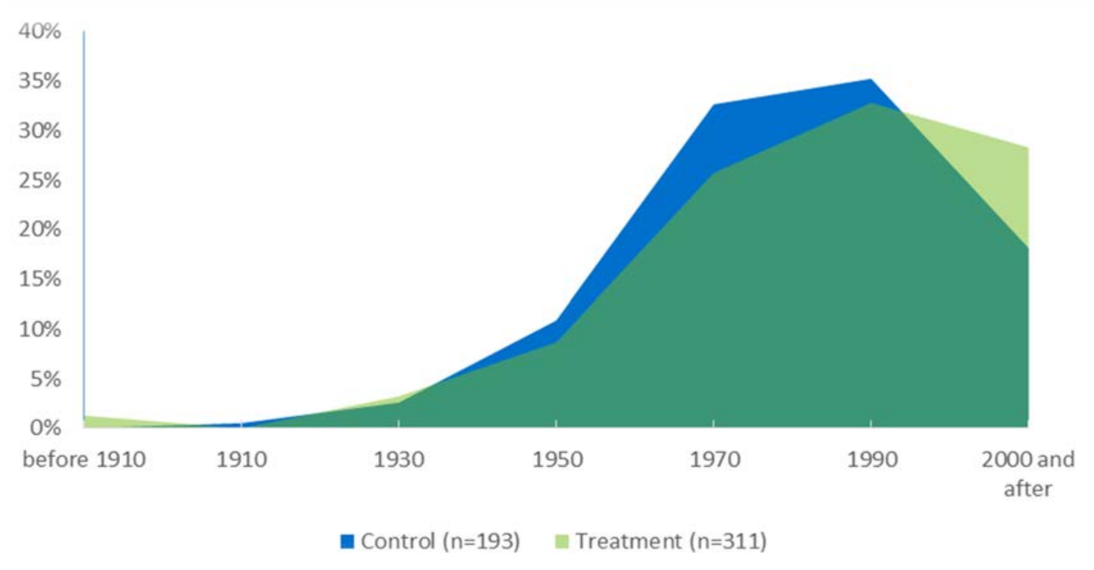
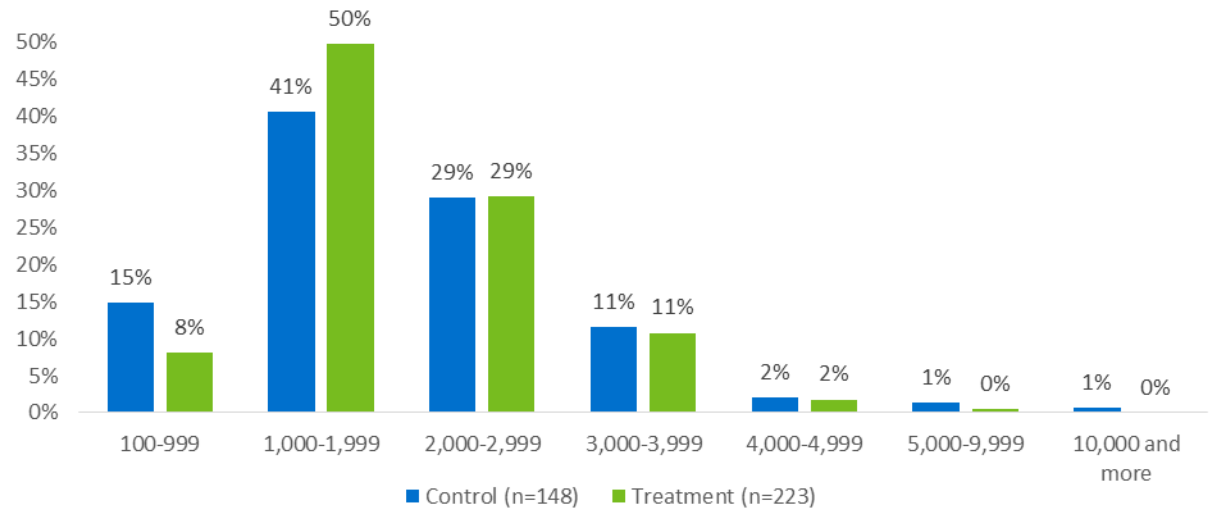


Figure 4-16 shows distribution of home square footage is similar between control and treatment households. The average square footage above ground is 2,031 for control households and 1,954 for treatment households, and the difference is not statistically significant.

Figure 4-16: How many square feet is above ground living space? - DEC



Respondent ages are relatively close to those reported by the U.S. Census American Community Survey (ACS) for 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 is true in this survey study, as well. Additionally, the average age is 62 for both control group respondents and treatment group respondents (see Table 4-15).

Table 4-15: Respondent Age Relative to American Community Survey - DEC

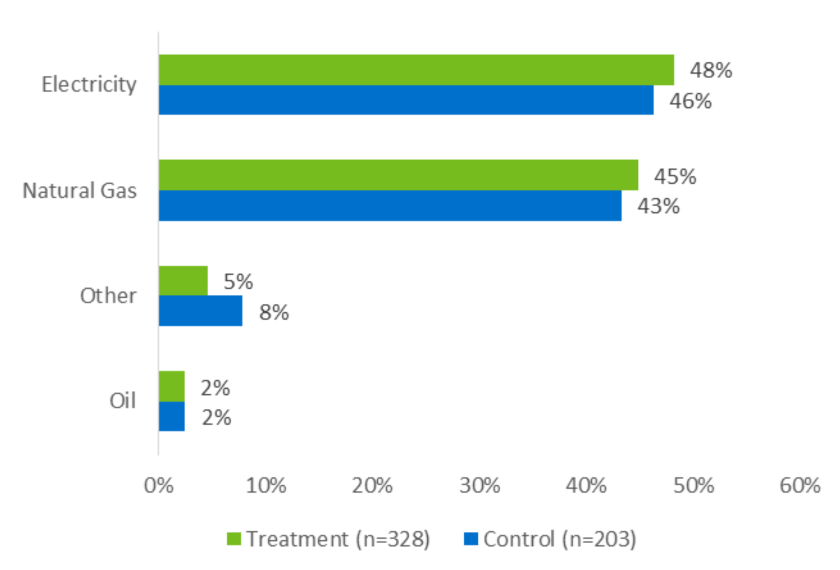
Age	Treatment Group (n=311)	Control Group (n=191)	2017 American Community Survey_Carolinas[13]
25-34	3%	3%	13%
35-44	8%	9%	13%
45-54	21%	19%	13%
55-64	25%	21%	13%
65 and over	43%	47%	16%

Figure 4-17 shows the primary heating fuel type used in control and treatment customers' households. Nearly half of treatment (48%) and control (46%) customers use electricity in their

[13] American Community Survey (ACS) is the Census Bureau's Population Estimates Program that produces and disseminates the official estimates of the population for the nation, states, counties, cities and towns and estimates of housing units for states and counties.
https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_16_SPL_K200104&prodType=table

households for heating. Forty-five percent of treatment customers and 43% of control customers use natural gas for heating. These differences are not statistically significant.

Figure 4-17: Primary Heating Fuel in Households - DEC

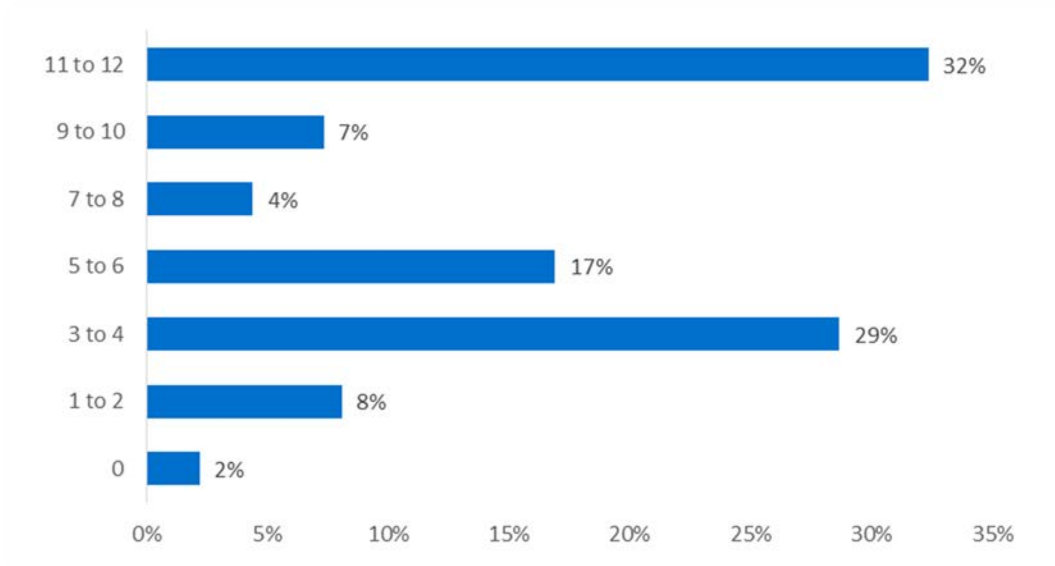


4.2.2.2 Treatment Households: Experience and Satisfaction with MyHER - DEC

A large majority of Treatment Only household respondents, 93%, (142 of 152) recalled receiving at least one of the MyHER reports.

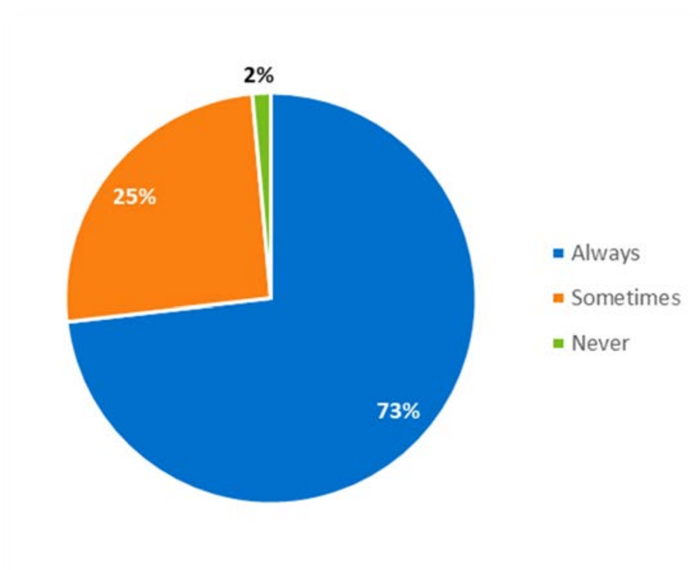
The survey asked those that could recall receiving at least one MyHER report if they could recall how many individual reports they had received “in the past 12 months” (Figure 4-18). The survey launched in January 2019, which means that most recipients would have received 8 MyHERs in the year since February 2018. Thirty-two percent (44 of 136) responded that they received 11 to 12 home energy reports in the past 12 months. The scattered 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 4-18: Reported Number of MyHERs Received "In the past 12 months" (n=136) - DEC



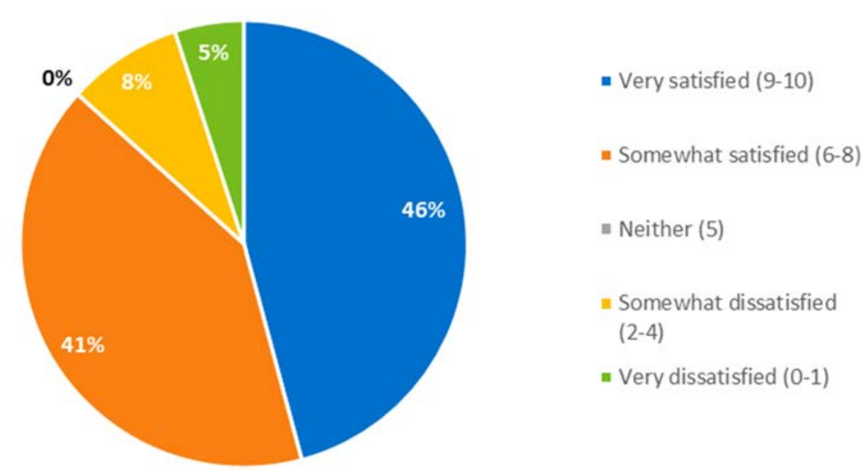
Survey respondents indicated high interest in the MyHER reports. As shown in Figure 4-19, when asked how often they read the reports, 99% of respondents indicated they "always" or "sometimes" read the reports. Two respondents (1%) indicated they do not read the reports.

Figure 4-19: How Often Customers Report Reading the MyHER (n=138) - DEC



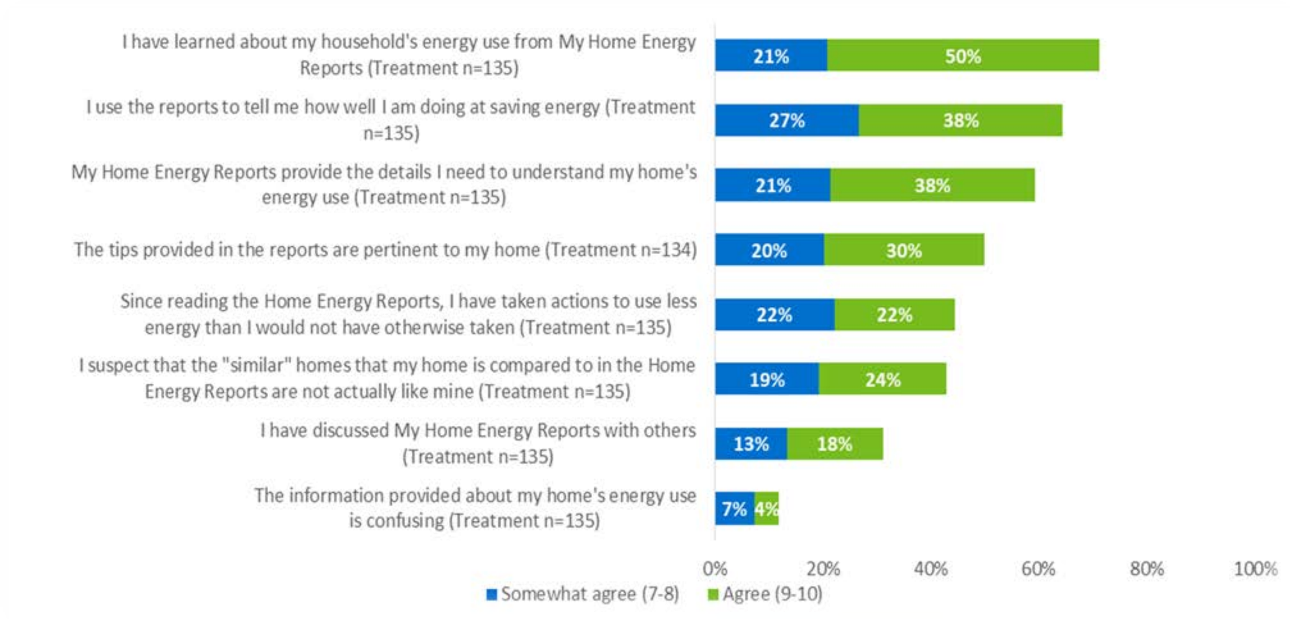
Eighty-seven percent (104 of the 120 respondents that provided a rating) reported being "somewhat" or "very" satisfied with the information contained in the reports (Figure 4-20). The survey asked a further question to the respondents of why they said so: sixty-one of the satisfied respondents provided reasons. Among customers who gave the highest satisfaction ratings, the most common comments on the MyHERs described the reports' ability to engage the customer and provide greater awareness. The customers who reported being somewhat satisfied most often simply described the reports as "helpful."

Figure 4-20: Satisfaction with the Information in MyHER Reports (n=120) - DEC



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 71% 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 (65% rating a seven or higher). More than half (59%) agreed that the reports provided the details they needed to understand their home's energy usage. Respondents provided weaker agreement to statements about the pertinence of the tips provided to their homes and whether they have taken actions to use less energy than they would not have since reading MyHERs. A relatively small percentage (11%) agreed with the statement that the information provided is confusing (Figure 4-21).

Figure 4-21: Level of Agreement with Statements about MyHER (0-10 Scale) - DEC



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 27% (37 of 136) offered suggestions, including seven who offered only appreciative comments. Among those offering suggestions for improvement, the most common request, mentioned by 16 of the 37 with suggestions, questioned accuracy of the comparison in the report. Fifteen of the 37 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:

- "*By explaining what factors influence our rating*"
- "*I know it's probably not possible but it would be nice to see the actual percentage of what in the household is using what energy…*"
- *"Be more specific as to which appliances, etc. are using how much energy compared to a standard or an efficient use"*
- "*Narrow the comparison to homes closer in size and age along with the number of household members to each consumer*"
- "*Pinpoint possible problems that could be causing energy waste*"

Other comments centered on other suggestions (such as providing free energy assessment, etc.), 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:

- " *Send via email....*"

- "*Send them via email instead of wasting paper and stamps*"

Nexant categorized these suggestions on the general basis of their content; the results are presented in Table 4-16.

Table 4-16: Distribution Suggestions for Improvement (Multiple Responses Allowed) - DEC

Suggestion	Count	Percent of Respondents Mentioning (n=37)	Percent of Total Mentions (n=47)
Don't believe comparison/accuracy	16	43%	34%
Provide more specific information or details	15	41%	32%
Appreciate the Home Energy Report	7	19%	15%
Change production (mail, paper, format)	4	11%	9%
Expressed frustration	2	5%	4%
Other suggestions (such as providing home inspection, etc.)	2	5%	4%
Don't see value/dislike	1	3%	2%

Treatment households were also asked questions that focused on the awareness and use of MyHER Interactive, revealing low awareness of the online Interactive platform:

- Only 28% of treatment customers are aware of MyHER Interactive;
- Among aware customers, 92% reported that they had not signed up to use MyHER Interactive; and
- When asked why they haven't signed up to use MyHER Interactive, 30% of respondents reported that they were very busy, 22% reported that they were not interested in it, and 9% further reported that they did not know about it.

4.2.3 Customer Surveys - DEP

As was the case for DEC, the DEP customer surveys included a section of questions focused specifically on the experience of and satisfaction with the information provided in MyHERs, and the awareness of MyHER Interactive—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 Duke Energy, and services Duke Energy provides to help households manage their energy use;
- Levels of awareness of and interest in household energy use; motivations and perceived importance;
- Reported behavioral or equipment-based upgrades; and

- Barriers that prevent customers from undertaking energy savings actions.

4.2.3.1 Comparing Treatment and Control Responses

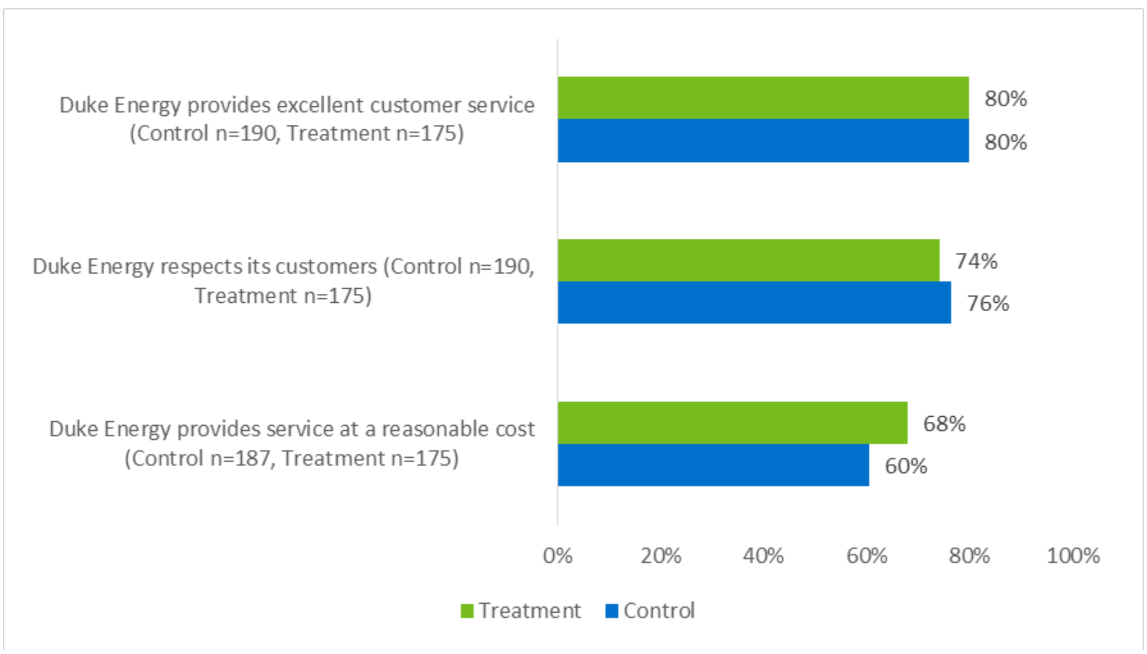
This section presents the results of survey questions asked of both treatment and control households in DEP and compares the response patterns between the two groups. Statistically significant differences between treatment and control households are noted.

Duke Energy Customer Satisfaction

Both treatment and control groups' overall satisfaction with Duke Energy are high. Seventy-six percent of treatment customers and 74% 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 at the 90% level of confidence.

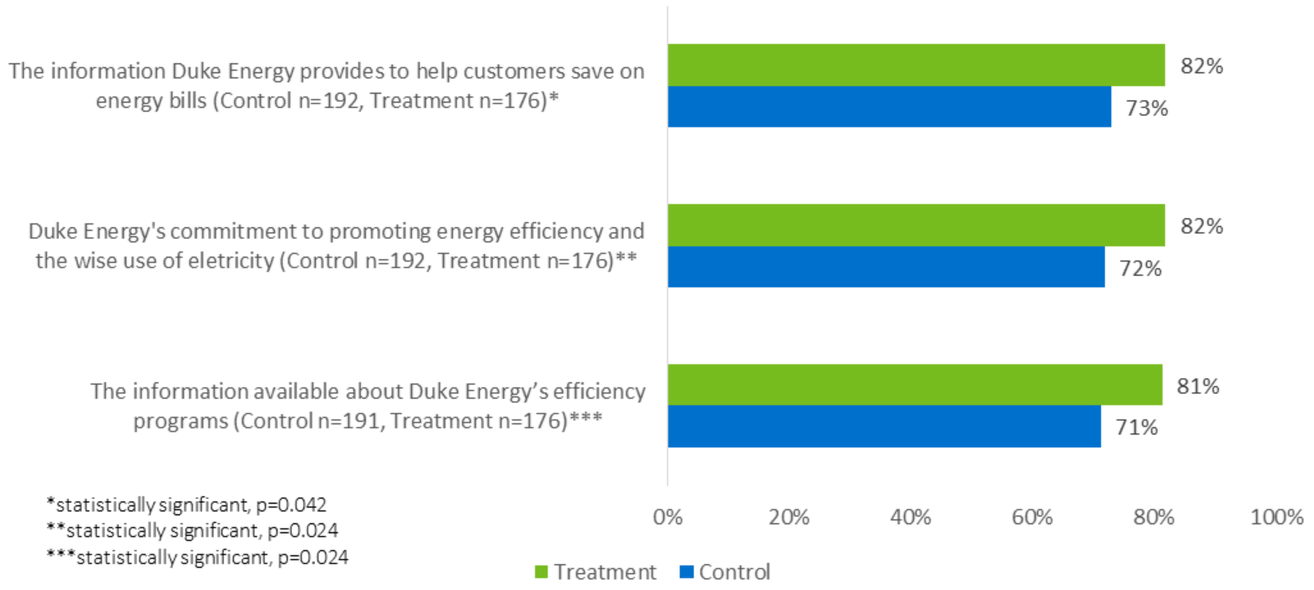
Treatment households rated Duke Energy higher on providing service at a reasonable cost, while control households rated Duke Energy higher on respecting its customers. These differences between treatment and control groups are also not statistically significant (Figure 4-22). Treatment and control households rated Duke Energy the same on providing excellent customer service. MyHER does not result in a measurable change in stated customer satisfaction with Duke Energy in DEP.

Figure 4-22: Satisfaction with Various Aspects of Customer Service - DEP



On the other hand, treatment group responses indicate that MyHER reports had a significant positive effect on customer satisfaction with certain aspects of Duke Energy's energy efficiency efforts (Figure 4-23). The differences between treatment and control customers with respect to satisfaction with the information available about Duke Energy's efficiency programs, the information Duke Energy provides to help customers save on energy bills, and Duke Energy's commitment to promoting energy efficiency and the wise use of electricity are statistically significant at the 90% level of confidence.

Figure 4-23: Portion Satisfied with Energy Efficiency Offerings and Information - DEP



Engagement with Duke Energy's Website

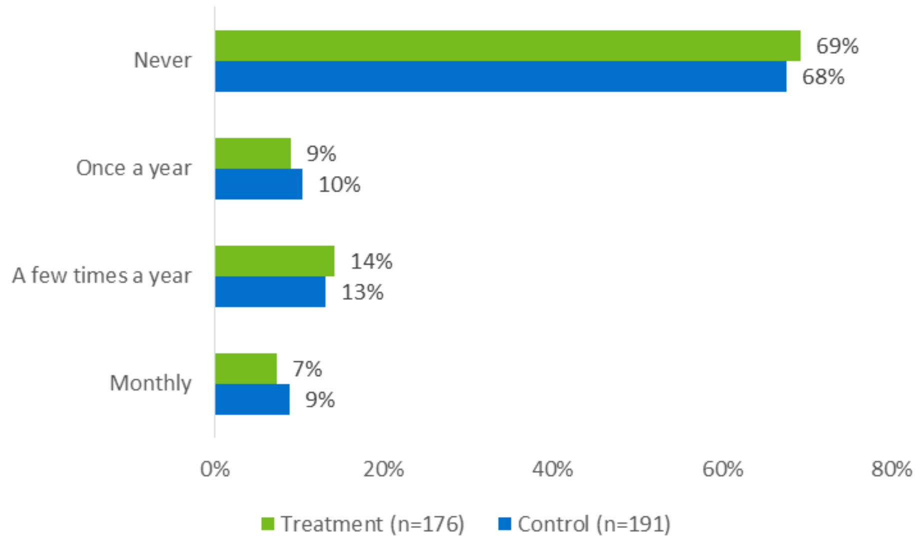
Both groups answered several questions about their use of the Duke Energy website, a proxy for overall engagement with information provided by the utility on energy efficiency and household energy use. Table 4-17 shows that 42% of the treatment group and 38% of the control group reported they had never logged in to their Duke Energy accounts. Among those that had logged in, the most commonly reported purpose was to pay their bill.

Table 4-17: Use of Duke Energy Online Account - DEP

Online Account Activity	Treatment Group (n=174)	Control Group (n=185)
Never logged in	42%	38%
Pay my bill	36%	38%
Look for energy efficiency opportunities or ideas	10%	8%

Treatment group households were more likely to report that they accessed the Duke Energy website to search for information about rebate programs, energy efficient products, or ways 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 4-24.

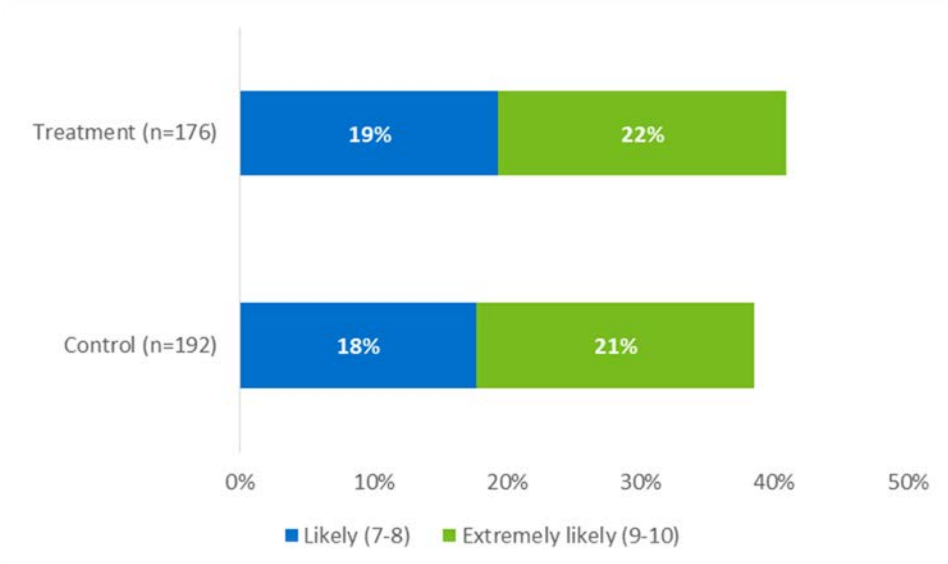
Figure 4-24: Frequency Accessing the Duke Energy Website to Search for Other Information - DEP



Thirty-nine percent of control group and 41% of treatment group customers reported they would be likely to check the Duke Energy website for information before purchasing major household equipment. The difference between the control and treatment group is not statistically significant at the 90% level of confidence. The portion of respondents rating their likelihood a “7” or higher on an 11-point scale of likelihood is plotted in Figure 4-25.

Overall, MyHER has not produced a measurable change in customer engagement with Duke Energy’s standard online offerings (distinct from the online MyHER Interactive offering) at DEP. As stated earlier in the presentation of DEC survey findings, these survey responses relating to engagement with Duke Energy’s online resources should be placed into context with the DEP respondents’ demographics. All DEP survey respondents reside in single-family homes, since the MyHER program is only available to customers in single-family homes. We therefore expect that the DEP respondents of this survey should skew towards respondents who have attained a greater age than that might be expected of the general Duke Energy customer base. We indeed find, as we discuss at greater length later in this section, that the average age of respondents of this survey is older than what would be expected relative to U.S. Census estimates of the age distribution of the population in North and South Carolinas. About 45% of DEP treatment respondents are 65 years of age or older. About 44% of DEP control customers are included in that age bracket as well. This is in comparison to U.S. Census estimates that 16% of the population of the Carolinas falls into the same age bracket. Therefore, Duke Energy should interpret the responses of this survey as representing an older group of customers than their customer base overall. Residents of multi-family homes would expected to be younger, on average, and would be hypothesized to report higher rates of engagement with Duke Energy’s online content.

Figure 4-25: Portion Likely to Check Duke Energy Website prior to Purchasing Major Home Equipment - DEP

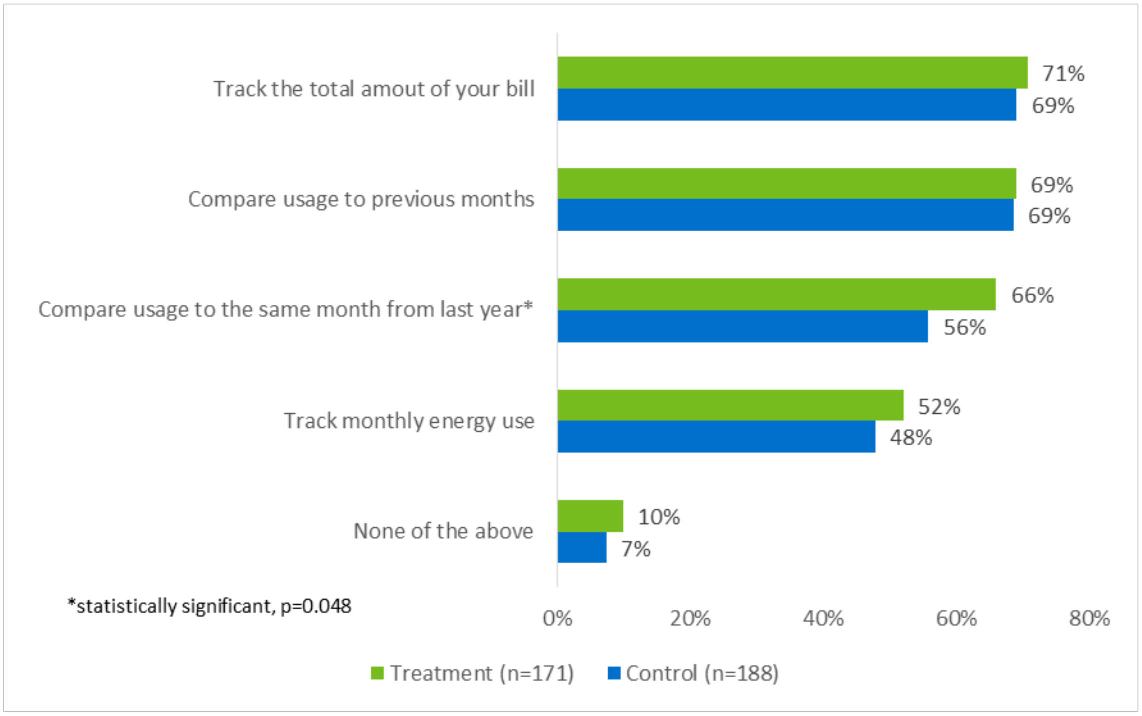


Reported Energy Saving Behaviors

Treatment and control customers track information (bills and usage) related to their household's energy usage in the following ways (Figure 4-26):

- Seventy-one percent of the treatment customers and 69% of the control customers reported tracking the total amount of the bill. The difference is not statistically significant at the 90% level of confidence.
- Sixty-nine percent of the treatment group and control group, respectively, compared usage to previous months. The difference is not statistically significant.
- Sixty-six percent of the treatment respondents and 56% of the control respondents compared usage to the same month from last year. The difference in responses here between treatment and control groups are statistically significant at the 90% level of confidence.

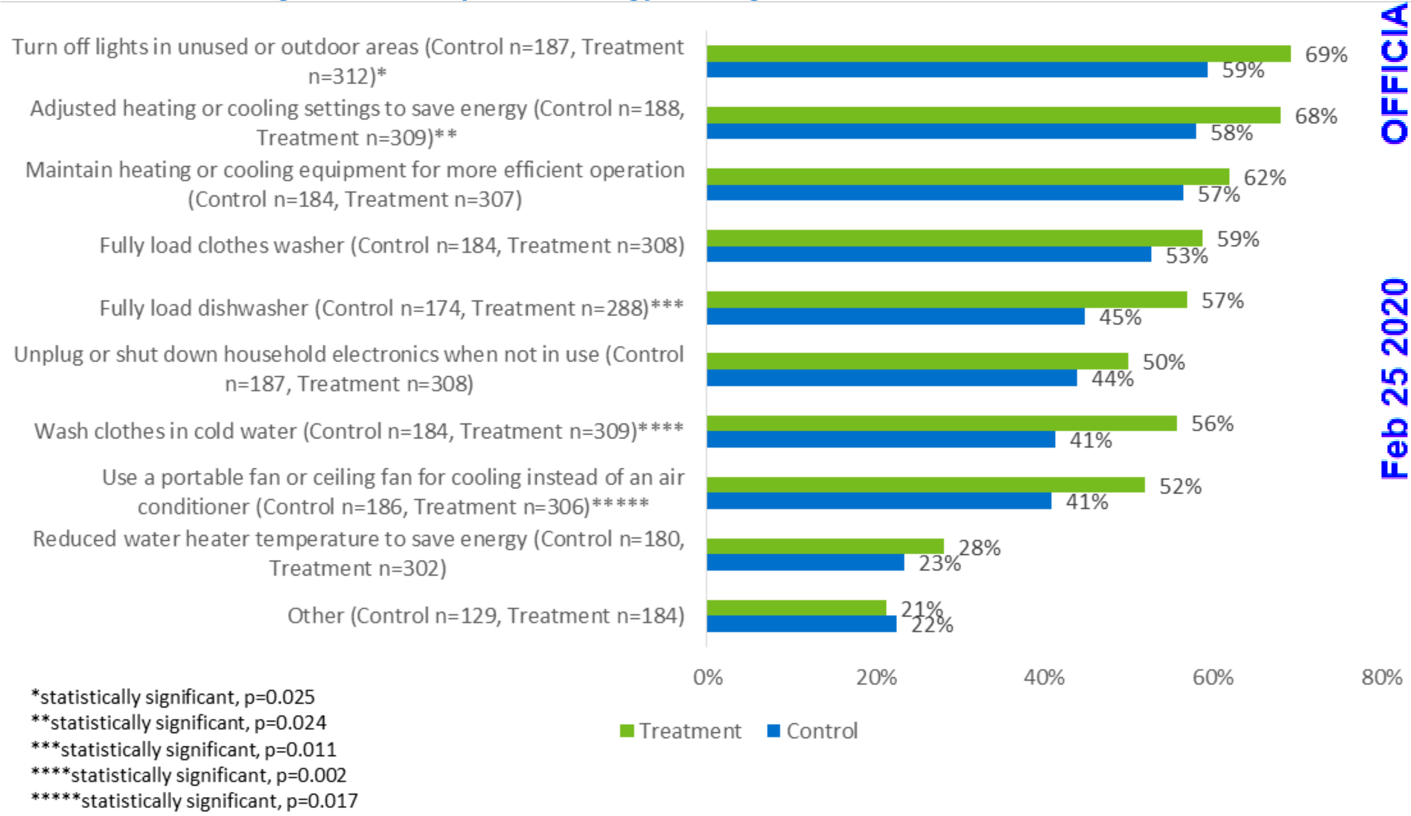
Figure 4-26: "Which of the Following Do you Do with Regard to Your Household's Energy Use?" - DEP



In general, treatment customers were more likely than control customers to report having undertaken behaviors to reduce household energy use or having made energy efficiency improvements to their home (71% to 60%; p = 0.008).

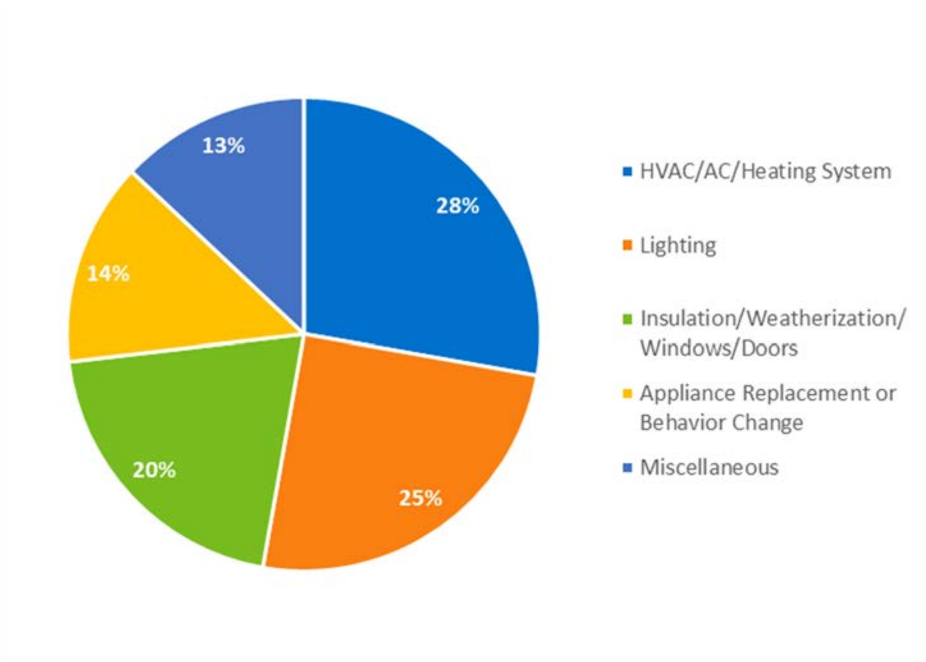
Specifically, the treatment group was more likely to turn off lights in unused or outdoor areas, adjust heating or cooling settings to save energy, fully load dishwasher, wash clothes in cold water and use a portable fan or ceiling fan for cooling than treatment group, as shown in Figure 4-27. These differences are statistically significant at the 90% level of confidence.

Figure 4-27: Reported Energy Saving Behaviors - DEP



Ninety-three respondents (treatment and control customers in total) reported other energy savings actions as free form text. Nexant categorized these actions and the results are shown in Figure 4-28. The most commonly reported action, mentioned by 30 respondents, pertains to HVAC/AC/Heating system, such as installing a new HVAC system.

Figure 4-28: Distribution of Other Energy Savings Behaviors - DEP



Reported Energy Efficiency Improvements Made

Respondents were provided with a list of energy efficiency improvements and asked if they had done each one in the past year. The treatment group had significantly higher percentages of customers who reported purchasing ENERGY STAR certified home electronic equipment, installing energy-efficient kitchen or laundry appliances, installing energy-efficient heating/cooling equipment, installing programmable thermostat or “smart” thermostat, and adding insulation to attic, walls, or floors than the control customers did (Table 4-18).

Table 4-18: Portion Indicating They had Made Each Energy Efficiency Upgrade - DEP

Upgrade	Control	Treatment
Install energy-efficient lighting (Control n=187, Treatment n=306)	50%	57%
Caulk or weatherstrip (windows or doors) (Control n=186, Treatment n=301)	35%	38%
Purchase ENERGY STAR certified home electronic equipment (a television, for example) (Control n=178, Treatment n=289)*	35%	45%
Install energy-efficient kitchen or laundry appliances (Control n=185, Treatment n=295)**	30%	45%
Install energy-efficient heating/cooling equipment (Control n=179, Treatment n=297)***	29%	38%
Install energy-efficient water heater (Control n=178, Treatment n=293)	28%	32%
Install programmable thermostat or "smart" thermostat (Control n=182, Treatment n=300)****	26%	36%
Replace windows or doors with more energy-efficient types (Control n=184, Treatment n=301)	22%	26%
Add insulation to attic, walls, or floors (Control n=180, Treatment n=299)*****	20%	28%

*statistically significant, p=0.049
**statistically significant, p=0.001
***statistically significant, p=0.054
****statistically significant, p=0.02
*****statistically significant, p=0.048

Behavior and Upgrade Category Variables

To examine broader patterns within the survey responses that cover many specific cases of energy saving behavior and upgrades, participant responses to the behavior and upgrade responses were combined into their respective categories, and were also combined into end-use categories. As shown in Table 4-19, treatment group respondents were significantly more likely to engage in energy efficiency behaviors and improvements, and also undertook significantly more energy efficiency behaviors and upgrades. These results demonstrate that MyHERs have increased energy efficiency behaviors in treatment customers in DEP.

Table 4-19: Percent of Households That Had Undertaken Energy Efficiency Actions - DEP

Behaviors/Improvements	Treatment Group	Control Group
Any Energy Efficiency Behavior (Treatment n=31, Control n=190)*	71%	60%
Average Number of Behaviors**	5.03	4.28
Any Energy Efficiency Improvements (Treatment n=313, Control n=189)***	70%	57%
Average Number of Improvements****	3.28	2.67

*statistically significant, p=0.008
**statistically significant, p=0.022
***statistically significant, p=0.003
****statistically significant, p=0.018

Further, Table 4-20 shows the proportion of respondents that had undertaken at least one behavior or upgrade in each end use category. In all nine categories, treatment group members were significantly more likely to have undertaken at least one of these activities. These results further demonstrate that MyHERs have increased energy efficiency behaviors in treatment customers.

Table 4-20: Percent of Households That Had Undertaken Energy Efficiency Actions, by End Use Category - DEP

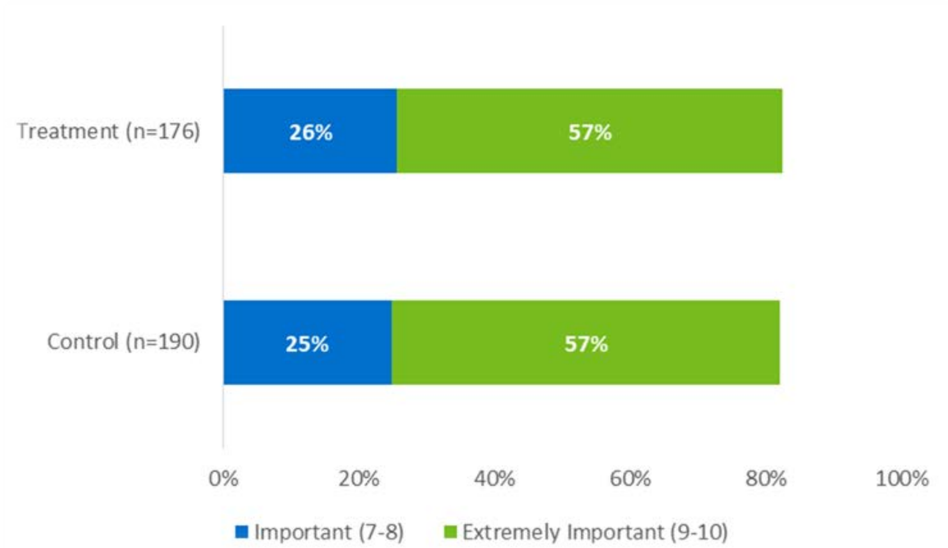
Behaviors/Improvements	Treatment Group	Control Group
Water Heating Behaviors/Upgrades (Treatment n=315, Control n=189)*	70%	59%
Water Heating Behaviors (Treatment n=315, Control n=187)**	70%	58%
Space Heating Behaviors/Upgrades (Treatment n=315, Control n=190)***	71%	60%
Space Heating Behaviors (Treatment n=315, Control n=190)****	71%	60%
Space Heating Upgrades (Treatment n=309, Control n=185)*****	49%	37%
Lighting Behaviors/Upgrades (Treatment n=314, Control n=190)******	71%	60%
Electronics and Appliances Behaviors/Upgrades (Treatment n=315, Control n=189)*******	68%	53%
Electronics and Appliances Upgrades (Treatment n=306, Control n=186)********	54%	43%
Sealing and Insulation Behaviors/Upgrades (Treatment n=306, Control n=187)*********	52%	42%

*statistically significant, p=0.001
**statistically significant, p=0.007
***statistically significant, p=0.01
****statistically significant, p=0.01
*****statistically significant, p=0.009
******statistically significant, p=0.011
*******statistically significant, p=0.001
********statistically significant, p=0.016
*********statistically significant, p=0.043

Customer Motivation and Awareness

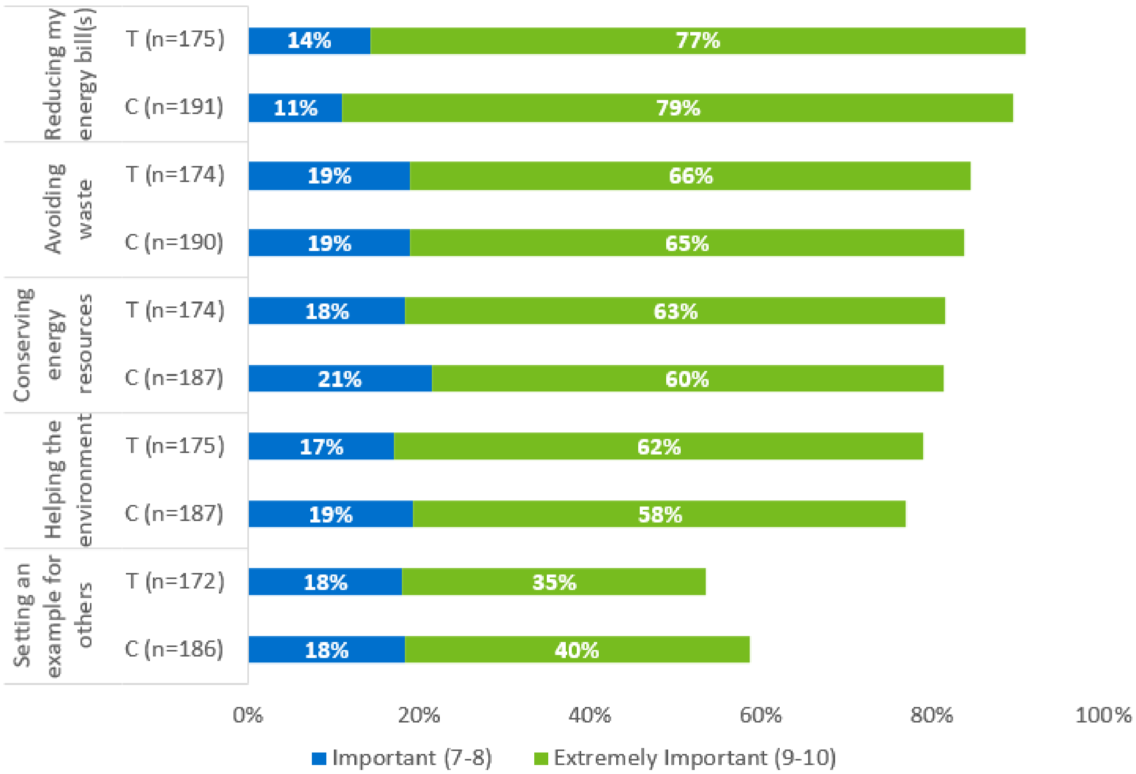
The control group and treatment groups report similar levels of motivation to save energy. Eighty-two percent of control customers and treatment customers respectively, indicated that knowing they are using energy wisely is important or "important" or "extremely important". (Figure 4-29). The reported percentage for the Treatment group differs from that in the figure due to rounding.

Figure 4-29: "How Important Is It for You to Know if Your Household is Using Energy Wisely?" - DEP



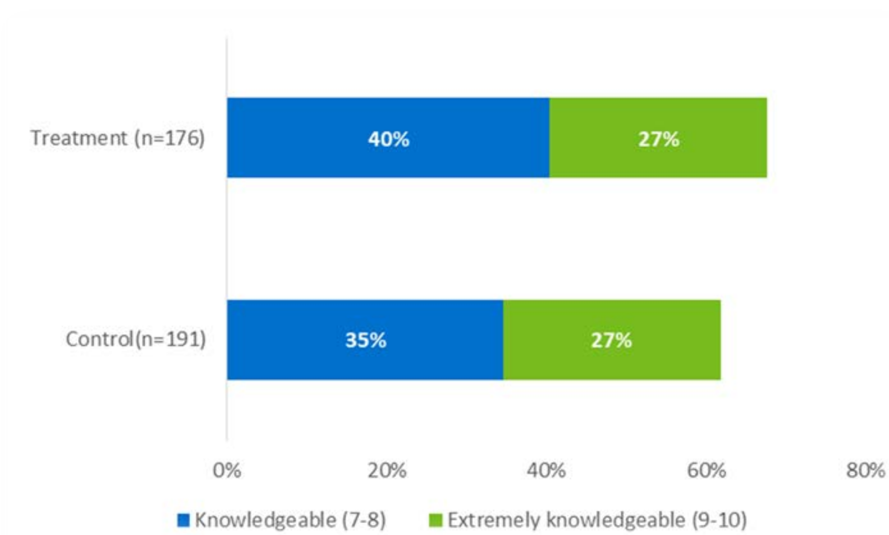
Customers were asked to rate, on a scale of 0 to 10, the importance of various reasons for why they might try to reduce their home's energy use. The strongest motivation for both groups is saving money on their energy bills, where 91% of treatment respondents and 90% of control respondents reported that saving money on their energy bills was "important" or "extremely important". Eighty-four percent of control respondents and 85% of treatment respondents, respectively, indicated that "avoiding waste" was important" or "extremely important" to them. Eighty-one percent of both treatment customers and control customers reported that "conserving energy resources" was important" or "extremely important". Seventy-nine percent of treatment customers and 77% of control customers reported that "helping the environment" was "important" or "extremely important". Those differences between the treatment and control group are not statistically significant. Figure 4-30 contains the frequency of responses to this question, shown as a percentage for both the treatment and control group.

Figure 4-30: "Please Indicate How Important Each Statement Is to You" - DEP



As indicated by Figure 4-31, 67% of treatment customers rated themselves above a seven on a 0-10 point scale of knowledgeability of ways to save energy, while 62% of control group customers rated themselves this way. The difference is not statistically significant at the 90% level of confidence.

Figure 4-31: "How Would You Rate Your Knowledge of the Different Ways You Can Save Energy in Your Home?" - DEP



Treatment respondents that took the treatment-only survey were asked how useful each MyHER feature was to their homes. A similar question was asked of both control group and treatment group respondents who took the primary survey rephrased to ask them how useful they *might expect* that information to be. Table 4-21 presents results of the portion, rating each item a "7" or higher on an 11-point scale of the hypothetical usefulness from the control and treatment customers who took the primary survey, and Table 4-22 presents the comparison results between the actual usefulness of each item rated by treatment customers (treatment-only survey) and the hypothetical usefulness rated by control customers in the primary survey).[14]

The results from the hypothetical usefulness rating (Table 4-21) did not find statistically significant differences in expected usefulness of information that is found on MyHER reports. Comparisons between the responses of customers in the treatment-only survey and control customers in the primary survey show that treatment customers respond differently to questions about information presented in MyHERs if the questions are asked in the context of the actual MyHER reports, however the response patterns show some limited significant separation between treatment and control customers in terms of usefulness of report content: Table 4-22 shows that control customers were significantly more likely to report that "Tips to help you save money and energy", "Information about services and offers from Duke Energy", and "Comparison to similar homes" would be useful than treatment customers reporting that they are actually useful. This finding suggests that there may be an opportunity to improve the presentment of this information in MyHERs.

Table 4-21: Hypothetical Usefulness of HER Features Treatment and Control - DEP

HER Feature	Control Group_Primary Survey	Treatment Group_Primary Survey
Tips to help you save money and energy	73% (n=188)	72% (n=173)
Graphs that display your home's energy use over time	72% (n=185)	73% (n=174)
Information about services and offers from Duke Energy	68% (n=186)	67% (n=172)
Examples of the energy use associated with common household items	67% (n=184)	67% (n=173)
Your home's energy use compared to that of similar homes	66% (n=183)	59% (n=173)
Customized suggestions for your home	60% (n=183)	66% (n=172)

[14] The implementation of a treatment-only survey, in addition to a primary survey provided to both treatment and control customers, afforded an opportunity to test the responses of treatment customers to a question asking about a MyHER feature they have actually seen vs. asking generally about how useful the information is (outside of the context of MyHER). This test leads us to the conclusion that the way customers are asked about this question matters and we recommend that in future surveys, MyHER treatment customers see questions about report content placed specifically in the context of them having seen the content in their reports, as opposed to in the hypothetical.

Table 4-22: Usefulness or Hypothetical Usefulness of HER Features Treatment and Control - DEP

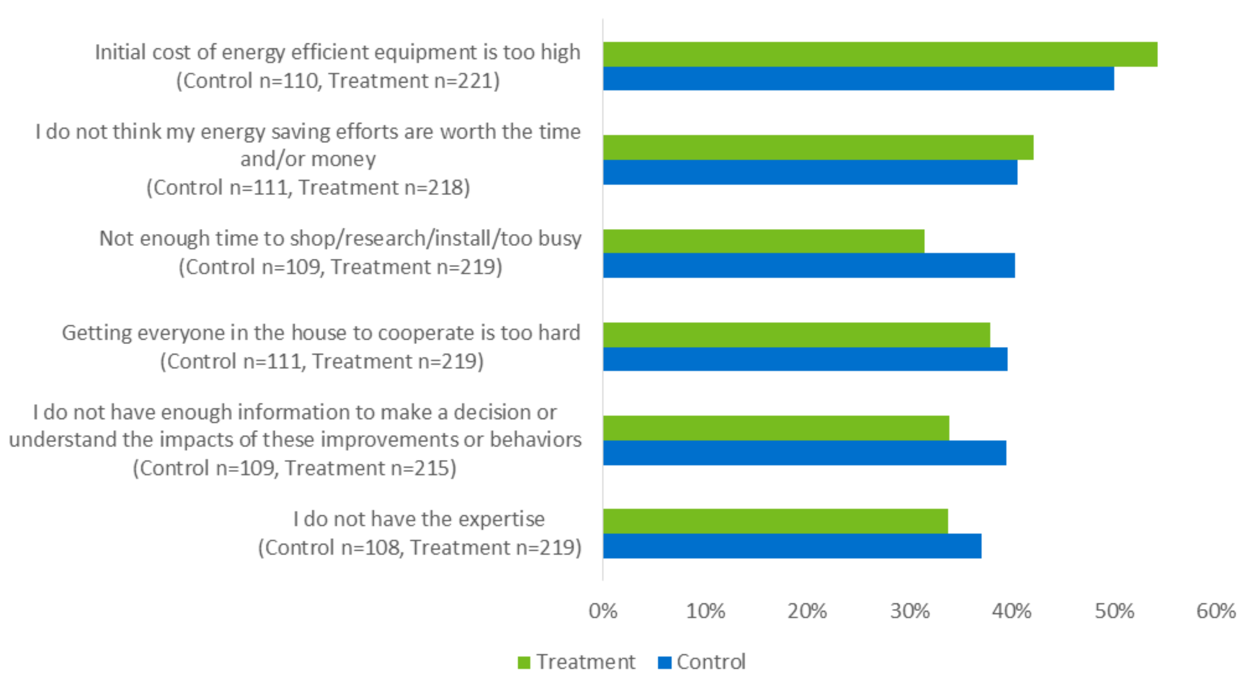
HER Feature	Control Group_Primary Survey	Treatment Group_Treatment Only Survey
Tips to help you save money and energy*	73% (n=188)	64% (n=146)
Graphs that display your home's energy use over time	72% (n=185)	73% (n=147)
Information about services and offers from Duke Energy**	68% (n=186)	54% (n=145)
Examples of the energy use associated with common household items	67% (n=184)	60% (n=146)
Comparison to similar homes***	66% (n=183)	46% (n=146)
Customized suggestions for your home	60% (n=183)	54% (n=147)

*statistically significant, p=0.073
**statistically significant, p=0.014
***statistically significant, p=0.000

Barriers to Customers Undertaking Energy Savings Actions

When asked the reasons why customers might not be able to save as much as energy as they would like, there were no statistically different response patterns between treatment and control customers, which indicates that MyHER is not making a measurable change in the potential barriers mentioned in this survey. The most commonly reported barrier is “the initial cost of energy efficient equipment is too high” (Figure 4-32): 54% of treatment respondents reported this as a barrier and 50% of control respondents did so as well. The least-commonly cited barrier was lack of expertise: 34% of treatment customers cited lack of expertise as a barrier as did 37% of control customers. The differences are not statistically significant.

Figure 4-32: Barriers to Customers Undertaking Energy Savings Actions - DEP



Suggestions about Duke Energy Improving Service Offerings

The survey provided an open-ended question to elicit suggestions about Duke Energy improving its service offerings to help customers reduce energy use. Only 22% (116 of 539, treatment and control customers in total) offered suggestions, including fourteen who offered only appreciative comments. Among those offering suggestions for improvement, the most common request, mentioned by 44 of the 116 with suggestions, reflected a desire for more energy savings information, programs, free light bulbs, and more incentives:

- "*They can make available those light bulbs, to us senior citizens that don't use computers. So we can order them*"
- "*Suggestions how to improve energy and reduce bill*"
- *"home energy inspections and a list of energy saving products that can be used to lower monthly costs"*
- "*Provide information regarding the amount of energy it takes to run dishwashers, lamps, televisions...*"
- "*Provide more rebates for large ticket items*"

Other comments centered on other suggestions, such as better communication, reducing price/providing senior and disability discounts, etc. Nexant categorized these suggestions on the general basis of their content; the results are presented in Table 4-23.

Table 4-23: Suggestions about Duke Energy Improving Service Offerings - DEP

Suggestion	Count	Percent of Respondents Mentioning (n=116)	Percent of Total Mentions (n=137)
Provide more energy savings information, programs, free light bulbs and more incentives	44	38%	32%
Better communication	26	22%	19%
Reduce price/provide senior and disability discounts	21	18%	15%
Miscellaneous	16	14%	12%
Appreciation	14	12%	10%
Express Frustration	10	9%	7%
Reduce power outages	4	3%	3%
Provide more detailed info in MyHER / offer MyHER to Townhomes / do more surveys	1	1%	1%
Improve website	1	1%	1%

Evidence of MyHER Effects

As noted above, while formal statistical testing found a number of 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. Table 4-24 presents 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 4-24: Survey Response Pattern Index - DEP

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	2	5	40%
Customers’ Reported Energy-saving Behaviors	10	11	91%
Customer's Reported Energy Efficiency Improvements Made	9	9	100%
Customer Motivation, Engagement & Awareness of Energy Efficiency	10	11	91%
Barriers of Customer Not Undertaking Energy Savings Actions	4	6	67%
Customer Satisfaction with Duke Energy	2	4	50%
Total	**40**	**49**	**82%**

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 – there are seven topic areas and 49 questions;
- Note any item for which the treatment group outperformed the control group – the treatment group outperformed the control group in 40 questions, or 82% of the total questions;
- Since this value is more than 50% we can conclude that MyHER had wide-ranging enhancing effects across all the various engagement and attitudinal areas probed by the survey.
- Considering these five areas, calculate the probability that the difference in response patterns is due to chance, rather than an underlying difference in populations – 0% (p-

value = 0.000). Since this probability is less than 10%, we reject the null hypothesis (that the number of positive responses for treatment and control customers is equal) at the 90% level of confidence.

Because this analysis compares the response patterns between the treatment and control group, 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 G.

Respondent Demographics

Majority of all respondents—93% of treatment group customers and 88% of control group customers—own their residence. This difference is statistically significant. More than half of households surveyed have two or fewer residents, but about 22% of treatment households and control households respectively, have four or more residents. There are no statistically significant differences in the distribution of age of homes assigned to the treatment and control groups (Figure 4-33) (chi-squared test).

Figure 4-33: “In What Year Was Your Home Built?” - DEP

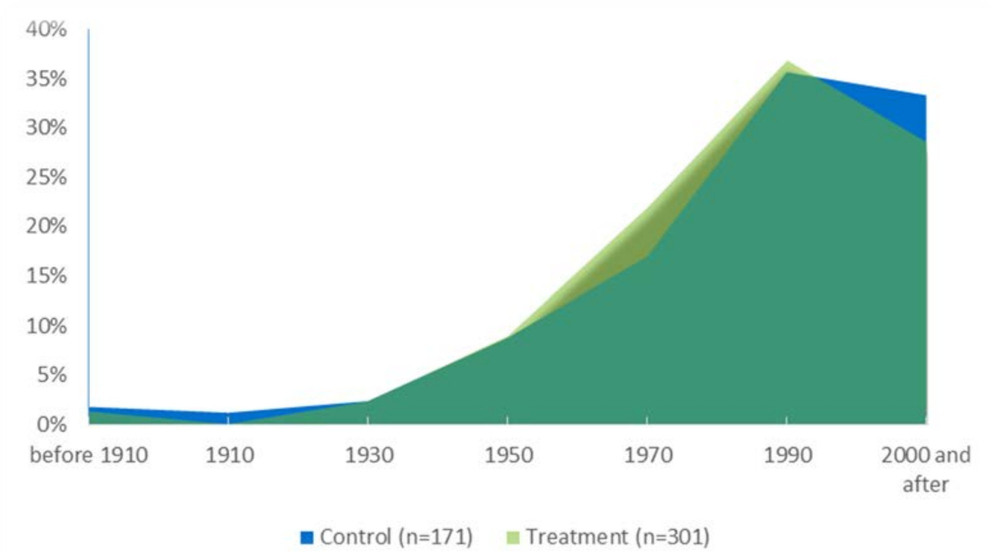
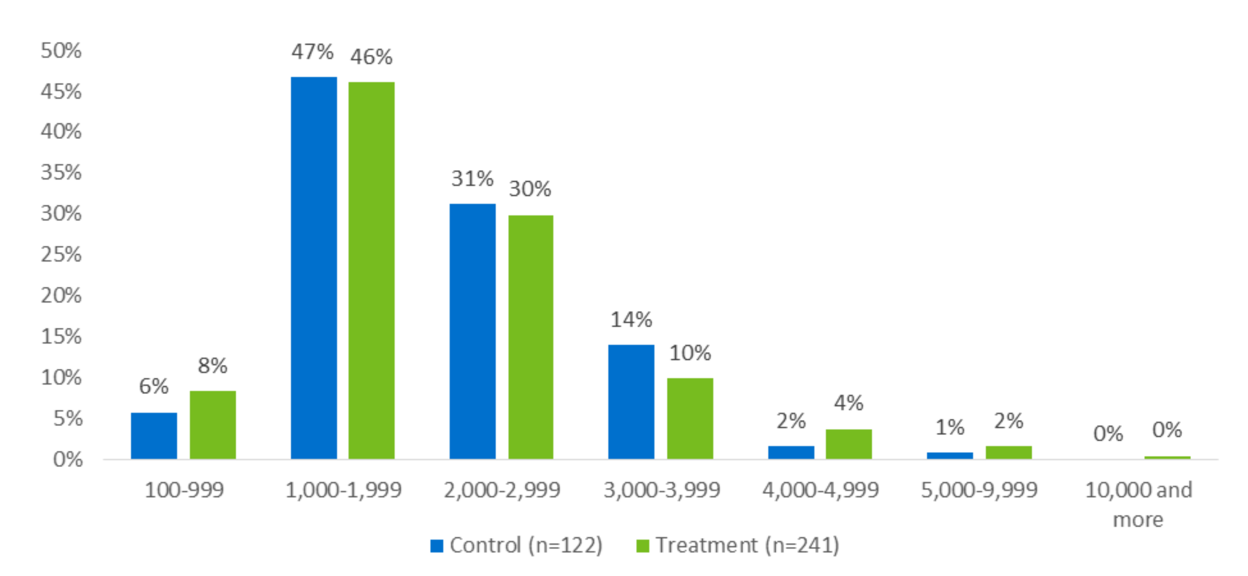


Figure 4-34 shows distribution of home square footage is similar between control and treatment households. The average square footage above ground is 2,022 for control households and 2,110 for treatment households.

Figure 4-34: How many square feet is above ground living space? - DEP



Respondent ages are relatively close to those reported by the U.S. Census American Community Survey (ACS) for 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 is true in this survey study, as well. The average age is 61 for control group respondents and 62 for treatment group respondents (see Table 4-25).

Table 4-25: Respondent Age Relative to American Community Survey - DEP

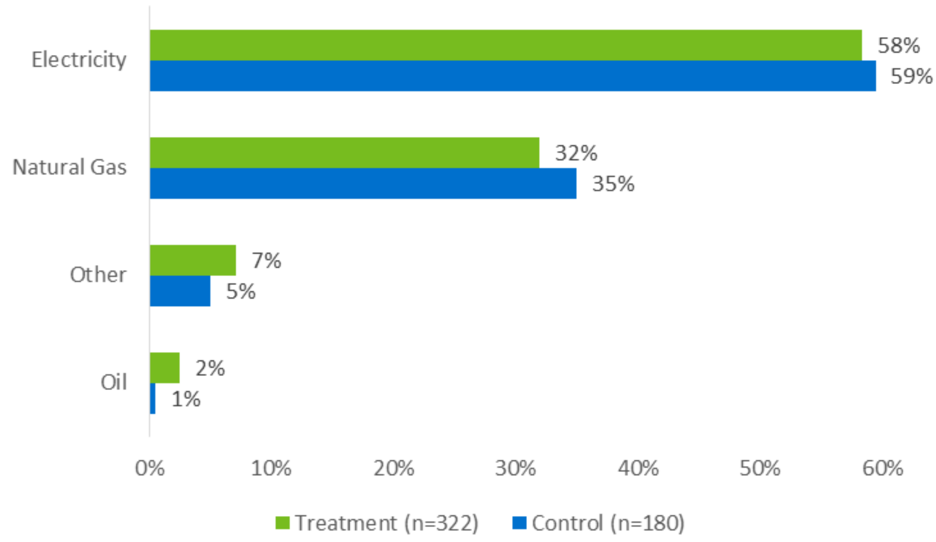
Age	Treatment Group (n=320)	Control Group (n=176)	2017 American Community Survey_Carolinas[15]
25-34	3%	3%	13%
35-44	14%	9%	13%
45-54	19%	18%	13%
55-64	19%	26%	13%
65 and over	45%	44%	16%

Figure 4-35 shows the primary heating fuel type used in control and treatment customers' households. More than half of treatment (58%) and control (59%) customers use electricity in

[15] American Community Survey (ACS) is the Census Bureau's Population Estimates Program that produces and disseminates the official estimates of the population for the nation, states, counties, cities and towns and estimates of housing units for states and counties.
https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_16_SPL_K200104&prodType=table

their households for heating. Thirty-two percent of treatment customers and 35% of control customers use natural gas for heating.

Figure 4-35: Primary Heating Fuel in Households - DEP

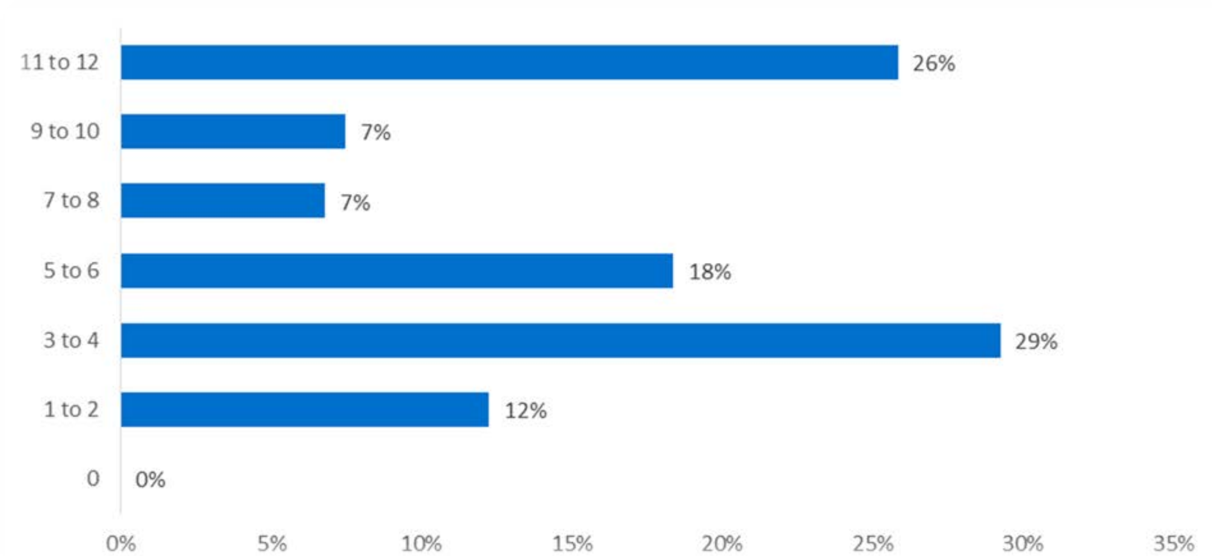


4.2.3.2 Treatment Households: Experience and Satisfaction with MyHER - DEP

A large majority of treatment household respondents, 94%, (160 of 170) recalled receiving at least one of the MyHER reports.

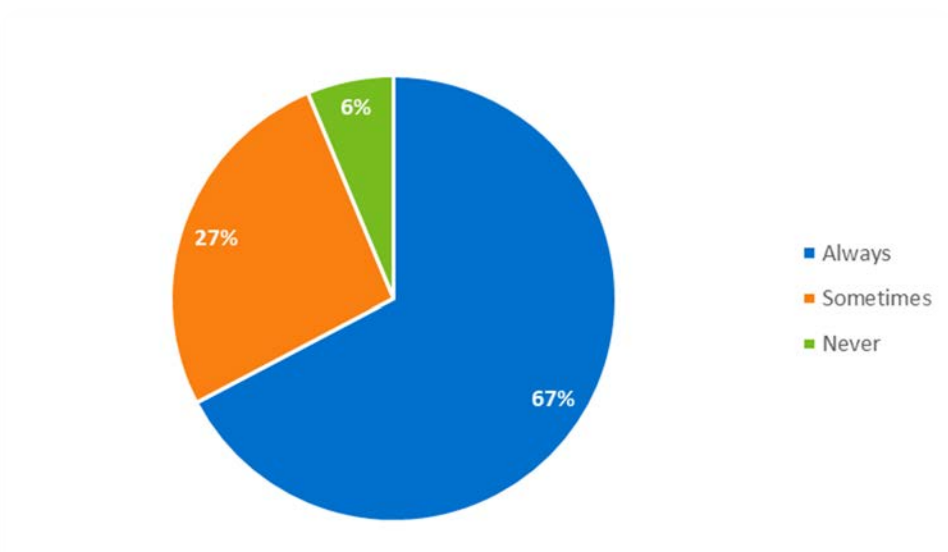
The survey asked those that could recall receiving at least one MyHER report if they could recall how many individual reports they had received "in the past 12 months" (Figure 4-36). The survey launched in January 2019, which means that most recipients would have received 8 MyHERs in the year since February 2018. Twenty-six percent (38 of 147) responded that they received 11 to 12 home energy reports in the past 12 months. The scattered 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 4-36: Reported Number of MyHERs Received "In the past 12 months" (n=147) - DEP



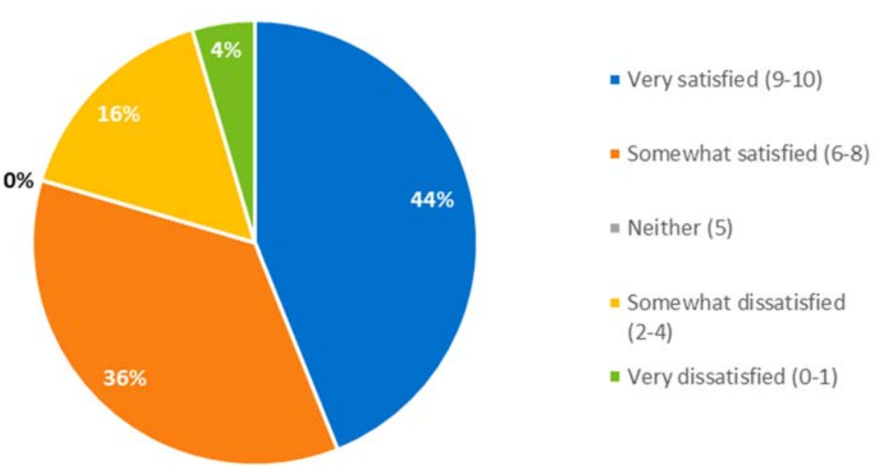
Survey respondents indicated high interest in the MyHER reports. As shown in Figure 4-37, when asked how often they read the reports, 94% of respondents indicated they "always" or "sometimes" read the reports. Ten respondents (6%) indicated they do not read the reports.

Figure 4-37: How Often Customers Report Reading the MyHER (n=159) - DEP



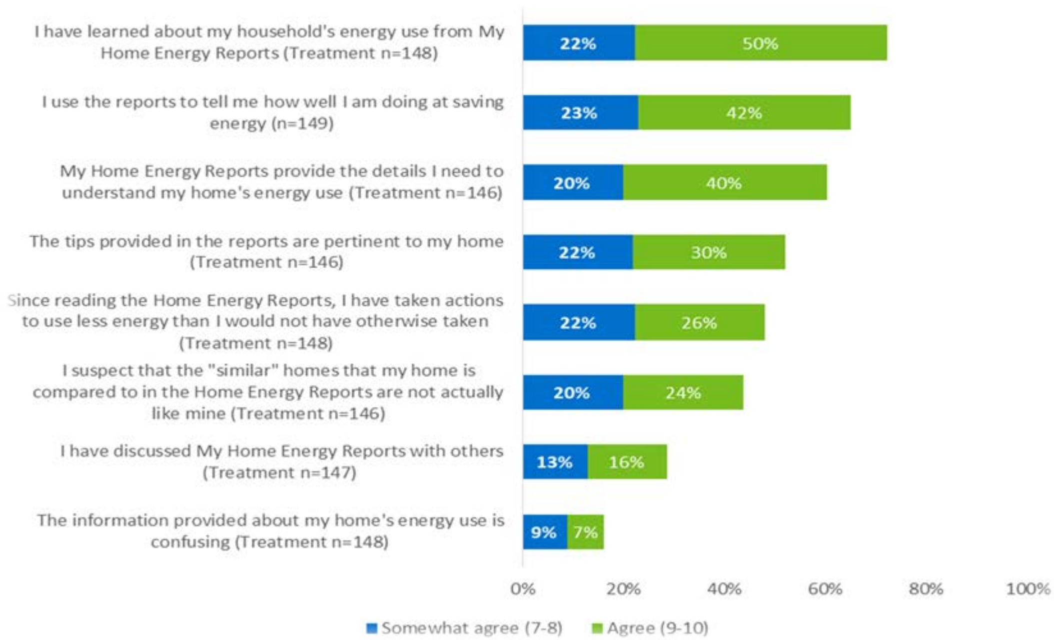
Eighty percent (105 of the 132 respondents that provided a rating) reported being "somewhat" or "very" satisfied with the information contained in the reports (Figure 4-38). The survey asked a further question to the respondents of why they said so: sixty-two of the satisfied respondents provided reasons. Among customers who gave the highest satisfaction ratings, the most common comments on the MyHERs described the reports' ability to engage the customer and provide greater awareness. The customers who reported being somewhat satisfied most often simply described the reports as "useful."

Figure 4-38: Satisfaction with the Information in MyHER Reports (n=132) - DEP



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 72% 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 (65% rating a seven or higher). Sixty percent of respondents agreed that the reports provided the details they needed to understand their home's energy usage. Respondents provided weaker agreement to statements about the pertinence of the tips provided to their homes and whether they have taken actions to use less energy than they would not have since reading MyHERs. A relatively small percentage (16%) agreed with the statement that the information provided is confusing. (Figure 4-39).

Figure 4-39: Level of Agreement with Statements about MyHER (0-10 Scale) - DEP



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 43% (64 of 149) offered suggestions, including six who offered only appreciative comments. Among those offering suggestions for improvement, the most common request, mentioned by 23 of the 64 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:

- "*How is energy distributed amongst outlets, appliances, etc.*"
- "*More specific about what electronics use the most energy so I can lower the usage"*
- *"Hours of use, including hours of the day, compare to previous months and or years"*
- "*Maybe by specifying where exactly do we need to focus in order to bring the bill payment down*"
- "*Provide size and age of houses compared to*"

Other comments centered on other suggestions (such as providing free energy assessment, etc.), 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:

- "*Make all these energy reports available online, so that consumer can view it any time*"
- "*Make it available online...*"

Nexant categorized these suggestions on the general basis of their content; the results are presented in Table 4-26.

Table 4-26: Distribution Suggestions for Improvement (Multiple Responses Allowed) - DEP

Suggestion	Count	Percent of Respondents Mentioning (n=64)	Percent of Total Mentions (n=75)
Provide more specific information or details	23	36%	31%
Don't believe comparison/accuracy	16	25%	21%
Other suggestions (such as providing information on solar panels, etc.)	8	13%	11%
Appreciate the Home Energy Report	9	14%	12%
Address unique home/circumstances	5	8%	7%
Expressed frustration	5	8%	7%
Provide discounts/incentives/equipment upgrades	5	8%	7%
Change production (mail, paper, format)	3	5%	4%
Don't see value/dislike	1	2%	1%

Treatment households were also asked questions that focused on the awareness and use of MyHER Interactive, revealing low awareness of the online Interactive platform:

- Only 35% of treatment customers are aware of MyHER Interactive;
- Among aware customers, 86% reported that they had not signed up to use MyHER Interactive; and
- When asked why they haven't signed up to use MyHER Interactive, 23% of respondents reported that they were very busy, 23% reported that they were not interested in it, 18% reported that they did not have either a computer or internet access, and another 10% reported that they actually did not know about it.

4.3 Summary of Process Evaluation Findings

In-depth interviews with MyHER implementation staff reveal that the DEP and DEC MyHER program has benefited from a number of enhancements to the program and improvements in process and program management, and continues to operate effectively. Electronic MyHERs are now sent via email to all treatment customers that have provided Duke Energy with an email address. This enhancement means that report production is now a year-round process since the email reports are sent on a monthly basis for each month of the year. The MyHER report template was also refreshed to increase visual appeal and value to the customer. The new template includes the addition of a module that presents energy usage disaggregated by end-use category, on a looking-forward basis for the month ahead. Also, the template update included the addition of images to the free form text (FFT) module of the reports. Lastly, the content and graphics of the email template was changed. There has also been increased enrollment for the MyHER Interactive online portal, which is emerging as a priority for Duke Energy and Tendril. The MyHER user experience is expected to be further enhanced in the future as the rollout of AMI meters and increased availability of AMI data continues.

From the backoffice perspective, Tendril, Duke Energy's MyHER program provider, implemented a number of process improvements. Tendril migrated their computational platform to Amazon Web Services (AWS), significantly reducing the time required to process data and generate batches of reports, and developed a pre-production platform to enable Duke Energy to review PDF drafts of MyHERs prior to promotion into production, which realized process efficiencies for Tendril. Additionally, Tendril has made progress on updating the "action tips" section of the report to "smart actions", by introducing the ability for these tips to be targeted to particular groups of MyHER recipients for which the tips are most appropriate. To date, roughly 20% of these tips are now "smart actions". Tendril also transitioned email MyHER production to Hypertext Markup Language (HTML) format to provide greater flexibility in Tendril's production processes.

Duke Energy and Tendril continue to collaborate for success through joint weekly status meetings, monthly operations meetings, and quarterly governance meetings. Working together, monthly key performance indicators (KPIs) such as in-home dates and percentage of treated customers treated are monitored. These meetings provide the venue for brainstorming and roadmapping activities as well as monitoring Duke Energy's MyHER product request list. This list is a priority for Duke Energy, and currently tracks about 25 items. Tendril has implemented an internal HER Improvement team to address the items on the list, and has made progress in this endeavor. Since the prior evaluation, Tendril has improved their performance in product quality, which is rigorously monitored by Duke Energy staff. These improvements have been attributed to a stable operations team at Tendril which has also expanded to include a quality control engineer. This engineer has designed and implemented automated QC checks, using AWS and other software, that have reduced errors in report production, increased the speed of the process, and reduced the staff necessary to manage it. This process will continue to change in 2019, as Tendril implements their HOMERS platform, allowing for increased efficiency in report production and quality control, as well as the implementation of the "self-serve" FFT tool that will eventually allow Duke Energy to produce and manage FFT content. This tool will eliminate the need for the highly resource-intensive collaboration procedure that has characterized FFT content production to this point.

Additionally, Tendril has also adopted a "Batch 0" strategy to implement significant changes to the MyHER reports on a test batch of data prior to producing a live batch to be mailed to customers. Batch 0 reports are tested for quality by both Tendril and Duke Energy and have allowed unexpected problems to be surfaced early and also to allow Duke Energy to fine tune the newly implemented changes. Improved product quality has resulted in fewer problems turning up in the quality control process.

In general, there was a strong emphasis on the development of procedures and strategies to prevent problems in the MyHER production process including a redesigned QC process, progress on the product request list, the management of messaging calendars, and the preparation for the rollout of HOMERS.

Though there has been continued success in communications and data transfers, there were some problems emerging from the process of reconciling customer email lists that resulted in the loss of emails that had been updated by Duke Energy customers, as well as some difficulty that Tendril experienced with importing AMI data from Duke Energy. The latter problem is being remedied with the implementation of a new data ingester, while the former is being addressed by a procedural change until the reconciliation process is automated. Other areas that were noted for potential improvement include improving the MyHER login requirements and Interactive profile questionnaire. The latter improvement is to address a larger concern among customers that the disaggregated energy use figures are not accurate.

Survey Findings - DEC

Surveys of DEC treatment and control customers show that, among treatment group households:

- 93% recalled receiving at least one MyHER and 99% of those indicated that they “always” or “sometimes” read the reports.
- 87% reported being “very” or “somewhat” satisfied with the information provided by MyHERs.
- Only 28% of MyHER recipients are aware of MyHER Interactive, and only 8% of the aware recipients report that they have signed up to use it. When asked why they haven’t signed up to use MyHER Interactive, 30% of respondents reported that they were too busy, 22% reported that they were not interested in it, and 9% further reported that they did not know about it.
- Seventy-one percent of respondents strongly agree with the statement “I have learned about my household’s energy use from My Home Energy Reports”. Very few (12%) 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 feature is customized suggestions for homes.
- 44% of treatment customers reported that MyHERs spurred them to undertake energy saving actions that they would not otherwise have done.
- Most (72%) respondents had no feedback or suggestions to improve the program. Those that made suggestions most frequently questioned the accuracy of the comparison, and 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 customers are significantly more likely than control customers to report having undertaken behaviors to reduce household energy use or having made energy efficiency improvements to their home (73% to 63%).
- Treatment group respondents were significantly more likely to have engaged in 7 (out of 10) energy saving behaviors and 1 (out of 9) energy efficiency improvement than control respondents.

An index designed to account for overall survey-wide differences in response patterns found a more positive response pattern (31 positive responses out of a total of 49 questions) for treatment customers in simple frequencies across many facets of the survey. Using standard statistical techniques (specifically, the non-parametric sign test), Nexant calculates the probability of randomly obtaining positive results for 31 of 49 questions is 2% and is not likely due to chance. We conclude that exposure to MyHER is positively affecting customer awareness of, engagement in, and attitudes towards energy savings opportunities and actions. MyHER is also implemented with the goal of increasing customer satisfaction with Duke Energy and its stance on Energy Efficiency. These survey results do not show evidence of a measurable uplift in satisfaction in DEC that can be attributed to MyHER.

Survey Findings - DEP

Surveys of DEP treatment and control customers show that, among treatment group households:

- 94% recalled receiving at least one MyHER and 94% of those indicated that they "always" or "sometimes" read the reports.
- 80% reported being "very" or "somewhat" satisfied with the information provided by MyHERs.
- Only 35% of MyHER recipients are aware of MyHER Interactive, and only 14% of the aware recipients report that they have signed up to use it. When those who hadn't signed up for MyHER Interactive were asked why, 23% of respondents reported that they were too busy, 23% reported that they were not interested in it, 18% reported that they did not have either a computer or internet access, and another 10% reported that they actually did not know about it.
- 48% of treatment-only group members reported that MyHERs spurred them to undertake energy saving actions that they would not otherwise have done.
- Seventy-two percent of respondents agree with the statement: "I have learned about my household's energy use from My Home Energy Reports". Few (16%) 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 feature is comparison to similar homes.

- More than half (57%) of respondents had no feedback or suggestions to improve the program. Those that made suggestions most frequently reflected a desire for more specific information or details about their home and specific actions they should take 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 customers significantly more likely than control customers to report having undertaken behaviors to reduce household energy use or having made energy efficiency improvements to their home (71% to 60%).
- Treatment group respondents were significantly more likely to have engaged in 5 (of 10) energy saving behaviors and 5 (of 9) energy efficiency improvements than control respondents.
- Treatment group respondents reported significantly higher levels of satisfaction with the information Duke Energy makes available about energy efficiency programs, with the information Duke Energy provides to help customers save on energy bills, and with Duke Energy's commitment to promoting energy efficiency and the wise use of electricity.

An index designed to account for overall survey-wide differences in response patterns finds a more positive response pattern for treatment customers in simple frequencies across the entire survey. Thirty-six out of 40 questions show more favorable responses for the treatment group. Using standard statistical techniques (specifically, the non-parametric sign test), Nexant calculates the probability of randomly obtaining this result is nearly 0% and thus extremely likely due to chance. We conclude that exposure to MyHER is increasing awareness of, engagement in, and attitudes towards energy savings opportunities of treatment customers relative to control customers.

5 Conclusions and Recommendations

Nexant finds 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 savings generated by the program are corroborated by survey findings of respondent awareness of, engagement in, and focus on the importance of saving energy. As an additional benefit, Nexant finds that MyHER is a useful tool for enhancing Duke Energy and increases uptake in other Duke Energy efficiency programs. The MyHER program has achieved full deployment among Duke Energy Carolinas and Progress single-family home 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 also 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 sends email challenges to portal users 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 estimates that the MyHER program saved a total of 292.2 GWh at Duke Energy Carolinas and 141.1 GWh at Duke Energy Progress during the period June 2017 to May 2018. The confidence and relative precision of the estimate is 90% and 6.4%, respectively for DEC and 9.4% for DEP. This impact estimate accounts for the fact that MyHER increases uptake of other Duke Energy programs; 6.0 kWh has been subtracted from the average household program impact to account for the MyHER uplift in other programs in both DEC and DEP. Without such a correction, those savings (6.0, kWh per household per year) would be double counted by Duke Energy.

Nexant estimates that DEC customers that sign up to use the MyHER Interactive Portal saved an additional 21 kWh per month, representing an additional 1.6% in energy savings during the period June 2017 to May 2018. These savings are statistically significant at the 90% level of confidence and are incremental, or over and above the savings that MyHER alone delivers. However, only a relatively small group of DEC MyHER recipients are signed up to use the portal, as of May 2018 38,190 DEC customers are Interactive users, out of 1,151,896 DEC MyHER recipients overall. It's important to note that 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. DEP MyHER participants do not generate statistically significant energy savings during the period June 2017 to May 2018.

5.2 Process Findings

The DEP and DEC MyHER programs are Duke Energy's most mature behavioral programs in terms of delivered energy savings in each jurisdiction. 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 and DEC customers' valuable information for managing home energy consumption.

The DEP and DEC MyHER programs have benefited from a number of process and product management improvements. Careful change management and a stable operations team at Tendril have been key enablers of maintaining a production process that consistently meets MyHER quality control standards.

MyHER participants have been found in this evaluation's customer surveys to display higher levels or incidence of a number of energy savings behaviors, opinions, attitudes, and engagement with energy efficiency. MyHER is also positively affecting customer's perception of Duke Energy's public stance on energy efficiency for DEP, and some aspects of customers' monitoring and tracking household energy consumption habits in both DEC and DEP.

5.3 Program Recommendations

- **Continue the commitment to simultaneous control and treatment assignment.** New assignments to treatment and control groups must be simultaneous and Tendril and Duke Energy should work to add all newly assigned treatment and control groups to their respective statuses in a single billing month, to the extent that is technically feasible.
- **Continue the practice of making assignments of new accounts to MyHER treatment and control groups once a year, or at most, twice a year.** The numbers of Duke Energy customers becoming eligible for the program each year do not facilitate more frequent assignments. This is due to the fact that sufficient numbers of customers must be set aside for the control group each time a group of customers is assigned to treatment in order for the evaluator to be able to measure the energy savings delivered by the new cohort.
- **Increase MyHER participant awareness of Interactive.** The process evaluation finds that current awareness of Interactive among DEP and DEC MyHER participants is very low, so another program objective above actual engagement with Interactive is to more effectively get the word out about its existence.
- **Continue to drive engagement with the Interactive Portal.** MyHER Interactive's ability to deliver measurable energy savings is on the rise, as shown by this evaluation in comparison to the prior DEC evaluation, as well as the MyHER evaluations for other

Duke Energy jurisdictions completed in the past year. We recommend that Duke Energy continue to drive more MyHER participants to the portal.

- **Continue to operate MyHER with an eye towards change management**. MyHER's implementer Tendril has made great strides in improving quality control performance since the prior evaluation in the automating of this process. Effective change management and stable staffing have been notable contributors to these improvements and they should continue to be emphasized in MyHER program operations, especially as Tendril's new HER production platform, HOMERS (the Home Energy Reporting Service), is rolled out and its implementation is optimized.
- **Continue to prioritize the structuring of the processes and schedules for program elements**. This organization of tasks for elements such as the FFT report module has been a significant success in the operations of the MyHER program and has the made reactive responses to impending deadlines and emergent challenges that characterized these operations in the past much less common. Program staff should seek out additional opportunities for the optimization of program schedules, tasks, and long term goals in this manner.

Appendix A Summary Forms

MyHER Carolinas

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	July 10, 2019
Region(s)	Carolinas
Evaluation Period	June 2017 – May 2018
Annual kWh Savings	292,174,507 kWh (Report) 7,378,007 kWh (Portal)
Per Participant kWh Savings	247.7 kWh/home (Report) 255.1 kWh/home (Portal)
Coincident kW Impact	0.069 kW/home (Report) 0.071 kW/home (Portal)
Net-to-Gross Ratio	Not Applicable
Process Evaluation	Yes
Previous Evaluation(s)	2017 – Nexant 2014 – TecMarket Works

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 = 108% for energy impacts; 247.7 kWh per home (Report)*

Process Evaluation Activities

- *337 surveys of treatment customers, 211 surveys for control group customers and staff interviews.*

Process Evaluation Findings

- *93% of MyHER recipients recall receiving the reports.*
- *87% of MyHER recipients are "very" or "somewhat" satisfied with the information provided by the reports.*
- *28% of MyHER recipients are aware of MyHER Interactive.*
- *MyHER produces an uplift in customer awareness of, engagement in, and attitudes towards energy savings.* opportunities and actions

MyHER Progress

Completed EMV Fact Sheet

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	July 10, 2019
Region(s)	Progress
Evaluation Period	June 2017 – May 2018
Annual kWh Savings	141,099,476 kWh
Per Participant kWh Savings	201.2 kWh/home
Coincident kW Impact	0.071 kW/home
Net-to-Gross Ratio	Not Applicable
Process Evaluation	Yes
Previous Evaluation(s)	2017 – Nexant

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 = 137% for energy impacts; 201.2 kWh per home*

Process Evaluation Activities

- *347 surveys of treatment customers, 192 surveys for control group customers and staff interviews.*

Process Evaluation Findings

- *94% of MyHER recipients recall receiving the reports.*
- *80% of MyHER recipients are "very" or "somewhat" satisfied with the information provided by the reports.*
- *35% of MyHER recipients are aware of MyHER Interactive.*
- *MyHER produces an uplift in customer awareness of, engagement in, and attitudes towards energy savings.* opportunities and actions

Appendix B Measure Impact Results

Table B-1: DSMore Measure Impact Results

Measure Category	Prod Code	Jurisdiction	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	DEC	248	0.0691	N/A	100%	248	0.0691	N/A	1
MyHER Interactive		DEC	255	0.0712	N/A	100%	255	0.0712	N/A	1
NC_ My Home Energy Report	HECR	DEP	201	0.0712	N/A	100%	201	0.0712	N/A	1

Appendix C Survey Instruments

Primary Survey

Q1. 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. Please rate your overall satisfaction with each of the following aspects of communications from Duke Energy.

	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. Have you logged in to your Duke Energy account to do any of the following? 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 information about rebate programs, energy efficient products, or ways 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. 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

Q7. 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

Q8. Over the past 12 months, have you or another member of your household taken any actions to reduce your household energy use, or made any energy efficiency improvements in your home?

☐ Yes ☐ No – **Skip to Q12**

Q9. Which actions have been taken?

	Yes	No	Don't Know
Adjusted heating or cooling settings to save energy	☐	☐	☐
Reduced water heater temperature to save energy	☐	☐	☐
Wash clothes in cold water	☐	☐	☐
Fully load clothes washer	☐	☐	☐
Fully load dishwasher	☐	☐	☐
Turn off lights in unused or outdoor areas	☐	☐	☐
Unplug or shut down household electronics when not in use	☐	☐	☐
Maintain heating or cooling equipment for more efficient operation	☐	☐	☐
Use a portable fan or ceiling fan for cooling instead of an air conditioner	☐	☐	☐
Other, please specify:			
Other, please specify:			

Q10. Which energy efficiency improvements have been made?

	Yes	No	Don't Know
Install energy-efficient kitchen or laundry appliances	☐	☐	☐
Install energy-efficient heating/cooling equipment	☐	☐	☐
Install energy-efficient water heater	☐	☐	☐
Replace windows or doors with more energy-efficient types	☐	☐	☐
Caulk or weatherstrip (windows or doors)	☐	☐	☐
Add insulation to attic, walls, or floors	☐	☐	☐
Install energy-efficient lighting	☐	☐	☐
Install programmable thermostat or "smart" thermostat	☐	☐	☐
Purchase ENERGY STAR certified home electronic equipment (a television, for example)	☐	☐	☐

Q11. Below are some reasons why you might not be able to save as much energy as you would like. How important are each of the following reasons? Scale: 0 = Not at all Important; 10 = Extremely Important

	Not at all Important										Extremely Important
Initial cost of energy efficient equipment is too high	0	1	2	3	4	5	6	7	8	9	10
Not enough time to shop/research/install /Too busy	0	1	2	3	4	5	6	7	8	9	10
I do not have the expertise	0	1	2	3	4	5	6	7	8	9	10
I do not have enough information to make a decision or understand the impacts of these improvements or behaviors	0	1	2	3	4	5	6	7	8	9	10
Getting everyone in the house to cooperate is too hard	0	1	2	3	4	5	6	7	8	9	10
I do not think my energy saving efforts are worth the time and/or money	0	1	2	3	4	5	6	7	8	9	10

Q12. 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

Q13. Thinking about the information you could 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 display 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

Q14. 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
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
Conserving energy resources	0	1	2	3	4	5	6	7	8	9	10

Q15. 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	☐	☐	☐	☐	☐

Q16. Before today, were you aware that you could order free or discounted lighting products through the Duke Energy website?

☐ Yes ☐ No – **Skip to Q17**

Q16a. How many **free** light bulbs have you ordered through the Duke Energy website this year? _______

Q16b. How many **discounted** light bulbs have you ordered through the Duke Energy website this year? _______

Q17. How could Duke Energy improve upon its service offerings to help you reduce your energy usage?

____

____

____

Q18. Do you own or rent this residence? ☐ Own ☐ Rent

Q19. Including yourself, how many people live in your home? _________

Q20. In what year was your home built? _________

Q21. How many square feet is the above-ground living space? _________

Q22. What is your primary heating fuel? ☐ Electricity ☐ Natural Gas ☐ Oil ☐ Other

Q23. In what year were you born? _________

Thank you! Please return your completed survey using the enclosed envelope.

NEXID

Treatment-only Survey

Q1. Duke Energy sends a personalized report called *My Home Energy Report* to a select group of homes. These reports are mailed in a standard envelope every few months and are meant to provide you with information on how your home's electric energy usage compares with similar homes. Have you seen one of these reports?

☐ Yes ☐ No – **Skip to Q13**

Q2. About how many *My Home Energy Reports* have you received in the past 12 months?____ **If zero, skip to Q13**

Q3. How often do you read the *My Home Energy Reports*?

☐ Always ☐ Sometimes ☐ Never – **Skip to Q13**

Q4. How much do 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
I suspect that the "similar" homes that my home is compared to in the *Home Energy Reports* are not actually like mine.	0	1	2	3	4	5	6	7	8	9	10
I like receiving the *Home Energy Reports*.	0	1	2	3	4	5	6	7	8	9	10
Since reading the *Home Energy Reports*, I have taken actions to use less energy than I would not have otherwise taken.	0	1	2	3	4	5	6	7	8	9	10

Q5. 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.

____

____

____

Q6. Please rate how useful each feature of the *Home Energy Report* 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 display 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

Q7. Overall, how satisfied are you with the information in the *My Home Energy Reports* you've received?
Scale: 0 = Not at all Satisfied; 10 = Completely Satisfied

Not at all Satisfied										Completely Satisfied
0	1	2	3	4	5	6	7	8	9	10

Q7a. Why do you say that? ______________________

Q8. Are you aware that you can go online to *My Home Energy Interactive* to access more information, above and beyond that found in the *My Home Energy Report*, which describes more ways to save energy?

☐ Yes ☐ No – **Skip to Q9**

Q8a. Have you signed up to use *My Home Energy Interactive*?

☐ Yes ☐ No – **Skip to Q8c**

Q8b. How useful is *My Home Energy Interactive* to you for saving energy?
Scale: 0 = Not at all Useful; 10 = Extremely Useful

Not at all Useful										Extremely Useful
0	1	2	3	4	5	6	7	8	9	10

Q8c. Why haven't you signed up to use *My Home Energy Interactive*?

____

____

____

Q9. Over the past 12 months, have you or another member of your household taken any actions to reduce your household energy use, or made any energy efficiency improvements in your home?

☐ Yes ☐ No – **Skip to Q13**

Q10. Which actions have been taken?

	Yes	No	Don't Know
Adjusted heating or cooling settings to save energy	☐	☐	☐
Reduced water heater temperature to save energy	☐	☐	☐
Wash clothes in cold water	☐	☐	☐
Fully load clothes washer	☐	☐	☐
Fully load dishwasher	☐	☐	☐
Turn off lights in unused or outdoor areas	☐	☐	☐
Unplug or shut down household electronics when not in use	☐	☐	☐
Maintain heating or cooling equipment for more efficient operation	☐	☐	☐
Use a portable fan or ceiling fan for cooling instead of an air conditioner	☐	☐	☐
Other, please specify:			
Other, please specify:			

Q11. Which energy efficiency improvements have been made?

	Yes	No	Don't Know
Install energy-efficient kitchen or laundry appliances	☐	☐	☐
Install energy-efficient heating/cooling system	☐	☐	☐
Install energy-efficient water heater	☐	☐	☐
Replace windows or doors with more energy-efficient types	☐	☐	☐
Caulk or weatherstrip (windows or doors)	☐	☐	☐
Add insulation to attic, walls, or floors	☐	☐	☐
Install energy-efficient lighting	☐	☐	☐
Install programmable thermostat or "smart" thermostat	☐	☐	☐
Purchase ENERGY STAR-certified home electronic equipment (a television, for example)	☐	☐	☐

Q12. Below are some reasons why you might not be able to save as much energy as you would like. How important are each of the following reasons? Scale: 0 = Not at all Important; 10 = Extremely Important

	Not at all Important										Extremely Important
Initial cost of energy efficient equipment is too high	0	1	2	3	4	5	6	7	8	9	10
Not enough time to shop/research/install /Too busy	0	1	2	3	4	5	6	7	8	9	10
I do not have the expertise	0	1	2	3	4	5	6	7	8	9	10
I do not have enough information to make a decision or understand the impacts of these improvements or behaviors	0	1	2	3	4	5	6	7	8	9	10
Getting everyone in the house to cooperate is too hard	0	1	2	3	4	5	6	7	8	9	10
I do not think my energy saving efforts are worth the time and/or money	0	1	2	3	4	5	6	7	8	9	10

Q13. Do you own or rent this residence? ☐ Own ☐ Rent

Q14. Including yourself, how many people live in your home? _________

Q15. In what year was your home built? _________

Q16. How many square feet is the above-ground living space? _________

Q17. What is your primary heating fuel? ☐ Electricity ☐ Natural Gas ☐ Oil ☐ Other

Q18. In what year were you born? _________

Thank you! Please return your completed survey using the enclosed envelope.

NEXID

Appendix D Survey Frequencies: DEC

PRI_Q1. 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	No Response	Total
Control	2	1	0	1	2	11	6	24	37	40	86	1	211
Percent	1	0	0	0	1	5	3	11	18	19	41	0	100
Treatment	2	0	1	1	1	14	7	23	35	35	65	0	184
Percent	1	0	1	1	1	8	4	13	19	19	35	0	100
Total	4	1	1	2	3	25	13	47	72	75	151	1	395
Percent	1	0	0	1	1	6	3	12	18	19	38	0	100

PRI_Q2 Please rate your overall satisfaction with each of the following aspects of communications from Duke Energy.

PRI_Q2_1 The information available about Duke Energy's efficiency programs.

Group	Very Satisfied	Somewhat Satisfied	Neither	Somewhat Dissatisfied	Very Dissatisfied	No Response	Total
Control	86	72	38	6	7	2	211
Percent	41	34	18	3	3	1	100
Treatment	82	60	28	5	8	1	184
Percent	45	33	15	3	4	1	100
Total	168	132	66	11	15	3	395
Percent	43	33	17	3	4	1	100

PRI_Q2_2 Duke Energy's commitment to promoting energy efficiency and the wise use of electricity.

Group	Very Satisfied	Somewhat Satisfied	Neither	Somewhat Dissatisfied	Very Dissatisfied	No Response	Total
Control	93	66	35	8	7	2	211
Percent	44	31	17	4	3	1	100
Treatment	80	61	27	5	9	2	184
Percent	43	33	15	3	5	1	100
Total	173	127	62	13	16	4	395
Percent	44	32	16	3	4	1	100

PRI_Q2_3 The information Duke Energy provides to help customers save on energy bills.

Group	Very Satisfied	Somewhat Satisfied	Neither	Somewhat Dissatisfied	Very Dissatisfied	No Response	Total
Control	93	76	23	11	5	3	211
Percent	**44**	**36**	**11**	**5**	**2**	**1**	**100**
Treatment	90	59	18	7	8	2	184
Percent	**49**	**32**	**10**	**4**	**4**	**1**	**100**
Total	183	135	41	18	13	5	395
Percent	**46.33**	**34**	**10**	**5**	**3**	**1**	**100**

PRI_Q3 Have you logged in to your Duke Energy account to do any of the following? Check all that apply.

PRI_Q3_1 I have never logged in

Group	Not Checked	Checked	Total
Control	129	75	204
Percent	**63**	**37**	**100**
Treatment	115	65	180
Percent	**64**	**36**	**100**
Total	244	140	384
Percent	**64**	**36**	**100**

PRI_Q3_2 Pay my bill

Group	Not Checked	Checked	Total
Control	128	76	204
Percent	**63**	**37**	**100**
Treatment	116	64	180
Percent	**64**	**36**	**100**
Total	244	140	384
Percent	**64**	**36**	**100**

PRI_Q3_3 Review energy consumption graphs

Group	Not Checked	Checked	Total
Control	163	41	204
Percent	**80**	**20**	**100**
Treatment	146	34	180
Percent	**81**	**19**	**100**
Total	309	75	384
Percent	**80**	**20**	**100**

PRI_Q3_4 Look for energy efficiency opportunities or ideas

Group	Not Checked	Checked	Total
Control	172	32	204
Percent	**84**	**16**	**100**
Treatment	151	29	180
Percent	**84**	**16**	**100**
Total	323	61	384
Percent	**84**	**16**	**100**

PRI_Q3_5 None of the above

Group	Not Checked	Checked	Total
Control	171	33	204
percent	**84**	**16**	**100**
Treatment	149	31	180
percent	**83**	**17**	**100**
Total	320	64	384
percent	**83**	**17**	**100**

PRI_ Q4. How often do you access the Duke Energy website to search for information about rebate programs, energy efficient products, or ways to make your home more energy efficient? Select only one.

Group	Monthly	Once a year	A few times a year	Never	No Response	Total
Control	14	18	48	130	1	211
Percent	**7**	**9**	**23**	**62**	**0**	**100**
Treatment	14	13	34	123	0	184
Percent	**8**	**7**	**18**	**67**	**0**	**100**
Total	28	31	82	253	1	395
Percent	**7**	**8**	**21**	**64**	**0**	**100**

PRI_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	No Response	Total
Control	47	12	14	14	4	20	22	21	23	18	14	2	211
Percent	**22**	**6**	**7**	**7**	**2**	**9**	**10**	**10**	**11**	**9**	**7**	**1**	**100**
Treatment	46	10	9	10	7	27	8	13	20	12	22	0	184
Percent	**25**	**5**	**5**	**5**	**4**	**15**	**4**	**7**	**11**	**7**	**12**	**0**	**100**
Total	93	22	23	24	11	47	30	34	43	30	36	2	395
Percent	**24**	**6**	**6**	**6**	**3**	**12**	**8**	**9**	**11**	**8**	**9**	**1**	**100**

PRI_Q6. 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	No Response	Total
Control	1	2	1	3	3	11	19	26	40	34	70	1	211
Percent	**0**	**1**	**0**	**1**	**1**	**5**	**9**	**12**	**19**	**16**	**33**	**0**	**100**
Treatment	3	1	2	0	2	22	11	22	29	24	68	0	184
Percent	**2**	**1**	**1**	**0**	**1**	**12**	**6**	**12**	**16**	**13**	**37**	**0**	**100**
Total	4	3	3	3	5	33	30	48	69	58	138	1	395
Percent	**1**	**1**	**1**	**1**	**1**	**8**	**8**	**12**	**17**	**15**	**35**	**0**	**100**

PRI_Q7. 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	No Response	Total
Control	2	0	8	6	6	31	19	43	48	26	21	1	211
Percent	**1**	**0**	**4**	**3**	**3**	**15**	**9**	**20**	**23**	**12**	**10**	**0**	**100**
Treatment	2	1	4	2	5	28	18	32	46	21	25	0	184
Percent	**1**	**1**	**2**	**1**	**3**	**15**	**10**	**17**	**25**	**11**	**14**	**0**	**100**
Total	4	1	12	8	11	59	37	75	94	47	46	1	395
Percent	**1**	**0**	**3**	**2**	**3**	**15**	**9**	**19**	**24**	**12**	**12**	**0**	**100**

PRI_Q8 & TRE_Q9. Over the past 12 months, have you or another member of your household taken any actions to reduce your household energy use, or made any energy efficiency improvements in your home?

Group	Yes	No	No Response	Missing	Total
Control	129	77	5	0	211
Percent	61	36	2	0	100
Treatment	229	85	6	17	337
Percent	68	25	2	5	100
Total	358	162	11	17	548
Percent	65	30	2	3	100

PRI_Q9 & TRE_Q10. Which actions have been taken?

PRI_Q9_1 & TRE_Q10_1. Adjusted heating or cooling settings to save energy

Group	Yes	No	Don't Know	No Response	Total
Control	115	7	2	5	129
Percent	89	5	2	4	100
Treatment	213	13	1	2	229
Percent	93	6	0	1	100
Total	328	20	3	7	358
Percent	92	6	1	2	100

PRI_Q9_2 & TRE_Q10_2. Reduced water heater temperature to save energy

Group	Yes	No	Don't Know	No Response	Total
Control	41	75	6	7	129
Percent	32	58	5	5	100
Treatment	84	130	8	7	229
Percent	37	57	3	3	100
Total	125	205	14	14	358
Percent	35	57	4	4	100

PRI_Q9_3 & TRE_Q10_3. Wash clothes in cold water

Group	Yes	No	Don't Know	No Response	Total
Control	85	38	1	5	129
Percent	66	29	1	4	100
Treatment	170	51	5	3	229
Percent	74	22	2	1	100
Total	255	89	6	8	358
Percent	71	25	2	2	100

PRI_Q9_4 & TRE_Q10_4. Fully load clothes washer

Group	Yes	No	Don't Know	No Response	Total
Control	98	23	3	5	129
Percent	76	18	2	4	100
Treatment	192	29	5	3	229
Percent	84	13	2	1	100
Total	290	52	8	8	358
Percent	81	15	2	2	100

PRI_Q9_5 & TRE_Q10_5. Fully load dishwasher

Group	Yes	No	Don't Know	No Response	Total
Control	81	27	12	9	129
Percent	63	21	9	7	100
Treatment	168	43	12	6	229
Percent	73	19	5	3	100
Total	249	70	24	15	358
Percent	70	20	7	4	100

PRI_Q9_6 & TRE_Q10_6. Turn off lights in unused or outdoor areas

Group	Yes	No	No Response	Total
Control	121	7	1	129
Percent	94	5	1	100
Treatment	224	4	1	229
Percent	98	2	0	100
Total	345	11	2	358
Percent	96	3	1	100

PRI_Q9_7 & TRE_Q10_7. Unplug or shut down household electronics when not in use

Group	Yes	No	No Response	Total
Control	100	25	4	129
Percent	78	19	3	100
Treatment	170	55	4	229
Percent	74	24	2	100
Total	270	80	8	358
Percent	75	22	2	100

PRI_Q9_8 & TRE_Q10_8. Maintain heating or cooling equipment for more efficient operation

Group	Yes	No	Don't Know	No Response	Total
Control	104	11	5	9	129
Percent	**81**	**9**	**4**	**7**	**100**
Treatment	200	26	2	1	229
Percent	**87**	**11**	**1**	**0**	**100**
Total	304	37	7	10	358
Percent	**85**	**10**	**2**	**3**	**100**

PRI_Q9_9 & TRE_Q10_9. Use a portable fan or ceiling fan for cooling instead of an air conditioner

Group	Yes	No	Don't Know	No Response	Total
Control	88	35	3	3	129
Percent	**68**	**27**	**2**	**2**	**100**
Treatment	133	90	5	1	229
Percent	**58**	**39**	**2**	**0**	**100**
Total	221	125	8	4	358
Percent	**62**	**35**	**2**	**1**	**100**

PRI_Q9_10 & TRE_Q10_10. Other, please specify:

Group	Yes	No	Don't Know	No Response	Total
Control	32	30	41	26	129
Percent	**25**	**23**	**32**	**20**	**100**
Treatment	42	44	98	45	229
Percent	**18**	**19**	**43**	**20**	**100**
Total	74	74	139	71	358
Percent	**21**	**21**	**39**	**20**	**100**

PRI_Q9_11 & TRE_Q10_11. Other, please specify:

Group	Yes	No	Don't Know	No Response	Total
Control	8	48	44	29	129
Percent	**6**	**37**	**34**	**22**	**100**
Treatment	15	59	107	48	229
Percent	**7**	**26**	**47**	**21**	**100**
Total	23	107	151	77	358
Percent	**6**	**30**	**42**	**22**	**100**

PRI_Q10 & TRE_Q11. Which energy efficiency improvements have been made?

PRI_Q10_1 & TRE_Q11_1. Install energy-efficient kitchen or laundry appliances

Group	Yes	No	Don't Know	No Response	Total
Control	66	53	6	4	129
Percent	**51**	**41**	**5**	**3**	**100**
Treatment	120	101	6	2	229
Percent	**52**	**44**	**3**	**1**	**100**
Total	186	154	12	6	358
Percent	**52**	**43**	**3**	**2**	**100**

PRI_Q10_2 & TRE_Q11_2. Install energy-efficient heating/cooling equipment

Group	Yes	No	Don't Know	No Response	Total
Control	65	54	5	5	129
Percent	**50**	**42**	**4**	**4**	**100**
Treatment	104	113	10	2	229
Percent	**45**	**49**	**4**	**1**	**100**
Total	169	167	15	7	358
Percent	**47**	**47**	**4**	**2**	**100**

PRI_Q10_3 & TRE_Q11_3. Install energy-efficient water heater

Group	Yes	No	Don't Know	No Response	Total
Control	51	67	6	5	129
Percent	**40**	**52**	**5**	**4**	**100**
Treatment	88	128	10	3	229
Percent	**38**	**56**	**4**	**1**	**100**
Total	139	195	16	8	358
Percent	**39**	**54**	**4**	**2**	**100**

PRI_Q10_4 & TRE_Q11_4. Replace windows or doors with more energy-efficient types)

Group	Yes	No	Don't Know	No Response	Total
Control	39	83	1	6	129
Percent	**30**	**64**	**1**	**5**	**100**
Treatment	79	144	3	3	229
Percent	**35**	**63**	**1**	**1**	**100**
Total	118	227	4	9	358
Percent	**33**	**63**	**1**	**3**	**100**

PRI_Q10_5 & TRE_Q11_5. Caulk or weatherstrip (windows or doors)

Group	Yes	No	Don't Know	No Response	Total
Control	57	60	6	6	129
Percent	**44**	**47**	**5**	**5**	**100**
Treatment	111	111	3	4	229
Percent	**48**	**48**	**1**	**2**	**100**
Total	168	171	9	10	358
Percent	**47**	**48**	**3**	**3**	**100**

PRI_Q10_6 & TRE_Q11_6. Add insulation to attic, walls, or floors

Group	Yes	No	Don't Know	No Response	Total
Control	45	75	3	6	129
Percent	**35**	**58**	**2**	**5**	**100**
Treatment	69	147	4	9	229
Percent	**30**	**64**	**2**	**4**	**100**
Total	114	222	7	15	358
Percent	**32**	**62**	**2**	**4**	**100**

PRI_Q10_7 & TRE_Q11_7. Install energy-efficient lighting

Group	Yes	No	Don't Know	No Response	Total
Control	103	18	3	5	129
Percent	**80**	**14**	**2**	**4**	**100**
Treatment	186	40	2	1	229
Percent	**81**	**17**	**1**	**0**	**100**
Total	289	58	5	6	358
Percent	**81**	**16**	**1**	**2**	**100**

PRI_Q10_8 & TRE_Q11_8. Install programmable thermostat or "smart" thermostat

Group	Yes	No	Don't Know	No Response	Total
Control	64	56	4	5	129
Percent	**50**	**43**	**3**	**4**	**100**
Treatment	103	119	4	3	229
Percent	**45**	**52**	**2**	**1**	**100**
Total	167	175	8	8	358
Percent	**47**	**49**	**2**	**2**	**100**

PRI_Q10_9 & TRE_Q11_9. Purchase ENERGY STAR certified home electronic equipment (a television, for example)

Group	Yes	No	Don't Know	No Response	Total
Control	73	37	12	7	129
Percent	57	29	9	5	100
Treatment	128	85	13	3	229
Percent	56	37	6	1	100
Total	201	122	25	10	358
Percent	56	34	7	3	100

PRI_Q11 & TRE_Q12. Below are some reasons why you might not be able to save as much energy as you would like. How important are each of the following reasons?

PRI_Q11_1 & TRE_Q12_1. Initial cost of energy efficient equipment is too high

Group	0	1	2	3	4	5	6	7	8	9	10	No Response	Total
Control	10	2	3	5	7	19	7	18	15	14	25	4	129
Percent	8	2	2	4	5	15	5	14	12	11	19	3	100
Treatment	14	8	8	7	8	39	8	21	33	16	65	2	229
Percent	6	3	3	3	3	17	3	9	14	7	28	1	100
Total	24	10	11	12	15	58	15	39	48	30	90	6	358
Percent	7	3	3	3	4	16	4	11	13	8	25	2	100

PRI_Q11_2 & TRE_Q12_2. Not enough time to shop/research/install/too busy

Group	0	1	2	3	4	5	6	7	8	9	10	No Response	Total
Control	20	3	7	7	3	23	9	15	10	9	16	7	129
Percent	16	2	5	5	2	18	7	12	8	7	12	5	100
Treatment	39	12	11	10	8	57	6	17	26	10	28	5	229
Percent	17	5	5	4	3	25	3	7	11	4	12	2	100
Total	59	15	18	17	11	80	15	32	36	19	44	12	358
Percent	16	4	5	5	3	22	4	9	10	5	12	3	100

PRI_Q11_3 & TRE_Q12_3. I do not have the expertise

Group	0	1	2	3	4	5	6	7	8	9	10	No Response	Total
Control	22	4	6	6	7	28	9	11	9	8	14	5	129
Percent	**17**	**3**	**5**	**5**	**5**	**22**	**7**	**9**	**7**	**6**	**11**	**4**	**100**
Treatment	41	12	8	12	9	57	13	21	14	11	28	3	229
Percent	**18**	**5**	**3**	**5**	**4**	**25**	**6**	**9**	**6**	**5**	**12**	**1**	**100**
Total	63	16	14	18	16	85	22	32	23	19	42	8	358
Percent	**18**	**4**	**4**	**5**	**4**	**24**	**6**	**9**	**6**	**5**	**12**	**2**	**100**

PRI_Q11_4 & TRE_Q12_4. I do not have enough information to make a decision or understand the impacts of these improvements or behaviors

Group	0	1	2	3	4	5	6	7	8	9	10	No Response	Total
Control	23	4	6	6	7	23	9	19	12	6	9	5	129
Percent	**18**	**3**	**5**	**5**	**5**	**18**	**7**	**15**	**9**	**5**	**7**	**4**	**100**
Treatment	40	6	14	9	9	48	20	16	22	5	35	5	229
Percent	**17**	**3**	**6**	**4**	**4**	**21**	**9**	**7**	**10**	**2**	**15**	**2**	**100**
Total	63	10	20	15	16	71	29	35	34	11	44	10	358
Percent	**18**	**3**	**6**	**4**	**4**	**20**	**8**	**10**	**10**	**3**	**12**	**3**	**100**

PRI_Q11_5 & TRE_Q12_5. Getting everyone in the house to cooperate is too hard

Group	0	1	2	3	4	5	6	7	8	9	10	No Response	Total
Control	26	6	3	7	6	22	8	6	7	5	25	8	129
Percent	**20**	**5**	**2**	**5**	**5**	**17**	**6**	**5**	**5**	**4**	**19**	**6**	**100**
Treatment	60	12	9	5	7	37	10	14	22	10	38	5	229
Percent	**26**	**5**	**4**	**2**	**3**	**16**	**4**	**6**	**10**	**4**	**17**	**2**	**100**
Total	86	18	12	12	13	59	18	20	29	15	63	13	358
Percent	**24**	**5**	**3**	**3**	**4**	**16**	**5**	**6**	**8**	**4**	**18**	**4**	**100**

PRI_Q11_6 & TRE_Q12_6. I do not think my energy saving efforts are worth the time and/or money

Group	0	1	2	3	4	5	6	7	8	9	10	No Response	Total
Control	23	9	5	5	8	20	6	4	12	8	23	6	129
Percent	18	7	4	4	6	16	5	3	9	6	18	5	100
Treatment	38	16	12	10	3	37	9	13	23	13	51	4	229
Percent	17	7	5	4	1	16	4	6	10	6	22	2	100
Total	61	25	17	15	11	57	15	17	35	21	74	10	358
Percent	17	7	5	4	3	16	4	5	10	6	21	3	100

PRI_Q12 Which of the following do you do with regard to your household's energy use? Check all that apply.

PRI_Q12_1 Track monthly energy use

Group	Not Checked	Checked	Total
Control	116	91	207
Percent	56	44	100
Treatment	100	83	183
Percent	55	45	100
Total	216	174	390
Percent	55	45	100

PRI_Q12_2 Track the total amount of your bill

Group	Not Checked	Checked	Total
Control	64	143	207
Percent	31	69	100
Treatment	78	105	183
Percent	43	57	100
Total	142	248	390
Percent	36	64	100

PRI_Q12_3 Compare usage to previous months

Group	Not Checked	Checked	Total
Control	66	141	207
Percent	32	68	100
Treatment	62	121	183
Percent	34	66	100
Total	128	262	390
Percent	33	67	100

PRI_Q12_4 Compare usage to the same month from last year

Group	Not Checked	Checked	Total
Control	87	120	207
Percent	42	58	100
Treatment	83	100	183
Percent	45	55	100
Total	170	220	390
Percent	44	56	100

PRI_Q12_5 None of the above

Group	Not Checked	Checked	Total
Control	189	18	207
Percent	91	9	100
Treatment	153	30	183
Percent	84	16	100
Total	342	48	390
Percent	88	12	100

PRI_Q13. Thinking about the information you could have about your home's energy use, please rate how useful each of the following items would be for your household.

PRI_Q13_1. Your home's energy use compared to that of similar homes

Group	0	1	2	3	4	5	6	7	8	9	10	No Response	Total
Control	17	5	5	11	4	34	10	27	22	21	46	9	211
Percent	8	2	2	5	2	16	5	13	10	10	22	4	100
Treatment	18	5	7	3	7	24	8	26	25	11	47	3	184
Percent	10	3	4	2	4	13	4	14	14	6	26	2	100
Total	35	10	12	14	11	58	18	53	47	32	93	12	395
Percent	9	3	3	4	3	15	5	13	12	8	24	3	100

PRI_Q13_2. Tips to help you save money and energy

Group	0	1	2	3	4	5	6	7	8	9	10	No Response	Total
Control	5	2	2	3	7	32	16	24	26	24	64	6	211
Percent	2	1	1	1	3	15	8	11	12	11	30	3	100
Treatment	10	3	3	4	2	24	5	28	29	17	58	1	184
Percent	5	2	2	2	1	13	3	15	16	9	32	1	100
Total	15	5	5	7	9	56	21	52	55	41	122	7	395
Percent	4	1	1	2	2	14	5	13	14	10	31	2	100

PRI_Q13_3. Examples of the energy use associated with common household items

Group	0	1	2	3	4	5	6	7	8	9	10	No Response	Total
Control	6	2	5	2	9	31	12	27	25	21	63	8	211
Percent	3	1	2	1	4	15	6	13	12	10	30	4	100
Treatment	16	3	3	2	3	24	11	27	28	20	45	2	184
Percent	9	2	2	1	2	13	6	15	15	11	24	1	100
Total	22	5	8	4	12	55	23	54	53	41	108	10	395
Percent	6	1	2	1	3	14	6	14	13	10	27	3	100

PRI_Q13_4. Customized suggestions for your home

Group	0	1	2	3	4	5	6	7	8	9	10	No Response	Total
Control	13	1	10	7	9	35	14	22	16	19	54	11	211
Percent	6	0	5	3	4	17	7	10	8	9	26	5	100
Treatment	15	5	4	7	2	23	11	23	28	19	43	4	184
Percent	8	3	2	4	1	13	6	13	15	10	23	2	100
Total	28	6	14	14	11	58	25	45	44	38	97	15	395
Percent	7	2	4	4	3	15	6	11	11	10	25	4	100

PRI_Q13_5. Graphs that display your home’s energy use over time

Group	0	1	2	3	4	5	6	7	8	9	10	No Response	Total
Control	11	2	7	3	2	25	10	26	30	19	69	7	211
Percent	5	1	3	1	1	12	5	12	14	9	33	3	100
Treatment	13	5	3	5	4	25	7	26	24	20	49	3	184
Percent	7	3	2	3	2	14	4	14	13	11	27	2	100
Total	24	7	10	8	6	50	17	52	54	39	118	10	395
Percent	6	2	3	2	2	13	4	13	14	10	30	3	100

PRI_Q13_6. Information about services and offers from Duke Energy

Group	0	1	2	3	4	5	6	7	8	9	10	No Response	Total
Control	9	1	4	4	5	30	14	20	28	24	66	6	211
Percent	4	0	2	2	2	14	7	9	13	11	31	3	100
Treatment	11	2	5	4	5	27	9	29	20	13	56	3	184
Percent	6	1	3	2	3	15	5	16	11	7	30	2	100
Total	20	3	9	8	10	57	23	49	48	37	122	9	395
Percent	5	1	2	2	3	14	6	12	12	9	31	2	100

PRI_Q14. 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.

PRI_Q14_1. Reducing my energy bill(s)

Group	0	1	2	3	4	5	6	7	8	9	10	No Response	Total
Control	1	0	1	0	1	11	8	15	29	20	121	4	211
Percent	**0**	**0**	**0**	**0**	**0**	**5**	**4**	**7**	**14**	**9**	**57**	**2**	**100**
Treatment	3	0	1	1	1	8	5	16	21	27	100	1	184
Percent	**2**	**0**	**1**	**1**	**1**	**4**	**3**	**9**	**11**	**15**	**54**	**1**	**100**
Total	4	0	2	1	2	19	13	31	50	47	221	5	395
Percent	**1**	**0**	**1**	**0**	**1**	**5**	**3**	**8**	**13**	**12**	**56**	**1**	**100**

PRI_Q14_2. Helping the environment

Group	0	1	2	3	4	5	6	7	8	9	10	No Response	Total
Control	2	0	3	4	4	18	10	22	34	18	92	4	211
Percent	**1**	**0**	**1**	**2**	**2**	**9**	**5**	**10**	**16**	**9**	**44**	**2**	**100**
Treatment	4	2	2	4	5	14	6	21	20	24	79	3	184
Percent	**2**	**1**	**1**	**2**	**3**	**8**	**3**	**11**	**11**	**13**	**43**	**2**	**100**
Total	6	2	5	8	9	32	16	43	54	42	171	7	395
Percent	**2**	**1**	**1**	**2**	**2**	**8**	**4**	**11**	**14**	**11**	**43**	**2**	**100**

PRI_Q14_3. Setting an example for others

Group	0	1	2	3	4	5	6	7	8	9	10	No Response	Total
Control	14	5	8	6	5	33	16	20	23	10	64	7	211
Percent	**7**	**2**	**4**	**3**	**2**	**16**	**8**	**9**	**11**	**5**	**30**	**3**	**100**
Treatment	21	6	1	5	9	26	11	24	21	16	41	3	184
Percent	**11**	**3**	**1**	**3**	**5**	**14**	**6**	**13**	**11**	**9**	**22**	**2**	**100**
Total	35	11	9	11	14	59	27	44	44	26	105	10	395
Percent	**9**	**3**	**2**	**3**	**4**	**15**	**7**	**11**	**11**	**7**	**27**	**3**	**100**

PRI_Q14_4. Avoiding waste

Group	0	1	2	3	4	5	6	7	8	9	10	No Response	Total
Control	1	0	3	2	2	13	6	22	40	24	94	4	211
Percent	**0**	**0**	**1**	**1**	**1**	**6**	**3**	**10**	**19**	**11**	**45**	**2**	**100**
Treatment	2	1	0	2	4	8	7	15	30	29	85	1	184
Percent	**1**	**1**	**0**	**1**	**2**	**4**	**4**	**8**	**16**	**16**	**46**	**1**	**100**
Total	3	1	3	4	6	21	13	37	70	53	179	5	395
Percent	**1**	**0**	**1**	**1**	**2**	**5**	**3**	**9**	**18**	**13**	**45**	**1**	**100**

PRI_Q14_5. Conserving energy resources

Group	0	1	2	3	4	5	6	7	8	9	10	No Response	Total
Control	1	0	2	4	1	17	11	22	33	23	93	4	211
Percent	**0**	**0**	**1**	**2**	**0**	**8**	**5**	**10**	**16**	**11**	**44**	**2**	**100**
Treatment	3	1	0	2	1	13	5	24	25	33	75	2	184
Percent	**2**	**1**	**0**	**1**	**1**	**7**	**3**	**13**	**14**	**18**	**41**	**1**	**100**
Total	4	1	2	6	2	30	16	46	58	56	168	6	395
Percent	**1**	**0**	**1**	**2**	**1**	**8**	**4**	**12**	**15**	**14**	**43**	**2**	**100**

PRI_Q15. Please indicate your level of agreement with each of the following statements

PRI_Q15_1. Duke Energy provides excellent customer service

Group	Strongly Disagree	Somewhat Disagree	Neither	Somewhat Agree	Strongly Agree	No Response	Total
Control	3	7	20	87	93	1	211
Percent	**1**	**3**	**9**	**41**	**44**	**0**	**100**
Treatment	1	4	26	72	79	2	184
Percent	**1**	**2**	**14**	**39**	**43**	**1**	**100**
Total	4	11	46	159	172	3	395
Percent	**1**	**3**	**12**	**40**	**44**	**1**	**100**

PRI_Q15_2. Duke Energy respects its customers

Group	Strongly Disagree	Somewhat Disagree	Neither	Somewhat Agree	Strongly Agree	No Response	Total
Control	5	14	23	76	90	3	211
Percent	**2**	**7**	**11**	**36**	**43**	**1**	**100**
Treatment	3	10	36	66	68	1	184
Percent	**2**	**5**	**20**	**36**	**37**	**1**	**100**
Total	8	24	59	142	158	4	395
Percent	**2**	**6**	**15**	**36**	**40**	**1**	**100**

PRI_Q15_3. Duke Energy provides service at a reasonable cost

Group	Strongly Disagree	Somewhat Disagree	Neither	Somewhat Agree	Strongly Agree	No Response	Total
Control	7	23	30	100	48	3	211
Percent	**3**	**11**	**14**	**47**	**23**	**1**	**100**
Treatment	4	22	39	75	42	2	184
Percent	**2**	**12**	**21**	**41**	**23**	**1**	**100**
Total	11	45	69	175	90	5	395
Percent	**3**	**11**	**17**	**44**	**23**	**1**	**100**

PRI_Q16. Before today, were you aware that you could order free or discounted lighting products through the Duke Energy website?

Group	Yes	No	No Response	Total
Control	156	52	3	211
Percent	**74**	**25**	**1**	**100**
Treatment	118	63	3	184
Percent	**64**	**34**	**2**	**100**
Total	274	115	6	395
Percent	**69**	**29**	**2**	**100**

PRI_Q16a. How many free light bulbs have you ordered through the Duke Energy website this year?

Group	0	1	2	3	4	5	6	8	10	12	14	15	16	20	24	30	50	N.R.	M.	T.
Control	92	8	3	1	1	1	3	4	2	15	1	4	0	1	1	1	1	3	14	156
Percent	**59**	**5**	**2**	**1**	**1**	**1**	**2**	**3**	**1**	**10**	**1**	**3**	**0**	**1**	**1**	**1**	**1**	**2**	**9**	**100**
Treatment	71	8	0	0	1	1	5	3	3	12	0	0	2	2	0	0	0	0	10	118
Percent	**60**	**7**	**0**	**0**	**1**	**1**	**4**	**3**	**3**	**10**	**0**	**0**	**2**	**2**	**0**	**0**	**0**	**0**	**8**	**100**
Total	163	16	3	1	2	2	8	7	5	27	1	4	2	3	1	1	1	3	24	274
Percent	**59**	**6**	**1**	**0**	**1**	**1**	**3**	**3**	**2**	**10**	**0**	**1**	**1**	**1**	**0**	**0**	**0**	**1**	**9**	**100**

PRI_Q16b. How many discounted light bulbs have you ordered through the Duke Energy website this year?

Group	0	1	2	4	5	6	8	12	15	16	20	24	30	No Response	Missing	Total
Control	128	1	0	1	0	0	1	5	1	0	2	2	1	1	13	156
Percent	**82**	**1**	**0**	**1**	**0**	**0**	**1**	**3**	**1**	**0**	**1**	**1**	**1**	**1**	**8**	**100**
Treatment	95	3	1	1	1	2	0	0	0	2	1	0	0	0	12	118
Percent	**81**	**3**	**1**	**1**	**1**	**2**	**0**	**0**	**0**	**2**	**1**	**0**	**0**	**0**	**10**	**100**
Total	223	4	1	2	1	2	1	5	1	2	3	2	1	1	25	274
Percent	**81**	**1**	**0**	**1**	**0**	**1**	**0**	**2**	**0**	**1**	**1**	**1**	**0**	**0**	**9**	**100**

PRI_Q18 & TRE_Q13. Do you own or rent this residence?

Group	Own	Rent	Missing	Total
Control	192	13	6	211
Percent	**91**	**6**	**3**	**100**
Treatment	306	24	7	337
Percent	**91**	**7**	**2**	**100**
Total	498	37	13	548
Percent	**91**	**7**	**2**	**100**

PRI_Q19 & TRE_Q14. Including yourself, how many people live in your home?

Group	1	2	3	4	5	6	7	9	10	No Response	Missing	Total
Control	43	95	27	26	11	1	1	0	1	0	6	211
Percent	**20**	**45**	**13**	**12**	**5**	**0**	**0**	**0**	**0**	**0**	**3**	**100**
Treatment	65	149	50	40	16	5	1	1	0	1	9	337
Percent	**19**	**44**	**15**	**12**	**5**	**1**	**0**	**0**	**0**	**0**	**3**	**100**
Total	108	244	77	66	27	6	2	1	1	1	15	548
Percent	**20**	**45**	**14**	**12**	**5**	**1**	**0**	**0**	**0**	**0**	**3**	**100**

PRI_Q22 & TRE_Q17. What is your primary heating fuel?

Group	Electricity	Natural Gas	Oil	Other	Missing	Total
Control	94	88	5	16	8	211
Percent	45	42	2	8	4	100
Treatment	158	147	8	15	9	337
Percent	47	44	2	4	3	100
Total	252	235	13	31	17	548
Percent	46	43	2	6	3	100

TRE_Q1. Duke Energy sends a personalized report called My Home Energy Report to a select group of homes. These reports are mailed in a standard envelope every few months and are meant to provide you with information on how your home's electric energy usage compares with similar homes. Have you seen one of these reports?

Group	Yes	No	No Response	Total
Treatment	142	10	1	153
Percent	93	7	1	100

TRE_Q2. About how many My Home Energy Reports have you received in the past 12 months?

Group	0	1	2	3	4	5	6	7	8	9	10	11	12	24	No Response	Missing	Total
Treatment	3	2	9	12	27	3	20	1	5	3	7	2	42	1	5	1	143
Percent	2	1	6	8	19	2	14	1	4	2	5	1	29	1	4	1	100

TRE_Q3. How often do you read the My Home Energy Reports?

Group	Always	Sometimes	Never	No Response	Missing	Total
Treatment	100	35	2	1	2	140
Percent	71	25	1	1	1	100

TRE_Q4. How much do you agree or disagree with the following statements about My Home Energy Reports?

TRE_Q4_1. 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	No Response	Missing	Total
Treatment	2	2	0	6	7	13	9	17	11	20	48	1	2	138
Percent	1	1	0	4	5	9	7	12	8	14	35	1	1	100

TRE_Q4_2. 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	No Response	Missing	Total
Treatment	6	2	3	6	5	20	6	18	18	12	39	1	2	138
Percent	**4**	**1**	**2**	**4**	**4**	**14**	**4**	**13**	**13**	**9**	**28**	**1**	**1**	**100**

TRE_Q4_3. The tips provided in the reports are pertinent to my home.

Group	0	1	2	3	4	5	6	7	8	9	10	No Response	Missing	Total
Treatment	4	5	6	5	7	19	21	9	18	13	27	2	2	138
Percent	**3**	**4**	**4**	**4**	**5**	**14**	**15**	**7**	**13**	**9**	**20**	**1**	**1**	**100**

TRE_Q4_4. 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	No Response	Missing	Total
Treatment	6	2	2	5	9	17	14	16	13	15	36	1	2	138
Percent	**4**	**1**	**1**	**4**	**7**	**12**	**10**	**12**	**9**	**11**	**26**	**1**	**1**	**100**

TRE_Q4_5. I have discussed My Home Energy Reports with others.

Group	0	1	2	3	4	5	6	7	8	9	10	No Response	Missing	Total
Treatment	36	17	6	4	7	16	7	8	10	2	22	1	2	138
Percent	**26**	**12**	**4**	**3**	**5**	**12**	**5**	**6**	**7**	**1**	**16**	**1**	**1**	**100**

TRE_Q4_6. The information provided about my home's energy use is confusing.

Group	0	1	2	3	4	5	6	7	8	9	10	No Response	Missing	Total
Treatment	51	24	10	12	6	14	2	5	5	3	3	1	2	138
Percent	**37**	**17**	**7**	**9**	**4**	**10**	**1**	**4**	**4**	**2**	**2**	**1**	**1**	**100**

TRE_Q4_7. I suspect that the "similar" homes that my home is compared to in the Home Energy Reports are not actually like mine.

Group	0	1	2	3	4	5	6	7	8	9	10	No Response	Missing	Total
Treatment	13	11	4	6	4	29	10	14	12	9	23	1	2	138
Percent	**9**	**8**	**3**	**4**	**3**	**21**	**7**	**10**	**9**	**7**	**17**	**1**	**1**	**100**

TRE_Q4_8. Since reading the Home Energy Reports, I have taken actions to use less energy than I would not have otherwise taken.

Group	0	1	2	3	4	5	6	7	8	9	10	No Response	Missing	Total
Treatment	11	5	5	4	12	28	10	17	13	9	21	1	2	138
Percent	**8**	**4**	**4**	**3**	**9**	**20**	**7**	**12**	**9**	**7**	**15**	**1**	**1**	**100**

TRE_Q6. Please rate how useful each feature of the Home Energy Report is to you.

TRE_Q6_1. Comparison to similar homes

Group	0	1	2	3	4	5	6	7	8	9	10	No Response	Missing	Total
Treatment	15	9	7	8	5	9	11	18	23	9	21	1	2	138
Percent	**11**	**7**	**5**	**6**	**4**	**7**	**8**	**13**	**17**	**7**	**15**	**1**	**1**	**100**

TRE_Q6_2. Tips to help you save money and energy

Group	0	1	2	3	4	5	6	7	8	9	10	No Response	Missing	Total
Treatment	5	0	2	2	7	20	10	21	24	9	35	1	2	138
Percent	**4**	**0**	**1**	**1**	**5**	**14**	**7**	**15**	**17**	**7**	**25**	**1**	**1**	**100**

TRE_Q6_3. Examples of the energy use associated with common household items

Group	0	1	2	3	4	5	6	7	8	9	10	No Response	Missing	Total
Treatment	6	1	2	7	5	19	9	18	21	13	34	1	2	138
Percent	**4**	**1**	**1**	**5**	**4**	**14**	**7**	**13**	**15**	**9**	**25**	**1**	**1**	**100**

TRE_Q6_4. Customized suggestions for your home

Group	0	1	2	3	4	5	6	7	8	9	10	No Response	Missing	Total
Treatment	9	2	2	6	8	19	9	22	18	10	29	2	2	138
Percent	**7**	**1**	**1**	**4**	**6**	**14**	**7**	**16**	**13**	**7**	**21**	**1**	**1**	**100**

TRE_Q6_5. Graphs that display your home's energy use over time

Group	0	1	2	3	4	5	6	7	8	9	10	No Response	Missing	Total
Treatment	5	2	3	1	2	10	9	13	20	19	51	1	2	138
Percent	**4**	**1**	**2**	**1**	**1**	**7**	**7**	**9**	**14**	**14**	**37**	**1**	**1**	**100**

TRE_Q6_6. Information about services and offers from Duke Energy

Group	0	1	2	3	4	5	6	7	8	9	10	No Response	Missing	Total
Treatment	4	4	1	3	7	28	9	21	17	9	31	2	2	138
Percent	**3**	**3**	**1**	**2**	**5**	**20**	**7**	**15**	**12**	**7**	**22**	**1**	**1**	**100**

TRE_Q7. Overall, how satisfied are you with the information in the My Home Energy Reports you've received?

Group	0	1	2	3	4	5	6	7	8	9	10	No Response	Missing	Total
Treatment	5	1	5	2	3	0	8	20	21	15	40	16	2	138
Percent	**4**	**1**	**4**	**1**	**2**	**0**	**6**	**14**	**15**	**11**	**29**	**12**	**1**	**100**

TRE_Q8. Are you aware that you can go online to My Home Energy Interactive to access more information, above and beyond that found in the My Home Energy Report, which describes more ways to save energy?

Group	Yes	No	No Response	Missing	Total
Treatment	38	97	1	2	138
Percent	**28**	**70**	**1**	**1**	**100**

TRE_Q8a. Have you signed up to use My Home Energy Interactive?

Group	Yes	No	Missing	Total
Treatment	3	35	3	41
Percent	**7**	**85**	**7**	**100**

TRE_Q8b. How useful is My Home Energy Interactive to you for saving energy?

Group	0	1	2	3	4	5	6	7	8	9	10	No Response	Missing	Total
Treatment	0	0	0	0	0	1	0	0	0	0	2	0	3	6
Percent	**0**	**0**	**0**	**0**	**0**	**17**	**0**	**0**	**0**	**0**	**33**	**0**	**50**	**100**

Appendix E Survey Frequencies: DEP

PRI_Q1. 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	No Response	Total
Control	1	0	0	4	2	10	10	22	37	35	69	2	192
Percent	**1**	**0**	**0**	**2**	**1**	**5**	**5**	**11**	**19**	**18**	**36**	**1**	**100**
Treatment	0	1	0	2	0	10	11	18	38	23	69	4	176
Percent	**0**	**1**	**0**	**1**	**0**	**6**	**6**	**10**	**22**	**13**	**39**	**2**	**100**
Total	1	1	0	6	2	20	21	40	75	58	138	6	368
Percent	**0**	**0**	**0**	**2**	**1**	**5**	**6**	**11**	**20**	**16**	**38**	**2**	**100**

PRI_Q2 Please rate your overall satisfaction with each of the following aspects of communications from Duke Energy.

PRI_Q2_1 The information available about Duke Energy's efficiency programs.

Group	Very Satisfied	Somewhat Satisfied	Neither	Somewhat Dissatisfied	Very Dissatisfied	No Response	Total
Control	71	65	44	5	6	1	192
Percent	**37**	**34**	**23**	**3**	**3**	**1**	**100**
Treatment	83	60	22	7	4	0	176
Percent	**47**	**34**	**13**	**4**	**2**	**0**	**100**
Total	154	125	66	12	10	1	368
Percent	**42**	**34**	**18**	**3**	**3**	**0**	**100**

PRI_Q2_2 Duke Energy's commitment to promoting energy efficiency and the wise use of electricity.

Group	Very Satisfied	Somewhat Satisfied	Neither	Somewhat Dissatisfied	Very Dissatisfied	Total
Control	70	68	40	8	6	192
Percent	**36**	**35**	**21**	**4**	**3**	**100**
Treatment	83	61	18	9	5	176
Percent	**47**	**35**	**10**	**5**	**3**	**100**
Total	153	129	58	17	11	368
Percent	**42**	**35**	**16**	**5**	**3**	**100**

PRI_Q2_3 The information Duke Energy provides to help customers save on energy bills.

Group	Very Satisfied	Somewhat Satisfied	Neither	Somewhat Dissatisfied	Very Dissatisfied	Total
Control	70	70	37	10	5	192
Percent	**36**	**36**	**19**	**5**	**3**	**100**
Treatment	83	61	16	12	4	176
Percent	**47**	**35**	**9**	**7**	**2**	**100**
Total	153	131	53	22	9	368
Percent	**41.58**	**36**	**14**	**6**	**2**	**100**

PRI_Q3 Have you logged in to your Duke Energy account to do any of the following? Check all that apply.

PRI_Q3_1 I have never logged in

Group	Not Checked	Checked	Total
Control	114	71	185
Percent	**62**	**38**	**100**
Treatment	101	73	174
Percent	**58**	**42**	**100**
Total	215	144	359
Percent	**60**	**40**	**100**

PRI_Q3_2 Pay my bill

Group	Not Checked	Checked	Total
Control	114	71	185
Percent	**62**	**38**	**100**
Treatment	112	62	174
Percent	**64**	**36**	**100**
Total	226	133	359
Percent	**63**	**37**	**100**

PRI_Q3_3 Review energy consumption graphs

Group	Not Checked	Checked	Total
Control	145	40	185
Percent	**78**	**22**	**100**
Treatment	141	33	174
Percent	**81**	**19**	**100**
Total	286	73	359
Percent	**80**	**20**	**100**

PRI_Q3_4 Look for energy efficiency opportunities or ideas

Group	Not Checked	Checked	Total
Control	170	15	185
Percent	**92**	**8**	**100**
Treatment	156	18	174
Percent	**90**	**10**	**100**
Total	326	33	359
Percent	**91**	**9**	**100**

PRI_Q3_5 None of the above

Group	Not Checked	Checked	Total
Control	154	31	185
percent	**83**	**17**	**100**
Treatment	142	32	174
percent	**82**	**18**	**100**
Total	296	63	359
percent	**82**	**18**	**100**

PRI_ Q4. How often do you access the Duke Energy website to search for information about rebate programs, energy efficient products, or ways to make your home more energy efficient? Select only one.

Group	Monthly	One a year	A few times a year	Never	No Response	Total
Control	17	20	25	129	1	192
Percent	**9**	**10**	**13**	**67**	**1**	**100**
Treatment	13	16	25	122	0	176
Percent	**7**	**9**	**14**	**69**	**0**	**100**
Total	30	36	50	251	1	368
Percent	**8**	**10**	**14**	**68**	**0**	**100**

PRI_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	Total
Control	53	9	5	9	1	29	12	13	21	8	32	192
Percent	**28**	**5**	**3**	**5**	**1**	**15**	**6**	**7**	**11**	**4**	**17**	**100**
Treatment	39	6	8	11	6	28	6	18	16	19	19	176
Percent	**22**	**3**	**5**	**6**	**3**	**16**	**3**	**10**	**9**	**11**	**11**	**100**
Total	92	15	13	20	7	57	18	31	37	27	51	368
Percent	**25**	**4**	**4**	**5**	**2**	**15**	**5**	**8**	**10**	**7**	**14**	**100**

PRI_Q6. 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	No Response	Total
Control	3	0	2	3	0	15	11	15	32	30	79	2	192
Percent	**2**	**0**	**1**	**2**	**0**	**8**	**6**	**8**	**17**	**16**	**41**	**1**	**100**
Treatment	3	0	2	3	0	14	9	19	26	29	71	0	176
Percent	**2**	**0**	**1**	**2**	**0**	**8**	**5**	**11**	**15**	**16**	**40**	**0**	**100**
Total	6	0	4	6	0	29	20	34	58	59	150	2	368
Percent	**2**	**0**	**1**	**2**	**0**	**8**	**5**	**9**	**16**	**16**	**41**	**1**	**100**

PRI_Q7. 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	No Response	Total
Control	5	1	5	5	5	29	23	35	31	30	22	1	192
Percent	**3**	**1**	**3**	**3**	**3**	**15**	**12**	**18**	**16**	**16**	**11**	**1**	**100**
Treatment	2	3	0	4	2	29	17	29	42	27	21	0	176
Percent	**1**	**2**	**0**	**2**	**1**	**16**	**10**	**16**	**24**	**15**	**12**	**0**	**100**
Total	7	4	5	9	7	58	40	64	73	57	43	1	368
Percent	**2**	**1**	**1**	**2**	**2**	**16**	**11**	**17**	**20**	**15**	**12**	**0**	**100**

PRI_Q8 & TRE_Q9. Over the past 12 months, have you or another member of your household taken any actions to reduce your household energy use, or made any energy efficiency improvements in your home?

Group	Yes	No	No Response	Missing	Total
Control	114	76	2	0	192
Percent	**59**	**40**	**1**	**0**	**100**
Treatment	225	90	10	22	347
Percent	**65**	**26**	**3**	**6**	**100**
Total	339	166	12	22	539
Percent	**63**	**31**	**2**	**4**	**100**

PRI_Q9 & TRE_Q10. Which actions have been taken?

PRI_Q9_1 & TRE_Q10_1. Adjusted heating or cooling settings to save energy

Group	Yes	No	Don't know	No Response	Total
Control	109	3	0	2	114
Percent	**96**	**3**	**0**	**2**	**100**
Treatment	210	9	2	4	225
Percent	**93**	**4**	**1**	**2**	**100**
Total	319	12	2	6	339
Percent	**94**	**4**	**1**	**2**	**100**

PRI_Q9_2 & TRE_Q10_2. Reduced water heater temperature to save energy

Group	Yes	No	Don't know	No Response	Total
Control	42	62	3	7	114
Percent	**37**	**54**	**3**	**6**	**100**
Treatment	85	127	8	5	225
Percent	**38**	**56**	**4**	**2**	**100**
Total	127	189	11	12	339
Percent	**37**	**56**	**3**	**4**	**100**

PRI_Q9_3 & TRE_Q10_3. Wash clothes in cold water

Group	Yes	No	Don't know	No Response	Total
Control	76	32	2	4	114
Percent	**67**	**28**	**2**	**4**	**100**
Treatment	172	47	2	4	225
Percent	**76**	**21**	**1**	**2**	**100**
Total	248	79	4	8	339
Percent	**73**	**23**	**1**	**2**	**100**

PRI_Q9_4 & TRE_Q10_4. Fully load clothes washer

Group	Yes	No	Don't know	No Response	Total
Control	97	11	2	4	114
Percent	**85**	**10**	**2**	**4**	**100**
Treatment	181	37	2	5	225
Percent	**80**	**16**	**1**	**2**	**100**
Total	278	48	4	9	339
Percent	**82**	**14**	**1**	**3**	**100**

PRI_Q9_5 & TRE_Q10_5. Fully load dishwasher

Group	Yes	No	Don't know	No Response	Total
Control	78	20	5	11	114
Percent	**68**	**18**	**4**	**10**	**100**
Treatment	164	34	16	11	225
Percent	**73**	**15**	**7**	**5**	**100**
Total	242	54	21	22	339
Percent	**71**	**16**	**6**	**6**	**100**

PRI_Q9_6 & TRE_Q10_6. Turn off lights in unused or outdoor areas

Group	Yes	No	No Response	Total
Control	111	0	3	114
Percent	**97**	**0**	**3**	**100**
Treatment	216	6	3	225
Percent	**96**	**3**	**1**	**100**
Total	327	6	6	339
Percent	**96**	**2**	**2**	**100**

PRI_Q9_7 & TRE_Q10_7. Unplug or shut down household electronics when not in use

Group	Yes	No	Don't know	No Response	Total
Control	82	29	1	2	114
Percent	**72**	**25**	**1**	**2**	**100**
Treatment	154	64	4	3	225
Percent	**68**	**28**	**2**	**1**	**100**
Total	236	93	5	5	339
Percent	**70**	**27**	**1**	**1**	**100**

PRI_Q9_8 & TRE_Q10_8. Maintain heating or cooling equipment for more efficient operation

Group	Yes	No	Don't know	No Response	Total
Control	104	4	3	3	114
Percent	**91**	**4**	**3**	**3**	**100**
Treatment	190	27	6	2	225
Percent	**84**	**12**	**3**	**1**	**100**
Total	294	31	9	5	339
Percent	**87**	**9**	**3**	**1**	**100**

PRI_Q9_9 & TRE_Q10_9. Use a portable fan or ceiling fan for cooling instead of an air conditioner

Group	Yes	No	Don't know	No Response	Total
Control	76	34	1	3	114
Percent	**67**	**30**	**1**	**3**	**100**
Treatment	159	57	5	4	225
Percent	**71**	**25**	**2**	**2**	**100**
Total	235	91	6	7	339
Percent	**69**	**27**	**2**	**2**	**100**

PRI_Q9_10 & TRE_Q10_10. Other, please specify:

Group	Yes	No	Don't know	No Response	Total
Control	29	24	34	27	114
Percent	**25**	**21**	**30**	**24**	**100**
Treatment	39	55	78	53	225
Percent	**17**	**24**	**35**	**24**	**100**
Total	68	79	112	80	339
Percent	**20**	**23**	**33**	**24**	**100**

PRI_Q9_11 & TRE_Q10_11. Other, please specify:

Group	Yes	No	Don't know	No Response	Total
Control	10	36	39	29	114
Percent	**9**	**32**	**34**	**25**	**100**
Treatment	15	71	82	57	225
Percent	**7**	**32**	**36**	**25**	**100**
Total	25	107	121	86	339
Percent	**7**	**32**	**36**	**25**	**100**

PRI_Q10 & TRE_Q11. Which energy efficiency improvements have been made?

PRI_Q10_1 & TRE_Q11_1. Install energy-efficient kitchen or laundry appliances

Group	Yes	No	Don't know	No Response	Total
Control	56	53	3	2	114
Percent	49	46	3	2	100
Treatment	133	72	11	9	225
Percent	59	32	5	4	100
Total	189	125	14	11	339
Percent	56	37	4	3	100

PRI_Q10_2 & TRE_Q11_2. Install energy-efficient heating/cooling equipment

Group	Yes	No	Don't know	No Response	Total
Control	52	51	8	3	114
Percent	46	45	7	3	100
Treatment	112	95	14	4	225
Percent	50	42	6	2	100
Total	164	146	22	7	339
Percent	48	43	6	2	100

PRI_Q10_3 & TRE_Q11_3. Install energy-efficient water heater

Group	Yes	No	Don't know	No Response	Total
Control	50	52	9	3	114
Percent	44	46	8	3	100
Treatment	95	108	17	5	225
Percent	42	48	8	2	100
Total	145	160	26	8	339
Percent	43	47	8	2	100

PRI_Q10_4 & TRE_Q11_4. Replace windows or doors with more energy-efficient types)

Group	Yes	No	Don't know	No Response	Total
Control	41	67	3	3	114
Percent	36	59	3	3	100
Treatment	78	133	6	8	225
Percent	35	59	3	4	100
Total	119	200	9	11	339
Percent	35	59	3	3	100

PRI_Q10_5 & TRE_Q11_5. Caulk or weatherstrip (windows or doors)

Group	Yes	No	Don't know	No Response	Total
Control	66	44	3	1	114
Percent	58	39	3	1	100
Treatment	115	96	6	8	225
Percent	51	43	3	4	100
Total	181	140	9	9	339
Percent	53	41	3	3	100

PRI_Q10_6 & TRE_Q11_6. Add insulation to attic, walls, or floors

Group	Yes	No	Don't know	No Response	Total
Control	36	68	5	5	114
Percent	32	60	4	4	100
Treatment	84	125	8	8	225
Percent	37	56	4	4	100
Total	120	193	13	13	339
Percent	35	57	4	4	100

PRI_Q10_7 & TRE_Q11_7. Install energy-efficient lighting

Group	Yes	No	Don't know	No Response	Total
Control	93	18	3	0	114
Percent	82	16	3	0	100
Treatment	173	43	5	4	225
Percent	77	19	2	2	100
Total	266	61	8	4	339
Percent	78	18	2	1	100

PRI_Q10_8 & TRE_Q11_8. Install programmable thermostat or "smart" thermostat

Group	Yes	No	Don't know	No Response	Total
Control	47	59	3	5	114
Percent	41	52	3	4	100
Treatment	108	102	8	7	225
Percent	48	45	4	3	100
Total	155	161	11	12	339
Percent	46	47	3	4	100

PRI_Q10_9 & TRE_Q11_9. Purchase ENERGY STAR certified home electronic equipment (a television, for example)

Group	Yes	No	Don't know	No Response	Total
Control	63	39	10	2	114
Percent	55	34	9	2	100
Treatment	129	70	16	10	225
Percent	57	31	7	4	100
Total	192	109	26	12	339
Percent	57	32	8	4	100

PRI_Q11 & TRE_Q12. Below are some reasons why you might not be able to save as much energy as you would like. How important are each of the following reasons?

PRI_Q11_1 & TRE_Q12_1. Initial cost of energy efficient equipment is too high

Group	0	1	2	3	4	5	6	7	8	9	10	No Response	Total
Control	8	4	3	4	6	19	11	11	9	12	23	4	114
Percent	7	4	3	4	5	17	10	10	8	11	20	4	100
Treatment	20	6	4	8	13	35	15	24	27	10	59	4	225
Percent	9	3	2	4	6	16	7	11	12	4	26	2	100
Total	28	10	7	12	19	54	26	35	36	22	82	8	339
Percent	8	3	2	4	6	16	8	10	11	6	24	2	100

PRI_Q11_2 & TRE_Q12_2. Not enough time to shop/research/install/too busy

Group	0	1	2	3	4	5	6	7	8	9	10	No Response	Total
Control	17	7	4	2	5	25	5	15	12	6	11	5	114
Percent	15	6	4	2	4	22	4	13	11	5	10	4	100
Treatment	42	8	9	13	16	49	13	18	17	7	27	6	225
Percent	19	4	4	6	7	22	6	8	8	3	12	3	100
Total	59	15	13	15	21	74	18	33	29	13	38	11	339
Percent	17	4	4	4	6	22	5	10	9	4	11	3	100

PRI_Q11_3 & TRE_Q12_3. I do not have the expertise

Group	0	1	2	3	4	5	6	7	8	9	10	No Response	Total
Control	22	5	7	8	6	16	4	22	3	2	13	6	114
Percent	**19**	**4**	**6**	**7**	**5**	**14**	**4**	**19**	**3**	**2**	**11**	**5**	**100**
Treatment	42	10	8	13	8	53	11	21	14	7	32	6	225
Percent	**19**	**4**	**4**	**6**	**4**	**24**	**5**	**9**	**6**	**3**	**14**	**3**	**100**
Total	64	15	15	21	14	69	15	43	17	9	45	12	339
Percent	**19**	**4**	**4**	**6**	**4**	**20**	**4**	**13**	**5**	**3**	**13**	**4**	**100**

PRI_Q11_4 & TRE_Q12_4. I do not have enough information to make a decision or understand the impacts of these improvements or behaviors

Group	0	1	2	3	4	5	6	7	8	9	10	No Response	Total
Control	22	7	7	1	4	19	6	16	10	3	14	5	114
Percent	**19**	**6**	**6**	**1**	**4**	**17**	**5**	**14**	**9**	**3**	**12**	**4**	**100**
Treatment	37	13	13	11	8	52	8	18	15	8	32	10	225
Percent	**16**	**6**	**6**	**5**	**4**	**23**	**4**	**8**	**7**	**4**	**14**	**4**	**100**
Total	59	20	20	12	12	71	14	34	25	11	46	15	339
Percent	**17**	**6**	**6**	**4**	**4**	**21**	**4**	**10**	**7**	**3**	**14**	**4**	**100**

PRI_Q11_5 & TRE_Q12_5. Getting everyone in the house to cooperate is too hard

Group	0	1	2	3	4	5	6	7	8	9	10	No Response	Total
Control	34	7	3	2	5	12	4	12	9	3	20	3	114
Percent	**30**	**6**	**3**	**2**	**4**	**11**	**4**	**11**	**8**	**3**	**18**	**3**	**100**
Treatment	53	12	11	5	6	42	7	19	16	10	38	6	225
Percent	**24**	**5**	**5**	**2**	**3**	**19**	**3**	**8**	**7**	**4**	**17**	**3**	**100**
Total	87	19	14	7	11	54	11	31	25	13	58	9	339
Percent	**26**	**6**	**4**	**2**	**3**	**16**	**3**	**9**	**7**	**4**	**17**	**3**	**100**

PRI_Q11_6 & TRE_Q12_6. I do not think my energy saving efforts are worth the time and/or money

Group	0	1	2	3	4	5	6	7	8	9	10	No Response	Total
Control	26	4	5	3	5	19	4	4	10	3	28	3	114
Percent	**23**	**4**	**4**	**3**	**4**	**17**	**4**	**4**	**9**	**3**	**25**	**3**	**100**
Treatment	47	12	15	5	8	30	9	20	19	11	42	7	225
Percent	**21**	**5**	**7**	**2**	**4**	**13**	**4**	**9**	**8**	**5**	**19**	**3**	**100**
Total	73	16	20	8	13	49	13	24	29	14	70	10	339
Percent	**22**	**5**	**6**	**2**	**4**	**14**	**4**	**7**	**9**	**4**	**21**	**3**	**100**

PRI_Q12 Which of the following do you do with regard to your household's energy use? Check all that apply.

PRI_Q12_1 Track monthly energy use

Group	Not Checked	Checked	Total
Control	98	90	188
Percent	**52**	**48**	**100**
Treatment	82	89	171
Percent	**48**	**52**	**100**
Total	180	179	359
Percent	**50**	**50**	**100**

PRI_Q12_2 Track the total amount of your bill

Group	Not Checked	Checked	Total
Control	58	130	188
Percent	**31**	**69**	**100**
Treatment	50	121	171
Percent	**29**	**71**	**100**
Total	108	251	359
Percent	**30**	**70**	**100**

PRI_Q12_3 Compare usage to previous months

Group	Not Checked	Checked	Total
Control	59	129	188
Percent	**31**	**69**	**100**
Treatment	53	118	171
Percent	**31**	**69**	**100**
Total	112	247	359
Percent	**31**	**69**	**100**

PRI_Q12_4 Compare usage to the same month from last year

Group	Not Checked	Checked	Total
Control	83	105	188
Percent	**44**	**56**	**100**
Treatment	58	113	171
Percent	**34**	**66**	**100**
Total	141	218	359
Percent	**39**	**61**	**100**

PRI_Q12_5 None of the above

Group	Not Checked	Checked	Total
Control	174	14	188
Percent	**93**	**7**	**100**
Treatment	154	17	171
Percent	**90**	**10**	**100**
Total	328	31	359
Percent	**91**	**9**	**100**

PRI_Q13. Thinking about the information you could have about your home's energy use, please rate how useful each of the following items would be for your household.

PRI_Q13_1. Your home's energy use compared to that of similar homes

Group	0	1	2	3	4	5	6	7	8	9	10	No Response	Total
Control	19	3	4	5	3	22	6	19	26	24	52	9	192
Percent	**10**	**2**	**2**	**3**	**2**	**11**	**3**	**10**	**14**	**13**	**27**	**5**	**100**
Treatment	23	3	4	7	4	16	14	19	18	19	46	3	176
Percent	**13**	**2**	**2**	**4**	**2**	**9**	**8**	**11**	**10**	**11**	**26**	**2**	**100**
Total	42	6	8	12	7	38	20	38	44	43	98	12	368
Percent	**11**	**2**	**2**	**3**	**2**	**10**	**5**	**10**	**12**	**12**	**27**	**3**	**100**

PRI_Q13_2. Tips to help you save money and energy

Group	0	1	2	3	4	5	6	7	8	9	10	No Response	Total
Control	14	3	3	0	5	20	6	15	22	31	69	4	192
Percent	**7**	**2**	**2**	**0**	**3**	**10**	**3**	**8**	**11**	**16**	**36**	**2**	**100**
Treatment	9	2	2	2	4	22	8	10	28	26	60	3	176
Percent	**5**	**1**	**1**	**1**	**2**	**13**	**5**	**6**	**16**	**15**	**34**	**2**	**100**
Total	23	5	5	2	9	42	14	25	50	57	129	7	368
Percent	**6**	**1**	**1**	**1**	**2**	**11**	**4**	**7**	**14**	**15**	**35**	**2**	**100**

PRI_Q13_3. Examples of the energy use associated with common household items

Group	0	1	2	3	4	5	6	7	8	9	10	No Response	Total
Control	14	6	2	3	5	22	9	21	24	19	59	8	192
Percent	**7**	**3**	**1**	**2**	**3**	**11**	**5**	**11**	**13**	**10**	**31**	**4**	**100**
Treatment	11	3	1	2	6	25	9	16	32	24	44	3	176
Percent	**6**	**2**	**1**	**1**	**3**	**14**	**5**	**9**	**18**	**14**	**25**	**2**	**100**
Total	25	9	3	5	11	47	18	37	56	43	103	11	368
Percent	**7**	**2**	**1**	**1**	**3**	**13**	**5**	**10**	**15**	**12**	**28**	**3**	**100**

PRI_Q13_4. Customized suggestions for your home

Group	0	1	2	3	4	5	6	7	8	9	10	No Response	Total
Control	23	3	6	3	8	23	8	21	15	21	52	9	192
Percent	**12**	**2**	**3**	**2**	**4**	**12**	**4**	**11**	**8**	**11**	**27**	**5**	**100**
Treatment	11	3	3	4	4	25	9	16	22	22	53	4	176
Percent	**6**	**2**	**2**	**2**	**2**	**14**	**5**	**9**	**13**	**13**	**30**	**2**	**100**
Total	34	6	9	7	12	48	17	37	37	43	105	13	368
Percent	**9**	**2**	**2**	**2**	**3**	**13**	**5**	**10**	**10**	**12**	**29**	**4**	**100**

PRI_Q13_5. Graphs that display your home's energy use over time

Group	0	1	2	3	4	5	6	7	8	9	10	No Response	Total
Control	20	2	3	0	4	17	5	15	27	21	71	7	192
Percent	**10**	**1**	**2**	**0**	**2**	**9**	**3**	**8**	**14**	**11**	**37**	**4**	**100**
Treatment	12	4	1	2	3	14	11	13	30	25	59	2	176
Percent	**7**	**2**	**1**	**1**	**2**	**8**	**6**	**7**	**17**	**14**	**34**	**1**	**100**
Total	32	6	4	2	7	31	16	28	57	46	130	9	368
Percent	**9**	**2**	**1**	**1**	**2**	**8**	**4**	**8**	**15**	**13**	**35**	**2**	**100**

PRI_Q13_6. Information about services and offers from Duke Energy

Group	0	1	2	3	4	5	6	7	8	9	10	No Response	Total
Control	19	1	4	0	5	22	9	22	23	23	58	6	192
Percent	**10**	**1**	**2**	**0**	**3**	**11**	**5**	**11**	**12**	**12**	**30**	**3**	**100**
Treatment	10	4	1	5	7	22	8	22	26	17	50	4	176
Percent	**6**	**2**	**1**	**3**	**4**	**13**	**5**	**13**	**15**	**10**	**28**	**2**	**100**
Total	29	5	5	5	12	44	17	44	49	40	108	10	368
Percent	**8**	**1**	**1**	**1**	**3**	**12**	**5**	**12**	**13**	**11**	**29**	**3**	**100**

PRI_Q14. 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.

PRI_Q14_1. Reducing my energy bill(s)

Group	0	1	2	3	4	5	6	7	8	9	10	No Response	Total
Control	4	2	1	0	0	11	2	7	14	28	122	1	192
Percent	**2**	**1**	**1**	**0**	**0**	**6**	**1**	**4**	**7**	**15**	**64**	**1**	**100**
Treatment	3	0	1	1	2	5	4	4	21	27	107	1	176
Percent	**2**	**0**	**1**	**1**	**1**	**3**	**2**	**2**	**12**	**15**	**61**	**1**	**100**
Total	7	2	2	1	2	16	6	11	35	55	229	2	368
Percent	**2**	**1**	**1**	**0**	**1**	**4**	**2**	**3**	**10**	**15**	**62**	**1**	**100**

PRI_Q14_2. Helping the environment

Group	0	1	2	3	4	5	6	7	8	9	10	No Response	Total
Control	9	1	2	3	2	17	9	13	23	13	95	5	192
Percent	**5**	**1**	**1**	**2**	**1**	**9**	**5**	**7**	**12**	**7**	**49**	**3**	**100**
Treatment	7	0	3	5	3	10	9	14	16	24	84	1	176
Percent	**4**	**0**	**2**	**3**	**2**	**6**	**5**	**8**	**9**	**14**	**48**	**1**	**100**
Total	16	1	5	8	5	27	18	27	39	37	179	6	368
Percent	**4**	**0**	**1**	**2**	**1**	**7**	**5**	**7**	**11**	**10**	**49**	**2**	**100**

PRI_Q14_3. Setting an example for others

Group	0	1	2	3	4	5	6	7	8	9	10	No Response	Total
Control	28	4	2	7	6	21	9	13	21	16	59	6	192
Percent	**15**	**2**	**1**	**4**	**3**	**11**	**5**	**7**	**11**	**8**	**31**	**3**	**100**
Treatment	23	6	3	7	7	22	12	12	19	15	46	4	176
Percent	**13**	**3**	**2**	**4**	**4**	**13**	**7**	**7**	**11**	**9**	**26**	**2**	**100**
Total	51	10	5	14	13	43	21	25	40	31	105	10	368
Percent	**14**	**3**	**1**	**4**	**4**	**12**	**6**	**7**	**11**	**8**	**29**	**3**	**100**

PRI_Q14_4. Avoiding waste

Group	0	1	2	3	4	5	6	7	8	9	10	No Response	Total
Control	7	2	3	2	0	12	5	7	29	22	101	2	192
Percent	**4**	**1**	**2**	**1**	**0**	**6**	**3**	**4**	**15**	**11**	**53**	**1**	**100**
Treatment	4	0	2	1	3	11	6	11	22	25	89	2	176
Percent	**2**	**0**	**1**	**1**	**2**	**6**	**3**	**6**	**13**	**14**	**51**	**1**	**100**
Total	11	2	5	3	3	23	11	18	51	47	190	4	368
Percent	**3**	**1**	**1**	**1**	**1**	**6**	**3**	**5**	**14**	**13**	**52**	**1**	**100**

PRI_Q14_5. Conserving energy resources

Group	0	1	2	3	4	5	6	7	8	9	10	No Response	Total
Control	8	1	2	1	1	15	7	15	25	17	95	5	192
Percent	**4**	**1**	**1**	**1**	**1**	**8**	**4**	**8**	**13**	**9**	**49**	**3**	**100**
Treatment	4	0	2	2	2	15	7	8	24	25	85	2	176
Percent	**2**	**0**	**1**	**1**	**1**	**9**	**4**	**5**	**14**	**14**	**48**	**1**	**100**
Total	12	1	4	3	3	30	14	23	49	42	180	7	368
Percent	**3**	**0**	**1**	**1**	**1**	**8**	**4**	**6**	**13**	**11**	**49**	**2**	**100**

PRI_Q15. Please indicate your level of agreement with each of the following statements

PRI_Q15_1. Duke Energy provides excellent customer service

Group	Strongly Disagree	Somewhat Disagree	Neither	Somewhat Agree	Strongly Agree	No Response	Total
Control	7	9	22	69	83	2	192
Percent	**4**	**5**	**11**	**36**	**43**	**1**	**100**
Treatment	2	10	23	62	78	1	176
Percent	**1**	**6**	**13**	**35**	**44**	**1**	**100**
Total	9	19	45	131	161	3	368
Percent	**2**	**5**	**12**	**36**	**44**	**1**	**100**

PRI_Q15_2. Duke Energy respects its customers

Group	Strongly Disagree	Somewhat Disagree	Neither	Somewhat Agree	Strongly Agree	No Response	Total
Control	8	11	26	57	88	2	192
Percent	4	6	14	30	46	1	100
Treatment	4	9	32	54	76	1	176
Percent	2	5	18	31	43	1	100
Total	12	20	58	111	164	3	368
Percent	3	5	16	30	45	1	100

PRI_Q15_3. Duke Energy provides service at a reasonable cost

Group	Strongly Disagree	Somewhat Disagree	Neither	Somewhat Agree	Strongly Agree	No Response	Total
Control	6	25	43	69	44	5	192
Percent	3	13	22	36	23	3	100
Treatment	5	27	24	86	33	1	176
Percent	3	15	14	49	19	1	100
Total	11	52	67	155	77	6	368
Percent	3	14	18	42	21	2	100

PRI_Q16. Before today, were you aware that you could order free or discounted lighting products through the Duke Energy website?

Group	Yes	No	No Response	Total
Control	39	150	3	192
Percent	20	78	2	100
Treatment	39	134	3	176
Percent	22	76	2	100
Total	78	284	6	368
Percent	21	77	2	100

PRI_Q16a. How many free light bulbs have you ordered through the Duke Energy website this year?

Group	0	1	4	6	10	12	14	30	Missing	Total
Control	32	1	0	0	0	1	0	0	5	39
Percent	82	3	0	0	0	3	0	0	13	100
Treatment	32	0	1	1	1	0	1	1	2	39
Percent	82	0	3	3	3	0	3	3	5	100
Total	64	1	1	1	1	1	1	1	7	78
Percent	82	1	1	1	1	1	1	1	9	100

PRI_Q16b. How many discounted light bulbs have you ordered through the Duke Energy website this year?

Group	0	6	10	12	20	24	25	30	Missing	Total
Control	32	0	0	1	0	1	1	0	4	39
Percent	**82**	**0**	**0**	**3**	**0**	**3**	**3**	**0**	**10**	**100**
Treatment	33	1	1	0	1	0	0	1	2	39
Percent	**85**	**3**	**3**	**0**	**3**	**0**	**0**	**3**	**5**	**100**
Total	65	1	1	1	1	1	1	1	6	78
Percent	**83**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**8**	**100**

PRI_Q18 & TRE_Q13. Do you own or rent this residence?

Group	Own	Rent	Missing	No Response	Total
Control	161	21	8	2	192
Percent	**84**	**11**	**4**	**1**	**100**
Treatment	310	24	10	3	347
Percent	**89**	**7**	**3**	**1**	**100**
Total	471	45	18	5	539
Percent	**87**	**8**	**3**	**1**	**100**

PRI_Q19 & TRE_Q14. Including yourself, how many people live in your home?

Group	1	2	3	4	5	6	7	8	9	19	No Response	Missing	Total
Control	49	66	28	22	11	4	0	1	1	1	1	8	192
Percent	**26**	**34**	**15**	**11**	**6**	**2**	**0**	**1**	**1**	**1**	**1**	**4**	**100**
Treatment	65	155	39	47	17	5	1	0	0	1	7	10	347
Percent	**19**	**45**	**11**	**14**	**5**	**1**	**0**	**0**	**0**	**0**	**2**	**3**	**100**
Total	114	221	67	69	28	9	1	1	1	2	8	18	539
Percent	**21**	**41**	**12**	**13**	**5**	**2**	**0**	**0**	**0**	**0**	**1**	**3**	**100**

PRI_Q22 & TRE_Q17. What is your primary heating fuel?

Group	Electricity	Natural Gas	Oil	Other	Don't know	No Response	Missing	Total
Control	107	63	1	9	3	1	8	192
Percent	**56**	**33**	**1**	**5**	**2**	**1**	**4**	**100**
Treatment	188	103	8	23	3	3	19	347
Percent	**54**	**30**	**2**	**7**	**1**	**1**	**5**	**100**
Total	295	166	9	32	6	4	27	539
Percent	**55**	**31**	**2**	**6**	**1**	**1**	**5**	**100**

TRE_Q1. Duke Energy sends a personalized report called My Home Energy Report to a select group of homes. These reports are mailed in a standard envelope every few months and are meant to provide you with information on how your home's electric energy usage compares with similar homes. Have you seen one of these reports?

Group	Yes	No	No Response	Total
Treatment	160	10	1	171
Percent	**94**	**6**	**1**	**100**

TRE_Q2. About how many My Home Energy Reports have you received in the past 12 months?

Group	1	2	3	4	5	6	7	8	9	10	11	12	No Response	Missing	Total
Treatment	4	14	14	29	6	21	2	8	2	9	1	37	13	1	161
Percent	**2**	**9**	**9**	**18**	**4**	**13**	**1**	**5**	**1**	**6**	**1**	**23**	**8**	**1**	**100**

TRE_Q3. How often do you read the My Home Energy Reports?

Group	Always	Sometimes	Never	No Response	Missing	Total
Treatment	107	42	10	1	1	161
Percent	**66**	**26**	**6**	**1**	**1**	**100**

TRE_Q4. How much do you agree or disagree with the following statements about My Home Energy Reports?

TRE_Q4_1. 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	No Response	Missing	Total
Treatment	5	2	2	4	2	16	10	14	19	22	52	1	2	151
Percent	**3**	**1**	**1**	**3**	**1**	**11**	**7**	**9**	**13**	**15**	**34**	**1**	**1**	**100**

TRE_Q4_2. 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	No Response	Missing	Total
Treatment	6	1	5	10	6	16	6	20	14	19	44	2	2	151
Percent	**4**	**1**	**3**	**7**	**4**	**11**	**4**	**13**	**9**	**13**	**29**	**1**	**1**	**100**

TRE_Q4_3. The tips provided in the reports are pertinent to my home.

Group	0	1	2	3	4	5	6	7	8	9	10	No Response	Missing	Total
Treatment	4	3	7	10	9	22	15	13	19	15	29	3	2	151
Percent	**3**	**2**	**5**	**7**	**6**	**15**	**10**	**9**	**13**	**10**	**19**	**2**	**1**	**100**

TRE_Q4_4. 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	No Response	Missing	Total
Treatment	5	2	6	3	6	24	12	14	15	15	44	3	2	151
Percent	**3**	**1**	**4**	**2**	**4**	**16**	**8**	**9**	**10**	**10**	**29**	**2**	**1**	**100**

TRE_Q4_5. I have discussed My Home Energy Reports with others.

Group	0	1	2	3	4	5	6	7	8	9	10	No Response	Missing	Total
Treatment	43	19	10	8	6	13	6	10	9	5	18	2	2	151
Percent	**28**	**13**	**7**	**5**	**4**	**9**	**4**	**7**	**6**	**3**	**12**	**1**	**1**	**100**

TRE_Q4_6. The information provided about my home's energy use is confusing.

Group	0	1	2	3	4	5	6	7	8	9	10	No Response	Missing	Total
Treatment	41	24	17	18	7	13	4	6	7	4	7	1	2	151
Percent	**27**	**16**	**11**	**12**	**5**	**9**	**3**	**4**	**5**	**3**	**5**	**1**	**1**	**100**

TRE_Q4_7. I suspect that the "similar" homes that my home is compared to in the Home Energy Reports are not actually like mine.

Group	0	1	2	3	4	5	6	7	8	9	10	No Response	Missing	Total
Treatment	15	6	12	13	7	22	7	7	22	9	26	3	2	151
Percent	**10**	**4**	**8**	**9**	**5**	**15**	**5**	**5**	**15**	**6**	**17**	**2**	**1**	**100**

TRE_Q4_8. Since reading the Home Energy Reports, I have taken actions to use less energy than I would not have otherwise taken.

Group	0	1	2	3	4	5	6	7	8	9	10	No Response	Missing	Total
Treatment	13	5	6	9	7	27	10	17	16	12	26	1	2	151
Percent	**9**	**3**	**4**	**6**	**5**	**18**	**7**	**11**	**11**	**8**	**17**	**1**	**1**	**100**

TRE_Q6. Please rate how useful each feature of the Home Energy Report is to you.

TRE_Q6_1. Comparison to similar homes

Group	0	1	2	3	4	5	6	7	8	9	10	No Response	Missing	Total
Treatment	19	10	3	7	12	21	7	17	18	7	25	3	2	151
Percent	**13**	**7**	**2**	**5**	**8**	**14**	**5**	**11**	**12**	**5**	**17**	**2**	**1**	**100**

TRE_Q6_2. Tips to help you save money and energy

Group	0	1	2	3	4	5	6	7	8	9	10	No Response	Missing	Total
Treatment	3	7	4	3	8	20	8	16	22	17	38	3	2	151
Percent	**2**	**5**	**3**	**2**	**5**	**13**	**5**	**11**	**15**	**11**	**25**	**2**	**1**	**100**

TRE_Q6_3. Examples of the energy use associated with common household items

Group	0	1	2	3	4	5	6	7	8	9	10	No Response	Missing	Total
Treatment	8	3	3	2	3	30	10	15	24	13	35	3	2	151
Percent	**5**	**2**	**2**	**1**	**2**	**20**	**7**	**10**	**16**	**9**	**23**	**2**	**1**	**100**

TRE_Q6_4. Customized suggestions for your home

Group	0	1	2	3	4	5	6	7	8	9	10	No Response	Missing	Total
Treatment	4	4	11	2	12	25	9	16	20	13	31	2	2	151
Percent	**3**	**3**	**7**	**1**	**8**	**17**	**6**	**11**	**13**	**9**	**21**	**1**	**1**	**100**

TRE_Q6_5. Graphs that display your home's energy use over time

Group	0	1	2	3	4	5	6	7	8	9	10	No Response	Missing	Total
Treatment	3	3	1	5	5	12	10	13	24	20	51	2	2	151
Percent	**2**	**2**	**1**	**3**	**3**	**8**	**7**	**9**	**16**	**13**	**34**	**1**	**1**	**100**

TRE_Q6_6. Information about services and offers from Duke Energy

Group	0	1	2	3	4	5	6	7	8	9	10	No Response	Missing	Total
Treatment	4	7	8	5	13	21	8	14	19	16	30	4	2	151
Percent	**3**	**5**	**5**	**3**	**9**	**14**	**5**	**9**	**13**	**11**	**20**	**3**	**1**	**100**

TRE_Q7. Overall, how satisfied are you with the information in the My Home Energy Reports you've received?

Group	0	1	2	3	4	5	6	7	8	9	10	No Response	Missing	Total
Treatment	4	2	0	15	6	0	10	18	19	15	43	17	2	151
Percent	**3**	**1**	**0**	**10**	**4**	**0**	**7**	**12**	**13**	**10**	**28**	**11**	**1**	**100**

TRE_Q8. Are you aware that you can go online to My Home Energy Interactive to access more information, above and beyond that found in the My Home Energy Report, which describes more ways to save energy?

Group	Yes	No	No Response	Missing	Total
Treatment	50	93	6	2	151
Percent	**33**	**62**	**4**	**1**	**100**

TRE_Q8a. Have you signed up to use My Home Energy Interactive?

Group	Yes	No	Missing	Total
Treatment	7	44	7	58
Percent	**12**	**76**	**12**	**100**

TRE_Q8b. How useful is My Home Energy Interactive to you for saving energy?

Group	0	1	2	3	4	5	6	7	8	9	10	No Response	Missing	Total
Treatment	0	0	1	0	0	1	1	0	2	1	1	0	7	14
Percent	**0**	**0**	**7**	**0**	**0**	**7**	**7**	**0**	**14**	**7**	**7**	**0**	**50**	**100**

Appendix F Detailed Regression Outputs/Models

Table F-1: Regression Coefficients for DEC Cohort 1

Number of obs	=	1762110
F(211,1746190)	=	3462.28
Prob>F	=	0.0000
R-squared	=	0.6990
AdjR-squared	=	0.6963
Root MSE	=	14.2230

Variable	Coefficient	Std. Err.	t	P > |t|	95% Conf. Interval	
i.ym						
12/2008	5.191487	.2007457	25.86	0.000	4.798033	5.584942
01/2009	8.474034	.2007376	42.21	0.000	8.080595	8.867473
02/2009	4.944045	.2007376	24.63	0.000	4.550607	5.337484
03/2009	-4.473073	.2007376	-22.28	0.000	-4.866511	-4.079634
04/2009	-10.36862	.2007399	-51.65	0.000	-10.76206	-9.975177
05/2009	-5.134012	.2007376	-25.58	0.000	-5.52745	-4.740573
06/2009	8.447003	.2007622	42.07	0.000	8.053516	8.84049
07/2009	12.29769	.2007376	61.26	0.000	11.90425	12.69113
08/2009	10.50211	.2007376	52.32	0.000	10.10867	10.89554
09/2009	-1.928812	.2007376	-9.61	0.000	-2.322251	-1.535373
10/2009	-10.3154	.2007376	-51.39	0.000	-10.70884	-9.921959
11/2009	-5.556012	.2007376	-27.68	0.000	-5.949451	-5.162574
12/2009	12.49879	.2007376	62.26	0.000	12.10535	12.89222
01/2010	17.97165	.2007376	89.53	0.000	17.57821	18.36509
02/2010	12.75866	.2007376	63.56	0.000	12.36522	13.1521
03/2010	-2.580372	.2007376	-12.85	0.000	-2.973811	-2.186933
05/2010	-1.914499	.2193415	-8.73	0.000	-2.3444	-1.484597
06/2010	13.97785	.2193415	63.73	0.000	13.54795	14.40775
07/2010	21.27298	.2193415	96.99	0.000	20.84308	21.70289
08/2010	16.37607	.2193517	74.66	0.000	15.94615	16.806
09/2010	3.002323	.2193415	13.69	0.000	2.572421	3.432225
10/2010	-10.85536	.2193415	-49.49	0.000	-11.28526	-10.42546
11/2010	-2.931544	.2193415	-13.37	0.000	-3.361445	-2.501642
12/2010	15.42983	.2193415	70.35	0.000	14.99993	15.85973
01/2011	16.05199	.2193467	73.18	0.000	15.62208	16.4819
02/2011	1.516525	.2193467	6.91	0.000	1.086613	1.946437

03/2011	-8.668877	.2193467	-39.52	0.000	-9.098789	-8.238966
04/2011	-10.7024	.2193467	-48.79	0.000	-11.13231	-10.27249
05/2011	-2.066455	.2193467	-9.42	0.000	-2.496367	-1.636544
06/2011	11.27938	.2193467	51.42	0.000	10.84947	11.70929
07/2011	18.50946	.2193467	84.38	0.000	18.07955	18.93937
08/2011	15.38748	.2193467	70.15	0.000	14.95757	15.81739
09/2011	-2.419517	.2193467	-11.03	0.000	-2.849429	-1.989605
10/2011	-11.95917	.2193467	-54.52	0.000	-12.38908	-11.52925
11/2011	-6.773594	.2193467	-30.88	0.000	-7.203506	-6.343682
12/2011	.3503983	.2193467	1.60	0.110	-.0795136	.7803101
01/2012	2.137307	.2193467	9.74	0.000	1.707396	2.567219
02/2012	-2.023987	.2193467	-9.23	0.000	-2.453899	-1.594075
03/2012	-10.96786	.2193467	-50.00	0.000	-11.39777	-10.53795
04/2012	-12.02501	.2193467	-54.82	0.000	-12.45493	-11.5951
05/2012	-5.344883	.2193467	-24.37	0.000	-5.774795	-4.914972
06/2012	5.043491	.2193467	22.99	0.000	4.613579	5.473403
07/2012	15.05386	.2193467	68.63	0.000	14.62395	15.48378
08/2012	7.429274	.2193467	33.87	0.000	6.999362	7.859186
09/2012	-4.481343	.2193467	-20.43	0.000	-4.911255	-4.051431
10/2012	-11.71996	.2193467	-53.43	0.000	-12.14987	-11.29005
11/2012	-3.644662	.2193467	-16.62	0.000	-4.074574	-3.21475
12/2012	-.3900915	.2193467	-1.78	0.075	-.8200034	.0398203
01/2013	3.125439	.2193467	14.25	0.000	2.695527	3.555351
02/2013	4.334034	.2193467	19.76	0.000	3.904122	4.763946
03/2013	-1.639171	.2193467	-7.47	0.000	-2.069083	-1.209259
04/2013	-10.92128	.2193467	-49.79	0.000	-11.3512	-10.49137
05/2013	-9.073495	.2193467	-41.37	0.000	-9.503407	-8.643583
06/2013	1.977657	.2193467	9.02	0.000	1.547745	2.407569
07/2013	6.9278	.2193467	31.58	0.000	6.497888	7.357712
08/2013	4.202586	.2193467	19.16	0.000	3.772674	4.632497
09/2013	-3.535703	.2193467	-16.12	0.000	-3.965615	-3.105791
10/2013	-12.08457	.2193467	-55.09	0.000	-12.51448	-11.65466
11/2013	-4.151322	.2193467	-18.93	0.000	-4.581234	-3.72141
12/2013	5.982545	.2193467	27.27	0.000	5.552633	6.412457
01/2014	13.94471	.2193467	63.57	0.000	13.5148	14.37462
02/2014	6.439797	.2193467	29.36	0.000	6.009885	6.869709
03/2014	-4.763844	.2193467	-21.72	0.000	-5.193755	-4.333932
04/2014	-11.30048	.2193467	-51.52	0.000	-11.73039	-10.87057
05/2014	-5.923049	.2193518	-27.00	0.000	-6.352971	-5.493127
06/2014	5.586936	.2193518	25.47	0.000	5.157014	6.016858
07/2014	6.807551	.2193518	31.03	0.000	6.377629	7.237473

08/2014	4.594464	.2193467	20.95	0.000	4.164553	5.024376
09/2014	-2.844089	.2193467	-12.97	0.000	-3.274001	-2.414177
10/2014	-12.83725	.2193467	-58.52	0.000	-13.26717	-12.40734
11/2014	-3.794079	.2193467	-17.30	0.000	-4.223991	-3.364168
12/2014	5.624176	.2193415	25.64	0.000	5.194275	6.054078
01/2015	7.697574	.2193415	35.09	0.000	7.267672	8.127475
02/2015	8.480056	.2193415	38.66	0.000	8.050154	8.909958
03/2015	-6.031693	.2193415	-27.50	0.000	-6.461595	-5.601791
04/2015	-13.39654	.2193415	-61.08	0.000	-13.82644	-12.96664
05/2015	-5.456317	.2193415	-24.88	0.000	-5.886219	-5.026415
06/2015	7.45144	.2193415	33.97	0.000	7.021538	7.881341
07/2015	13.00821	.2193415	59.31	0.000	12.57831	13.43811
08/2015	8.063715	.2193415	36.76	0.000	7.633813	8.493616
09/2015	-5.04434	.2193415	-23.00	0.000	-5.474241	-4.614438
10/2015	-14.22894	.2193415	-64.87	0.000	-14.65884	-13.79903
11/2015	-10.26639	.2193415	-46.81	0.000	-10.69629	-9.836487
12/2015	-4.744726	.2193415	-21.63	0.000	-5.174627	-4.314824
01/2016	4.96105	.2193465	22.62	0.000	4.531139	5.390962
02/2016	2.108975	.2193816	9.61	0.000	1.678995	2.538955
03/2016	-11.48936	.2195124	-52.34	0.000	-11.9196	-11.05912
04/2016	-13.86226	.2197353	-63.09	0.000	-14.29294	-13.43159
05/2016	-7.251094	.2199293	-32.97	0.000	-7.682147	-6.82004
06/2016	7.00792	.2201299	31.84	0.000	6.576473	7.439367
07/2016	15.72801	.2204102	71.36	0.000	15.29602	16.16001
08/2016	11.98578	.2206354	54.32	0.000	11.55334	12.41821
09/2016	1.356097	.220921	6.14	0.000	.9230997	1.789095
10/2016	-12.62069	.221172	-57.06	0.000	-13.05418	-12.1872
11/2016	-9.658069	.2213335	-43.64	0.000	-10.09188	-9.224264
12/2016	-.6289618	.2215121	-2.84	0.005	-1.063118	-.1948056
01/2017	-2.849558	.2216975	-12.85	0.000	-3.284077	-2.415039
02/2017	-8.607431	.221851	-38.80	0.000	-9.042251	-8.172611
03/2017	-10.77751	.2220055	-48.55	0.000	-11.21263	-10.34238
04/2017	-13.76509	.2222722	-61.93	0.000	-14.20073	-13.32944
05/2017	-8.217315	.2225359	-36.93	0.000	-8.653478	-7.781152
06/2017	1.158951	.2228875	5.20	0.000	.722099	1.595803
07/2017	8.833328	.2231686	39.58	0.000	8.395925	9.270731
08/2017	4.53006	.2234059	20.28	0.000	4.092192	4.967928
09/2017	-5.786104	.2236804	-25.87	0.000	-6.22451	-5.347698
10/2017	-11.066	.2239339	-49.42	0.000	-11.5049	-10.62709
11/2017	-8.475153	.2241597	-37.81	0.000	-8.914499	-8.035808
12/2017	4.758375	.2243693	21.21	0.000	4.318619	5.198131

01/2018	9.863339	.2246289	43.91	0.000	9.423074	10.3036
02/2018	-5.781853	.2248725	-25.71	0.000	-6.222595	-5.34111
03/2018	-9.912905	.2250997	-44.04	0.000	-10.35409	-9.471718
04/2018	-13.94758	.2253348	-61.90	0.000	-14.38923	-13.50593
05/2018	-6.950921	.2255593	-30.82	0.000	-7.393009	-6.508832
i.ym#c.treatment						
05/2010	-.1910499	.2394967	-0.80	0.425	-.6604551	.2783552
06/2010	-.2860475	.2394967	-1.19	0.232	-.7554527	.1833577
07/2010	-.5401676	.2394967	-2.26	0.024	-1.009573	-.0707624
08/2010	-.4921973	.239506	-2.06	0.040	-.9616208	-.0227738
09/2010	-.463216	.2394967	-1.93	0.053	-.9326212	.0061891
10/2010	-.5357518	.2394967	-2.24	0.025	-1.005157	-.0663467
11/2010	-.1931776	.2394967	-0.81	0.420	-.6625827	.2762276
12/2010	.0610646	.2394967	0.25	0.799	-.4083406	.5304697
01/2011	.0866716	.2395014	0.36	0.717	-.3827428	.556086
02/2011	.0078406	.2395126	0.03	0.974	-.4615958	.477277
03/2011	-.454115	.2395126	-1.90	0.058	-.9235514	.0153213
04/2011	-.484397	.2395126	-2.02	0.043	-.9538333	-.0149606
05/2011	-.7348654	.2395238	-3.07	0.002	-1.204324	-.2654072
06/2011	-.5874111	.2395126	-2.45	0.014	-1.056847	-.1179747
07/2011	-.8212494	.2395126	-3.43	0.001	-1.290686	-.3518131
08/2011	-.6037938	.2395126	-2.52	0.012	-1.07323	-.1343574
09/2011	-.5673285	.2395126	-2.37	0.018	-1.036765	-.0978922
10/2011	-.5760798	.2395126	-2.41	0.016	-1.045516	-.1066434
11/2011	-.4092845	.2395126	-1.71	0.087	-.8787209	.0601518
12/2011	-.3575161	.2395126	-1.49	0.136	-.8269524	.1119203
01/2012	-.2747792	.2395126	-1.15	0.251	-.7442156	.1946571
02/2012	-.3863291	.2395126	-1.61	0.107	-.8557654	.0831073
03/2012	-.556866	.2395126	-2.32	0.020	-1.026302	-.0874297
04/2012	-.685426	.2395126	-2.86	0.004	-1.154862	-.2159896
05/2012	-.5552546	.2395126	-2.32	0.020	-1.024691	-.0858182
06/2012	-.6511456	.2395126	-2.72	0.007	-1.120582	-.1817092
07/2012	-.5138519	.2395126	-2.15	0.032	-.9832883	-.0444155
08/2012	-.6455145	.2395126	-2.70	0.007	-1.114951	-.1760781
09/2012	-.5557067	.2395126	-2.32	0.020	-1.025143	-.0862704
10/2012	-.6565749	.2395014	-2.74	0.006	-1.125989	-.1871605
11/2012	-.983766	.2395014	-4.11	0.000	-1.45318	-.5143516
12/2012	-.4109544	.2395014	-1.72	0.086	-.8803688	.05846
01/2013	-.2759519	.2395014	-1.15	0.249	-.7453663	.1934625
02/2013	-.3054777	.2395014	-1.28	0.202	-.7748921	.1639367

03/2013	-.5427792	.2395014	-2.27	0.023	-1.012194	-.0733648
04/2013	-.582956	.2395014	-2.43	0.015	-1.05237	-.1135416
05/2013	-.7678896	.2395014	-3.21	0.001	-1.237304	-.2984752
06/2013	-.8816336	.2395014	-3.68	0.000	-1.351048	-.4122192
07/2013	-1.034716	.2395014	-4.32	0.000	-1.504131	-.565302
08/2013	-.9875511	.2395014	-4.12	0.000	-1.456966	-.5181367
09/2013	-.6532961	.2395014	-2.73	0.006	-1.122711	-.1838818
10/2013	-.6239904	.2395014	-2.61	0.009	-1.093405	-.154576
11/2013	-.3569448	.2395014	-1.49	0.136	-.8263592	.1124696
12/2013	-.1515506	.2395014	-0.63	0.527	-.620965	.3178638
01/2014	-.2228782	.2395014	-0.93	0.352	-.6922926	.2465362
02/2014	-.1320108	.2395014	-0.55	0.582	-.6014252	.3374036
03/2014	-.36386	.2395014	-1.52	0.129	-.8332744	.1055544
04/2014	-.6727505	.2395014	-2.81	0.005	-1.142165	-.2033362
05/2014	-.6869799	.2395061	-2.87	0.004	-1.156403	-.2175563
06/2014	-.9441145	.2395061	-3.94	0.000	-1.413538	-.474691
07/2014	-.9629565	.2395061	-4.02	0.000	-1.43238	-.4935329
08/2014	-.9183834	.2395014	-3.83	0.000	-1.387798	-.448969
09/2014	-.7614144	.2395014	-3.18	0.001	-1.230829	-.292
10/2014	-.6365438	.2395014	-2.66	0.008	-1.105958	-.1671294
11/2014	-.4433267	.2395014	-1.85	0.064	-.9127411	.0260877
12/2014	-.2697246	.2394967	-1.13	0.260	-.7391298	.1996806
01/2015	-.2573507	.2394967	-1.07	0.283	-.7267559	.2120545
02/2015	-.3339995	.2394967	-1.39	0.163	-.8034046	.1354057
03/2015	-.5212122	.2394967	-2.18	0.030	-.9906174	-.0518071
04/2015	-.6320871	.2394967	-2.64	0.008	-1.101492	-.1626819
05/2015	-.6295939	.2394967	-2.63	0.009	-1.098999	-.1601887
06/2015	-.5415726	.2394967	-2.26	0.024	-1.010978	-.0721674
07/2015	-.4877207	.2394967	-2.04	0.042	-.9571259	-.0183156
08/2015	-.5460176	.2394967	-2.28	0.023	-1.015423	-.0766125
09/2015	-.6018334	.2394967	-2.51	0.012	-1.071239	-.1324282
10/2015	-.6344547	.2394967	-2.65	0.008	-1.10386	-.1650496
11/2015	-.4519346	.2394967	-1.89	0.059	-.9213398	.0174705
12/2015	-.2701377	.2394967	-1.13	0.259	-.7395429	.1992674
01/2016	-.0118044	.2395238	-0.05	0.961	-.4812627	.457654
02/2016	.0119737	.2396241	0.05	0.960	-.4576812	.4816286
03/2016	-.3992353	.2399267	-1.66	0.096	-.8694835	.0710128
04/2016	-.5908526	.2403388	-2.46	0.014	-1.061908	-.1197969
05/2016	-.6390015	.2408954	-2.65	0.008	-1.111148	-.1668549
06/2016	-.6533725	.2413804	-2.71	0.007	-1.12647	-.1802753
07/2016	-.6972425	.2419413	-2.88	0.004	-1.171439	-.223046

08/2016	-.5881896	.2424409	-2.43	0.015	-1.063365	-.1130138
09/2016	-.533938	.2431858	-2.20	0.028	-1.010574	-.0573022
10/2016	-.6331126	.243749	-2.60	0.009	-1.110852	-.1553731
11/2016	-.4772002	.2442789	-1.95	0.051	-.9559785	.001578
12/2016	-.3995216	.2446356	-1.63	0.102	-.8789989	.0799558
01/2017	-.5412792	.244975	-2.21	0.027	-1.021422	-.0611367
02/2017	-.4773872	.2453217	-1.95	0.052	-.9582092	.0034348
03/2017	-.5299467	.2456578	-2.16	0.031	-1.011427	-.048466
04/2017	-.6764316	.2462687	-2.75	0.006	-1.15911	-.1937534
05/2017	-.6656495	.2469533	-2.70	0.007	-1.149669	-.1816296
06/2017	-.7430946	.2477597	-3.00	0.003	-1.228695	-.2574941
07/2017	-.723818	.2483676	-2.91	0.004	-1.21061	-.2370262
08/2017	-.7733249	.2489882	-3.11	0.002	-1.261333	-.2853167
09/2017	-.9654595	.2495057	-3.87	0.000	-1.454482	-.476437
10/2017	-.725397	.2499668	-2.90	0.004	-1.215323	-.2354707
11/2017	-.6503956	.2504678	-2.60	0.009	-1.141304	-.1594875
12/2017	-.6432011	.2509038	-2.56	0.010	-1.134964	-.1514384
01/2018	-.8176798	.2513993	-3.25	0.001	-1.310414	-.3249459
02/2018	-.7727947	.2518814	-3.07	0.002	-1.266473	-.2791159
03/2018	-.7919056	.2523102	-3.14	0.002	-1.286425	-.2973863
04/2018	-.6624927	.2527603	-2.62	0.009	-1.157894	-.1670912
05/2018	-.7587147	.2532945	-3.00	0.003	-1.255163	-.2622664
06/2018	-.8077236	.2681764	-3.01	0.003	-1.33334	-.2821072
cons	45.77712	.1655728	276.48	0.000	45.4526	46.10163

Table F-2: Regression Coefficients for DEC Cohort 2

Number of obs	=	66019536
F(184,65383332)	=	107813.97
Prob>F	=	0.0000
R-squared	=	0.6861
AdjR-squared	=	0.6831
Root MSE	=	14.5232

Variable	Coefficient	Std. Err.	t	P > |t|	95% Conf. Interval	
i.ym						
12/2008	15.60621	3.538483	4.41	0.000	8.670906	22.54151
01/2009	18.55965	3.538483	5.25	0.000	11.62435	25.49495
02/2009	15.16359	3.538483	4.29	0.000	8.228292	22.09889
03/2009	6.65773	3.538483	1.88	0.060	-.2775681	13.59303
04/2009	.6109856	3.538482	0.17	0.863	-6.324312	7.546284
05/2009	4.159499	3.538482	1.18	0.240	-2.775798	11.0948
06/2009	14.83888	3.538482	4.19	0.000	7.903585	21.77418
07/2009	18.6593	3.538481	5.27	0.000	11.72401	25.5946
08/2009	17.93512	3.538481	5.07	0.000	10.99982	24.87041
09/2009	6.611174	3.538481	1.87	0.062	-.3241207	13.54647
10/2009	.494279	3.53848	0.14	0.889	-6.441015	7.429573
11/2009	5.650804	3.53848	1.60	0.110	-1.28449	12.5861
12/2009	21.0607	3.53848	5.95	0.000	14.1254	27.99599
01/2010	25.40384	3.53848	7.18	0.000	18.46855	32.33914
02/2010	21.15344	3.538479	5.98	0.000	14.21814	28.08873
03/2010	7.036302	3.538479	1.99	0.047	.1010102	13.97159
04/2010	-.1561714	3.538479	-0.04	0.965	-7.091462	6.779119
05/2010	6.554885	3.538478	1.85	0.064	-.3804053	13.49017
06/2010	20.61625	3.538478	5.83	0.000	13.68096	27.55154
07/2010	26.5117	3.538477	7.49	0.000	19.57641	33.44699
08/2010	22.42108	3.538477	6.34	0.000	15.48579	29.35637
09/2010	10.95032	3.538477	3.09	0.002	4.015031	17.88561
10/2010	.0531436	3.538477	0.02	0.988	-6.882143	6.988431
11/2010	7.951184	3.538476	2.25	0.025	1.015897	14.88647
12/2010	24.3034	3.538476	6.87	0.000	17.36811	31.23868
01/2011	24.59635	3.538476	6.95	0.000	17.66107	31.53164
02/2011	12.14872	3.538476	3.43	0.001	5.213439	19.08401
03/2011	3.271488	3.538475	0.92	0.355	-3.663796	10.20677
04/2011	.0254961	3.538475	0.01	0.994	-6.909788	6.96078
05/2011	6.722884	3.538475	1.90	0.057	-.2123994	13.65817
06/2011	18.30611	3.538475	5.17	0.000	11.37082	25.24139

07/2011	24.57749	3.538474	6.95	0.000	17.6422	31.51277
08/2011	21.24229	3.538474	6.00	0.000	14.307	28.17757
09/2011	6.32984	3.538474	1.79	0.074	-.605441	13.26512
10/2011	-.7090731	3.538473	-0.20	0.841	-7.644354	6.226207
11/2011	4.789263	3.538473	1.35	0.176	-2.146016	11.72454
12/2011	11.08201	3.538473	3.13	0.002	4.146733	18.01729
01/2012	12.99586	3.538472	3.67	0.000	6.060582	19.93114
02/2012	9.304971	3.538472	2.63	0.009	2.369693	16.24025
03/2012	.2922054	3.538472	0.08	0.934	-6.643072	7.227483
04/2012	-1.444199	3.538472	-0.41	0.683	-8.379476	5.491079
05/2012	3.84496	3.538476	1.09	0.277	-3.090325	10.78025
06/2012	13.37637	3.538477	3.78	0.000	6.441086	20.31166
07/2012	22.48779	3.538472	6.36	0.000	15.55251	29.42307
08/2012	15.61638	3.53847	4.41	0.000	8.681104	22.55165
10/2012	-.1389972	3.539339	-0.04	0.969	-7.075974	6.797979
11/2012	6.747932	3.539339	1.91	0.057	-.1890448	13.68491
12/2012	11.72247	3.539339	3.31	0.001	4.785494	18.65945
01/2013	15.2848	3.539339	4.32	0.000	8.347819	22.22177
02/2013	16.0512	3.539339	4.54	0.000	9.114225	22.98818
03/2013	10.31997	3.539329	2.92	0.004	3.383015	17.25693
04/2013	.7307316	3.539329	0.21	0.836	-6.206225	7.667688
05/2013	2.014527	3.539329	0.57	0.569	-4.92243	8.951484
06/2013	10.40249	3.539329	2.94	0.003	3.465537	17.33945
07/2013	15.21497	3.539329	4.30	0.000	8.278016	22.15193
08/2013	12.16316	3.539329	3.44	0.001	5.226203	19.10012
09/2013	4.993709	3.539329	1.41	0.158	-1.943248	11.93067
10/2013	-.5978868	3.539329	-0.17	0.866	-7.534844	6.33907
11/2013	8.227127	3.539329	2.32	0.020	1.29017	15.16408
12/2013	17.12029	3.539329	4.84	0.000	10.18333	24.05724
01/2014	23.99797	3.539329	6.78	0.000	17.06102	30.93493
02/2014	18.12497	3.539329	5.12	0.000	11.18801	25.06192
03/2014	8.762832	3.539329	2.48	0.013	1.825875	15.69979
04/2014	.3260062	3.539329	0.09	0.927	-6.610951	7.262963
05/2014	3.696197	3.539329	1.04	0.296	-3.24076	10.63315
06/2014	13.51021	3.539329	3.82	0.000	6.57325	20.44716
07/2014	13.74943	3.539329	3.88	0.000	6.812471	20.68639
08/2014	12.28417	3.539329	3.47	0.001	5.347213	19.22113
09/2014	5.353721	3.539329	1.51	0.130	-1.583237	12.29068
10/2014	-1.159543	3.539329	-0.33	0.743	-8.096501	5.777415
11/2014	8.391809	3.539329	2.37	0.018	1.454851	15.32877
12/2014	16.67983	3.539329	4.71	0.000	9.742874	23.61679

01/2015	19.03981	3.539328	5.38	0.000	12.10285	25.97677
02/2015	21.99416	3.539329	6.21	0.000	15.0572	28.93112
03/2015	7.006767	3.539329	1.98	0.048	.0698103	13.94372
04/2015	-1.618107	3.539329	-0.46	0.648	-8.555064	5.31885
05/2015	4.506174	3.539329	1.27	0.203	-2.430783	11.44313
06/2015	16.51763	3.539329	4.67	0.000	9.580674	23.45459
07/2015	20.28945	3.539329	5.73	0.000	13.35249	27.22641
08/2015	15.72859	3.539329	4.44	0.000	8.791636	22.66555
09/2015	4.758353	3.539329	1.34	0.179	-2.178604	11.69531
10/2015	-2.040086	3.539329	-0.58	0.564	-8.977043	4.896871
11/2015	2.449674	3.539329	0.69	0.489	-4.487283	9.386632
12/2015	7.374783	3.539329	2.08	0.037	.4378261	14.31174
01/2016	16.87508	3.539329	4.77	0.000	9.93812	23.81204
02/2016	14.81747	3.53933	4.19	0.000	7.880515	21.75443
03/2016	1.449485	3.539335	0.41	0.682	-5.487484	8.386454
04/2016	-1.655205	3.539341	-0.47	0.640	-8.592187	5.281777
05/2016	2.03059	3.539348	0.57	0.566	-4.906405	8.967584
06/2016	13.63592	3.539355	3.85	0.000	6.698916	20.57293
07/2016	21.68849	3.539363	6.13	0.000	14.75146	28.62551
08/2016	19.69544	3.539369	5.56	0.000	12.75841	26.63248
09/2016	10.20204	3.539377	2.88	0.004	3.264991	17.13909
10/2016	-1.283525	3.539383	-0.36	0.717	-8.220589	5.653538
11/2016	2.897853	3.539389	0.82	0.413	-4.039222	9.834927
12/2016	12.58997	3.539395	3.56	0.000	5.652881	19.52705
01/2017	10.76085	3.539401	3.04	0.002	3.823751	17.69795
02/2017	4.390035	3.539406	1.24	0.215	-2.547074	11.32714
03/2017	2.278205	3.539411	0.64	0.520	-4.658913	9.215322
04/2017	-1.117221	3.539417	-0.32	0.752	-8.05435	5.819909
05/2017	2.517216	3.539423	0.71	0.477	-4.419927	9.454358
06/2017	10.64104	3.539432	3.01	0.003	3.703883	17.5782
07/2017	17.42826	3.539439	4.92	0.000	10.49109	24.36544
08/2017	12.37889	3.539445	3.50	0.000	5.441705	19.31608
09/2017	4.11828	3.539452	1.16	0.245	-2.81892	11.05548
10/2017	-.1526433	3.539458	-0.04	0.966	-7.089855	6.784568
11/2017	4.710299	3.539466	1.33	0.183	-2.226926	11.64752
12/2017	18.23206	3.539472	5.15	0.000	11.29482	25.16929
01/2018	21.79532	3.539477	6.16	0.000	14.85807	28.73257
02/2018	7.776363	3.539483	2.20	0.028	.8391038	14.71362
03/2018	4.591732	3.539489	1.30	0.195	-2.345538	11.529
04/2018	-1.023749	3.539494	-0.29	0.772	-7.961031	5.913532
05/2018	4.715948	3.539501	1.33	0.183	-2.221346	11.65324

06/2018	8.871852	3.539601	2.51	0.012	1.934362	15.80934
i.ym#c.treatment						
10/2012	-.840534	.0857929	-9.80	0.000	-1.008685	-.672383
11/2012	-.6158147	.0849309	-7.25	0.000	-.7822762	-.4493533
12/2012	-.9676389	.0849346	-11.39	0.000	-1.134108	-.8011701
01/2013	-.6976332	.0849016	-8.22	0.000	-.8640373	-.5312291
02/2013	-.8442805	.0848814	-9.95	0.000	-1.010645	-.6779161
03/2013	-.9611976	.084455	-11.38	0.000	-1.126726	-.7956688
04/2013	-.5014042	.0844052	-5.94	0.000	-.6668354	-.335973
05/2013	-.6168377	.0844077	-7.31	0.000	-.7822737	-.4514016
06/2013	.2525404	.0844003	2.99	0.003	.0871189	.417962
07/2013	.1679476	.0843964	1.99	0.047	.0025337	.3333615
08/2013	-.1075249	.0843856	-1.27	0.203	-.2729176	.0578677
09/2013	.185229	.0843737	2.20	0.028	.0198595	.3505985
10/2013	-.6812523	.0843209	-8.08	0.000	-.8465182	-.5159864
11/2013	-1.086973	.0842983	-12.89	0.000	-1.252195	-.9217514
12/2013	-.9384901	.0842995	-11.13	0.000	-1.103714	-.773266
01/2014	-.8469811	.0842631	-10.05	0.000	-1.012134	-.6818285
02/2014	-1.160827	.0842618	-13.78	0.000	-1.325977	-.9956765
03/2014	-1.102494	.0842631	-13.08	0.000	-1.267647	-.9373415
04/2014	-.8452056	.0842631	-10.03	0.000	-1.010358	-.680053
05/2014	-.3981435	.0842655	-4.72	0.000	-.5633009	-.2329861
06/2014	-.0148477	.084268	-0.18	0.860	-.1800099	.1503146
07/2014	.3927861	.0842692	4.66	0.000	.2276214	.5579508
08/2014	-.3569773	.0842717	-4.24	0.000	-.5221468	-.1918078
09/2014	.146575	.0842717	1.74	0.082	-.0185945	.3117445
10/2014	-.8074913	.0842742	-9.58	0.000	-.9726656	-.642317
11/2014	-.8933922	.0842742	-10.60	0.000	-1.058567	-.7282179
12/2014	-.5790381	.0842482	-6.87	0.000	-.7441616	-.4139147
01/2015	-.753809	.084247	-8.95	0.000	-.9189301	-.5886879
02/2015	-1.536854	.0842507	-18.24	0.000	-1.701982	-1.371726
03/2015	-1.178561	.0842507	-13.99	0.000	-1.343689	-1.013432
04/2015	-.7316073	.0842532	-8.68	0.000	-.8967405	-.5664741
05/2015	-.216203	.0842544	-2.57	0.010	-.3813386	-.0510673
06/2015	-.0699967	.0842557	-0.83	0.406	-.2351348	.0951414
07/2015	.0738049	.0842569	0.88	0.381	-.0913357	.2389455
08/2015	.0956977	.0842583	1.14	0.256	-.0694454	.2608409
09/2015	-.2657058	.0842583	-3.15	0.002	-.430849	-.1005626
10/2015	-.8266346	.0842608	-9.81	0.000	-.9917828	-.6614864
11/2015	-1.18499	.0842609	-14.06	0.000	-1.350139	-1.019842
12/2015	-.8655857	.084261	-10.27	0.000	-1.030734	-.7004371

01/2016	-.7369833	.0842738	-8.75	0.000	-.9021568	-.5718098
02/2016	-1.372489	.0843195	-16.28	0.000	-1.537752	-1.207226
03/2016	-1.1059	.0845333	-13.08	0.000	-1.271582	-.9402177
04/2016	-.9229459	.0848208	-10.88	0.000	-1.089192	-.7567001
05/2016	-.3351069	.085112	-3.94	0.000	-.5019234	-.1682904
06/2016	.3111512	.0854262	3.64	0.000	.143719	.4785835
07/2016	.416008	.0857828	4.85	0.000	.2478768	.5841393
08/2016	.3587588	.086059	4.17	0.000	.1900863	.5274312
09/2016	-.0348806	.0864056	-0.40	0.686	-.2042326	.1344713
10/2016	-.7398302	.0866785	-8.54	0.000	-.909717	-.5699435
11/2016	-.961785	.0869257	-11.06	0.000	-1.132156	-.7914139
12/2016	-1.424701	.0871976	-16.34	0.000	-1.595605	-1.253797
01/2017	-1.330731	.0874459	-15.22	0.000	-1.502122	-1.159341
02/2017	-.9211357	.0876705	-10.51	0.000	-1.092967	-.7493047
03/2017	-1.004827	.0878734	-11.43	0.000	-1.177056	-.8325988
04/2017	-1.222549	.0881431	-13.87	0.000	-1.395306	-1.049791
05/2017	-.530477	.0884276	-6.00	0.000	-.7037919	-.3571621
06/2017	-.2310028	.088785	-2.60	0.009	-.4050183	-.0569873
07/2017	.164544	.0891015	1.85	0.065	-.0100917	.3391797
08/2017	.1487353	.0893719	1.66	0.096	-.0264303	.3239009
09/2017	-.593236	.0896693	-6.62	0.000	-.7689846	-.4174875
10/2017	-.4416378	.0899238	-4.91	0.000	-.6178851	-.2653905
11/2017	-1.13602	.0902223	-12.59	0.000	-1.312853	-.959188
12/2017	-1.967648	.0904728	-21.75	0.000	-2.144971	-1.790324
01/2018	-1.022046	.0907028	-11.27	0.000	-1.199821	-.8442722
02/2018	-1.24192	.0909442	-13.66	0.000	-1.420167	-1.063672
03/2018	-1.294107	.0911858	-14.19	0.000	-1.472828	-1.115386
04/2018	-1.025383	.0914225	-11.22	0.000	-1.204567	-.8461979
05/2018	-.6825252	.0916871	-7.44	0.000	-.8622286	-.5028219
06/2018	.5910098	.0958751	6.16	0.000	.403098	.7789215
07/2018	4.231694	3.611954	1.17	0.241	-2.847607	11.31099
cons	32.27554	3.538422	9.12	0.000	25.34036	39.21072

Table F-3: Regression Coefficients for DEC Cohort 3

Number of obs	=	40604310
F(157,40091478)	=	70899.87
Prob>F	=	0.0000
R-squared	=	0.6872
AdjR-squared	=	0.6832
Root MSE	=	14.5430

Variable	Coefficient	Std. Err.	t	P > |t|	95% Conf. Interval	
i.ym						
12/2008	4.800107	3.052301	1.57	0.116	-1.182292	10.78251
01/2009	8.610748	3.0523	2.82	0.005	2.628349	14.59315
02/2009	5.412161	3.052299	1.77	0.076	-.5702365	11.39456
03/2009	-3.517968	3.052299	-1.15	0.249	-9.500363	2.464428
04/2009	-8.94665	3.052298	-2.93	0.003	-14.92904	-2.964255
05/2009	-5.550734	3.052297	-1.82	0.069	-11.53313	.4316593
06/2009	5.096909	3.052297	1.67	0.095	-.8854824	11.0793
07/2009	9.083436	3.052296	2.98	0.003	3.101046	15.06583
08/2009	8.128167	3.052295	2.66	0.008	2.145779	14.11055
09/2009	-3.162188	3.052294	-1.04	0.300	-9.144574	2.820198
10/2009	-9.100818	3.052293	-2.98	0.003	-15.0832	-3.118434
11/2009	-4.361905	3.052292	-1.43	0.153	-10.34429	1.620478
12/2009	11.13158	3.052292	3.65	0.000	5.149194	17.11396
01/2010	14.49521	3.052291	4.75	0.000	8.512831	20.47759
02/2010	10.89715	3.05229	3.57	0.000	4.914774	16.87953
03/2010	-3.095136	3.05229	-1.01	0.311	-9.077514	2.887242
04/2010	-9.618042	3.052289	-3.15	0.002	-15.60042	-3.635665
05/2010	-3.324066	3.052288	-1.09	0.276	-9.306441	2.658308
06/2010	10.91221	3.052287	3.58	0.000	4.929841	16.89459
07/2010	16.63914	3.052286	5.45	0.000	10.65677	22.62151
08/2010	12.89966	3.052286	4.23	0.000	6.917294	18.88203
09/2010	1.158567	3.052285	0.38	0.704	-4.823801	7.140936
10/2010	-9.297072	3.052284	-3.05	0.002	-15.27944	-3.314705
11/2010	-2.228662	3.052283	-0.73	0.465	-8.211028	3.753704
12/2010	13.72268	3.052281	4.50	0.000	7.740317	19.70504
01/2011	14.22493	3.05228	4.66	0.000	8.242569	20.20729
02/2011	1.972608	3.05228	0.65	0.518	-4.009751	7.954967
03/2011	-6.208965	3.052279	-2.03	0.042	-12.19132	-.226607
04/2011	-9.801175	3.052279	-3.21	0.001	-15.78353	-3.818819
05/2011	-2.970979	3.052278	-0.97	0.330	-8.953334	3.011376
06/2011	8.251382	3.052277	2.70	0.007	2.269028	14.23374

07/2011	15.05179	3.052276	4.93	0.000	9.069437	21.03414
08/2011	11.00737	3.052276	3.61	0.000	5.025023	16.98972
09/2011	-3.53773	3.052275	-1.16	0.246	-9.520079	2.444619
10/2011	-10.13682	3.052274	-3.32	0.001	-16.11917	-4.154473
11/2011	-5.304448	3.052274	-1.74	0.082	-11.2868	.6778992
12/2011	1.088651	3.052274	0.36	0.721	-4.893697	7.070998
01/2012	2.56618	3.052274	0.84	0.400	-3.416166	8.548527
02/2012	-.4115271	3.052273	-0.13	0.893	-6.393873	5.570819
03/2012	-9.293764	3.052273	-3.04	0.002	-15.27611	-3.311419
04/2012	-10.83941	3.052272	-3.55	0.000	-16.82175	-4.857068
05/2012	-5.790665	3.052271	-1.90	0.058	-11.77301	.1916767
06/2012	4.227752	3.05227	1.39	0.166	-1.754588	10.21009
07/2012	12.66149	3.052269	4.15	0.000	6.679154	18.64383
08/2012	6.13941	3.052268	2.01	0.044	.1570739	12.12175
09/2012	-5.064978	3.052267	-1.66	0.097	-11.04731	.9173565
10/2012	-10.21502	3.052267	-3.35	0.001	-16.19735	-4.232688
11/2012	-3.700038	3.052266	-1.21	0.225	-9.68237	2.282293
12/2012	1.193116	3.052264	0.39	0.696	-4.789211	7.175444
01/2013	4.405621	3.052262	1.44	0.149	-1.576703	10.38794
02/2013	5.09963	3.05226	1.67	0.095	-.882689	11.08195
03/2013	-.4906964	3.052257	-0.16	0.872	-6.473011	5.491619
04/2013	-9.723053	3.052255	-3.19	0.001	-15.70536	-3.740742
05/2013	-8.05872	3.052253	-2.64	0.008	-14.04103	-2.076414
06/2013	.551404	3.05225	0.18	0.857	-5.430897	6.533705
07/2013	5.409738	3.052248	1.77	0.076	-.5725577	11.39203
08/2013	2.308546	3.052245	0.76	0.449	-3.673745	8.290836
09/2013	-5.072823	3.052243	-1.66	0.097	-11.05511	.9094641
10/2013	-10.80706	3.052241	-3.54	0.000	-16.78934	-4.824778
11/2013	-2.349596	3.052239	-0.77	0.441	-8.331875	3.632683
12/2013	6.189431	3.052238	2.03	0.043	.2071557	12.17171
01/2014	12.71102	3.052238	4.16	0.000	6.728742	18.6933
02/2014	6.987426	3.052235	2.29	0.022	1.005156	12.9697
03/2014	-2.046078	3.052237	-0.67	0.503	-8.028352	3.936196
04/2014	-10.05183	3.052231	-3.29	0.001	-16.03409	-4.069567
05/2014	-6.329871	3.052232	-2.07	0.038	-12.31214	-.347607
06/2014	3.61481	3.052228	1.18	0.236	-2.367448	9.597068
07/2014	3.793964	3.052227	1.24	0.214	-2.188291	9.776219
08/2014	2.388031	3.052224	0.78	0.434	-3.594219	8.370281
09/2014	-4.630212	3.052221	-1.52	0.129	-10.61246	1.352033
10/2014	-11.21452	3.052222	-3.67	0.000	-17.19677	-5.232276
11/2014	-1.953173	3.052218	-0.64	0.522	-7.935411	4.029064

01/2015	8.419659	3.05412	2.76	0.006	2.433694	14.40562
02/2015	12.0633	3.053307	3.95	0.000	6.078928	18.04767
03/2015	-2.622299	3.053307	-0.86	0.390	-8.606671	3.362072
04/2015	-10.99208	3.053307	-3.60	0.000	-16.97645	-5.00771
05/2015	-4.858547	3.053307	-1.59	0.112	-10.84292	1.125825
06/2015	6.97091	3.053307	2.28	0.022	.9865374	12.95528
07/2015	10.56639	3.053307	3.46	0.001	4.582019	16.55076
08/2015	6.219886	3.053307	2.04	0.042	.2355132	12.20426
09/2015	-4.476623	3.053307	-1.47	0.143	-10.461	1.507749
10/2015	-11.29456	3.053307	-3.70	0.000	-17.27893	-5.31019
11/2015	-7.138996	3.053307	-2.34	0.019	-13.12337	-1.154623
12/2015	-2.345706	3.053307	-0.77	0.442	-8.330078	3.638667
01/2016	7.305592	3.053004	2.39	0.017	1.321814	13.28937
02/2016	5.167734	3.053005	1.69	0.091	-.8160463	11.15151
03/2016	-7.910725	3.053013	-2.59	0.010	-13.89452	-1.92693
04/2016	-10.89657	3.053025	-3.57	0.000	-16.88039	-4.91275
05/2016	-7.143642	3.053036	-2.34	0.019	-13.12748	-1.1598
06/2016	4.332453	3.05305	1.42	0.156	-1.651414	10.31632
07/2016	12.35783	3.053063	4.05	0.000	6.373932	18.34172
08/2016	10.63225	3.053075	3.48	0.000	4.648337	16.61617
09/2016	1.210586	3.053091	0.40	0.692	-4.773363	7.194534
10/2016	-10.36873	3.053103	-3.40	0.001	-16.3527	-4.384755
11/2016	-6.557732	3.053113	-2.15	0.032	-12.54172	-.5737399
12/2016	2.734994	3.053123	0.90	0.370	-3.249018	8.719005
01/2017	1.080316	3.053131	0.35	0.723	-4.903711	7.064344
02/2017	-5.081815	3.05314	-1.66	0.096	-11.06586	.9022294
03/2017	-7.07275	3.053148	-2.32	0.021	-13.05681	-1.088689
04/2017	-10.3789	3.05316	-3.40	0.001	-16.36298	-4.394817
05/2017	-6.473595	3.05317	-2.12	0.034	-12.4577	-.4894912
06/2017	1.672422	3.053184	0.55	0.584	-4.311709	7.656553
07/2017	8.493432	3.053196	2.78	0.005	2.509278	14.47759
08/2017	3.566817	3.053209	1.17	0.243	-2.417362	9.550996
09/2017	-4.763079	3.053222	-1.56	0.119	-10.74728	1.221127
10/2017	-8.978536	3.053233	-2.94	0.003	-14.96276	-2.99431
11/2017	-4.669028	3.053244	-1.53	0.126	-10.65328	1.315221
12/2017	8.236015	3.053254	2.70	0.007	2.251748	14.22028
01/2018	12.3005	3.053262	4.03	0.000	6.31622	18.28479
02/2018	-1.551407	3.05327	-0.51	0.611	-7.535706	4.432893
03/2018	-4.526992	3.053278	-1.48	0.138	-10.51131	1.457323
04/2018	-10.04692	3.053288	-3.29	0.001	-16.03126	-4.062587
05/2018	-3.988248	3.053299	-1.31	0.191	-9.972604	1.996108

06/2018	.6335512	3.053467	0.21	0.836	-5.351135	6.618238
i.ym#c.treatment						
01/2015	.0377955	.114059	0.33	0.740	-.1857559	.261347
02/2015	-.833235	.0892735	-9.33	0.000	-1.008208	-.6582621
03/2015	-.7262734	.0892039	-8.14	0.000	-.9011097	-.551437
04/2015	-.5938088	.0891373	-6.66	0.000	-.7685147	-.419103
05/2015	-.306374	.0891457	-3.44	0.001	-.4810964	-.1316517
06/2015	.1450813	.0889965	1.63	0.103	-.0293486	.3195113
07/2015	.3757419	.0889162	4.23	0.000	.2014694	.5500144
08/2015	.0726542	.0888267	0.82	0.413	-.1014431	.2467514
09/2015	-.4029971	.0887425	-4.54	0.000	-.5769292	-.2290651
10/2015	-.682674	.0887454	-7.69	0.000	-.8566118	-.5087363
11/2015	-.6008986	.0887482	-6.77	0.000	-.7748419	-.4269552
12/2015	-.6356207	.0887498	-7.16	0.000	-.8095671	-.4616743
01/2016	-.9710795	.0774821	-12.53	0.000	-1.122942	-.8192174
02/2016	-.8419055	.0775239	-10.86	0.000	-.9938496	-.6899613
03/2016	-.7040577	.077845	-9.04	0.000	-.8566311	-.5514843
04/2016	-.6087804	.0783888	-7.77	0.000	-.7624197	-.4551411
05/2016	-.3715941	.0788764	-4.71	0.000	-.5261889	-.2169992
06/2016	-.0540306	.0794407	-0.68	0.496	-.2097315	.1016704
07/2016	.1053861	.0799999	1.32	0.188	-.0514108	.262183
08/2016	-.1484794	.0805214	-1.84	0.065	-.3062985	.0093396
09/2016	-.2846716	.081177	-3.51	0.000	-.4437757	-.1255676
10/2016	-.53451	.081661	-6.55	0.000	-.6945627	-.3744573
11/2016	-.6804318	.0820996	-8.29	0.000	-.841344	-.5195196
12/2016	-.6992574	.082492	-8.48	0.000	-.8609388	-.537576
01/2017	-.8758714	.0828364	-10.57	0.000	-1.038228	-.7135151
02/2017	-.8394719	.0831888	-10.09	0.000	-1.002519	-.6764248
03/2017	-.8224493	.0835177	-9.85	0.000	-.986141	-.6587576
04/2017	-.5234548	.0839714	-6.23	0.000	-.6880358	-.3588738
05/2017	-.4768314	.0844012	-5.65	0.000	-.6422547	-.3114082
06/2017	-.2849351	.0849403	-3.35	0.001	-.4514151	-.1184552
07/2017	-.2419255	.0854177	-2.83	0.005	-.4093411	-.0745099
08/2017	-.3216228	.0859063	-3.74	0.000	-.4899961	-.1532495
09/2017	-.37507	.0864309	-4.34	0.000	-.5444715	-.2056684
10/2017	-.7246407	.0868411	-8.34	0.000	-.8948461	-.5544353
11/2017	-.9305442	.0872721	-10.66	0.000	-1.101594	-.7594939
12/2017	-.8993463	.0876383	-10.26	0.000	-1.071114	-.7275784
01/2018	-1.502409	.0879592	-17.08	0.000	-1.674806	-1.330012
02/2018	-1.09973	.0882721	-12.46	0.000	-1.27274	-.9267195
03/2018	-1.204989	.0885769	-13.60	0.000	-1.378596	-1.031381

04/2018	-.8783212	.0889505	-9.87	0.000	-1.052661	-.7039813
05/2018	-.5710127	.0893625	-6.39	0.000	-.7461601	-.3958654
06/2018	-.7933233	.0953859	-8.32	0.000	-.9802761	-.6063704
07/2018	-1.619952	3.283889	-0.49	0.622	-8.056256	4.816353
cons	40.62169	3.05215	13.31	0.000	34.63958	46.60379

Table F-4: Regression Coefficients for DEC Cohort 4

Number of obs	=	2786506
F(66,2704706)	=	11996.52
Prob>F	=	0.0000
R-squared	=	0.6768
AdjR-squared	=	0.6670
Root MSE	=	13.4629

Variable	Coefficient	Std. Err.	t	P > |t|	95% Conf. Interval	
i.ym						
11/2014	-2.129968	.5160509	-4.13	0.000	-3.141409	-1.118526
12/2014	.7995394	.1809991	4.42	0.000	.4447874	1.154291
01/2015	3.89335	.159155	24.46	0.000	3.581412	4.205288
02/2015	5.849923	.1488146	39.31	0.000	5.558252	6.141594
03/2015	-9.51515	.1428783	-66.60	0.000	-9.795186	-9.235113
04/2015	-15.97402	.1391285	-114.81	0.000	-16.24671	-15.70133
05/2015	-9.411435	.1361754	-69.11	0.000	-9.678333	-9.144536
06/2015	1.840266	.1343183	13.70	0.000	1.577007	2.103525
07/2015	5.658733	.1337927	42.29	0.000	5.396504	5.920962
08/2015	2.205322	.1337911	16.48	0.000	1.943097	2.467548
09/2015	-7.724652	.1337896	-57.74	0.000	-7.986875	-7.462429
10/2015	-13.9259	.1337888	-104.09	0.000	-14.18812	-13.66368
11/2015	-9.326421	.1337878	-69.71	0.000	-9.58864	-9.064201
12/2015	-4.45948	.133787	-33.33	0.000	-4.721698	-4.197262
01/2016	5.543039	.1337978	41.43	0.000	5.2808	5.805278
02/2016	3.400328	.1337861	25.42	0.000	3.138111	3.662544
03/2016	-9.983961	.1337864	-74.63	0.000	-10.24618	-9.721744
04/2016	-12.95555	.133787	-96.84	0.000	-13.21777	-12.69333
05/2016	-9.032726	.1337919	-67.51	0.000	-9.294954	-8.770499
07/2016	9.598957	.1560437	61.51	0.000	9.293117	9.904797
08/2016	8.037947	.1566562	51.31	0.000	7.730906	8.344988
09/2016	-.8432209	.157321	-5.36	0.000	-1.151565	-.5348773
10/2016	-12.11847	.1579077	-76.74	0.000	-12.42796	-11.80898
11/2016	-8.161454	.1584371	-51.51	0.000	-8.471985	-7.850923
12/2016	1.069164	.1589149	6.73	0.000	.7576961	1.380631
01/2017	-.5059034	.1593422	-3.17	0.001	-.8182085	-.1935983
02/2017	-6.49126	.1597712	-40.63	0.000	-6.804406	-6.178114
03/2017	-8.551896	.1602284	-53.37	0.000	-8.865938	-8.237854
04/2017	-11.85432	.1608505	-73.70	0.000	-12.16958	-11.53906
05/2017	-7.881329	.1613408	-48.85	0.000	-8.197551	-7.565107
06/2017	.0995906	.1620685	0.61	0.539	-.218058	.4172392

07/2017	6.745274	.1628356	41.42	0.000	6.426122	7.064426
08/2017	2.178437	.1635059	13.32	0.000	1.857971	2.498903
09/2017	-5.947133	.1640964	-36.24	0.000	-6.268756	-5.62551
10/2017	-10.11436	.1645538	-61.47	0.000	-10.43688	-9.791838
11/2017	-6.043799	.1651138	-36.60	0.000	-6.367416	-5.720181
12/2017	6.906876	.1655694	41.72	0.000	6.582366	7.231386
01/2018	11.01763	.1659428	66.39	0.000	10.69239	11.34287
02/2018	-2.829121	.1663363	-17.01	0.000	-3.155134	-2.503107
03/2018	-6.102164	.1667903	-36.59	0.000	-6.429067	-5.775261
04/2018	-11.26316	.1672252	-67.35	0.000	-11.59092	-10.9354
05/2018	-4.986363	.1679172	-29.70	0.000	-5.315475	-4.657251
i.ym#c.treatment						
07/2016	.1828978	.113821	1.61	0.108	-.0401874	.4059831
08/2016	.0753366	.1150448	0.65	0.513	-.1501472	.3008203
09/2016	.0573918	.1164161	0.49	0.622	-.1707796	.2855632
10/2016	-.0432637	.1175481	-0.37	0.713	-.2736539	.1871265
11/2016	-.2011198	.1185656	-1.70	0.090	-.4335042	.0312646
12/2016	-.3388227	.11946	-2.84	0.005	-.5729601	-.1046853
01/2017	-.4191447	.1202964	-3.48	0.000	-.6549213	-.1833681
02/2017	-.322171	.1211429	-2.66	0.008	-.5596067	-.0847353
03/2017	-.3026794	.1220086	-2.48	0.013	-.5418119	-.0635469
04/2017	-.305068	.1231544	-2.48	0.013	-.5464463	-.0636897
05/2017	-.2628031	.1240657	-2.12	0.034	-.5059675	-.0196386
06/2017	-.2290852	.1254093	-1.83	0.068	-.4748829	.0167126
07/2017	-.1646681	.1268028	-1.30	0.194	-.4131971	.0838609
08/2017	-.1280379	.1280134	-1.00	0.317	-.3789398	.1228639
09/2017	-.1215365	.1290981	-0.94	0.346	-.3745642	.1314913
10/2017	-.2776967	.129931	-2.14	0.033	-.5323568	-.0230365
11/2017	-.5977234	.1309114	-4.57	0.000	-.8543051	-.3411417
12/2017	-.7841506	.1317133	-5.95	0.000	-1.042304	-.5259972
01/2018	-.6980149	.1323786	-5.27	0.000	-.9574723	-.4385574
02/2018	-.6492616	.1330744	-4.88	0.000	-.9100827	-.3884404
03/2018	-.6414613	.1338591	-4.79	0.000	-.9038203	-.3791022
04/2018	-.4786892	.1346351	-3.56	0.000	-.7425691	-.2148092
05/2018	-.3898461	.1357834	-2.87	0.004	-.6559768	-.1237155
06/2018	-.2791806	.1445601	-1.93	0.053	-.5625133	.004152
cons	40.93424	.1251303	327.13	0.000	40.68899	41.17949

Table F-5: Regression Coefficients for DEC Cohort 5

Number of obs	=	5015283
F(55,4813508)	=	24906.39
Prob>F	=	0.0000
R-squared	=	0.6783
AdjR-squared	=	0.6648
Root MSE	=	13.3705

Variable	Coefficient	Std. Err.	t	P > |t|	95% Conf. Interval	
i.ym						
11/2014	-.5435081	.5493008	-0.99	0.322	-1.620118	.5331018
12/2014	2.555639	.1699153	15.04	0.000	2.222611	2.888667
01/2015	5.198331	.1671576	31.10	0.000	4.870708	5.525954
02/2015	7.457801	.164184	45.42	0.000	7.136006	7.779595
03/2015	-8.452811	.1610993	-52.47	0.000	-8.76856	-8.137062
04/2015	-16.87648	.1581985	-106.68	0.000	-17.18654	-16.56642
05/2015	-11.28277	.1552743	-72.66	0.000	-11.5871	-10.97844
06/2015	-.2107536	.1507475	-1.40	0.162	-.5062134	.0847061
07/2015	2.855071	.1288381	22.16	0.000	2.602553	3.107589
08/2015	-2.192529	.1159251	-18.91	0.000	-2.419738	-1.96532
09/2015	-11.72147	.1103524	-106.22	0.000	-11.93775	-11.50518
10/2015	-16.57337	.106735	-155.28	0.000	-16.78257	-16.36417
11/2015	-11.69213	.1046589	-111.72	0.000	-11.89726	-11.487
12/2015	-7.018907	.102948	-68.18	0.000	-7.220681	-6.817132
01/2016	3.029555	.1017131	29.79	0.000	2.830201	3.228909
02/2016	.2910354	.1006586	2.89	0.004	.0937482	.4883227
03/2016	-12.67847	.0996331	-127.25	0.000	-12.87374	-12.48319
04/2016	-15.18306	.0987026	-153.83	0.000	-15.37651	-14.9896
05/2016	-11.15793	.0979399	-113.93	0.000	-11.34989	-10.96597
06/2016	.2973939	.0971935	3.06	0.002	.1068981	.4878897
07/2016	7.903994	.0965266	81.88	0.000	7.714806	8.093183
08/2016	6.071698	.0959907	63.25	0.000	5.883559	6.259836
09/2016	-2.666698	.0956047	-27.89	0.000	-2.85408	-2.479316
10/2016	-13.20457	.0955226	-138.24	0.000	-13.3918	-13.01735
11/2016	-8.784182	.0955225	-91.96	0.000	-8.971403	-8.596961
12/2016	.493144	.0955222	5.16	0.000	.3059239	.6803641
01/2017	-1.243375	.095522	-13.02	0.000	-1.430595	-1.056156
02/2017	-7.227807	.0955222	-75.67	0.000	-7.415027	-7.040587
03/2017	-9.279795	.0955247	-97.15	0.000	-9.46702	-9.09257
04/2017	-12.69417	.0955735	-132.82	0.000	-12.88149	-12.50685
06/2017	-.9581217	.1736778	-5.52	0.000	-1.298524	-.6177193

07/2017	5.859184	.1751748	33.45	0.000	5.515847	6.20252
08/2017	1.226236	.1766362	6.94	0.000	.8800355	1.572437
09/2017	-6.870248	.1780275	-38.59	0.000	-7.219175	-6.52132
10/2017	-11.16482	.1791494	-62.32	0.000	-11.51594	-10.81369
11/2017	-6.590741	.1181327	-55.79	0.000	-6.822276	-6.359205
12/2017	5.810316	.1184699	49.04	0.000	5.57812	6.042513
01/2018	9.980797	.1187885	84.02	0.000	9.747976	10.21362
02/2018	-3.575404	.1191229	-30.01	0.000	-3.80888	-3.341927
03/2018	-6.785102	.1194497	-56.80	0.000	-7.019219	-6.550985
04/2018	-11.58747	.1198312	-96.70	0.000	-11.82234	-11.35261
05/2018	-4.981079	.1203004	-41.41	0.000	-5.216863	-4.745294
i.ym#c.treatment						
06/2017	-.5173647	.1557323	-3.32	0.001	-.8225946	-.2121349
07/2017	-.6983529	.1575726	-4.43	0.000	-1.00719	-.3895162
08/2017	-.5044947	.1593592	-3.17	0.002	-.8168331	-.1921563
09/2017	-.4812305	.1610643	-2.99	0.003	-.7969108	-.1655502
10/2017	-.2823175	.1624306	-1.74	0.082	-.6006757	.0360408
11/2017	-.4001677	.0892927	-4.48	0.000	-.5751782	-.2251573
12/2017	-.0392246	.0899129	-0.44	0.663	-.2154507	.1370015
01/2018	-.0004226	.0904822	-0.00	0.996	-.1777645	.1769192
02/2018	-.3374415	.091078	-3.70	0.000	-.5159511	-.1589318
03/2018	-.3964715	.0916601	-4.33	0.000	-.5761219	-.216821
04/2018	-.7122844	.092324	-7.72	0.000	-.8932362	-.5313325
05/2018	-1.211497	.0931284	-13.01	0.000	-1.394026	-1.028969
06/2018	-1.349513	.0995255	-13.56	0.000	-1.54458	-1.154447
cons	41.63829	.0909139	458.00	0.000	41.4601	41.81647

Table F-6: Regression Coefficients for DEC Cohort 6

Number of obs	=	932468
F(79,912163)	=	4651.03
Prob>F	=	0.0000
R-squared	=	0.6947
AdjR-squared	=	0.6879
Root MSE	=	14.3218

Variable	Coefficient	Std. Err.	t	P > |t|	95% Conf. Interval	
i.ym						
12/2008	5.041887	.1955036	25.79	0.000	4.658706	5.425067
01/2009	8.460343	.1955007	43.28	0.000	8.077168	8.843518
02/2009	4.973629	.1955007	25.44	0.000	4.590455	5.356804
03/2009	-4.451376	.1955007	-22.77	0.000	-4.834551	-4.068201
04/2009	-10.17105	.1955022	-52.03	0.000	-10.55422	-9.787869
05/2009	-4.912101	.1955007	-25.13	0.000	-5.295276	-4.528927
06/2009	8.786893	.1955198	44.94	0.000	8.403681	9.170105
07/2009	12.66884	.1955007	64.80	0.000	12.28567	13.05202
08/2009	10.79143	.1955007	55.20	0.000	10.40826	11.17461
09/2009	-1.687633	.1955007	-8.63	0.000	-2.070807	-1.304458
10/2009	-10.13697	.1955007	-51.85	0.000	-10.52015	-9.753796
11/2009	-5.4866	.1955007	-28.06	0.000	-5.869774	-5.103425
12/2009	12.36428	.1955007	63.24	0.000	11.98111	12.74746
01/2010	17.60885	.1955007	90.07	0.000	17.22567	17.99202
02/2010	12.61609	.1955007	64.53	0.000	12.23291	12.99926
03/2010	-2.469856	.1955007	-12.63	0.000	-2.853031	-2.086681
11/2015	-10.18717	.2210844	-46.08	0.000	-10.62049	-9.753851
12/2015	-4.665506	.2210844	-21.10	0.000	-5.098824	-4.232187
01/2016	5.039164	.2210892	22.79	0.000	4.605837	5.472491
02/2016	2.188841	.2211231	9.90	0.000	1.755447	2.622235
03/2016	-11.4052	.2212496	-51.55	0.000	-11.83884	-10.97155
04/2016	-13.77942	.2214656	-62.22	0.000	-14.21349	-13.34536
05/2016	-7.164986	.2216541	-32.33	0.000	-7.59942	-6.730551
06/2016	7.092381	.2218493	31.97	0.000	6.657564	7.527198
07/2016	15.79796	.2221225	71.12	0.000	15.36261	16.23332
08/2016	12.0507	.2223425	54.20	0.000	11.61492	12.48648
09/2016	1.411673	.2226219	6.34	0.000	.9753416	1.848004
10/2016	-12.57083	.2228677	-56.40	0.000	-13.00764	-12.13401
11/2016	-9.608094	.223026	-43.08	0.000	-10.04522	-9.17097
12/2016	-.5816872	.2232015	-2.61	0.009	-1.019155	-.1442198
01/2017	-2.80344	.2233837	-12.55	0.000	-3.241264	-2.365615

02/2017	-8.565695	.2235348	-38.32	0.000	-9.003816	-8.127574
03/2017	-10.73747	.2236869	-48.00	0.000	-11.17589	-10.29905
04/2017	-13.73371	.2239498	-61.32	0.000	-14.17265	-13.29478
05/2017	-8.190045	.22421	-36.53	0.000	-8.629489	-7.750601
06/2017	1.173897	.2245572	5.23	0.000	.7337723	1.614021
07/2017	8.841137	.2248349	39.32	0.000	8.400468	9.281806
08/2017	4.531975	.2250696	20.14	0.000	4.090846	4.973104
09/2017	-5.786436	.2253412	-25.68	0.000	-6.228098	-5.344775
10/2017	-11.07195	.2255921	-49.08	0.000	-11.51411	-10.6298
11/2017	-8.484853	.2258159	-37.57	0.000	-8.927445	-8.042262
12/2017	4.745923	.2260237	21.00	0.000	4.302925	5.188922
01/2018	9.844017	.2262811	43.50	0.000	9.400514	10.28752
02/2018	-5.799516	.2265228	-25.60	0.000	-6.243493	-5.355538
03/2018	-9.931726	.2267483	-43.80	0.000	-10.37615	-9.487307
04/2018	-13.96921	.2269819	-61.54	0.000	-14.41409	-13.52433
05/2018	-6.979706	.2272049	-30.72	0.000	-7.42502	-6.534392
i.ym#c.treatment						
11/2015	.08458	.2079576	0.41	0.684	-.3230099	.4921699
12/2015	.1099624	.2079576	0.53	0.597	-.2976275	.5175523
01/2016	-.2175456	.2079633	-1.05	0.296	-.6251467	.1900555
02/2016	-.1796001	.2080442	-0.86	0.388	-.5873598	.2281596
03/2016	-.0315635	.2083977	-0.15	0.880	-.440016	.3768891
04/2016	-.0395616	.2088236	-0.19	0.850	-.4488488	.3697257
05/2016	-.0551549	.2092673	-0.26	0.792	-.4653118	.3550019
06/2016	-.0480782	.2097605	-0.23	0.819	-.4592019	.3630455
07/2016	-.0691823	.2103488	-0.33	0.742	-.4814589	.3430942
08/2016	-.0422501	.2108154	-0.20	0.841	-.4554414	.3709411
09/2016	-.1268783	.2114394	-0.60	0.548	-.5412925	.2875358
10/2016	-.208193	.2118933	-0.98	0.326	-.6234967	.2071108
11/2016	-.4404545	.2123196	-2.07	0.038	-.8565939	-.0243151
12/2016	-.5706292	.2127374	-2.68	0.007	-.9875875	-.153671
01/2017	-.6035371	.2131731	-2.83	0.005	-1.021349	-.185725
02/2017	-.3146924	.2134679	-1.47	0.140	-.7330823	.1036975
03/2017	-.2962436	.2137588	-1.39	0.166	-.7152036	.1227165
04/2017	-.1736185	.2143096	-0.81	0.418	-.5936581	.2464212
05/2017	-.1094373	.2148385	-0.51	0.610	-.5305137	.311639
06/2017	-.2106441	.2155687	-0.98	0.328	-.6331515	.2118633
07/2017	-.3139904	.2161692	-1.45	0.146	-.7376749	.1096941
08/2017	-.4149419	.2166938	-1.91	0.056	-.8396545	.0097707
09/2017	-.4059735	.2172397	-1.87	0.062	-.8317561	.0198091
10/2017	-.351112	.2177589	-1.61	0.107	-.7779122	.0756882

11/2017	-.5587344	.2182237	-2.56	0.010	-.9864456	-.1310232
12/2017	-.62449	.2186823	-2.86	0.004	-1.0531	-.19588
01/2018	-.8825185	.2191279	-4.03	0.000	-1.312002	-.4530352
02/2018	-.5237236	.2196562	-2.38	0.017	-.9542425	-.0932047
03/2018	-.6866934	.2200998	-3.12	0.002	-1.118082	-.2553052
04/2018	-.4439611	.2206005	-2.01	0.044	-.8763306	-.0115916
05/2018	-.499444	.2210376	-2.26	0.024	-.9326702	-.0662177
06/2018	-.6342094	.2331416	-2.72	0.007	-1.091159	-.1772597
cons	45.58088	.1674973	272.13	0.000	45.25259	45.90917

Table F-7: Regression Coefficients for DEC Cohort 7

Number of obs	=	8299134
F(108,8180957)	=	22249.73
Prob>F	=	0.0000
R-squared	=	0.7006
AdjR-squared	=	0.6963
Root MSE	=	14.8302

Variable	Coefficient	Std. Err.	t	P > |t|	95% Conf. Interval	
i.ym						
12/2008	6.63468	.1067528	62.15	0.000	6.425448	6.843912
01/2009	10.50638	.1067023	98.46	0.000	10.29725	10.71552
02/2009	7.248244	.1066483	67.96	0.000	7.039217	7.457271
03/2009	-1.858576	.1065871	-17.44	0.000	-2.067483	-1.649669
04/2009	-7.724038	.106532	-72.50	0.000	-7.932836	-7.515239
05/2009	-4.904396	.1064595	-46.07	0.000	-5.113053	-4.695739
06/2009	5.135311	.1063953	48.27	0.000	4.926781	5.343842
07/2009	8.90383	.1063155	83.75	0.000	8.695456	9.112205
08/2009	8.088819	.1062409	76.14	0.000	7.880591	8.297047
09/2009	-2.589432	.1061753	-24.39	0.000	-2.797532	-2.381332
10/2009	-7.883209	.1060962	-74.30	0.000	-8.091154	-7.675264
11/2009	-2.734342	.1060323	-25.79	0.000	-2.942161	-2.526522
12/2009	12.9659	.1059685	122.36	0.000	12.7582	13.17359
01/2010	16.56347	.1059189	156.38	0.000	16.35587	16.77106
02/2010	12.76491	.105867	120.57	0.000	12.55741	12.9724
03/2010	-1.560876	.1058037	-14.75	0.000	-1.768248	-1.353505
04/2010	-8.540132	.1057297	-80.77	0.000	-8.747359	-8.332906
05/2010	-2.732645	.1056449	-25.87	0.000	-2.939705	-2.525584
06/2010	10.76693	.1055719	101.99	0.000	10.56001	10.97385
07/2010	16.23684	.1054992	153.90	0.000	16.03006	16.44361
08/2010	12.6379	.1054367	119.86	0.000	12.43124	12.84455
09/2010	1.491803	.1053833	14.16	0.000	1.285256	1.698351
10/2010	-8.168209	.1053197	-77.56	0.000	-8.374632	-7.961786
11/2010	-.5088313	.1052718	-4.83	0.000	-.7151602	-.3025024
12/2010	15.77979	.1052173	149.97	0.000	15.57357	15.98601
01/2011	16.31188	.1051705	155.10	0.000	16.10575	16.51801
02/2011	3.798693	.1051237	36.14	0.000	3.592654	4.004731
03/2011	-4.666683	.105064	-44.42	0.000	-4.872605	-4.460761
04/2011	-8.529953	.1050072	-81.23	0.000	-8.735764	-8.324143
05/2011	-2.30731	.1049513	-21.98	0.000	-2.513011	-2.101609
06/2011	8.407116	.1048911	80.15	0.000	8.201534	8.612699

07/2011	14.8288	.1048115	141.48	0.000	14.62337	15.03422
08/2011	11.00042	.1047064	105.06	0.000	10.7952	11.20564
09/2011	-2.913439	.1045977	-27.85	0.000	-3.118447	-2.708432
10/2011	-8.915685	.1045466	-85.28	0.000	-9.120592	-8.710777
11/2011	-3.662732	.1045456	-35.03	0.000	-3.867638	-3.457827
12/2011	2.784185	.1045443	26.63	0.000	2.579281	2.989088
01/2012	4.476587	.1045273	42.83	0.000	4.271717	4.681457
02/2012	1.30326	.10448	12.47	0.000	1.098483	1.508037
03/2012	-7.954345	.1044434	-76.16	0.000	-8.15905	-7.74964
04/2012	-9.741258	.1044409	-93.27	0.000	-9.945959	-9.536558
05/2012	-4.950153	.1044409	-47.40	0.000	-5.154854	-4.745453
06/2012	4.580658	.104441	43.86	0.000	4.375958	4.785359
07/2012	12.81242	.1044409	122.68	0.000	12.60772	13.01712
08/2012	6.515639	.104441	62.39	0.000	6.310938	6.720339
11/2015	-6.372445	.1256059	-50.73	0.000	-6.618628	-6.126262
12/2015	-1.447519	.1256059	-11.52	0.000	-1.693702	-1.201336
01/2016	8.053045	.1256142	64.11	0.000	7.806845	8.299244
02/2016	5.993706	.125644	47.70	0.000	5.747449	6.239964
03/2016	-7.376266	.1257824	-58.64	0.000	-7.622795	-7.129737
04/2016	-10.48149	.1259675	-83.21	0.000	-10.72838	-10.2346
05/2016	-6.797012	.1261557	-53.88	0.000	-7.044273	-6.549752
06/2016	4.808092	.1263586	38.05	0.000	4.560434	5.055751
07/2016	12.85767	.1265898	101.57	0.000	12.60956	13.10578
08/2016	10.86405	.126768	85.70	0.000	10.61559	11.11251
09/2016	1.366338	.126994	10.76	0.000	1.117434	1.615242
10/2016	-10.12053	.127172	-79.58	0.000	-10.36978	-9.871275
11/2016	-5.940203	.1273335	-46.65	0.000	-6.189772	-5.690634
12/2016	3.746748	.1275126	29.38	0.000	3.496828	3.996668
01/2017	1.91543	.1276766	15.00	0.000	1.665188	2.165672
02/2017	-4.458172	.1278252	-34.88	0.000	-4.708705	-4.207639
03/2017	-6.570818	.1279588	-51.35	0.000	-6.821613	-6.320024
04/2017	-9.967335	.1281367	-77.79	0.000	-10.21848	-9.716192
05/2017	-6.33538	.1283256	-49.37	0.000	-6.586894	-6.083867
06/2017	1.787446	.1285641	13.90	0.000	1.535465	2.039426
07/2017	8.571358	.1287744	66.56	0.000	8.318965	8.823751
08/2017	3.520584	.1289543	27.30	0.000	3.267838	3.77333
09/2017	-4.741817	.1291531	-36.71	0.000	-4.994952	-4.488681
10/2017	-9.012064	.1293237	-69.69	0.000	-9.265534	-8.758594
11/2017	-4.150784	.1295249	-32.05	0.000	-4.404649	-3.89692
12/2017	9.370016	.129694	72.25	0.000	9.115821	9.624212
01/2018	12.93185	.1298495	99.59	0.000	12.67735	13.18635

02/2018	-1.087792	.1300131	-8.37	0.000	-1.342613	-.8329714
03/2018	-4.273792	.1301772	-32.83	0.000	-4.528935	-4.018649
04/2018	-9.890106	.1303374	-75.88	0.000	-10.14556	-9.634649
05/2018	-4.150729	.1305172	-31.80	0.000	-4.406538	-3.89492
i.ym#c.treatment						
11/2015	-.0371516	.0982694	-0.38	0.705	-.2297561	.1554529
12/2015	-.1025569	.0982697	-1.04	0.297	-.295162	.0900482
01/2016	-.0952013	.0982833	-0.97	0.333	-.2878331	.0974305
02/2016	-.1078629	.0983325	-1.10	0.273	-.300591	.0848653
03/2016	-.1347891	.0985748	-1.37	0.172	-.3279923	.058414
04/2016	-.1659005	.0989088	-1.68	0.093	-.3597582	.0279572
05/2016	-.181293	.0992522	-1.83	0.068	-.3758239	.0132378
06/2016	-.2988676	.0996305	-3.00	0.003	-.4941399	-.1035953
07/2016	-.3339437	.1000505	-3.34	0.001	-.5300392	-.1378483
08/2016	-.3068337	.1003827	-3.06	0.002	-.5035802	-.1100872
09/2016	-.2748773	.1007907	-2.73	0.006	-.4724236	-.0773311
10/2016	-.1441438	.1011125	-1.43	0.154	-.3423207	.054033
11/2016	-.123375	.1014063	-1.22	0.224	-.3221278	.0753777
12/2016	-.2335462	.1017181	-2.30	0.022	-.4329101	-.0341823
01/2017	-.2909031	.1020073	-2.85	0.004	-.4908337	-.0909724
02/2017	-.2518571	.1022726	-2.46	0.014	-.4523077	-.0514065
03/2017	-.2672344	.1025103	-2.61	0.009	-.4681508	-.0663179
04/2017	-.3105615	.1028324	-3.02	0.003	-.5121093	-.1090138
05/2017	-.3154442	.1031603	-3.06	0.002	-.5176348	-.1132536
06/2017	-.3646096	.1035768	-3.52	0.000	-.5676165	-.1616027
07/2017	-.5011984	.1039479	-4.82	0.000	-.7049326	-.2974642
08/2017	-.4079286	.1042687	-3.91	0.000	-.6122916	-.2035657
09/2017	-.3313687	.1046242	-3.17	0.002	-.5364284	-.126309
10/2017	-.2276498	.1049184	-2.17	0.030	-.4332861	-.0220135
11/2017	-.2772142	.1052634	-2.63	0.008	-.4835266	-.0709018
12/2017	-.4037421	.1055507	-3.83	0.000	-.6106177	-.1968664
01/2018	-.5183084	.1058129	-4.90	0.000	-.7256979	-.3109189
02/2018	-.3762491	.1060947	-3.55	0.000	-.5841909	-.1683073
03/2018	-.3108275	.1063713	-2.92	0.003	-.5193115	-.1023435
04/2018	-.2742283	.1066624	-2.57	0.010	-.4832827	-.0651739
05/2018	-.2879504	.1069818	-2.69	0.007	-.4976308	-.07827
06/2018	-.3500807	.1116893	-3.13	0.002	-.5689878	-.1311737
cons	40.30704	.0950932	423.87	0.000	40.12066	40.49342

Table F-8: Regression Coefficients for DEC Cohort 8

Number of obs	=	5307646
F(135,5231818)	=	9498.05
Prob>F	=	0.0000
R-squared	=	0.7128
AdjR-squared	=	0.7087
Root MSE	=	14.9134

Variable	Coefficient	Std. Err.	t	P > |t|	95% Conf. Interval	
i.ym						
12/2008	4.665554	.1284077	36.33	0.000	4.41388	4.917229
01/2009	7.884682	.1283026	61.45	0.000	7.633213	8.13615
02/2009	4.619858	.1282018	36.04	0.000	4.368587	4.871129
03/2009	-3.759741	.1281051	-29.35	0.000	-4.010823	-3.50866
04/2009	-9.435569	.1279839	-73.72	0.000	-9.686413	-9.184726
05/2009	-5.94497	.1278607	-46.50	0.000	-6.195572	-5.694367
06/2009	4.577267	.1277431	35.83	0.000	4.326895	4.827639
07/2009	8.525671	.1275873	66.82	0.000	8.275604	8.775737
08/2009	7.816227	.1274158	61.34	0.000	7.566497	8.065958
09/2009	-3.59539	.1272721	-28.25	0.000	-3.844838	-3.345941
10/2009	-9.605671	.1271463	-75.55	0.000	-9.854873	-9.356468
11/2009	-4.805069	.1270129	-37.83	0.000	-5.05401	-4.556128
12/2009	10.12117	.1269192	79.74	0.000	9.872409	10.36992
01/2010	14.09355	.1268292	111.12	0.000	13.84497	14.34213
02/2010	10.33827	.1267061	81.59	0.000	10.08993	10.58661
03/2010	-3.474907	.1265927	-27.45	0.000	-3.723024	-3.22679
04/2010	-10.14663	.1264552	-80.24	0.000	-10.39448	-9.898786
05/2010	-3.688045	.126273	-29.21	0.000	-3.935536	-3.440555
06/2010	10.36194	.1261212	82.16	0.000	10.11475	10.60914
07/2010	16.14098	.125978	128.13	0.000	15.89406	16.38789
08/2010	12.15247	.1258577	96.56	0.000	11.90579	12.39914
09/2010	.6684701	.1257539	5.32	0.000	.421997	.9149432
10/2010	-10.00717	.125636	-79.65	0.000	-10.25342	-9.760931
11/2010	-2.711028	.1255112	-21.60	0.000	-2.957026	-2.465031
12/2010	13.08271	.1248498	104.79	0.000	12.83801	13.32741
01/2011	13.41232	.1247462	107.52	0.000	13.16782	13.65682
02/2011	1.505877	.1246218	12.08	0.000	1.261622	1.750131
03/2011	-6.780822	.1245043	-54.46	0.000	-7.024846	-6.536798
04/2011	-10.25104	.1243865	-82.41	0.000	-10.49483	-10.00724
05/2011	-3.707322	.1242591	-29.84	0.000	-3.950865	-3.463779
06/2011	7.670862	.1241328	61.80	0.000	7.427567	7.914158

07/2011	14.08484	.1239602	113.62	0.000	13.84188	14.3278
08/2011	10.43422	.123824	84.27	0.000	10.19153	10.67691
09/2011	-4.085844	.1236838	-33.03	0.000	-4.32826	-3.843428
10/2011	-10.76552	.1235026	-87.17	0.000	-11.00758	-10.52346
11/2011	-5.747247	.1233199	-46.60	0.000	-5.98895	-5.505545
12/2011	.4708192	.1231544	3.82	0.000	.2294409	.7121975
01/2012	2.229247	.1229934	18.12	0.000	1.988185	2.47031
02/2012	-1.142252	.1227078	-9.31	0.000	-1.382755	-.9017493
03/2012	-10.24984	.1216331	-84.27	0.000	-10.48824	-10.01144
04/2012	-11.85453	.1205722	-98.32	0.000	-12.09084	-11.61821
05/2012	-7.040986	.1194806	-58.93	0.000	-7.275164	-6.806809
06/2012	2.522609	.1180561	21.37	0.000	2.291224	2.753995
07/2012	10.63797	.1164128	91.38	0.000	10.4098	10.86613
08/2012	4.200655	.1159483	36.23	0.000	3.9734	4.427909
09/2012	-6.141831	.1158662	-53.01	0.000	-6.368924	-5.914737
10/2012	-10.94715	.1157883	-94.54	0.000	-11.17409	-10.72021
11/2012	-4.144843	.115706	-35.82	0.000	-4.371622	-3.918063
12/2012	.5006342	.1156251	4.33	0.000	.2740131	.7272553
01/2013	4.159401	.1154921	36.01	0.000	3.933041	4.385761
02/2013	4.623465	.1141373	40.51	0.000	4.399759	4.84717
03/2013	-1.691674	.1119129	-15.12	0.000	-1.911019	-1.472328
04/2013	-10.71707	.1108811	-96.65	0.000	-10.93439	-10.49975
05/2013	-9.385884	.1105303	-84.92	0.000	-9.602519	-9.169249
06/2013	-.8121385	.1104983	-7.35	0.000	-1.028711	-.5955657
07/2013	4.019102	.1104702	36.38	0.000	3.802584	4.235619
08/2013	1.097629	.1104415	9.94	0.000	.8811679	1.314091
09/2013	-5.601978	.1104156	-50.74	0.000	-5.818388	-5.385567
10/2013	-11.1088	.1103913	-100.63	0.000	-11.32516	-10.89244
11/2013	-2.61966	.1103726	-23.73	0.000	-2.835986	-2.403333
12/2013	5.934792	.1103622	53.78	0.000	5.718486	6.151097
01/2014	12.70092	.1103539	115.09	0.000	12.48463	12.91721
02/2014	7.079014	.1103435	64.15	0.000	6.862744	7.295283
03/2014	-1.800152	.110331	-16.32	0.000	-2.016397	-1.583907
04/2014	-10.18771	.1103205	-92.35	0.000	-10.40394	-9.971489
05/2014	-6.75133	.1103119	-61.20	0.000	-6.967538	-6.535123
06/2014	2.93814	.1103014	26.64	0.000	2.721953	3.154327
07/2014	3.363768	.1102713	30.50	0.000	3.14764	3.579896
08/2014	1.527332	.1097456	13.92	0.000	1.312235	1.74243
09/2014	-5.125591	.1092542	-46.91	0.000	-5.339726	-4.911457
10/2014	-11.57056	.1087406	-106.41	0.000	-11.78369	-11.35743
11/2014	-2.212373	.1083036	-20.43	0.000	-2.424644	-2.000102

11/2015	-7.786029	.1195374	-65.13	0.000	-8.020318	-7.55174
12/2015	-2.99641	.1195383	-25.07	0.000	-3.2307	-2.762119
01/2016	6.667491	.1195434	55.77	0.000	6.43319	6.901792
02/2016	4.529995	.1195698	37.89	0.000	4.295642	4.764348
03/2016	-8.547934	.1197704	-71.37	0.000	-8.78268	-8.313189
04/2016	-11.53369	.1201094	-96.03	0.000	-11.7691	-11.29828
05/2016	-7.779562	.1204119	-64.61	0.000	-8.015565	-7.543559
06/2016	3.698339	.1207616	30.63	0.000	3.46165	3.935027
07/2016	11.72515	.1211075	96.82	0.000	11.48778	11.96251
08/2016	10.00137	.1214333	82.36	0.000	9.763361	10.23937
09/2016	.5802458	.1218473	4.76	0.000	.3414294	.8190622
10/2016	-10.99863	.1221547	-90.04	0.000	-11.23805	-10.75921
11/2016	-7.187041	.1224334	-58.70	0.000	-7.427006	-6.947076
12/2016	2.105999	.1226829	17.17	0.000	1.865545	2.346453
01/2017	.4515227	.1229016	3.67	0.000	.2106399	.6924054
02/2017	-5.710318	.1231276	-46.38	0.000	-5.951644	-5.468993
03/2017	-7.701129	.1233379	-62.44	0.000	-7.942867	-7.459391
04/2017	-11.00663	.1236309	-89.03	0.000	-11.24894	-10.76432
05/2017	-7.101803	.1239091	-57.31	0.000	-7.344661	-6.858946
06/2017	1.044401	.1242602	8.40	0.000	.8008555	1.287947
07/2017	7.866372	.1245683	63.15	0.000	7.622222	8.110521
08/2017	2.939208	.1248888	23.53	0.000	2.69443	3.183985
09/2017	-5.390468	.1252344	-43.04	0.000	-5.635923	-5.145013
10/2017	-9.605647	.1255052	-76.54	0.000	-9.851633	-9.359661
11/2017	-5.296113	.1257904	-42.10	0.000	-5.542657	-5.049568
12/2017	7.608321	.1260331	60.37	0.000	7.361301	7.855342
01/2018	11.67184	.1262456	92.45	0.000	11.4244	11.91927
02/2018	-2.180505	.1264529	-17.24	0.000	-2.428348	-1.932662
03/2018	-5.155833	.1266551	-40.71	0.000	-5.404072	-4.907593
04/2018	-10.67642	.1269045	-84.13	0.000	-10.92515	-10.42769
05/2018	-4.617779	.1271795	-36.31	0.000	-4.867046	-4.368512
i.ym#c.treatment						
11/2015	-.104931	.110377	-0.95	0.342	-.321266	.1114041
12/2015	-.0904764	.110382	-0.82	0.412	-.3068212	.1258684
01/2016	-.240037	.1103935	-2.17	0.030	-.4564043	-.0236696
02/2016	-.365843	.1104566	-3.31	0.001	-.582334	-.1493521
03/2016	-.2549059	.1109388	-2.30	0.022	-.472342	-.0374698
04/2016	-.2275735	.1117059	-2.04	0.042	-.4465131	-.0086339
05/2016	-.2434956	.1124013	-2.17	0.030	-.4637981	-.0231931
06/2016	-.2538641	.1132241	-2.24	0.025	-.4757794	-.0319488
07/2016	-.1666165	.1140145	-1.46	0.144	-.3900809	.056848

08/2016	-.1863185	.1147453	-1.62	0.104	-.4112152	.0385783
09/2016	-.205087	.1156041	-1.77	0.076	-.4316669	.021493
10/2016	-.2845099	.1162077	-2.45	0.014	-.5122729	-.0567469
11/2016	-.2214904	.1167966	-1.90	0.058	-.4504076	.0074269
12/2016	-.2502649	.1173095	-2.13	0.033	-.4801873	-.0203425
01/2017	-.3032699	.1177743	-2.58	0.010	-.5341034	-.0724364
02/2017	-.3129059	.1182413	-2.65	0.008	-.5446545	-.0811573
03/2017	-.3410571	.1186914	-2.87	0.004	-.573688	-.1084262
04/2017	-.3438212	.1192805	-2.88	0.004	-.5776067	-.1100358
05/2017	-.3832894	.1198336	-3.20	0.001	-.618159	-.1484199
06/2017	-.3325817	.1205142	-2.76	0.006	-.5687853	-.096378
07/2017	-.2901547	.1211789	-2.39	0.017	-.5276611	-.0526483
08/2017	-.4532241	.1218012	-3.72	0.000	-.6919501	-.214498
09/2017	-.5107921	.1224879	-4.17	0.000	-.750864	-.2707202
10/2017	-.5119521	.1230486	-4.16	0.000	-.7531229	-.2707812
11/2017	-.4492225	.1236348	-3.63	0.000	-.6915423	-.2069026
12/2017	-.6012704	.1240946	-4.85	0.000	-.8444913	-.3580494
01/2018	-.7673052	.124539	-6.16	0.000	-1.011397	-.5232132
02/2018	-.5773163	.1249784	-4.62	0.000	-.8222695	-.332363
03/2018	-.5391807	.1253574	-4.30	0.000	-.7848768	-.2934845
04/2018	-.4942607	.1258908	-3.93	0.000	-.7410022	-.2475191
05/2018	-.6235547	.126472	-4.93	0.000	-.8714354	-.375674
06/2018	-.6160671	.1352241	-4.56	0.000	-.8811016	-.3510327
cons	40.88909	.093722	436.28	0.000	40.7054	41.07278

Table F-9: Regression Coefficients for DEP Cohort 1

Number of obs	=	33350747
F(95,32692933)	=	116722.9
Prob>F	=	0.0000
R-squared	=	0.7049
AdjR-squared	=	0.6990
Root MSE	=	14.7490

Variable	Coefficient	Std. Err.	t	P > |t|	95% Conf. Interval	
i.ym						
12/2013	12.2834	.0643833	190.79	0.000	12.15721	12.40959
01/2014	16.09035	.0642157	250.57	0.000	15.96449	16.21621
02/2014	11.61602	.0641994	180.94	0.000	11.49019	11.74184
03/2014	.194614	.0641805	3.03	0.002	.0688227	.3204054
04/2014	-9.439009	.0641602	-147.12	0.000	-9.56476	-9.313257
05/2014	-7.483544	.0641366	-116.68	0.000	-7.60925	-7.357838
06/2014	3.605807	.0641143	56.24	0.000	3.480145	3.731469
07/2014	3.776511	.0640892	58.93	0.000	3.650899	3.902124
08/2014	.7913161	.0640772	12.35	0.000	.6657271	.9169051
09/2014	-4.432772	.0640772	-69.18	0.000	-4.558361	-4.307183
10/2014	-10.87639	.0640773	-169.74	0.000	-11.00198	-10.7508
11/2014	-.953653	.0640774	-14.88	0.000	-1.079242	-.8280636
01/2015	12.46407	.0808453	154.17	0.000	12.30562	12.62252
02/2015	15.36702	.0808455	190.08	0.000	15.20857	15.52547
03/2015	-7.267612	.0808463	-89.89	0.000	-7.426068	-7.109157
04/2015	-13.06598	.0808473	-161.61	0.000	-13.22444	-12.90752
05/2015	-7.276841	.0808513	-90.00	0.000	-7.435307	-7.118376
06/2015	6.42289	.0808513	79.44	0.000	6.264424	6.581356
07/2015	9.933711	.0808515	122.86	0.000	9.775245	10.09218
08/2015	4.242141	.0808502	52.47	0.000	4.083677	4.400605
09/2015	-5.783397	.0808505	-71.53	0.000	-5.941861	-5.624933
10/2015	-13.42975	.0808515	-166.10	0.000	-13.58821	-13.27128
11/2015	-9.268152	.080852	-114.63	0.000	-9.426619	-9.109685
12/2015	-2.697141	.0808502	-33.36	0.000	-2.855605	-2.538678
01/2016	8.638449	.0808523	106.84	0.000	8.479981	8.796916
02/2016	5.955176	.0808522	73.66	0.000	5.796709	6.113644
03/2016	-8.873138	.080874	-109.72	0.000	-9.031648	-8.714628
04/2016	-13.3391	.0808945	-164.89	0.000	-13.49765	-13.18055
05/2016	-9.483721	.0809217	-117.20	0.000	-9.642325	-9.325117
06/2016	2.159006	.081034	26.64	0.000	2.000182	2.31783
07/2016	11.7407	.0811849	144.62	0.000	11.58158	11.89982

08/2016	10.27816	.0813185	126.39	0.000	10.11877	10.43754
09/2016	-2.21304	.0814679	-27.16	0.000	-2.372714	-2.053366
10/2016	-13.0337	.081593	-159.74	0.000	-13.19362	-12.87378
11/2016	-7.00772	.0817209	-85.75	0.000	-7.16789	-6.84755
12/2016	3.412713	.0818273	41.71	0.000	3.252335	3.573092
01/2017	1.293354	.0819326	15.79	0.000	1.132769	1.453939
02/2017	-5.060346	.0820269	-61.69	0.000	-5.221116	-4.899576
03/2017	-7.398162	.0821172	-90.09	0.000	-7.559108	-7.237215
04/2017	-10.65626	.0822438	-129.57	0.000	-10.81745	-10.49506
05/2017	-6.130672	.0823515	-74.45	0.000	-6.292078	-5.969266
06/2017	1.350413	.0824829	16.37	0.000	1.188749	1.512076
07/2017	8.146761	.0826304	98.59	0.000	7.984809	8.308714
08/2017	2.655059	.0827752	32.08	0.000	2.492823	2.817296
09/2017	-5.745961	.0829125	-69.30	0.000	-5.908467	-5.583456
10/2017	-10.83542	.0830296	-130.50	0.000	-10.99816	-10.67269
11/2017	-5.806494	.0831559	-69.83	0.000	-5.969476	-5.643511
12/2017	11.02851	.0832607	132.46	0.000	10.86532	11.1917
01/2018	15.14194	.0833635	181.64	0.000	14.97855	15.30533
02/2018	-2.588517	.0834621	-31.01	0.000	-2.7521	-2.424934
03/2018	-5.478516	.0835579	-65.57	0.000	-5.642286	-5.314745
04/2018	-11.58877	.0836662	-138.51	0.000	-11.75275	-11.42478
05/2018	-6.145086	.0837831	-73.35	0.000	-6.309298	-5.980874
i.ym#c.treatment						
01/2015	-.4817097	.0607594	-7.93	0.000	-.600796	-.3626235
02/2015	-.436845	.0606836	-7.20	0.000	-.5557827	-.3179072
03/2015	-.1174143	.0606575	-1.94	0.053	-.2363008	.0014722
04/2015	-.0673995	.0606275	-1.11	0.266	-.1862273	.0514283
05/2015	-.1747214	.0606331	-2.88	0.004	-.29356	-.0558828
06/2015	-.4916212	.0605496	-8.12	0.000	-.6102963	-.3729461
07/2015	-1.060098	.0604023	-17.55	0.000	-1.178484	-.9417117
08/2015	-.0259156	.0603607	-0.43	0.668	-.1442204	.0923892
09/2015	.5182035	.0603221	8.59	0.000	.3999744	.6364326
10/2015	-.5007566	.0603235	-8.30	0.000	-.6189885	-.3825246
11/2015	-.5913001	.0603244	-9.80	0.000	-.7095337	-.4730665
12/2015	-.8549834	.0603219	-14.17	0.000	-.9732122	-.7367546
01/2016	-.9830312	.0603248	-16.30	0.000	-1.101266	-.8647967
02/2016	-1.071648	.0603251	-17.76	0.000	-1.189883	-.9534131
03/2016	-.6991122	.0603606	-11.58	0.000	-.8174168	-.5808076
04/2016	-.5303321	.060395	-8.78	0.000	-.6487041	-.41196
05/2016	-.6681653	.0604398	-11.06	0.000	-.7866251	-.5497055
06/2016	-.9008946	.0606266	-14.86	0.000	-1.019721	-.7820686

07/2016	.3912485	.0608749	6.43	0.000	.2719359	.510561
08/2016	.6585321	.0610927	10.78	0.000	.5387926	.7782715
09/2016	-.5908955	.0613353	-9.63	0.000	-.7111105	-.4706806
10/2016	-.4819024	.0615381	-7.83	0.000	-.6025148	-.36129
11/2016	-.8080836	.0617412	-13.09	0.000	-.9290941	-.6870732
12/2016	-.9301903	.0619118	-15.02	0.000	-1.051535	-.8088453
01/2017	-.7288759	.0620791	-11.74	0.000	-.8505488	-.607203
02/2017	-.6644125	.0622298	-10.68	0.000	-.7863807	-.5424443
03/2017	-.5728819	.0623733	-9.18	0.000	-.6951314	-.4506325
04/2017	-.6203572	.0625727	-9.91	0.000	-.7429974	-.497717
05/2017	-.747571	.0627427	-11.91	0.000	-.8705444	-.6245977
06/2017	-.734003	.0629484	-11.66	0.000	-.8573796	-.6106264
07/2017	-.6906028	.0631787	-10.93	0.000	-.8144309	-.5667748
08/2017	-.7995024	.0634028	-12.61	0.000	-.9237696	-.6752353
09/2017	-.0924717	.0636168	-1.45	0.146	-.2171584	.032215
10/2017	.3488348	.063798	5.47	0.000	.2237929	.4738767
11/2017	-.8007647	.0639923	-12.51	0.000	-.9261874	-.6753421
12/2017	-1.339632	.0641537	-20.88	0.000	-1.46537	-1.213893
01/2018	-1.25309	.0643109	-19.48	0.000	-1.379137	-1.127043
02/2018	-.8744615	.0644618	-13.57	0.000	-1.000804	-.7481186
03/2018	-.6129992	.0646076	-9.49	0.000	-.7396277	-.4863707
04/2018	-.6321574	.0647741	-9.76	0.000	-.7591122	-.5052025
05/2018	-.6934061	.0649537	-10.68	0.000	-.8207129	-.5660992
06/2018	-.9752954	.0654621	-14.90	0.000	-1.103599	-.846992
cons	44.96266	.0614262	731.98	0.000	44.84226	45.08305

Table F-10: Regression Coefficients for DEP Cohort 2

Number of obs	=	1324363
F(83,1291654)	=	5018.47
Prob>F	=	0.0000
R-squared	=	0.6873
AdjR-squared	=	0.6793
Root MSE	=	14.3698

Variable	Coefficient	Std. Err.	t	P > |t|	95% Conf. Interval	
i.ym						
12/2013	10.59739	.2911435	36.40	0.000	10.02676	11.16802
01/2014	18.6943	.284998	65.59	0.000	18.13571	19.25288
02/2014	14.98298	.282832	52.97	0.000	14.42864	15.53732
03/2014	.0714642	.2802071	0.26	0.799	-.4777321	.6206605
04/2014	-9.570875	.2778032	-34.45	0.000	-10.11536	-9.02639
05/2014	-10.6451	.2752273	-38.68	0.000	-11.18453	-10.10566
06/2014	3.708345	.2729562	13.59	0.000	3.17336	4.24333
07/2014	4.282465	.2704597	15.83	0.000	3.752373	4.812557
08/2014	-3.142081	.2451161	-12.82	0.000	-3.6225	-2.661662
09/2014	-9.089674	.2293094	-39.64	0.000	-9.539113	-8.640236
10/2014	-12.47666	.2211061	-56.43	0.000	-12.91002	-12.0433
11/2014	-3.60765	.2168758	-16.63	0.000	-4.032719	-3.182581
12/2014	4.460534	.2154846	20.70	0.000	4.038191	4.882876
01/2015	10.01601	.215483	46.48	0.000	9.593666	10.43834
02/2015	12.8998	.2154815	59.87	0.000	12.47747	13.32214
03/2015	-8.531963	.215477	-39.60	0.000	-8.954291	-8.109636
04/2015	-14.4935	.2154747	-67.26	0.000	-14.91582	-14.07118
05/2015	-9.523378	.2154734	-44.20	0.000	-9.945698	-9.101057
06/2015	2.650262	.21547	12.30	0.000	2.227948	3.072576
07/2015	5.867211	.2154669	27.23	0.000	5.444903	6.289519
08/2015	1.184402	.2154642	5.50	0.000	.7620995	1.606705
09/2015	-7.280168	.2154631	-33.79	0.000	-7.702468	-6.857867
10/2015	-13.87055	.2154625	-64.38	0.000	-14.29285	-13.44825
11/2015	-9.83021	.2154619	-45.62	0.000	-10.25251	-9.407912
01/2016	7.759313	.2538258	30.57	0.000	7.261823	8.256803
02/2016	5.457167	.2538377	21.50	0.000	4.959654	5.954681
03/2016	-9.121958	.2540502	-35.91	0.000	-9.619888	-8.624028
04/2016	-13.48322	.2542302	-53.04	0.000	-13.9815	-12.98494
05/2016	-10.04955	.2545241	-39.48	0.000	-10.54841	-9.550696
06/2016	.5504089	.2554268	2.15	0.031	.0497812	1.051037
07/2016	9.391358	.2564471	36.62	0.000	8.88873	9.893986

08/2016	8.828805	.2573584	34.31	0.000	8.324392	9.333219
09/2016	-2.198706	.2586277	-8.50	0.000	-2.705608	-1.691805
10/2016	-12.65787	.2597651	-48.73	0.000	-13.167	-12.14874
11/2016	-7.470831	.2608013	-28.65	0.000	-7.981993	-6.959669
12/2016	2.649381	.2619808	10.11	0.000	2.135907	3.162854
01/2017	.8161692	.2626015	3.11	0.002	.3014793	1.330859
02/2017	-5.108788	.2633038	-19.40	0.000	-5.624854	-4.592721
03/2017	-7.10749	.2639027	-26.93	0.000	-7.62473	-6.590249
04/2017	-10.36758	.2649704	-39.13	0.000	-10.88691	-9.848242
05/2017	-6.229106	.265656	-23.45	0.000	-6.749783	-5.708429
06/2017	.6069767	.2664214	2.28	0.023	.0847999	1.129153
07/2017	7.115578	.267587	26.59	0.000	6.591117	7.640039
08/2017	2.278062	.2686861	8.48	0.000	1.751447	2.804678
09/2017	-5.002681	.2696091	-18.56	0.000	-5.531106	-4.474257
10/2017	-9.639181	.2704857	-35.64	0.000	-10.16932	-9.109038
11/2017	-5.715277	.2715362	-21.05	0.000	-6.247478	-5.183075
12/2017	10.73481	.2722424	39.43	0.000	10.20122	11.2684
01/2018	15.18117	.2728966	55.63	0.000	14.6463	15.71604
02/2018	-2.281692	.2734719	-8.34	0.000	-2.817688	-1.745696
03/2018	-4.950265	.274138	-18.06	0.000	-5.487566	-4.412964
04/2018	-10.96508	.2748404	-39.90	0.000	-11.50376	-10.4264
05/2018	-5.712968	.2756631	-20.72	0.000	-6.253259	-5.172678
i.ym#c.treatment						
01/2016	-.2940158	.1902775	-1.55	0.122	-.6669533	.0789217
02/2016	-.3127838	.1902194	-1.64	0.100	-.6856073	.0600396
03/2016	.140052	.1906249	0.73	0.463	-.2335662	.5136702
04/2016	.1417772	.1909861	0.74	0.458	-.2325491	.5161035
05/2016	-.0330458	.1915494	-0.17	0.863	-.4084761	.3423844
06/2016	-.372274	.1932973	-1.93	0.054	-.75113	.0065821
07/2016	-.4670928	.1953296	-2.39	0.017	-.8499321	-.0842535
08/2016	-.3679604	.1971357	-1.87	0.062	-.7543396	.0184187
09/2016	-.0095294	.1995383	-0.05	0.962	-.4006176	.3815588
10/2016	.0961081	.2016543	0.48	0.634	-.2991274	.4913436
11/2016	.0530629	.2035533	0.26	0.794	-.3458947	.4520205
12/2016	-.1555799	.2055601	-0.76	0.449	-.5584707	.2473108
01/2017	.06298	.2067812	0.30	0.761	-.342304	.4682641
02/2017	.0083661	.2080313	0.04	0.968	-.3993681	.4161003
03/2017	-.034834	.2091218	-0.17	0.868	-.4447055	.3750376
04/2017	-.0862931	.2109464	-0.41	0.682	-.4997408	.3271546
05/2017	-.2581741	.2121577	-1.22	0.224	-.6739959	.1576478
06/2017	-.1880658	.2136218	-0.88	0.379	-.6067572	.2306255

07/2017	-.3441835	.2155689	-1.60	0.110	-.7666912	.0783241
08/2017	-.3619368	.217431	-1.66	0.096	-.7880942	.0642205
09/2017	-.3588089	.2190726	-1.64	0.101	-.7881838	.0705659
10/2017	-.1918852	.2205187	-0.87	0.384	-.6240943	.240324
11/2017	-.2994767	.2222814	-1.35	0.178	-.7351407	.1361874
12/2017	-.6200525	.2235098	-2.77	0.006	-1.058124	-.181981
01/2018	-.8011186	.2246129	-3.57	0.000	-1.241352	-.360885
02/2018	-.2764544	.2256365	-1.23	0.220	-.7186943	.1657855
03/2018	-.1774399	.2267308	-0.78	0.434	-.6218245	.2669448
04/2018	-.0360123	.2279476	-0.16	0.874	-.4827819	.4107573
05/2018	-.2245772	.2293994	-0.98	0.328	-.6741923	.2250378
06/2018	-.5141316	.2321059	-2.22	0.027	-.9690513	-.0592119
cons	42.70114	.2000864	213.41	0.000	42.30898	43.0933

Table F-11: Regression Coefficients for DEP Cohort 3

Number of obs	=	1870493
F(77,1816295)	=	7279.54
Prob>F	=	0.0000
R-squared	=	0.6797
AdjR-squared	=	0.6701
Root MSE	=	14.2891

Variable	Coefficient	Std. Err.	t	P > |t|	95% Conf. Interval	
i.ym						
12/2013	10.82818	.2712209	39.92	0.000	10.2966	11.35977
01/2014	18.34483	.2662765	68.89	0.000	17.82293	18.86672
02/2014	11.2674	.2652203	42.48	0.000	10.74758	11.78722
03/2014	1.056151	.2635461	4.01	0.000	.5396102	1.572692
04/2014	-6.794034	.2621178	-25.92	0.000	-7.307776	-6.280292
05/2014	-13.44633	.2607022	-51.58	0.000	-13.95729	-12.93536
06/2014	5.899975	.2591258	22.77	0.000	5.392098	6.407853
07/2014	4.434636	.2570903	17.25	0.000	3.930748	4.938524
08/2014	-5.645866	.2546092	-22.17	0.000	-6.144891	-5.146841
09/2014	-8.477301	.252634	-33.56	0.000	-8.972454	-7.982147
10/2014	-13.62876	.2503069	-54.45	0.000	-14.11935	-13.13817
11/2014	1.833326	.2473004	7.41	0.000	1.348626	2.318026
12/2014	7.201564	.2141278	33.63	0.000	6.781881	7.621247
01/2015	8.699186	.1891209	46.00	0.000	8.328515	9.069856
02/2015	11.62882	.1760723	66.05	0.000	11.28373	11.97392
03/2015	-10.73633	.1675336	-64.08	0.000	-11.0647	-10.40797
04/2015	-17.14845	.1621513	-105.76	0.000	-17.46626	-16.83064
05/2015	-10.3839	.1579611	-65.74	0.000	-10.6935	-10.0743
06/2015	1.264688	.1549842	8.16	0.000	.9609247	1.568452
07/2015	3.672569	.1536792	23.90	0.000	3.371363	3.973775
08/2015	-.4947735	.1536774	-3.22	0.001	-.7959758	-.1935712
09/2015	-8.55043	.1536764	-55.64	0.000	-8.851631	-8.24923
10/2015	-14.85945	.1536758	-96.69	0.000	-15.16065	-14.55825
11/2015	-10.77076	.153676	-70.09	0.000	-11.07196	-10.46956
12/2015	-4.687162	.1536744	-30.50	0.000	-4.988359	-4.385966
01/2016	6.938365	.1536736	45.15	0.000	6.63717	7.23956
02/2016	4.435331	.1536731	28.86	0.000	4.134137	4.736525
03/2016	-9.808236	.1536719	-63.83	0.000	-10.10943	-9.507044
04/2016	-14.08789	.1536704	-91.68	0.000	-14.38908	-13.7867
05/2016	-10.66267	.1536698	-69.39	0.000	-10.96386	-10.36148
07/2016	9.336595	.1778265	52.50	0.000	8.988062	9.685129

08/2016	8.777054	.178728	49.11	0.000	8.426754	9.127355
09/2016	-3.221495	.1797014	-17.93	0.000	-3.573704	-2.869287
10/2016	-12.94114	.1804582	-71.71	0.000	-13.29483	-12.58745
11/2016	-7.751709	.1810579	-42.81	0.000	-8.106576	-7.396842
12/2016	2.048704	.1816174	11.28	0.000	1.692741	2.404668
01/2017	.3949252	.1823009	2.17	0.030	.0376217	.7522286
02/2017	-5.390989	.182895	-29.48	0.000	-5.749457	-5.032521
03/2017	-7.458004	.1835123	-40.64	0.000	-7.817681	-7.098326
04/2017	-10.65468	.1842414	-57.83	0.000	-11.01579	-10.29358
05/2017	-6.517875	.1849133	-35.25	0.000	-6.880298	-6.155451
06/2017	.4418084	.1857929	2.38	0.017	.0776607	.805956
07/2017	6.906229	.1868015	36.97	0.000	6.540104	7.272353
08/2017	1.924281	.1877588	10.25	0.000	1.55628	2.292282
09/2017	-5.264901	.1886116	-27.91	0.000	-5.634574	-4.895229
10/2017	-9.717548	.1892761	-51.34	0.000	-10.08852	-9.346573
11/2017	-6.194776	.1900108	-32.60	0.000	-6.567191	-5.822362
12/2017	9.584095	.1906094	50.28	0.000	9.210507	9.957683
01/2018	14.15336	.191097	74.06	0.000	13.77882	14.52791
02/2018	-2.432517	.1916147	-12.69	0.000	-2.808076	-2.056959
03/2018	-5.172238	.1921078	-26.92	0.000	-5.548763	-4.795714
04/2018	-11.03074	.1928141	-57.21	0.000	-11.40865	-10.65283
05/2018	-5.66916	.1936228	-29.28	0.000	-6.048654	-5.289666
i.ym#c.treatment						
07/2016	-.2364876	.1381473	-1.71	0.087	-.5072516	.0342764
08/2016	-.3991652	.1399745	-2.85	0.004	-.6735103	-.1248201
09/2016	-.3619444	.1419405	-2.55	0.011	-.6401429	-.0837459
10/2016	-.2975852	.1434501	-2.07	0.038	-.5787425	-.0164279
11/2016	-.0660174	.1446492	-0.46	0.648	-.3495248	.21749
12/2016	.0485513	.1457605	0.33	0.739	-.2371342	.3342368
01/2017	.0044539	.1470077	0.03	0.976	-.2836761	.2925838
02/2017	-.2270715	.14815	-1.53	0.125	-.5174404	.0632974
03/2017	-.2801664	.1493279	-1.88	0.061	-.5728438	.012511
04/2017	-.3360605	.1507459	-2.23	0.026	-.6315172	-.0406038
05/2017	-.3775782	.1520177	-2.48	0.013	-.6755276	-.0796289
06/2017	-.5042509	.153686	-3.28	0.001	-.8054702	-.2030316
07/2017	-.6311936	.1555855	-4.06	0.000	-.9361358	-.3262514
08/2017	-.5327004	.1573394	-3.39	0.001	-.8410802	-.2243207
09/2017	-.5532146	.1589	-3.48	0.000	-.8646531	-.2417761
10/2017	-.5722229	.1600786	-3.57	0.000	-.8859713	-.2584744
11/2017	-.3548008	.1613668	-2.20	0.028	-.6710741	-.0385276
12/2017	-.0669128	.1624294	-0.41	0.680	-.3852689	.2514432

01/2018	-.070757	.1633214	-0.43	0.665	-.3908613	.2493473
02/2018	-.5025356	.1642171	-3.06	0.002	-.8243954	-.1806758
03/2018	-.4768844	.1651377	-2.89	0.004	-.8005486	-.1532202
04/2018	-.6556493	.1663534	-3.94	0.000	-.9816961	-.3296024
05/2018	-.7246817	.1677257	-4.32	0.000	-1.053418	-.3959451
06/2018	-.7034253	.1699905	-4.14	0.000	-1.036601	-.3702498
cons	43.09341	.1406951	306.29	0.000	42.81765	43.36917

Table F-12: Regression Coefficients for DEP Cohort 4

Number of obs	=	3127601
F(53,3025223)	=	18311.52
Prob>F	=	0.0000
R-squared	=	0.6566
AdjR-squared	=	0.6450
Root MSE	=	16.0197

Variable	Coefficient	Std. Err.	t	P > |t|	95% Conf. Interval	
i.ym						
01/2015	42.0015	.3640951	115.36	0.000	41.28789	42.71511
02/2015	25.7931	.2910192	88.63	0.000	25.22271	26.36349
03/2015	.0888886	.2507836	0.35	0.723	-.4026383	.5804156
04/2015	-14.44873	.2431523	-59.42	0.000	-14.9253	-13.97216
05/2015	10.60925	.2426207	43.73	0.000	10.13372	11.08477
06/2015	19.84851	.2420862	81.99	0.000	19.37403	20.32299
07/2015	8.1361	.2393017	34.00	0.000	7.667077	8.605123
08/2015	9.29721	.2359954	39.40	0.000	8.834668	9.759753
09/2015	3.484304	.2338265	14.90	0.000	3.026012	3.942596
10/2015	-13.16111	.2321962	-56.68	0.000	-13.61621	-12.70602
11/2015	-9.894599	.2312317	-42.79	0.000	-10.34781	-9.441393
12/2015	-4.300453	.230293	-18.67	0.000	-4.751819	-3.849087
01/2016	8.334057	.2296242	36.29	0.000	7.884001	8.784112
02/2016	4.889433	.2290246	21.35	0.000	4.440553	5.338313
03/2016	-9.80188	.2283662	-42.92	0.000	-10.24947	-9.35429
04/2016	-13.17324	.2278224	-57.82	0.000	-13.61976	-12.72671
05/2016	-9.909555	.2276834	-43.52	0.000	-10.35581	-9.463304
06/2016	1.198147	.2276833	5.26	0.000	.751896	1.644399
07/2016	17.49121	.2276832	76.82	0.000	17.04496	17.93747
08/2016	17.71617	.2276828	77.81	0.000	17.26992	18.16242
09/2016	-.5585539	.2276826	-2.45	0.014	-1.004804	-.1123039
10/2016	-11.81609	.2276824	-51.90	0.000	-12.26234	-11.36984
11/2016	-6.418996	.2276823	-28.19	0.000	-6.865245	-5.972746
12/2016	4.27747	.2276823	18.79	0.000	3.83122	4.723719
01/2017	2.675342	.2276823	11.75	0.000	2.229093	3.121591
02/2017	-3.752356	.227682	-16.48	0.000	-4.198605	-3.306107
03/2017	-5.521757	.2276941	-24.25	0.000	-5.96803	-5.075485
04/2017	-9.230526	.2278002	-40.52	0.000	-9.677007	-8.784046
06/2017	1.854392	.2929733	6.33	0.000	1.280175	2.42861
07/2017	8.380718	.2942959	28.48	0.000	7.803908	8.957527
08/2017	3.328861	.2957553	11.26	0.000	2.749191	3.908531

09/2017	-.3274947	.2971527	-1.10	0.270	-.9099035	.2549142
10/2017	-3.762946	.2981534	-12.62	0.000	-4.347316	-3.178576
11/2017	-4.289536	.2992498	-14.33	0.000	-4.876055	-3.703017
12/2017	11.58691	.3003237	38.58	0.000	10.99829	12.17553
01/2018	16.63571	.301101	55.25	0.000	16.04556	17.22586
02/2018	-1.299607	.3019557	-4.30	0.000	-1.891429	-.707784
03/2018	-3.266138	.3028899	-10.78	0.000	-3.859791	-2.672484
04/2018	-10.0344	.3040123	-33.01	0.000	-10.63025	-9.438546
05/2018	-4.759072	.3050362	-15.60	0.000	-5.356933	-4.161212
i.ym#c.treatment						
06/2017	-.2840964	.2083152	-1.36	0.173	-.6923868	.1241941
07/2017	-.1798442	.2105184	-0.85	0.393	-.5924529	.2327645
08/2017	-.1314894	.2128982	-0.62	0.537	-.5487623	.2857835
09/2017	-.1687879	.2151689	-0.78	0.433	-.5905113	.2529356
10/2017	-.0873951	.2167886	-0.40	0.687	-.5122931	.337503
11/2017	-.283198	.2185507	-1.30	0.195	-.7115497	.1451537
12/2017	-.4871267	.2202422	-2.21	0.027	-.9187937	-.0554597
01/2018	-.4412774	.2214845	-1.99	0.046	-.8753793	-.0071755
02/2018	-.4264186	.2228336	-1.91	0.056	-.8631647	.0103275
03/2018	-.2953128	.2242871	-1.32	0.188	-.7349076	.1442821
04/2018	-.2095437	.2260123	-0.93	0.354	-.6525198	.2334324
05/2018	-.030492	.2276016	-0.13	0.893	-.4765831	.4155991
06/2018	-.1604255	.2305315	-0.70	0.486	-.6122591	.2914082
cons	42.04246	.2220709	189.32	0.000	41.60721	42.47772

Table F-13: Regression Coefficients for DEP Cohort 5

Number of obs	=	1042278
F(46,995879)	=	5675.15
Prob>F	=	0.0000
R-squared	=	0.6913
AdjR-squared	=	0.6769
Root MSE	=	13.8521

Variable	Coefficient	Std. Err.	t	P > |t|	95% Conf. Interval	
i.ym						
02/2015	7.859332	1.03145	7.62	0.000	5.837724	9.880939
03/2015	-14.72819	.5009908	-29.40	0.000	-15.71012	-13.74627
04/2015	-19.22476	.4593114	-41.86	0.000	-20.12499	-18.32452
05/2015	-12.46654	.4538566	-27.47	0.000	-13.35609	-11.577
06/2015	-2.073978	.4480566	-4.63	0.000	-2.952154	-1.195802
07/2015	-.6775616	.4404268	-1.54	0.124	-1.540783	.1856601
08/2015	-4.209871	.4292188	-9.81	0.000	-5.051125	-3.368616
09/2015	-11.54887	.4149626	-27.83	0.000	-12.36218	-10.73555
11/2015	-14.48223	.3958936	-36.58	0.000	-15.25817	-13.70629
12/2015	-9.743026	.3854937	-25.27	0.000	-10.49858	-8.987471
01/2016	-.4357276	.375123	-1.16	0.245	-1.170956	.2995008
02/2016	-3.248327	.3616983	-8.98	0.000	-3.957243	-2.53941
03/2016	-16.40977	.3412315	-48.09	0.000	-17.07857	-15.74096
04/2016	-20.83725	.2979269	-69.94	0.000	-21.42118	-20.25332
05/2016	-14.20739	.2083906	-68.18	0.000	-14.61583	-13.79895
06/2016	-3.413052	.175071	-19.50	0.000	-3.756185	-3.069919
07/2016	6.838243	.1635854	41.80	0.000	6.517621	7.158865
08/2016	5.001092	.1577112	31.71	0.000	4.691983	5.310201
09/2016	-4.802548	.1547891	-31.03	0.000	-5.105929	-4.499166
10/2016	-14.16475	.1541552	-91.89	0.000	-14.46689	-13.86261
11/2016	-9.006045	.154155	-58.42	0.000	-9.308183	-8.703906
12/2016	1.722556	.1541532	11.17	0.000	1.420421	2.024691
01/2017	.118167	.1541529	0.77	0.443	-.1839676	.4203015
02/2017	-6.008087	.1541516	-38.98	0.000	-6.310219	-5.705955
03/2017	-7.882833	.1541514	-51.14	0.000	-8.184965	-7.580702
04/2017	-11.17579	.1541501	-72.50	0.000	-11.47792	-10.87366
05/2017	-7.152663	.1541477	-46.40	0.000	-7.454788	-6.850539
06/2017	-.2981455	.1541465	-1.93	0.053	-.6002675	.0039764
07/2017	5.948751	.1541447	38.59	0.000	5.646632	6.250869
08/2017	1.368454	.1541421	8.88	0.000	1.066341	1.670568
09/2017	-4.875907	.1542055	-31.62	0.000	-5.178145	-4.57367

11/2017	-6.410534	.1874958	-34.19	0.000	-6.77802	-6.043049
12/2017	8.676972	.1881879	46.11	0.000	8.30813	9.045814
01/2018	13.12556	.1888482	69.50	0.000	12.75542	13.4957
02/2018	-3.244625	.1895723	-17.12	0.000	-3.61618	-2.873069
03/2018	-5.659177	.1902589	-29.74	0.000	-6.032078	-5.286276
04/2018	-10.97504	.1910124	-57.46	0.000	-11.34941	-10.60066
05/2018	-5.355889	.1918697	-27.91	0.000	-5.731947	-4.979831
i.ym#c.treatment						
11/2017	.3283646	.1541795	2.13	0.033	.0261781	.6305512
12/2017	.9927588	.1554924	6.38	0.000	.687999	1.297519
01/2018	1.069641	.1566775	6.83	0.000	.7625586	1.376724
02/2018	.4895946	.1579523	3.10	0.002	.1800135	.7991757
03/2018	.3649788	.1591562	2.29	0.022	.053038	.6769196
04/2018	-.1933651	.1604854	-1.20	0.228	-.507911	.1211808
05/2018	-.5897201	.161981	-3.64	0.000	-.9071974	-.2722427
06/2018	-.7145588	.1645078	-4.34	0.000	-1.036989	-.3921291
cons	42.01288	.1400189	300.05	0.000	41.73845	42.28731

Table F-14: Regression Coefficients for DEP Cohort 6

Number of obs	=	5818963
F(75,5679812)	=	25017.65
Prob>F	=	0.0000
R-squared	=	0.7158
AdjR-squared	=	0.7089
Root MSE	=	14.2181

Variable	Coefficient	Std. Err.	t	P > |t|	95% Conf. Interval	
i.ym						
12/2013	11.70871	.070371	166.39	0.000	11.57079	11.84663
01/2014	15.49768	.0697846	222.08	0.000	15.3609	15.63445
02/2014	12.08945	.0697845	173.24	0.000	11.95267	12.22622
03/2014	-.1279688	.0697845	-1.83	0.067	-.2647439	.0088064
04/2014	-10.09903	.0697843	-144.72	0.000	-10.2358	-9.962251
05/2014	-6.837694	.0697841	-97.98	0.000	-6.974468	-6.70092
06/2014	3.284255	.0697841	47.06	0.000	3.147481	3.42103
07/2014	4.081132	.069784	58.48	0.000	3.944358	4.217906
08/2014	1.764097	.0697838	25.28	0.000	1.627324	1.900871
09/2014	-3.757227	.069784	-53.84	0.000	-3.894001	-3.620452
10/2014	-10.33492	.0697845	-148.10	0.000	-10.4717	-10.19815
11/2014	-1.688237	.0697846	-24.19	0.000	-1.825012	-1.551461
11/2015	-9.232248	.0779718	-118.40	0.000	-9.38507	-9.079426
12/2015	-2.661476	.0779701	-34.13	0.000	-2.814295	-2.508657
01/2016	8.674027	.077972	111.25	0.000	8.521205	8.82685
02/2016	5.9907	.077972	76.83	0.000	5.837878	6.143522
03/2016	-8.838062	.0779925	-113.32	0.000	-8.990925	-8.6852
04/2016	-13.30352	.0780119	-170.53	0.000	-13.45643	-13.15062
05/2016	-9.44699	.0780375	-121.06	0.000	-9.599941	-9.294039
06/2016	2.194711	.0781436	28.09	0.000	2.041552	2.34787
07/2016	11.77389	.0782866	150.39	0.000	11.62045	11.92733
08/2016	10.30823	.0784133	131.46	0.000	10.15454	10.46192
09/2016	-2.183175	.0785551	-27.79	0.000	-2.33714	-2.029209
10/2016	-13.0053	.078674	-165.31	0.000	-13.1595	-12.8511
11/2016	-6.980919	.0787958	-88.60	0.000	-7.135356	-6.826482
12/2016	3.439117	.0788971	43.59	0.000	3.284481	3.593752
01/2017	1.318201	.0789975	16.69	0.000	1.163369	1.473033
02/2017	-5.036775	.0790875	-63.69	0.000	-5.191783	-4.881766
03/2017	-7.376649	.0791736	-93.17	0.000	-7.531826	-7.221471
04/2017	-10.63689	.0792945	-134.14	0.000	-10.7923	-10.48147
05/2017	-6.112698	.0793975	-76.99	0.000	-6.268314	-5.957082

06/2017	1.366243	.079523	17.18	0.000	1.210381	1.522105
07/2017	8.161536	.0796641	102.45	0.000	8.005397	8.317675
08/2017	2.668037	.0798028	33.43	0.000	2.511626	2.824448
09/2017	-5.734664	.0799342	-71.74	0.000	-5.891332	-5.577996
10/2017	-10.82592	.0800463	-135.25	0.000	-10.98281	-10.66903
11/2017	-5.79847	.0801673	-72.33	0.000	-5.955595	-5.641345
12/2017	11.03428	.0802677	137.47	0.000	10.87696	11.1916
01/2018	15.14574	.0803662	188.46	0.000	14.98822	15.30325
02/2018	-2.586148	.0804608	-32.14	0.000	-2.743848	-2.428448
03/2018	-5.476302	.0805527	-67.98	0.000	-5.634182	-5.318422
04/2018	-11.58772	.0806566	-143.67	0.000	-11.7458	-11.42963
05/2018	-6.145941	.0807687	-76.09	0.000	-6.304244	-5.987637
i.ym#c.treatment						
11/2015	-.1657308	.0794857	-2.09	0.037	-.32152	-.0099416
12/2015	-.2809974	.0794828	-3.54	0.000	-.4367809	-.1252139
01/2016	-.4857805	.0794845	-6.11	0.000	-.6415674	-.3299937
02/2016	-.5875254	.0794857	-7.39	0.000	-.7433146	-.4317362
03/2016	-.3260493	.079533	-4.10	0.000	-.4819312	-.1701674
04/2016	-.1940438	.0795805	-2.44	0.015	-.3500187	-.0380688
05/2016	-.1250364	.0796366	-1.57	0.116	-.2811213	.0310485
06/2016	-.0957303	.0798921	-1.20	0.231	-.252316	.0608554
07/2016	-.0052869	.0802199	-0.07	0.947	-.162515	.1519411
08/2016	-.0813614	.0805005	-1.01	0.312	-.2391395	.0764166
09/2016	-.1006956	.0808235	-1.25	0.213	-.2591068	.0577156
10/2016	-.197732	.0810956	-2.44	0.015	-.3566765	-.0387876
11/2016	-.324476	.0813496	-3.99	0.000	-.4839184	-.1650337
12/2016	-.3983929	.0815737	-4.88	0.000	-.5582744	-.2385113
01/2017	-.3999776	.0817827	-4.89	0.000	-.5602688	-.2396864
02/2017	-.3528999	.0819735	-4.31	0.000	-.513565	-.1922349
03/2017	-.326023	.0821581	-3.97	0.000	-.4870499	-.1649961
04/2017	-.2227447	.0824171	-2.70	0.007	-.3842792	-.0612102
05/2017	-.1700432	.082627	-2.06	0.040	-.3319892	-.0080972
06/2017	-.097265	.0829011	-1.17	0.241	-.2597482	.0652182
07/2017	-.0851771	.0831946	-1.02	0.306	-.2482355	.0778814
08/2017	-.1316635	.0834652	-1.58	0.115	-.2952524	.0319254
09/2017	-.1896956	.0837418	-2.27	0.023	-.3538266	-.0255646
10/2017	-.2170639	.0839737	-2.58	0.010	-.3816494	-.0524785
11/2017	-.4155898	.0842191	-4.93	0.000	-.5806562	-.2505234
12/2017	-.7004644	.084429	-8.30	0.000	-.8659422	-.5349866
01/2018	-.6509102	.0846283	-7.69	0.000	-.8167788	-.4850417
02/2018	-.4346815	.0848319	-5.12	0.000	-.600949	-.268414

03/2018	-.4591289	.0850171	-5.40	0.000	-.6257594	-.2924984
04/2018	-.3998165	.0852301	-4.69	0.000	-.5668645	-.2327686
05/2018	-.2731368	.0854661	-3.20	0.001	-.4406473	-.1056262
06/2018	-.2636914	.0861242	-3.06	0.002	-.4324918	-.0948909
cons	45.07433	.058409	771.70	0.000	44.95985	45.18881

Appendix G 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.

Nexant assigned each survey question a category. Table G-1 and Table G-2 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, for each jurisdiction. A response is considered "favorable" if the treatment group gave a response that is consistent with the program objectives of MyHER.

Table G-1: Classification of Survey Responses and Treatment Group "Success Rate" - DEC

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	2	5	40%
Customers' Reported Energy-savings Behaviors	10	11	91%
Customer's Reported Energy Efficiency Improvements Made	9	9	100%
Customer Motivation, Engagement & Awareness of Energy Efficiency	4	11	36%
Barriers of Customer Not Undertaking Energy Savings Actions	3	6	50%
Customer Satisfaction with Duke Energy	0	4	0%
Total	**31**	**49**	**63%**

Table G-2: Classification of Survey Responses and Treatment Group "Success Rate" - DEP

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	2	5	40%
Customers' Reported Energy-saving Behaviors	10	11	91%
Customer's Reported Energy Efficiency Improvements Made	9	9	100%
Customer Motivation, Engagement & Awareness of Energy Efficiency	10	11	91%
Barriers of Customer Not Undertaking Energy Savings Actions	4	6	67%
Customer Satisfaction with Duke Energy	2	4	50%
Total	**40**	**49**	**82%**

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 DEC treatment group provided answers consistent with a MyHER treatment effect in approximately 63% of the survey questions, and 82% in the case of DEP, which represents an uplift from the expected percentage of 50% if the null hypothesis were true. Thus we cannot make the case that MyHER had wide-ranging enhancing effects across all the various engagement and attitudinal areas probed by the survey. Using standard statistical techniques (the non-parametric sign test), Nexant calculates the probability of randomly obtaining this result in the case of DEC is 2% and in the case of DEP essentially 0%.

What do those 2% and 0% probabilities mean? Consider a series of coin flips. What is the probability of obtaining 40 heads in 49 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 40 out of 49 survey questions if MyHER has no influence on customer engagement and energy usage behavior? The answer, 0%, is "exceedingly low". The same logic applies to the 2% probability we calculate for DEC. Thus we conclude that the survey responses in these two jurisdictions favorably affects DEC and DEP customer attitudes and actions related to energy-saving behavior.[16]

[16] The technical way of putting this is to say that we reject the hypothesis that MyHERs have no effect on customer engagement with energy-saving behaviors.

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NAVIGANT

Duke Energy PowerShare Program

2018 Evaluation Report for Duke Energy Carolinas

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Reference No.: 147037
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TABLE OF CONTENTS

1. DUKE ENERGY POWERSHARE PROGRAM DESIGN

This document presents Navigant's evaluation of the Duke Energy Carolinas (DEC) PowerShare® program for program year (PY) 2018. The PowerShare Program is a demand response (DR) program offered to commercial and industrial (C&I) customers that is part of Duke Energy's portfolio of demand-side management (DSM) programs. PowerShare offers participating C&I customers a financial incentive to reduce their electricity consumption when called upon by Duke Energy.

The DEC PowerShare program has approximately 160 customers with a contracted curtailment load of 337 MW. The DEC program offers customers different participation options to choose from:

- **Mandatory Curtailment:** In exchange for a monthly availability payment and event performance payments, participants must reduce load during each Mandatory Curtailment Period to a contracted firm level.
- **Voluntary Curtailment:** In exchange for an event performance payment, participants may reduce load to a pre-nominated level during Voluntary Curtailment Periods.
- **Generator Curtailment:** In exchange for a monthly availability payment and event performance payments, participants must transfer load from a Duke Energy source to a private generation source during Generator Curtailment Periods.

There are many factors that affect the curtailment potential. For example, as customers install large-scale energy efficiency projects, such as a LED lighting retrofits, their demand is lowered, reducing the potential of curtailable load. The persistence of the contracted curtailable load also fluctuates as DEC participants may leave the program due to business closure.

The curtailment potential is also affected by other factors, such as jurisdictional tariffs and federal US Environmental Protection Agency (EPA) emissions guidelines for onsite backup generators. In the DEC jurisdiction, program staff report that enrollment dropped from a high of about 400 MW in 2014, largely due to customer backup generators not meeting new EPA emissions guidelines.

2. PROGRAM EVALUATION METHODS

This report summarizes the findings from Navigant's process evaluation of the PowerShare program for PY2018, as well as a brief summary of Navigant's review of program impacts as determined by Duke Energy's Energy Profiler Online (EPO) software developed by Schneider Electric. Navigant used the following questions to guide the evaluation.

- What is the status of the program?
- What are the strengths of the program, and what are areas for improvement?
- What are the barriers to program participation? How can these barriers be addressed?
- In what ways can the program potentially increase kilowatt (kW) impacts?
- What actions can be taken, if any, to increase the efficiency of program implementation?
- Are there opportunities for implementation of the program?
- Why do customers desire to continue with or leave the program?

The research methods used in this evaluation include program materials review, program staff interviews, an implementer interview, surveys and interviews with Duke Energy Account Executives who implement the program, and a survey of participating customers. The evaluation team synthesized the results of the materials review, interviews, and surveys to identify trends, findings, and recommendations. All findings were mapped to the research questions outlined in the evaluation plan.

2.1 Program Impact Evaluation

Process evaluation activities were the primary focus of this evaluation cycle. The impact evaluation for the 2018 program year included a review and summary of the EPO event settlement data provided by Duke Energy. Navigant reviewed the settlement results to check for relative consistency with previous program years, and this report includes a summary of those results.

2.2 Program Staff Interviews

Navigant conducted a telephone interview with the DEC jurisdiction program manager on May 9, 2018. The interview identified strengths and opportunities to improve Duke Energy's PowerShare Program. Interview findings are incorporated into this report to support the evaluation.

2.3 PowerShare Implementer Interview

Navigant interviewed implementation contractor personnel from Schneider Electric over the phone on June 27, 2018. The interview identified strengths and opportunities to improve Duke Energy's PowerShare Program. As with the program manager interview, interview findings are incorporated into this report to support the evaluation.

2.4 Duke Energy Account Executive Interviews and Surveys

Navigant interviewed five DEC Account Executives over the phone from May 29 through June 28, 2018. These interviews identified how Duke Energy's PowerShare Program is currently operating, how the process has changed over the past few years, and the effect of those changes on the program and participants to identify improvements to the program.

2.5 PowerShare Participant Surveys

Navigant targeted 10-20 online participant surveys for the DEC jurisdiction. Navigant sent survey invitations to DEC participants in October-November 2018, receiving 30 usable and completed surveys.

2.6 Process Evaluation Analysis Methods

The evaluation team used multiple analysis methods for the various modes of research, which included program materials review, interviews, email surveys with Account Executives, and online participant surveys. The transcription notes from the program manager and implementation contractor interviews and the email survey results were reviewed for consistency of issues and concerns. For the participant surveys, an SPSS analysis of the surveys categorized and summarized the responses. In some cases, the participant contact list contained multiple contacts at a given participant site. When more than one member of a participant's staff responded, those responses were weighted to prevent skewing of the results.

3. POWERSHARE PROGRAM EVALUATION FINDINGS

The following section presents the program evaluation findings, split into several categories:

- Program impacts
- Program strengths
- Areas for improvement
- Barriers to participation
- Opportunities to increase enrolled capacity
- Opportunities to improve program implementation

3.1 Program Impacts

Duke Energy called two DR events in 2018, one on January 2nd and the other on January 7th. The event on January 2nd began at 7:00 a.m. and concluded at 10:00 a.m. The event on January 7th began at 7:30 a.m. and concluded at 10:30 a.m. Table 1 shows a summary of the capacity impacts by program option for each of these events. Table 2 shows a summary of the energy impacts by program option for each hour of the January 2nd event, as well as the total curtailed energy over the three-hour duration of the event. Table 3 shows a summary of the energy impacts by program option for each hour of the January 7th event, as well as the total curtailed energy over the three-hour duration of the event.

Table 1. Summary of 2018 Event Capacity Impacts (MW)

Program Name	January 2, 2018	January 7, 2018
Mandatory Curtailment	258	190
Generator Curtailment	8	8

Source: Navigant summary of Duke Energy EPO Event Settlement Data, results subject to rounding

Table 2. Summary of January 2, 2018 Event Energy Impacts by Hour of Event (MWh)

Program Name	7:00-8:00	8:00-9:00	9:00-10:00	Total
Mandatory Curtailment	258	258	258	**773**
Generator Curtailment	8	8	8	**24**

Source: Navigant summary of Duke Energy EPO Event Settlement Data, results subject to rounding

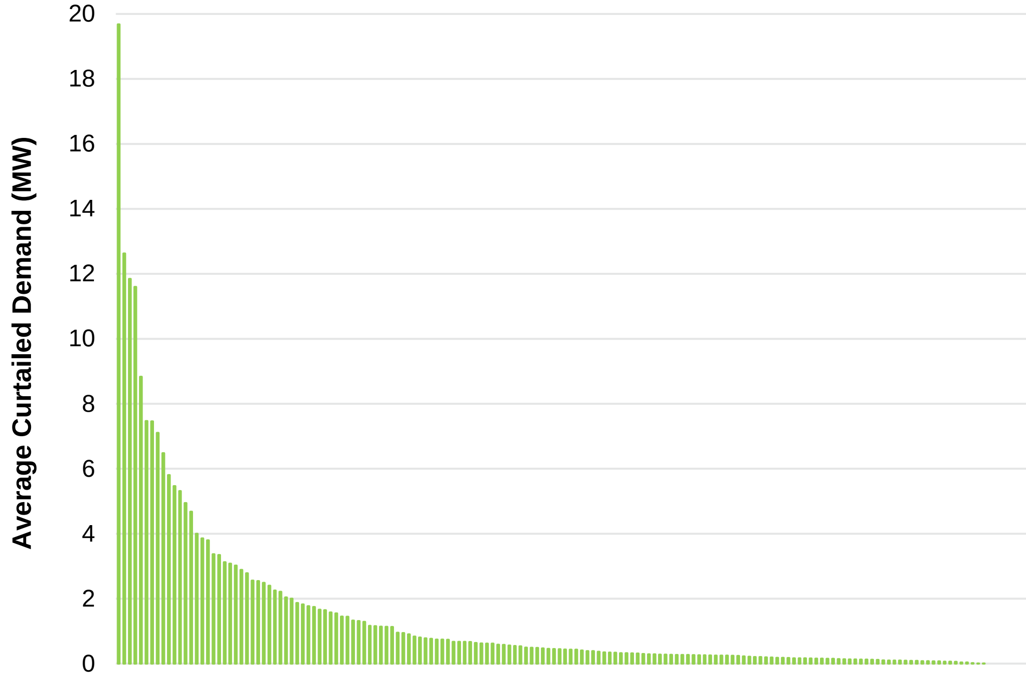
Table 3. Summary of January 7, 2018 Event Energy Impacts by Hour of Event (MWh)

Program Name	7:30-8:30	8:30-9:30	9:30-10:30	Total
Mandatory Curtailment	190	190	190	**569**
Generator Curtailment	8	8	8	**24**

Source: Navigant summary of Duke Energy EPO Event Settlement Data, results subject to rounding

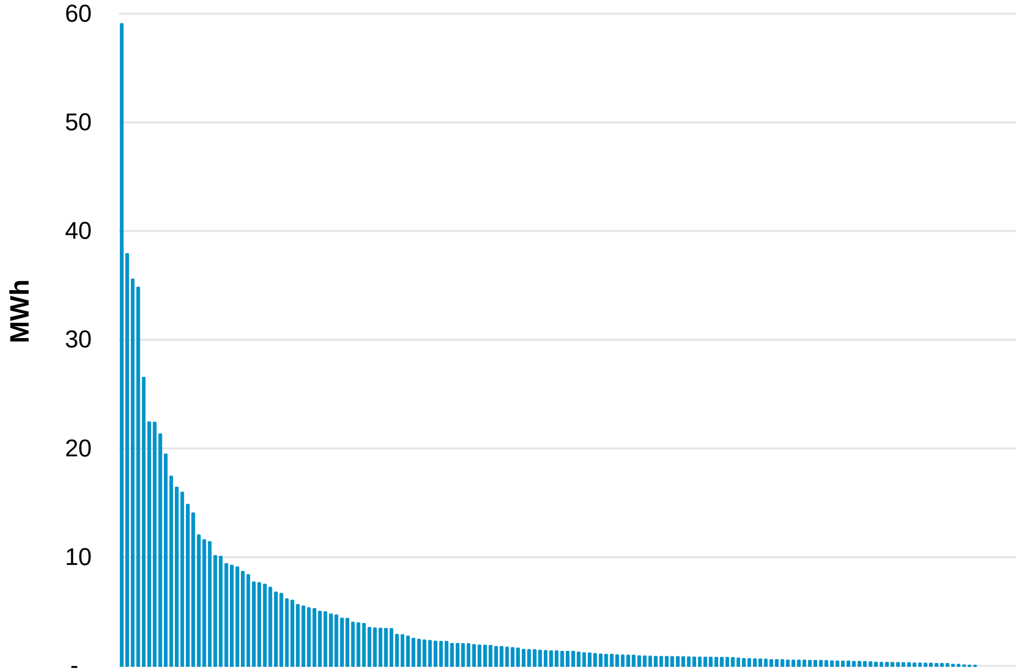
Figure 1 shows the average curtailed demand for each participant across the two 2018 events. The largest participant curtailed an average of nearly 20 MW during each event. Figure 2 shows the average energy curtailment for each participant across both events.

Figure 1. Average Curtailed Demand by Participant (163 unique accounts)



Source: Navigant summary of Duke Energy EPO Event Settlement Data

Figure 2. Average Event Energy Curtailment by Participant (163 unique accounts)



Source: Navigant summary of Duke Energy EPO Event Settlement Data

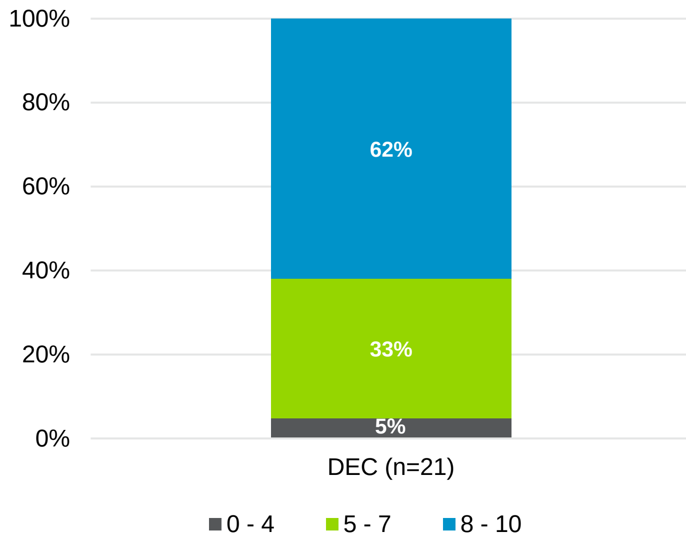
3.2 Program Strengths

Through the participant surveys, many respondents provided positive feedback about the program. Customers reported overall satisfaction with the program, finding the incentives, the notification time before events, and the frequency and duration of events to be acceptable.

Most DEC customers were satisfied with the program, with 62% of survey respondents ranking their satisfaction 8-10 (on a 10-point scale), as shown in Figure 3. Of those who rated their satisfaction as 5 or below, three respondents provided additional insight:

- I would rate it close to neutral, at times we are given very little notice when we need to curtail load which can be tight with our limited staffing."
- "[I am] unable to understand how our bill is figured."
- "Winter power sharing has greater impact due to when it is called and the cold weather making it harder to justify."

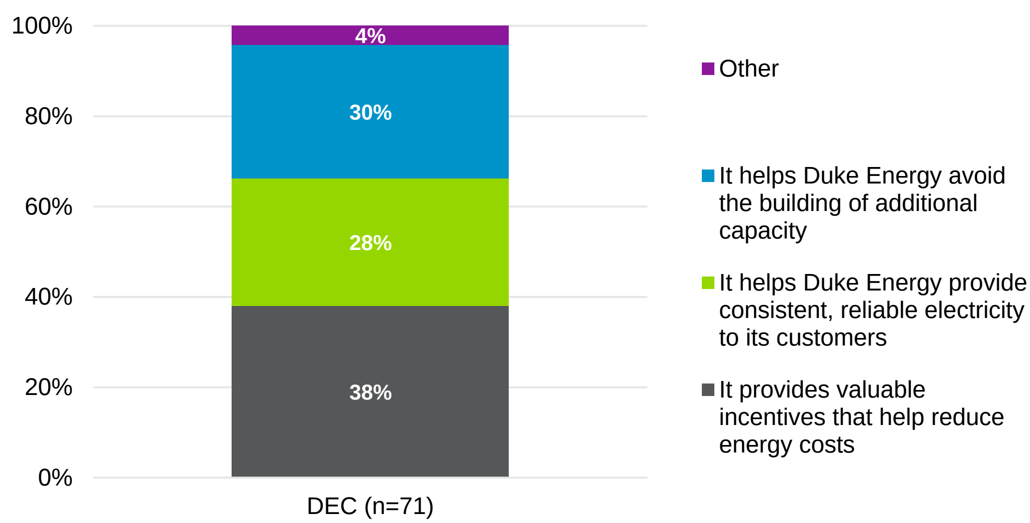
Figure 3. PowerShare Program Satisfaction Scores (0-10 Scale)



Source: Navigant analysis

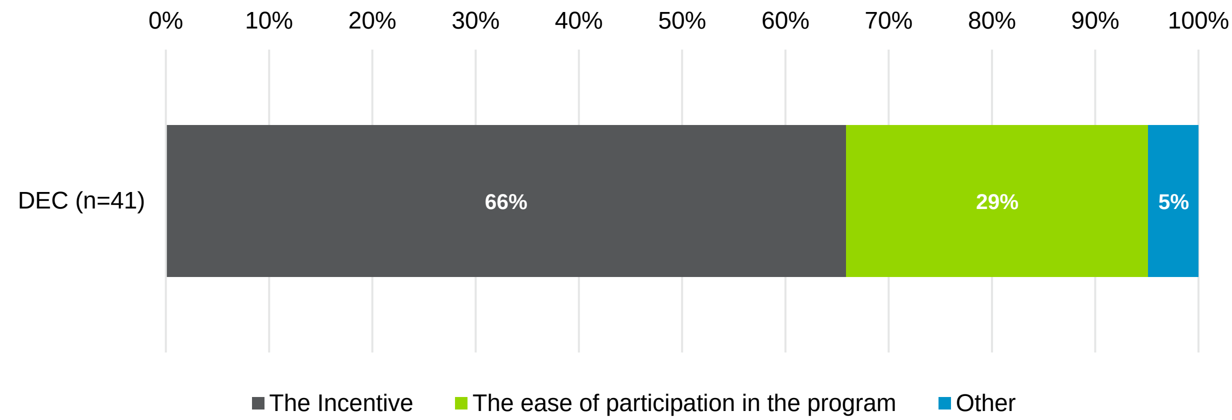
The incentive is a major factor for respondent participation in the PowerShare program. Of DEC survey respondents, 75% reported that incentives helping lower their overall energy bill was the main *motivation* to participate in the program. As shown in Figure 4, participants also report the incentive as a *strength* of the program. Of DEC respondents, 38% indicated that a primary strength of the program is that it provides valuable incentives that help reduce energy costs. Furthermore, the incentive was the main reason 66% of DEC respondents choose to continue in the program, as seen in Figure 5. These respondents also felt that their participation allowed Duke Energy to provide consistent, reliable energy to its customers while avoiding building additional capacity.

Figure 4. What do you think are the program strengths? (multiple response)



Source: Navigant analysis

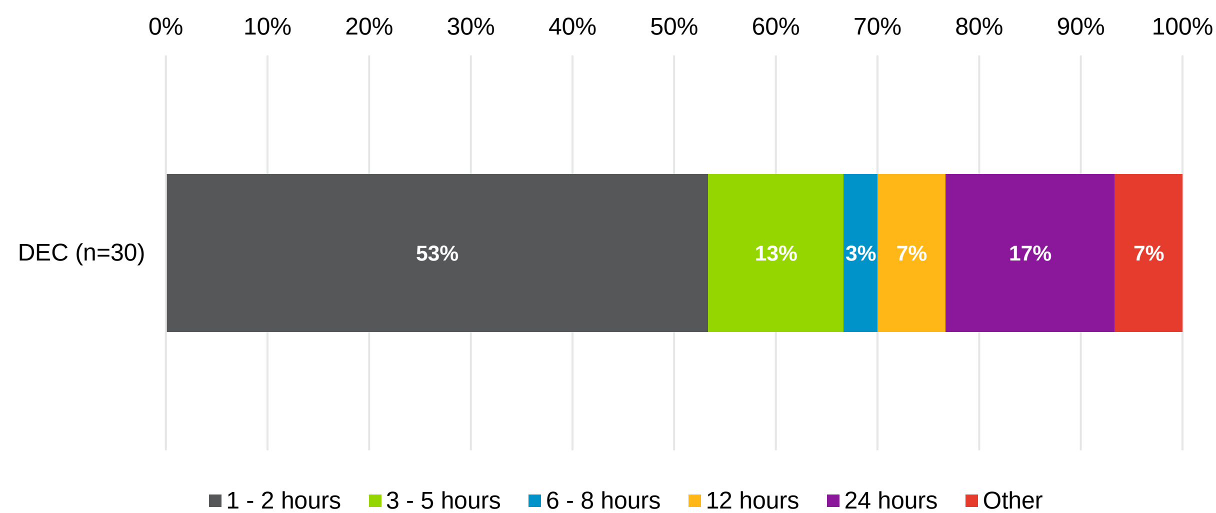
Figure 5. What aspects of the program encourage a customer to continue in the program? (multiple response)



Source: Navigant analysis

Figure 6 shows that 53% of the DEC survey respondents thought a 1- to 2-hour notification prior to a DR event was reasonable, while 17% thought a 24-hour notice was the minimum they needed.

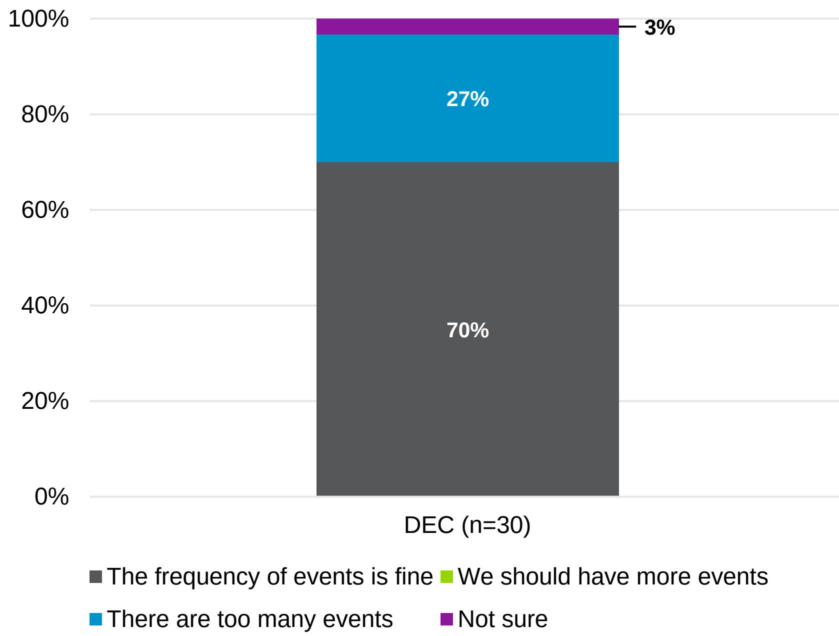
Figure 6. What is the minimum amount of time you would like to be notified ahead of a curtailment event?



Source: Navigant analysis

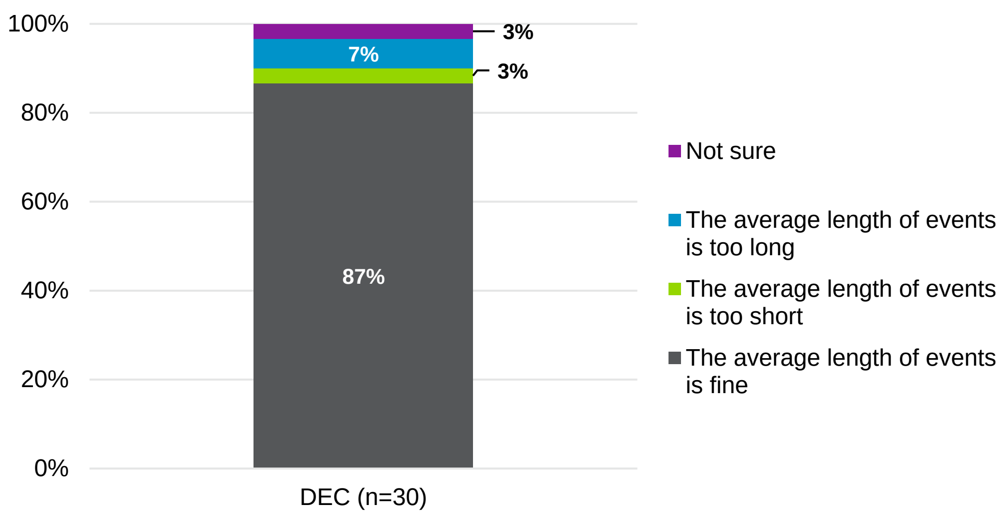
As seen in Figure 7 and Figure 8, 70% of DEC participants thought the frequency of events was reasonable, and 87% felt the length of the events was acceptable as well.

Figure 7. What are your thoughts on the frequency of events?



Source: Navigant analysis

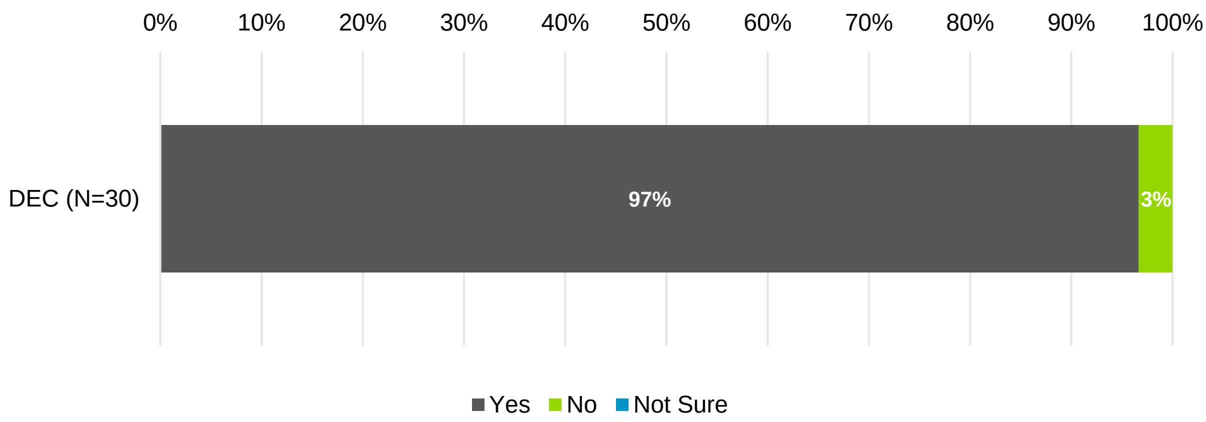
Figure 8. What are your thoughts on the duration of events?



Source: Navigant analysis

Most DEC survey respondents (97%) could meet their curtailment load during an event, as shown in Figure 9. For those participants not able to reduce their load to contracted levels, the timing of the event came at critical production times.

Figure 9. Are you able to meet curtailment?



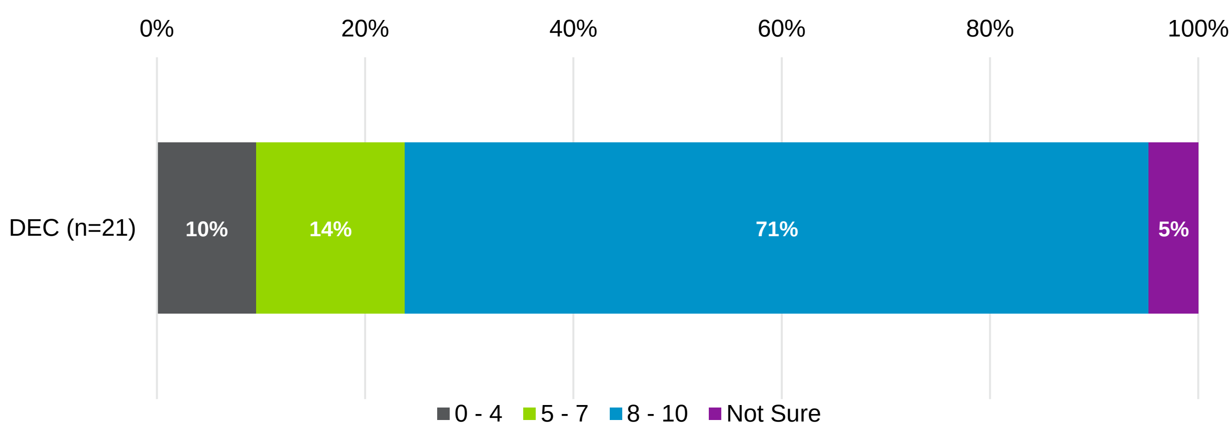
Source: Navigant analysis

3.3 Areas for Improvement

While the PowerShare program is well-liked by participants, there are some opportunities for improvement.

Even though the incentive is the main reason for participation, 29% of DEC respondents do not have a strong understanding of how the incentive is calculated, as shown in Figure 10 as the sum of responses of 7 or less and those who reported “not sure”.

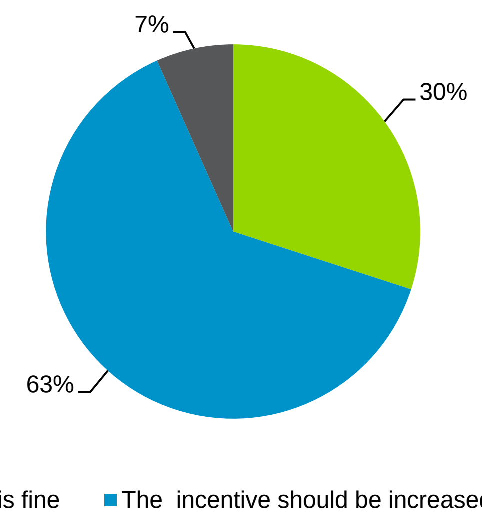
Figure 10. How well do you understand the incentive you receive for the load curtailed?



Source: Navigant analysis

As seen in Figure 11, the majority of DEC PowerShare respondents (63%) thought the incentive level should be increased.

Figure 11. What are your thoughts on the PowerShare incentives? (n=30)



Source: Navigant analysis

The program staff and Account Executive interviews also found that PowerShare participants do not receive communication at the end of the season thanking them for participating and ensuring they understand the results of the program. While most Account Executives do conduct an annual DR review with their customers, Duke Energy could increase its efforts to acknowledge/thank participants for contributing to load management and ensuring that participants fully understand their performance and credits. This acknowledgement might go a long way toward participants feeling appreciated and a part of a larger initiative to manage peak demand.

3.4 Barriers to Program Participation

As mentioned in the discussion above Figure 4, the monthly incentive is one of the main motivators for respondent participation in the program. However, the financial benefit of participating is offset by the following costs to the participant:

- Loss of production
- Not meeting manufacturing deadlines
- Impact to employee wages

Duke Energy must continue to review the benefit of the incentive levels to ensure they help offset these costs while remaining a cost-effective program.

The evaluation team also identified the following other barriers to participation:

- If the cost of electricity is a small percentage of overall business costs, a customer will likely not participate.
- While the concept of how to participate in the PowerShare program is easy to understand, understanding the specifics of the performance report can be confusing.

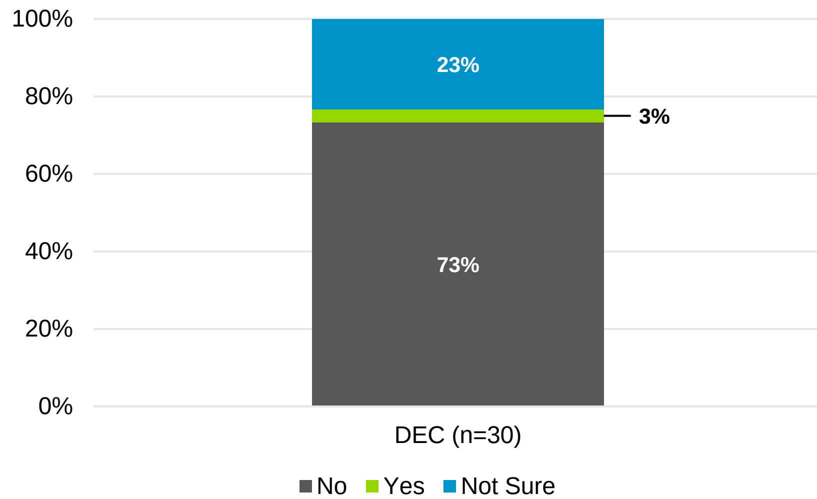
3.5 Opportunities to Increase Enrolled Capacity

Only 3% of DEC respondents were planning on increasing their curtailable load, as shown in Figure 12. This is interesting when 97% of these same respondents were able to meet their curtailment load.

There is also potential to increase the curtailment load by customers in certain segments:

- Customers with EPA-compliant onsite backup generators such as hospitals
- Customers who have a tight profit margin and may benefit from the monthly incentives

Figure 12. Do you have plans to increase the kW enrolled for curtailment?



Source: Navigant analysis

3.6 Opportunities to Improve Program Implementation

Both Duke Energy Account Executives and the survey respondents reported that participants would benefit from near real-time usage data on their load reductions. The ability to monitor the status of their actual curtailment compared to their contracted curtailment at the time of the event will provide participants the information needed to know if additional equipment should be shut down. If Duke Energy could create a web portal, app, or other means of accessing performance data quicker than waiting for their next bill or reviewing EPO the day following an event, participants would be more highly satisfied and could potentially also improve their overall curtailment capabilities. Providing near real-time usage data to the customer may help Duke Energy increase its curtailed load if the participant is able to identify other lines or processes that could be shut down during the event.

As mentioned in Section 3.4, respondents weighed the benefits of participating in a curtailment event against negative impacts to their business such as lost production, lost wages, and missing deadlines. Having the most current information on curtailment schedule changes helps the participant determine if they need to notify their employees of schedule or production changes. It should be noted that Duke Energy does provide participants with the ability to view curtailment schedules for each event through EPO, but some survey respondents indicated a need for additional notification of events. Official event notification occurs via the participant's preferred communication channel (e.g. email, text, phone). But Duke Energy may be able to improve participant understanding by providing further communication with participants to ensure they know where to look for event schedules and/or to provide additional notifications via the preferred notification channels.

Supporting the PowerShare program is one of the many responsibilities of an Account Executive. Helping to minimize their workload will improve the efficiency and implementation of the program. The following program delivery considerations can help the Account Executives sell and administer the PowerShare program more efficiently:

- During curtailment season, provide a daily status update email to all Account Executives that they can edit and send out to their specific customers. One Account Executive indicated that it would be helpful for this email to contain information about weather, generation status, and the likelihood of an event being called during a given day.
- Similar to other energy efficiency programs, have a team to support the Account Executives in enrolling customers in the program and writing the curtailment agreements

4. POWERSHARE PROGRAM EVALUATION RECOMMENDATIONS

The following tables present a summary of the findings from the PY2018 program evaluation and associated recommendations. The findings and recommendations are categorized into process improvements, curtailment improvements, and opportunities to increase the enrolled load. Navigant developed these findings and recommendations by synthesizing the information collected during the interviews and surveys performed during this evaluation cycle. This process generated the following list of *potential* program improvements. Navigant does not suggest that all should be pursued or that any one recommendation is needed to maintain an effective program with high customer satisfaction; however, they are listed here for Duke Energy to consider.

4.1 Process Improvements

#	Finding	Recommendation	Status of Recommendation
1	Participants are not acknowledged/thanked for their contribution.	Consider sending an end of season thank you as a nice goodwill gesture. Include total program impact.	Under consideration
3	Participants seem to understand the program in face-to-face interactions, but they report the performance report is confusing and may be a deterrent to participation.	Consider ways to simplify the performance report.	Under consideration
4	Some participants do not understand how their incentives are calculated.	Consider providing a simple breakdown of the incentive structure and how the pro forma is calculated to allow Account Executives and participants to find and use existing information. Consider ways to ensure that participants know where to find this information.	Under consideration

4.2 Curtailment Improvements

#	Finding	Recommendation	Status of Recommendation
1	Participants lack access to near real-time usage data and need faster performance feedback.	Consider providing access to near real-time usage data through a web portal or other platform.	Under consideration
2	Some participants would like more notification time.	When possible, offer earlier notification.	Under consideration
3	Due to the difficulty of shutting down, the length of the curtailment period needs to be worth it.	Consider possibility of making all curtailments 3 hours or longer.	Under consideration

4.3 Opportunities to Increase Enrolled Load

#	Finding	Recommendation	Status of Recommendation
1	Certain customer segments may have higher potential for enrolled load.	Periodically revisit program participation opportunities with customers that have EPA-compliant onsite generators (such as hospitals) and those with tight profit margins (such as quarries and textiles). Existing participants may find opportunity to increase enrolled load, and there may be opportunity to recruit additional participants.	Under consideration

Energy Efficiency Education in Schools Program Year 2017 – 2018 Evaluation Report

Submitted to Duke Energy Carolinas and Progress in partnership with Research into Action

March 20th, 2019

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1 Executive Summary

1.1 Program Summary

The Energy Efficiency Education in Schools Program is a Duke Energy Carolinas (DEC) and 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 DEC and 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 2017 through July 2018.

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 2017-2018 DEC and DEP NTC 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 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: 2017-2018 DEC Savings per Kit

Measurement	Reported	Realization Rate	Gross Verified	Net-to-Gross Ratio	Net Verified
Energy (kWh)	201.0	135.0%	271.3	0.94	254.1
Summer Demand (kW)	0.054	61.7%	0.034		0.031
Winter Demand (kW)	N/A	N/A	0.048		0.045

*Values may appear inaccurate due to rounding errors

Table 1-2: 2017-2018 DEC Program Level Savings

Measurement	Reported	Realization Rate	Gross Verified*	Net-to-Gross Ratio	Net Verified*
Energy (kWh)	4,655,361	135.0%	6,283,232	0.94	5,884,250
Summer Demand (kW)	1260.7	61.7%	777.7		723.5
Winter Demand (kW)	N/A	N/A	1,113.4		1,036.4

* Values may appear inaccurate due to rounding errors

Table 1-3 and Table 1-4 present the summarized findings of the DEP impact evaluation.

Table 1-3: 2017-2018 DEP Savings per Kit

Measurement	Reported	Realization Rate	Gross Verified*	Net-to-Gross Ratio	Net Verified*
Energy (kWh)	276.4	124.3%	343.5	0.92	317.5
Summer Demand (kW)	0.079	52.5%	0.041		0.038
Winter Demand (kW)	N/A	N/A	0.064		0.059

* Values may appear inaccurate due to rounding errors

Table 1-4: 2017-2018 DEP Program Level Savings

Measurement	Reported	Realization Rate	Gross Verified*	Net-to-Gross Ratio	Net Verified*
Energy (kWh)	2,494,510	124.3%	3,055,293	0.92	2,865,616
Summer Demand (kW)	711.0	52.5%	373.1		343.0
Winter Demand (kW)	N/A	N/A	581.0		534.1

* Values may appear inaccurate due to rounding errors

Figure 1-1 and Figure 1-2 provide the verified energy saving share by measure for DEC and DEP, respectively.

Figure 1-1: 2017-2018 DEC NTC Gross Verified Energy Savings

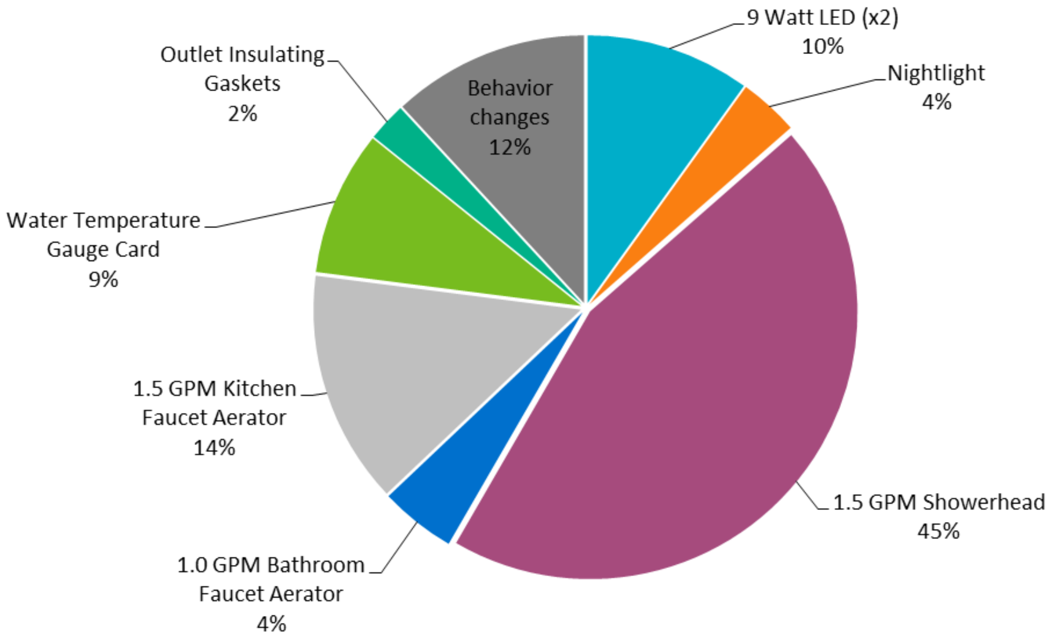


Figure 1-2: 2017-2018 DEP NTC Gross Verified Energy Savings

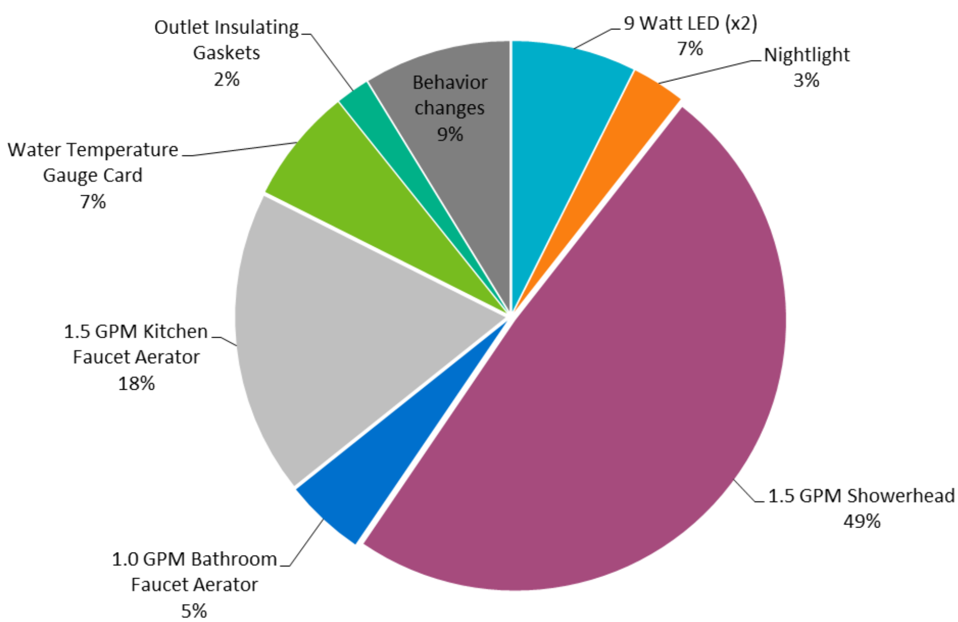


Table 1-5 and Table 1-6 provide gross verified energy and demand savings by measure and net to gross ratio details for DEC and DEP, respectively.

Table 1-5: DEC NTC Program Year 2017-2018 Verified Impacts by Measure

Measure	Gross Energy Savings per unit (kWh)	Gross Summer Demand per unit (kW)	Gross Winter Demand per unit (kW)	Free Ridership	Spillover	Net to Gross Ratio
9 Watt LED*	27.0	0.005	0.002	0.16	0.09	0.93
Nightlight	9.8	0.000	0.000			
1.5 GPM Showerhead	121.6	0.010	0.027			
1.0 GPM Bathroom Faucet Aerator	12.4	0.002	0.003			
1.5 GPM Kitchen Faucet Aerator	38.2	0.005	0.008			
Water Temperature Gauge Card	23.7	0.003	0.005			
Outlet Insulating Gaskets	6.3	0.008	0.000			
Behavioral Changes	32.3	0.001	0.002	-	-	1.00
Total Kit and Behavioral Impacts	**271.3**	**0.034**	**0.048**	**0.16**	**0.09**	**0.94**

*Reflects savings for two 9 watt LEDs bulbs

Table 1-6: DEP NTC Program Year 2017-2018 Verified Impacts by Measure

Measure	Gross Energy Savings per unit (kWh)	Gross Summer Demand per unit (kW)	Gross Winter Demand per unit (kW)	Free Ridership	Spillover	Net to Gross Ratio
9 Watt LED*	25.4	0.004	0.002	0.13	0.05	0.92
Nightlight	10.9	0.000	0.000			
1.5 GPM Showerhead	168.1	0.013	0.038			
1.0 GPM Bathroom Faucet Aerator	16.4	0.002	0.004			
1.5 GPM Kitchen Faucet Aerator	62.3	0.008	0.014			
Water Temperature Gauge Card	23.5	0.003	0.005			
Outlet Insulating Gaskets	6.8	0.009	0.000			
Behavioral Changes	30.1	0.001	0.001	-	-	1.00
Total Kit and Behavioral Impacts	**343.5**	**0.041**	**0.064**	**0.13**	**0.05**	**0.92**

*Reflects savings for two 9 watt LEDs bulbs

1.2.2 Process Evaluation

The process evaluation assessed opportunities for improving the program's design and delivery in DEC and DEP service territories. 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 phone (n=74 DEC and n=70 DEP) and web surveys (n=260 DEC and n=102 DEP) with student families that received a kit and teachers who attended the performance (n=44 DEC and n=29 DEP). The team also conducted in-depth interviews with utility staff, NTC staff, and ten teachers (five in DEC territory and five in DEP territory) who completed the web survey.

Program Successes

The 2017-2018 DEC and DEP NTC program evaluation's found successes in the following areas:

Teachers and parents are aware of Duke Energy sponsorship of the kits. Most parents (94% in DEC and 88% in DEP) and teachers (84% in DEC and 79% in DEP) knew that Duke Energy sponsored the kits. Parents became aware of Duke Energy sponsorship via the materials their children brought home (58% in DEC and 57% in DEP), or via engagement by their school or teacher (29% in DEC and 30% in DEP). DEC teachers most commonly became aware via communication from other teachers (14 of 37), whereas DEP teachers more commonly reported learning about Duke's sponsorship via marketing materials (8 of 23) and NTC staff (8 of 23).

Parents largely learned about Duke Energy kits from materials brought home by child. About three-quarters (75% in DEC and 72% in DEP) of parents learned about the kits from program engagement materials their children brought home. Lesser reported ways included school newsletters (17% in DEC and 11% in DEP) and emails from their children's teacher or school (14% in DEC and 13% in DEP).

Teachers were highly satisfied with the performance reporting that the performance was not missing important components, was age appropriate for most students, and engaged students. Nearly all stated they were "highly satisfied" (39 of 44 in DEC and 25 of 29 in DEP), most noted the performance was not missing important concepts (43 of 44 in DEC and 28 of 29 in DEP), and most noted the performance was age appropriate (40 of 44 in DEC and 27 of 29 in DEP). All interviewed teachers reported the performance was engaging, humorous, and effective.

Distribution of kit request forms goes well. Teachers reported no problems receiving kit request forms and almost all (42 of 44 in DEC and 28 of 29 in DEP) noted they distributed the forms to their students, typically immediately after the performance.

Student families are highly satisfied with kit items. Respondents were highly satisfied with all measures, especially the lighting items (Figure 1-3 and Figure 1-4).

Figure 1-3: DEC Kit Recipient Satisfaction with Installed Measures

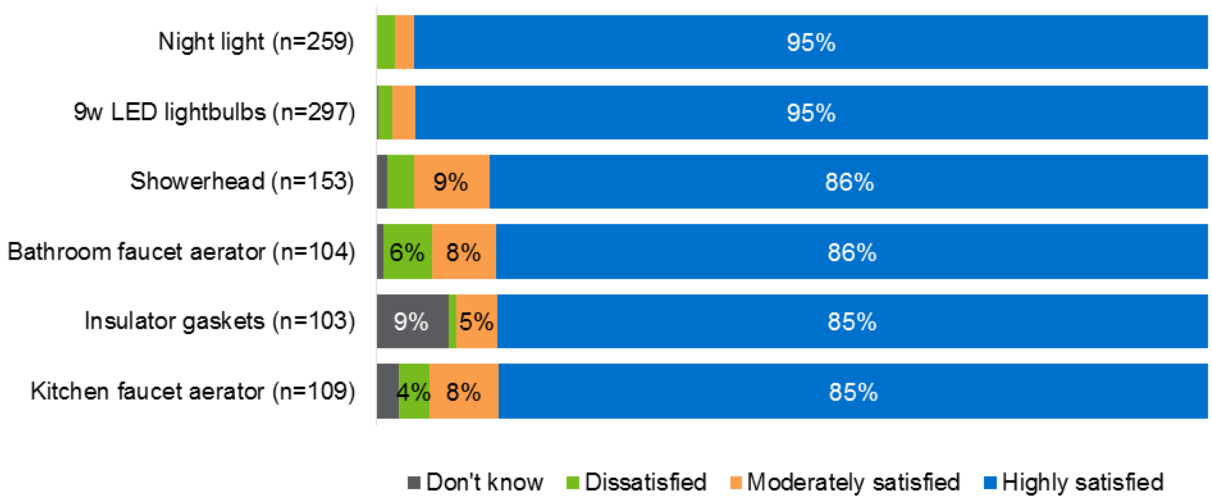
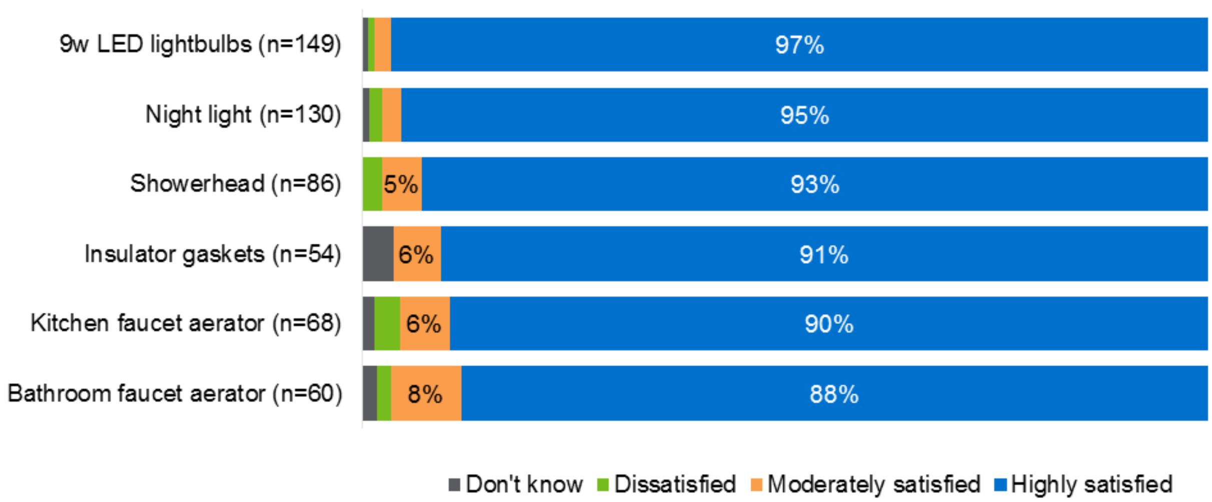


Figure 1-4: DEP Kit Recipient Satisfaction with Installed Measures



Many kit recipients value the educational information in the kit. About three-quarters of respondents (73% in DEC and 74% of DEP) read the energy saving educational information in the kit and most of those reported it was "highly helpful."

The program influenced some families to adopt energy saving behaviors. In both the DEC and DEP territories, about half of parents and half of children adopted new energy saving behaviors since receiving their kit. Parents most commonly said that their child now turns off lights when not using a room and parents noted they had changed their thermostat settings.

Program Challenges

The 2017-2018 NTC program evaluation met some challenges in the following areas:

Instructional material use is limited. Teachers reported distributing kit request forms to their students yet noted limited use of the instructional materials associated with the performance. Although about half of respondents in DEC territory (29 of 44) and DEP territory (12 of 29) reported receiving the educational materials, those that received them either did not use the materials or used them in a limited way. Of those that used the materials, teachers deemed them "somewhat useful" at best. Additionally, use of online materials was limited.

There is variation in teacher efforts to encourage kit requests. All teachers encouraged their students to request kits, but they varied in the tenacity of their approach. Almost all reported vocally encouraging students (40 of 44 in DEC and 24 of 29 in DEP) and to request a kit, but far fewer reported taking additional actions (e.g., sending reminders to parents or awarding prizes to students who request kits).

There may be opportunities to get families to install more kit measures. Most parent respondents noted they installed at least one measure in the kit, but few install all measures. Most student families installed the LED lights and the nightlights, however far fewer installed the water saving measures or the insulator gaskets.

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 satisfy teachers by engaging students. It is less clear that the performances are linked to classroom learning, awareness at home, or change in behavior. Teachers reported high satisfaction with the performance and recalled that the performance engaged students. However, curriculum materials were not always distributed or remembered by teachers, and those who used them did so in a limited way.

Parents were often not aware the performance occurred and about half of parents reported changes in their or their children's energy use behavior but those changes in behavior were limited.

Recommendation: Consider exploring ways to increase teacher receipt and use of materials, such as:

- Making sure teachers are aware that NTC aligns their materials with state science standards, and
- Requesting that teachers align energy-focused lesson plans with performance timing.

Conclusion 2: There is an opportunity to increase parental awareness of the kits and thus get more families to request and install kits. Currently, students bear the bulk of the burden of generating parental awareness of the kit opportunity. Although most teachers engage students on the kit request process, only about half engage parents. Parent surveys corroborate this lack of teacher to parent engagement on the kits; few parents mentioned their child's teacher or school as the source of awareness of the kit (instead, most parents learned about the kit from their child). Additionally, two-thirds of parents did not know kits were associated with a performance and instructional materials. Although about one-third of teachers follow-up with students to see if parents requested kits, there is great variation in how much emphasis teachers place on promoting the kits.

Further, the contests appear to have limited success in encouraging kit requests, as a) only one teacher mentioned using the contests to encourage kit requests, and b) the household- and school-level contests had particularly low influence on parent motivations to get a kit.

> **Recommendation:** Explore ways to increase parent awareness of and motivation for requesting the kits. For example: create a household-level contest that engages both students and their parents, so students are motivated to ask their parents to sign up and so parents are motivated to participate. For example, in addition to a cash prize drawing for parents, include a prize drawing aimed at students (e.g., toys, electronics, or other items valued by students) or a guaranteed incentive such as a coupon for pizza (e.g., Book It model).

Conclusion 3: The program influences families to save energy. Families save energy they would not have saved without receiving the kits. Nearly all respondents installed at least one kit measure, and few would have installed the kit measures if they had not received them for free from the program (as evidenced by low free-ridership rates). About one-fifth of parent respondents reported making additional energy saving improvements, and over half of parent respondents said they or their children adopted new energy saving behaviors since receiving the kit.

> **Recommendation:** Continue engaging student family households with the Education program.

Conclusion 4: The Education program could be a good "gateway" program to generate even more energy savings in Duke Energy territories. Kit recipients could be good targets for other Duke Energy efficiency program promotions, as they:

- Demonstrated willingness to save energy in their home

- Expressed interest in installing additional kit items or other energy saving measures (many of which Duke Energy currently incents)
- Are highly likely to read any information included with the kit
- Are commonly single family homeowners

Recommendations: Leverage kits to promote other Duke Energy efficiency programs, such as targeting these households for direct mail campaigns or including information on Smart $aver in the kit.

Conclusion 5: Energy savings could be increased by encouraging partipants to install LED lamps as soon as they are received and in higher usage areas. LED lamp in-service rates (ISR) measured just below 80% for both DEC and DEP. This included some participants who store the LED kit lamp until a similar lamp in the home burns-out. Continue to encourage participants to install the lamps as soon as the kit is received can increase LED lamp in-service rates and generate additional savings for the program.

Most kit lamps were installed in rooms with average (2 to 4 hour) daily lighting usage, while very few lamps were installed in high use locations such as kitchens or exterior fixtures (Table 1-7). Installation of lamps in high usage areas will results in higher energy savings.

Table 1-7: Lamp HOU Installation Rates

Daily Lamp Use*	DEC Installation Rate	DEP Installation Rate
Low (< 2 hours)	43%	44%
Average (2-4 hours)	36%	32%
High (> 4 hours)	21%	24%

*Based on the participant survey responses

Recommendations: Program should continue to encourage lamp installations as soon as possible informing them where their new lamps can save the most energy. Alternatively, consider swapping out one of the A-shape LEDs with a lamp, such as an LED PAR, that may be more applicable to higher use areas like the kitchen.

Conclusion 6: Water-related measures drive savings, but installation rates are low. Water measures contributed the majority of verified savings (DEC 74%, DEP 80%), yet fewer than half of all participants installed an aerator or showerhead (Table 1-8).

Table 1-8: Water Measure In-Service Rates

Measure	DEC ISR	DEP ISR
Kitchen Faucet Aerator	30%	40%
Bathroom Faucet Aerator	30%	34%
Showerhead	42%	50%

*Based on the participant survey responses

Recommendations: Review water savings measures' satisfaction and dislikes as well as elicit feedback from Save Energy and Water Kit Program to determine if there are ways to improve the ISR for water measures.

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 Carolinas (DEC) and 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, including a take-home form that students and parents can complete to receive an energy efficiency starter kit (kit) from Duke Energy; 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 request the kits.

The program can achieve energy savings in two ways:

1. Through the installation of specific energy efficiency measures provided in the kit.
2. By increasing students' and their families' awareness about energy conservation and engaging them to change behaviors to reduce energy consumption.

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: 2017-2018 Kit Measures

Measures	Details
9 Watt LED	2 bulbs
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 each utility 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: Kilowatt Kitchen for elementary age students (Kindergarten through sixth grade) and The E-Team 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 their utility 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 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 to 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 ($2,500). The utilities use 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 Energy 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. Because some school districts may straddle a Duke territory and a non-Duke territory, the kit contents will differ if a family is a Duke utility (DEP or DEC) customer versus a non-Duke Energy customer (Table 2-2).[1]

Table 2-2: Measures Received by Customer Type

Measures	Duke Energy Customer	Non-Duke Energy Customer
1.5 GPM Showerhead	✓	
1.5 GPM Kitchen Faucet Aerator	✓	
1.0 GPM Bathroom Faucet Aerator	✓	
Water flow meter bag	✓	
Water Temperature Gauge Card	✓	✓
9 Watt LEDs	✓	
LED Nightlight	✓	✓
Outlet Insulating Gaskets	✓	✓
Energy savers booklet	✓	✓
Product information and instruction sheet	✓	
Glow ring toy	✓	✓

2.2.5 Participation

For the defined evaluation period of September 2017 through May 2018, the program recorded a total of 23,161 kit recipients in DEC and 9,025 kit recipients in DEP. 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] Only Duke customers were surveyed for the evaluation

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 DEC and DEP NTC programs:

- 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 DEC and DEP service territory. It specifically documented teacher, student, and parent 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 DEC or DEP sponsorship of the program?
  - Is there a need to increase this awareness?
- **Program experience and satisfaction:**
  - How satisfied are teachers with the NTC performance and program curriculum in terms of ease of use ability to engage and motivate students to conserve energy at home?
  - How satisfied are student families with the measures in the kit and to what extent do the kits motivate families to save energy?

[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.

- **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 outlined goals:

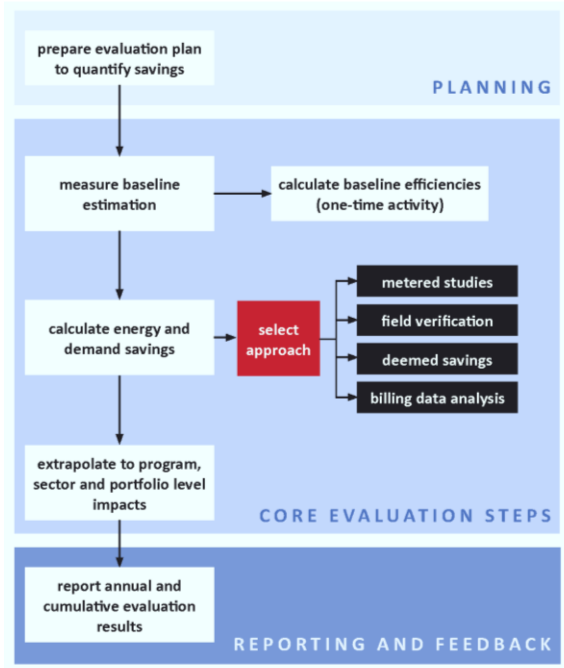
- **Task 1 –** Develop and manage evaluation work plan to describe the processes that will be followed to complete the evaluation tasks outlined in this project;
- **Task 2 –** Conduct a process review to determine how successfully the programs are being delivered to participants and to identify opportunities 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 2017 - 2018 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 applied 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 2-3 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. These surveys served both the process and impact evaluation work.

The team also held in-depth interviews (IDI) with utility staff, implementation staff, and teachers. Table 2-3 provides a summary of the evaluation team activities.

Table 2-3: DEC and DEP NTC Summary of Evaluation Activities

Target Group	Method	Duke Energy Carolinas (DEC)			Duke Energy Progress (DEP)		
		Population	Sample	C/P	Population	Sample	C/P
Impact Activities							
Participants	Phone/Web Survey	23,161	334	90/5	9,025	172	90/6
Process Activities							
Duke Energy Program Staff	Phone IDI	n/a	1	n/a	n/a	1	n/a
Implementer Staff: NTC	Phone IDI	n/a	1	n/a	n/a	1	n/a
Implementer Staff: R1	Phone IDI	n/a	1	n/a	n/a	1	n/a
Teachers who attended a NTC workshop	Web Survey	Unknown	44[a]	90/12	Unknown	29[b]	90/17
Participating teacher follow-up interviews	Phone IDI	Unknown	5	n/a	Unknown	5	n/a
Participants – student families who received a kit and are Duke customers	Phone/Web Survey	23,161	334	95/5	9,025	172	90/6

[a] 34 elementary teachers and 10 middle school teachers
[b] 19 elementary teachers and 10 middle school teachers

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 2017 through July 2018. 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 DEC and DEP 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

DEC and 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. Since DEC and DEP were 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.

DEC and DEP provided ex-ante, or deemed, energy and summer demand savings values at the kit-level; however, they did not have measure-level ex-ante energy savings available nor winter demand savings at the kit-level. Because measure-level energy and demand savings and kit-level winter demand savings were not provided, realization rates could only be calculated at the kit-level for energy and summer demand savings.

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 a prior Energy Efficiency Education in Schools evaluation conducted in Duke Energy Carolinas. The benchmarking review illustrated variations in deemed savings among each source for each given measure, with much of the variation reflecting different baseline, household size, or water temperature assumptions. The evaluation team ultimately used assumptions outlined by the Mid-Atlantic and Pennsylvania TRMs (see section 3.4.4) to better capture region-specific assumptions such as water temperature.

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 23,161 participants for DEC and 9,025 participants for DEP within our defined evaluation period.

Based on the populations of 23,161 and 9,025 participants, the evaluation team established sub-sample frames for phone and web-based survey administration. As illustrated in Table 3-1 and Table 3-2 below, we completed a total of 334 DEC and 172 DEP surveys. This sample size resulted in an achieved confidence and precision of 90/4.5 and 90/6.2 for DEC and DEP, respectively.

Table 3-1: DEC NTC Impact Sampling

Survey Mode	Population*	Sampled Participants	Achieved Confidence/ Precisions**
Phone	7,953	74	90/4.5
Web-based	11,629	260	
Total	**19,582**	**334**	

*Sampling population excludes participants flagged as "do not contact"
**Based on full population of 23,161 participants

Table 3-2: DEP NTC Impact Sampling

Survey Mode	Population*	Sampled Participants	Achieved Confidence/ Precisions**
Phone	2,406	70	90/6.2
Web-based	4,037	102	
Total	**6,443**	**172**	

*Sampling population excludes participants flagged as "do not contact"
**Based on full population of 9,025 participants

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 from the 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
9 Watt LEDs 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	Gauge 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 LED each, and five customers reported to still have the LED 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 3-4 and Table 3-5 for DEC and DEP, respectively.

Table 3-4: DEC NTC In-Service Rates

Measure	Distributed	Installed	Removed	ISR
9 Watt LEDs[1]	668	528	10	78%
Nightlight	334	259	8	75%
1.5 GPM Showerhead	334	153	13	42%
1.0 GPM Bathroom Faucet Aerator	334	104	4	30%
1.5 GPM Kitchen Faucet Aerator	334	109	10	30%
Water Temperature Gauge Card	334	57	2	16%
Outlet Insulating Gaskets[2]	4,008	620	2	15%

[1]Note that two 9 watt LEDs were included in each kit.

[2]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.

Table 3-5: DEP NTC In-Service Rates

Measure	Distributed	Installed	Removed	ISR
9 Watt LEDs[1]	344	266	1	77%
Nightlight	172	130	1	75%
1.5 GPM Showerhead	172	86	0	50%
1.0 GPM Bathroom Faucet Aerator	172	60	1	34%
1.5 GPM Kitchen Faucet Aerator	172	68	0	40%
Water Temperature Gauge Card	172	25	2	13%
Outlet Insulating Gaskets[2]	2,064	345	0	17%

[1]Note that two 9 watt LEDs were included in each kit.

[2]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.

3.4.3 Lighting

The two lighting measures in the kit include two 9W LEDs and an LED nightlight. Equation 3-1, Equation 3-2, and Equation 3-3 outline the algorithms utilized to estimate savings accrued by the lighting measures, with key parameters defined in Table 3-6.

Equation 3-1: LED Bulb Energy Savings

$$\Delta kWh = \frac{Watts_{BASE} - Watts_{EE}}{1000\frac{W}{kW}} \times (1 + IE_{kWh}) \times 365.25\frac{days}{year} \times ISR$$

Equation 3-2: LED Nightlight Energy Savings

$$\Delta kWh = \frac{Watts_{BASE} \times HOU_{BASE} - Watts_{EE} \times HOU_{EE}}{1000\frac{W}{kW}} \times (1 + IE_{kWh}) \times 365.25\frac{days}{year} \times ISR$$

Equation 3-3: LED Bulb Demand Savings

$$\Delta kW = \frac{Watts_{BASE} - Watts_{EE}}{1000\frac{W}{kW}} \times CF \times (1 + IE_{kW}) \times IS$$

Table 3-6: Inputs for Lighting Measures Savings Calculations

Input	Units	DEC Value	DEP Value	Source
$Watts_{BASE}$	Watts	LED: 27.7 Nightlight: 3.2	LED: 26.8 Nightlight: 3.6	LED: Federal minimum standards; Survey responses Nightlight: Survey responses
$Watts_{EE}$	Watts	LED: 9 Nightlight: 0.03		Equipment specifications
HOU	Hours	LED: 2.71 Nightlight: 12 / 24	LED: 2.69 Nightlight: 12 / 24	LED: Opinion Dynamics - Energy Efficient Lighting & Retail LED Programs for Duke Energy Progress and Carolinas, April 2018; Survey responses; Nightlight (HOU_{BASE} / HOU_{EE}): Pennsylvannia 2016 TRM
CF_{SUMMER}	N/A	LED: 0.1283 Nightlight: 0.0000		LED: Opinion Dynamics - Energy Efficient Lighting & Retail LED Programs for Duke Energy Progress and Carolinas, April 2018 Nightlight: Pennsylvannia 2016 TRM
CF_{WINTER}	N/A	LED: 0.1454 Nightlight: 0.0000		LED: Opinion Dynamics - Energy Efficient Lighting & Retail LED Programs for Duke Energy Progress and Carolinas, April 2018 Nightlight: Pennsylvannia 2016 TRM
IE_{kWh}	N/A	-6%		Opinion Dynamics - Energy Efficient Lighting & Retail LED Programs for Duke Energy Progress and Carolinas, April 2018
$IE_{kW\text{-}SUMMER}$	N/A	+27%		Opinion Dynamics - Energy Efficient Lighting & Retail LED Programs for Duke Energy Progress and Carolinas, April 2018
$IE_{kW\text{-}WINTER}$	N/A	-50%		Opinion Dynamics - Energy Efficient Lighting & Retail LED Programs for Duke Energy Progress and Carolinas, April 2018
ISR	N/A	LED: 78% Nightlight: 75%	LED: 77% Nightlight: 75%	Survey responses

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 LED bulbs, the evaluation team used participant-reported lamp types (e.g., incandescent or CFL) and assigned the EISA-compliant bulb that would produce the same lumen output as the 9W LEDs from the kits. This resulted in the use of a 53W baseline for halogen lamps, a 43W baseline for incandescents, a 13W baseline for CFLs, and a 9W baseline for LEDs. The final baseline wattage applied in the evaluation is a blended average of all the reported lamp technologies, which resulted in a lower wattage than would be assumed if we relied on the Uniform Methods Project least efficient baseline approach. Using a blended average baseline wattage based on the participant survey results more accurately captures the diversity of bulbs replaced by the program participants and provides greater confidence in our savings estimates. Nightlights, which are not affected by EISA, were evaluated using a baseline wattage dependent on what the participant specified as the removed lamp.

Hours of use (HOU) for LED lighting was based on the 2018 Duke Energy Progress & Duke Energy Carolinas Energy Efficient Lighting & Retail LED Programs Evaluation Report, which estimated hours of use for 7 different room types. Based on installation locations from survey responses the evaluation estimated an average lighting hours of use of 2.71 for DEC and 2.69 for DEP.

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 3-7 and Table 3-8.

Table 3-7: DEC NTC Energy and Demand Savings, Lighting Measures

Kit Measure	Gross per bulb energy savings (kWh)	Gross per bulb summer demand savings (kW)	Gross per bulb winter demand savings (kW)
9W LED*	13.5	0.002	0.001
Nightlight	9.8	0.000	0.000

*Reflects savings per 9 watt LED bulb

Table 3-8: DEP NTC Energy and Demand Savings, Lighting Measures

Kit Measure	Gross per bulbenergy savings (kWh)	Gross per bulb demand savings (kW)	Gross per bulbwinter demand savings (kW)
9W LED*	12.7	0.002	0.001
Nightlight	10.9	0.000	0.000

*Reflects savings per 9 watt LED bulb

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 3-9.

Equation 3-4: Aerator Energy Savings

$$\Delta kWh = ISR \times ELEC \times \left[\frac{\Delta GPM \times T_{person/day} \times N_{persons} \times 365\,\frac{days}{year} \times DF \times \Delta T \times 8.3\,\frac{BTU}{gal \cdot °F}}{\#_{faucets} \times 3{,}412\,\frac{BTU}{kWh} \times RE}\right]$$

Equation 3-5: Showerhead Energy Savings

$$\Delta kWh = ISR \times ELEC \times \left[\frac{\Delta GPM \times T_{person/day} \times N_{persons} \times 365\,\frac{days}{year} \times N_{showers-day} \times \Delta T \times 8.3\,\frac{BTU}{gal \cdot °F}}{\#_{showers} \times 3{,}412\,\frac{BTU}{kWh} \times RE}\right]$$

Equation 3-6: Water Heater Setback Energy Savings

$$\Delta kWh = ISR \times ELEC \times \left[\frac{A_{tank} \times \Delta T \times 8760\frac{hrs}{yr}}{R_{tank} \times RE \times 3{,}412\frac{Btu}{kWh}} + \frac{V_{HW} \times \left(8.3\frac{lb}{gal}\right) \times \left(365\frac{days}{yr}\right) \times \left(1\frac{Btu}{°F \cdot lb}\right) \times \Delta T}{\left(3412\frac{Btu}{kWh}\right) \times EF_{WH}}\right]$$

Equation 3-7: Water Heating Measures Demand Savings

$$\Delta kW = ETDF \times \Delta kWh$$

Table 3-9: Inputs for Water Heating Measures Savings Calculations

Input	Units	DEC Value	DEP Value	Source
ISR	N/A	Bath: 30% Kitchen: 30% Shower: 42% Setback: 16%	Bath: 34% Kitchen: 40% Shower: 50% Setback: 13%	Survey responses
ELEC	N/A	Bath: 76% Kitchen: 75% Shower: 73% Setback: 64%	Bath: 90% Kitchen: 92% Shower: 87% Setback: 78%	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		Mid-Atlantic 2018 TRM
$N_{persons}$	Persons	Bath: 3.8 Kitchen: 3.8 Shower: 3.8	Bath: 3.7 Kitchen: 3.7 Shower: 3.7	Survey responses
$N_{showers\text{-}day}$	Showers per Day	Shower: 0.6		Mid-Atlantic 2018 TRM
DF	N/A	Bath: 70% Kitchen: 50%		Mid-Atlantic 2018 TRM
ΔT	°F	Bath: 25.1 Kitchen: 32.1 Shower: 44.1 Setback: 15.0		Mid-Atlantic 2018 TRM
$\#_{faucets}$	Units	Bath: 2.28 Kitchen: 1.0 Shower: 1.8		Bathroom: 2013 RASS Data[1] Kitchen: Pennsylvania 2016 TRM Showerhead: 2015 Residential Energy Consumption Survey - South Atlantic Region
$ETDF_{SUMMER}$	N/A	Bath: 0.00013 Kitchen: 0.00013 Shower: 0.00008		Pennsylvania 2016 TRM; Ratio of calculated measure demand to energy savings
$ETDF_{WINTER}$	N/A	Bath: 0.00022 Kitchen: 0.00022 Shower: 0.00022		TVA 2017 TRM; Ratio of calculated measure demand to energy savings
RE	N/A	98%		Mid-Atlantic 2018 TRM
A_{tank}	Ft^2	24.99		Mid-Atlantic 2018 TRM
R_{tank}	$°F \cdot ft^2 \cdot hr/BTU$	8.0		Mid-Atlantic 2018 TRM
V_{HW}	GPD	7.3		Pennsylvania 2016 TRM
EF_{WH}	N/A	0.945		Mid-Atlantic 2018 TRM

[1]Duke Energy 2013 Residential Appliance Saturation Survey. North and South Carolina respondents.

The evaluation team determined that the 2018 Mid-Atlantic and 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. Neither the Mid-Atlantic nor Pennsylvania TRM provide information on winter demand savings, therefore the evaluation team used assumptions from the 2017 Tennessee Valley Authority TRM to calculate winter demand 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 3-10 and Table 3-11.

Table 3-10: DEC NTC Gross Energy Savings, Water Heating Measures

Kit Measure	Gross per unit energy savings (kWh)	Gross per unit summer demand savings (kW)	Gross per unit winter demand savings (kW)
1.5 GPM Showerhead	121.6	0.010	0.027
1.0 GPM Bathroom Faucet Aerator	12.4	0.002	0.003
1.5 GPM Kitchen Faucet Aerator	38.2	0.005	0.008
Water Temperature Gauge Card	23.7	0.003	0.005

Table 3-11: DEP NTC Gross Energy Savings, Water Heating Measures

Kit Measure	Gross per unit energy savings (kWh)	Gross per unit summer demand savings (kW)	Gross per unit winter demand savings (kW)
1.5 GPM Showerhead	168.1	0.013	0.038
1.0 GPM Bathroom Faucet Aerator	16.4	0.002	0.004
1.5 GPM Kitchen Faucet Aerator	62.3	0.008	0.014
Water Temperature Gauge Card	23.5	0.003	0.005

3.4.5 Air Infiltration

Equation 3-8 and Equation 3-9 outline the algorithms utilized to estimate savings accrued by the outlet insulating gaskets. The parameters are defined in Table 3-12.

Equation 3-8: Air Infiltration Energy Savings

$$\Delta kWh = ISR \times gaskets \times \frac{\Delta CFM}{gasket} \times \frac{kWh}{CFM}$$

Equation 3-9: Air Infiltration Demand Savings

$$\Delta kW = ETDF \times \Delta kWh$$

Table 3-12: Inputs for Air Infiltration Measures Savings Calculations

Input	Units	DEC Value	DEP Value	Source
ISR	N/A	17.4%	16.7%	Survey responses
Gaskets per kit	N/A	12		Duke Energy Kit Materials
∆CFM/gasket	CFM	0.23		2015 DEC Energy Efficiency Education Program Evaluation Final Report
kWh/CFM	kWh/CFM	14.64	14.46	2016 Duke Energy RASS Data[1], 2015 DEC Energy Efficiency Education Program Evaluation Final Report
$ETDF_{SUMMER}$	N/A	0.00127		Pennsylvania 2016 TRM; Ratio of calculated measure demand to energy savings
$ETDF_{WINTER}$	N/A	0.00005		TVA 2017 TRM; Ratio of calculated measure demand to energy savings

[1]Duke Energy 2016 Residential Appliance Saturation Survey. DEC and DEP respondents.

Since very few regional or national studies exist that document outlet gasket savings this analysis used parameters estimated from a prior evaluation of the Energy Efficiency Education in Schools program conducted in the Duke Energy Carolinas service territory[3]. 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 2016 residential appliance saturation study to ensure the savings value represented the NTC program participants. All DEC and DEP 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 3-13 and Table 3-14.

Table 3-13: DEC NTC Gross Energy Savings, Air Infiltration Measures

Kit Measure	Gross per kit energy savings (kWh)	Gross per kit summer demand savings (kW)	Gross per kit winter demand savings (kW)
Outlet Gaskets*	6.3	0.0081	0.0003

*Reflects savings for the 12 outlet gaskets per kit

[3] The Cadmus Group (2015). *Duke Energy Carolinas' Energy Efficiency Education for Schools Program Evaluation*. Retrieved December 18, 2018 from https://dms.psc.sc.gov/Attachments/Matter/ab859368-1ab3-44e5-ad5d-d6a9fb6ba2f5

Table 3-14: DEP NTC Gross Energy Savings, Air Infiltration Measures

Kit Measure	Gross per kit energy savings (kWh)	Gross per kit summer demand savings (kW)	Gross per kit winter demand savings (kW)
Outlet Gaskets*	6.8	0.0086	0.0003

*Reflects savings for the 12 outlet gaskets per kit

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 and materials on saving energy have on your decision to make changes in your energy using behaviors?
- 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 3-15 and Table 3-16 for DEC and DEP, respectively.

Table 3-15: DEC Behavioral Savings In-Service Rates

Behavior	Child Adoption Rate	Parent Adoption Rate
Turn off lights	37%	10%
Turn off electronics	25%	16%
Take shorter showers	19%	16%
Turn off heat / CAC	N/A	5% / 12%
Change thermostat settings	N/A	22%
Use fans instead of CAC	N/A	15%

Table 3-16: DEP Behavioral Savings In-Service Rates

Behavior	Child Adoption Rate	Parent Adoption Rate
Turn off lights	32%	13%
Turn off electronics	27%	19%
Take shorter showers	16%	9%
Turn off heat / CAC	N/A	5% / 9%
Change thermostat settings	N/A	22%
Use fans instead of CAC	N/A	12%

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 3-17.

Table 3-17: Behavioral Savings Kit Influence Adjustment Factor

Influence Score	DEC Response Rate	DEP Response Rate
0	2.0%	3.2%
1	0.4%	0.0%
2	0.0%	0.8%
3	0.4%	1.6%
4	1.2%	0.0%
5	5.6%	5.6%
6	8.8%	2.4%
7	16.3%	16.8%
8	19.5%	13.6%
9	7.2%	8.0%
10	38.6%	51.3%
Weighted	**81%**	**83%**

Kit Informational Materials

The energy saving kit came with some literature on various other ways participants could save energy in their homes. 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, which seems counterintuitive. Nexant used the kit informational materials adjustment factor to correct for apparent bias in the self-reported answers on kit influence. Nexant found that 245 out of 334 respondents read the provided literature and set the adjustment factor at 73% for DEC and 128 out of 172 respondents read the provided literature and set the adjustment factor at 74% for DEP.

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%[4]. 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 (0.257 kWh DEC and 0.255 kWh DEP) to the decay coefficient (0.924 kWh DEC and 0.916 kWh DEP) 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 3-18 below provides the adjustment factors which are applied to the behavioral savings described in Section 3.4.6.2.

Table 3-18: Behavorial Savings Adjustment Factors

Adjustment Factor	DEC	DEP
In-service rate	Varies by measure	Varies by measure
Kit influence	81%	83%
Kit informational materials	73%	74%
Persistence	28%	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, Equation 3-2, and Equation 3-3) as illustrated in Equation 3-10 and Equation 3-11.

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[4] The persistence rate is calculated based on the ratio of the daily estimated savings impact (0.257 kWh DEC and 0.255 DEP) to the the daily rate of decay of savings (0.924 kWh DEC and 0.916 DEP). For both DEC and DEP this ratio is 28%.

[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.

Equation 3-10: 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 3-11: Turn Off Lights Demand Savings

$$\Delta kW = ETDF * kWh\ savings \times Adj.Factors$$

The calculations assumed the wattage of the lamps associated with the reported behavorial change was equivalent to the average reported baseline lamp wattage found in the lighting analysis of 27.7 watts for DEC and 26.8 watts for DEP. The hours of use term in the standard lighting equations 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 2018 DEP and DEC Energy Efficient Lighting and Retail LED Program Evaluation Report. 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	Bedroom	Kitchen	Bathroom	Basement	Outdoors	Don't Know
		3.23	**4.27**	**1.83**	**4.26**	**1.51**	**3.75**	**4.25**	**1.97**
Living Room	**3.23**	0.00	1.04	0.00	1.03	0.00	0.52	1.02	0.00
Dining Room	**4.27**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bedroom	**1.83**	1.40	2.44	0.00	2.43	0.00	1.92	2.42	0.14
Kitchen	**4.26**	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Bathroom	**1.51**	1.72	2.76	0.32	2.75	0.00	2.24	2.74	0.46
Basement	**3.75**	0.00	0.52	0.00	0.51	0.00	0.00	0.50	0.00
Outdoors	**4.25**	0.00	0.02	0.00	0.01	0.00	0.00	0.00	0.00
Don't Know	**1.97**	1.26	2.30	0.00	2.29	0.00	1.78	2.28	0.00

The evaluation team calculated the likely reduction in daily runtime to be 0.61 hours, or 222 hours annually. The savings were calculated and adjusted based on this key assumption.

Energy savings were calculated at 5.8 kWh for DEC and 5.6 kWh for DEP (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 3-19 and Table 3-20.

Table 3-19: DEC Behavioral Savings Achieved by Turning off Lights (per home)

Input	Units	Value	Source
Watts	Watts	27.7	Federal minimum standards
$HOU_{Reduced}$	Hours	0.61	Opinion Dynamics - Energy Efficient Lighting & Retail LED Programs for Duke Energy Progress and Carolinas, April 2018;
IE_{kWh}	N/A	-6%	Opinion Dynamics - Energy Efficient Lighting & Retail LED Programs for Duke Energy Progress and Carolinas, April 2018;
Summer Energy to Demand Factor ($ETDF_{SUMMER}$)	N/A	0.00017	Opinion Dynamics - Energy Efficient Lighting & Retail LED Programs for Duke Energy Progress and Carolinas, April 2018; Ratio of evaluated lighting measure demand to energy savings
Winter Energy to Demand Factor ($ETDF_{WINTER}$)	N/A	0.00008	Tennessee Valley Authority 2017 TRM; Ratio of evluated lighting measure demand to energy savings
Energy Savings	**kWh**	**5.8**	**Calculated from algorithm**
Summer Demand Savings	**kW**	**0.001**	**Calculated from algorithm**
Winter Demand Savings	**kW**	**0.0004**	**Calculated from algorithm**
Adjustment Factors			
ISR	**Influence**	**Kit Info.**	**Persistence**
Child: 37% Parent: 10%	81%	73%	28%
Savings from child behavior (Energy and Summer Demand):			**0.4 kWh; 0.0001 kW**
Savings from parent behavior (Energy and Summer Demand):			**0.1 kWh; 0.0000 kW**
Total Energy Savings:			**0.4 kWh**
Total Summer Demand Savings:			**0.0001 kW**
Total Winter Demand Savings:			**0.0000 kW**

*Totals may not sum to due to rounding

Table 3-20: DEP Behavioral Savings Achieved by Turning off Lights (per home)

Input	Units	Value	Source
Watts	Watts	26.8	Federal minimum standards
$HOU_{Reduced}$	Hours	0.61	Opinion Dynamics - Energy Efficient Lighting & Retail LED Programs for Duke Energy Progress and Carolinas, April 2018
IE_{kWh}	N/A	-6%	Opinion Dynamics - Energy Efficient Lighting & Retail LED Programs for Duke Energy Progress and Carolinas, April 2018
Summer Energy to Demand Factor ($ETDF_{SUMMER}$)	N/A	0.00018	Opinion Dynamics - Energy Efficient Lighting & Retail LED Programs for Duke Energy Progress and Carolinas, April 2018; Ratio of evaluated lighting measure demand to energy savings
Winter Energy to Demand Factor ($ETDF_{WINTER}$)	N/A	0.00008	Tennessee Valley Authority 2017 TRM; Ratio of evluated lighting measure demand to energy savings
Energy Savings	**kWh**	**5.6**	**Calculated from algorithm**
Summer Demand Savings	**kW**	**0.001**	**Calculated from algorithm**
Winter Demand Savings	**kW**	**0.0004**	**Calculated from algorithm**
Adjustment Factors			
ISR	**Influence**	**Kit Info.**	**Persistence**
Child: 32% Parent: 13%	83%	74%	28%
Savings from child behavior (Energy and Summer Demand):			**0.3 kWh; 0.0001 kW**
Savings from parent behavior (Energy and Summer Demand):			**0.1 kWh; 0.0000 kW**
Total Energy Savings:			**0.4 kWh**
Total Summer Demand Savings:			**0.0001 kW**
Total Winter Demand Savings:			**0.0000 kW**

*Totals may not sum to due to rounding

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 3-21) and used the average value as the calculated savings amount for this behavioral change.

Table 3-21: Smart Strip Savings

Source	Savings (kWh)
2016 Ameren Missouri Evaluation	54.0
Duke Energy Potential Study	74.5
Illinois 2018 TRM	55.0
Mid-Atlantic 2018 TRM	50.7
Pennsylvania 2016 TRM	61.1
Average	**59.0**

The demand savings were calculated from the energy savings using an assumed hours of use value of 6,351 and an assumed coincidence factor of 80%, both from the 2018 Mid-Atlantic TRM. Equation 3-12 and Equation 3-13 present the algorithms used to calculate energy and demand savings for the behavior change of turning off electronics.

Equation 3-12: Turn Off Electronics Energy Savings

$$\Delta kWh = Average\ of\ deemed\ savings \times Adj.Factors$$

Equation 3-13: Turn Off Electronics Demand Savings

$$\Delta kW = kWh\ savings/HOU \times CF \times Adj.Factors$$

Energy savings (before applying adjustment factors) were calculated at 59.0 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 3-22 and Table 3-35.

Table 3-22: DEC Behavioral Savings Achieved by Turning off Electronics

Input	Units	Value	Source
Summer Coincidence factor (CF)	N/A	0.8	Mid-Atlantic 2018 TRM
Winter Coincidence factor (CF)	N/A	0.8	Engineering Judgment
HOU	hours	6,351	Mid-Atlantic 2018 TRM
Energy Savings	**kWh**	**59.0**	**Average of TRMs and prior studies (see Table 3-21)**
Summer Demand Savings	**kW**	**0.007**	**Calculated from algorithm**
Winter Demand Savings	**kW**	**0.007**	**Calculated from algorithm**
ISR	**Influence**	**Kit Info.**	**Persistence**
Child: 25% Parent: 16%	81%	73%	28%
Savings from child behavior (Energy and Summer Demand):			**2.5 kWh; 0.0003 kW**
Savings from parent behavior (Energy and Summer Demand):			**1.6 kWh; 0.0002 kW**
Total Energy Savings:			**4.1 kWh**
Total Summer Demand Savings:			**0.0005 kW**
Total Winter Demand Savings:			**0.0005 kW**

*Totals may not sum to due to rounding

Table 3-23: DEP Behavioral Savings Achieved by Turning off Electronics

Input	Units	Value	Source
Summer Coincidence factor (CF)	N/A	0.8	Pennsylvania 2016 TRM
Winter Coincidence factor (CF)	N/A	0.8	Engineering Judgment
HOU	hours	6,351	Pennsylvania 2016 TRM
Energy Savings	**kWh**	**59.0**	**Average of TRMs and prior studies (see Table 3-21)**
Summer Demand Savings	**kW**	**0.007**	**Calculated from algorithm**
Winter Demand Savings	**kW**	**0.007**	**Calculated from algorithm**
ISR	**Influence**	**Kit Info.**	**Persistence**
Child: 27% Parent: 19%	83%	74%	28%
Savings from child behavior (Energy and Summer Demand):			**2.8 kWh; 0.0003 kW**
Savings from parent behavior (Energy and Summer Demand):			**1.9 kWh; 0.0002 kW**
Total Energy Savings:			**4.6 kWh**
Total Summer Demand Savings:			**0.0006 kW**
Total Winter Demand Savings:			**0.0000 kW**

*Totals may not sum to due to rounding

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 3-24.

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 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 3-14 and Equation 3-15, respectively.

Equation 3-14: 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 3-15: Take Shorter Shower Demand Savings

$$\Delta kW = ETDF \times Energy\ Savings \times Adj.Factors$$

Table 3-24: 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**

[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 2016 Indiana TRM, 2015 Illinois TRM, 2012 TVA Saturation Survey, 2015 Maine TRM, and the 2016 Pennsylvania TRM.

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 3-25 and Table 3-26.

Table 3-25: DEC Behavioral Savings Achieved by Taking Shorter Showers

Input	Units	Value	Source
GPM	GPM	1.96	Survey responses, Federal minimum standards
$T_{person/day}$	Minutes	3.47	Aquacraft 2011 Report
$N_{persons/day}$	Showers/Person/Day	0.6	Mid-Atlantic 2018 TRM
365	Days/Year	365	-
ΔT	°F	44.1	Mid-Atlantic 2018 TRM
ELEC	%	66.9	Duke Energy 2016 RASS Data (DEC Respondents)
RE	%	98	Mid-Atlantic 2018 TRM
Summer Energy to Demand Factor (ETDF)	N/A	0.000008	Ratio of evaluated showerhead measure demand to energy savings
Winter Energy to Demand Factor (ETDF)	N/A	0.00022	Ratio of evaluated showerhead measure demand to energy savings
Energy Savings	**kWh**	**109.3**	**Calculated**
Summer Demand Savings	**kW**	**0.009**	**Calculated**
Winter Demand Savings	**kW**	**0.025**	**Calculated**
ISR	**Influence**	**Kit Info.**	**Persistence**
Child: 19% Parent: 16%	81%	73%	28%
Savings from child behavior (Energy and Summer Demand):			**3.5 kWh; 0.0003 kW**
Savings from parent behavior (Energy and Summer Demand):			**2.8 kWh; 0.0002 kW**
Total Energy Savings:			**6.3 kWh**
Total Summer Demand Savings:			**0.0005 kW**
Total Winter Demand Savings:			**0.0014 kW**

*Totals may not sum to due to rounding

Table 3-26: DEP Behavioral Savings Achieved by Taking Shorter Showers

Input	Units	Value	Source
GPM	GPM	1.89	Survey responses, Federal minimum standards
$T_{person/day}$	Minutes	3.47	Aquacraft 2011 Report
$N_{persons/day}$	Showers/Person/Day	0.6	Mid-Atlantic 2018 TRM
365	Days/Year	365	-
ΔT	°F	44.1	Mid-Atlantic 2018 TRM
ELEC	%	74	Duke Energy 2016 RASS Data (DEP Respondents)
RE	%	98	Mid-Atlantic 2018 TRM
Summer Energy to Demand Factor (ETDF)	N/A	0.000008	Ratio of evaluated showerhead measure demand to energy savings
Winter Energy to Demand Factor (ETDF)	N/A	0.00022	Ratio of evaluated showerhead measure demand to energy savings
Energy Savings	**kWh**	**117.3**	**Calculated**
Summer Demand Savings	**kW**	**0.009**	**Calculated**
Winter Demand Savings	**kW**	**0.026**	**Calculated**
ISR	**Influence**	**Kit Info.**	**Persistence**
Child: 16% Parent: 9%	83%	74%	28%
Savings from child behavior (Energy and Summer Demand):			**3.1 kWh; 0.0003 kW**
Savings from parent behavior (Energy and Summer Demand):			**1.9 kWh; 0.0001 kW**
Total Energy Savings:			**5.0 kWh**
Total Summer Demand Savings:			**0.0004 kW**
Total Winter Demand Savings:			**0.0011 kW**

*Totals may not sum to due to rounding

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 their furnace or air conditioner.

Equation 3-16 and Equation 3-17 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 2018 Mid-Atlantic TRM and 2016 Pennsylvania.

Equation 3-16: Turn off CAC or use fan mode energy savings algorithm

$$\Delta kWh_{cool} = EUI_{cool} \times Area \times Tstat_{cool} \times Adj.Factors$$

Equation 3-17: 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 3-27). 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 3-27: Smart Thermostat Savings

Study Location	Cooling Savings	Heating Savings
Vectren Indiana[8]	13.9%	12.5%
NIPSCO[9]	16.1%	13.4%
National Grid[10]	10.0%	N/A
Median	**13.9%**	**13.0%**

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 3-28 and Table 3-30 for DEC and Table 3-29 and Table 3-31 for DEP.

[8] Evaluation of 2013–2014 Programmable and Smart Thermostat Program for Vectren Corporation. The Cadmus Group, January 2015

[9] Evaluation of the 2013–2014 Programmable and Smart Thermostat Program for Northern Indiana Public Service Company. The Cadmus Group, January 2015

[10] Evaluation of 2013- 2014 Smart Thermostat Pilots: Home Energy Monitoring, Automatic Temperature Control, Demand Response. The Cadmus Group, July 2015

Table 3-28: DEC Behavioral Savings Achieved by Changing AC Use Patterns

Input	Units	Value	Source
Cooling Energy Use Intensity (EUI_{cool})	kWh/ft^2	1.4522	2009 RECS Data, North and South Carolina
Average Cooled Area ($Area_{cool}$)	ft^2	1,495	2009 RECS Data, North and South Carolina
T-stat $savings_{cool}$	%	13.9%	Multiple Smart Thermostat Studies as noted above
Energy Savings	**kWh**	**301.8**	**Calculated**
Summer Demand Savings	**kW**	**0.000**	**Deemed**
Winter Demand Savings	**kW**	**0.000**	**Deemed**
Turning off Air Conditioning when Not Home			
ISR	**Influence**	**Kit Info.**	**Persistence**
12%	81%	73%	28%
		Total Energy Savings:	**6.0 kWh**
		Total Demand Savings:	**0.000 kW**
		Total Winter Demand Savings:	**0.000 kW**
Using Fans Instead of Air Conditioning			
ISR	**Influence**	**Kit Info.**	**Persistence**
15%	81%	73%	28%
		Total Energy Savings:	**7.3 kWh**
		Total Summer Demand Savings:	**0.000 kW**
		Total Winter Demand Savings:	**0.000 kW**

*Totals may not sum to due to rounding

Table 3-29: DEP Behavioral Savings Achieved by Changing AC Use Patterns

Input	Units	Value	Source
Cooling Energy Use Intensity (EUI_{cool})	kWh/ft^2	1.4522	2009 RECS Data, North and South Carolina
Average Cooled Area ($Area_{cool}$)	ft^2	1,495	2009 RECS Data, North and South Carolina
T-stat $savings_{cool}$	%	13.9%	Multiple Smart Thermostat Studies as noted above
Energy Savings	**kWh**	**301.8**	**Calculated**
Summer Demand Savings	**kW**	**0.000**	**Deemed**
Winter Demand Savings	**kW**	**0.000**	**Deemed**
Turning off Air Conditioning when Not Home			
ISR	**Influence**	**Kit Info.**	**Persistence**
9%	83%	74%	28%
		Total Energy Savings:	**4.8 kWh**
		Total Summer Demand Savings:	**0.000 kW**
		Total Winter Demand Savings:	**0.000 kW**
Using Fans Instead of Air Conditioning			
ISR	**Influence**	**Kit Info.**	**Persistence**
12%	83%	74%	28%
		Total Energy Savings:	**6.0 kWh**
		Total Summer Demand Savings:	**0.000 kW**
		Total Winter Demand Savings:	**0.000 kW**

*Totals may not sum to due to rounding

Table 3-30: DEC Behavioral Savings Achieved by Changing Heating Use Patterns

Input	Units	Value	Source
Heating Energy Use Intensity	kWh/ft^2	1.1724	2009 RECS Data, North and South Carolina
Average Heated Area	ft^2	1,574	2009 RECS Data, North and South Carolina
Savings	%	13.0%	Multiple Smart Thermostat Studies as noted above
ELEC	%	63.1%	Duke Energy 2016 RASS Data (DEC Respondents)
Energy Savings	**kWh**	**150.7**	**Calculated**
Summer Demand Savings	**kW**	**0.000**	**Deemed**
Winter Demand Savings	**kW**	**0.000**	**Deemed**
ISR	**Influence**	**Kit Info.**	**Persistence**
5%	81%	73%	28%
		Total Energy Savings:	**1.2 kWh**
		Total Summer Demand Savings:	**0.000 kW**
		Total Winter Demand Savings:	**0.000 kW**

*Totals may not sum to due to rounding

Table 3-31: DEP Behavioral Savings Achieved by Changing Heating Use Patterns

Input	Units	Value	Source
Heating Energy Use Intensity	kWh/ft^2	1.1724	2009 RECS Data, North and South Carolina
Average Heated Area	ft^2	1,574	2009 RECS Data, North and South Carolina
Savings	%	13.0%	Multiple Smart Thermostat Studies as noted above
ELEC	%	74.8%	Duke Energy 2016 RASS Data (DEP Respondents)
Energy Savings	**kWh**	**178.9**	**Calculated**
Summer Demand Savings	**kW**	**0.000**	**Deemed**
Winter Demand Savings	**kW**	**0.000**	**Deemed**
ISR	**Influence**	**Kit Info.**	**Persistence**
5%	83%	74%	28%
		Total Energy Savings:	**1.4 kWh**
		Total Summer Demand Savings:	**0.000 kW**
		Total Winter Demand Savings:	**0.000 kW**

*Totals may not sum to due to rounding

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 3-18 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 2018 Mid-Atlantic TRM and 2016 Pennsylvania.

Equation 3-18: 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 3-32.

Table 3-32: Smart Thermostat Savings

Study Location	Cooling Savings	Heating Savings
Vectren Corporation[11]	N/A	5.0%
NIPSCO[12]	N/A	7.8%
Xcel Energy[13]	4.6%	N/A
Commonwealth Edison[14]	4.8%	6.7%
Median	**4.7%**	**6.7%**

The savings were calculated and adjusted based on these key assumptions as detailed in Table 3-33 and Table 3-34.

[11] Evaluation of 2013–2014 Programmable and Smart Thermostat Program for Vectren Corporation. The Cadmus Group, January 2015

[12] Evaluation of the 2013–2014 Programmable and Smart Thermostat Program for Northern Indiana Public Service Company. The Cadmus Group, November 2014

[13] In-Home Smart Device Pilot. Public Service Company of Colorado. EnerNOC, Inc., April, 2014

[14] Commonwealth Edison Residential Smart Thermostats. Navigant Consulting, February 2016

Table 3-33: DEC Behavioral Savings Achieved by Changing Thermostat Settings

Input	Units	Value	Source
Heating Energy Use Intensity	kWh/ft^2	1.1724	2009 RECS Data, North and South Carolina
Average Heated Area	ft^2	1,574	2009 RECS Data, North and South Carolina
ELEC	%	63.1%	Duke Energy 2016 RASS Data (DEC Respondents)
Heating Savings	%	6.7%	Multiple Smart Thermostat Studies as noted above
Cooling Energy Use Intensity	kWh/ft^2	1.4522	2009 RECS Data, North and South Carolina
Average Cooled Area	ft^2	1,495	2009 RECS Data, North and South Carolina
Savings	%	4.7%	Multiple Smart Thermostat Studies as noted above
Energy Savings	**kWh**	**189.7**	**Calculated**
Summer Demand Savings	**kW**	**0.000**	**Deemed**
Winter Demand Savings	**kW**	**0.000**	**Deemed**
ISR	**Influence**	**Kit Info.**	**Persistence**
22%	81%	73%	28%
		Total Energy Savings:	**7.0 kWh**
		Total Summer Demand Savings:	**0.000 kW**
		Total Winter Demand Savings:	**0.000 kW**

*Totals may not sum to due to rounding

Table 3-34: DEP Behavioral Savings Achieved by Changing Thermostat Settings

Input	Units	Value	Source
Heating Energy Use Intensity	kWh/ft^2	1.1724	2009 RECS Data, North and South Carolina
Average Heated Area	ft^2	1,574	2009 RECS Data, North and South Carolina
ELEC	%	74.8%	Duke Energy 2016 RASS Data (DEP Respondents)
Heating Savings	%	6.7%	Multiple Smart Thermostat Studies as noted above
Cooling Energy Use Intensity	kWh/ft^2	1.4522	2009 RECS Data, North and South Carolina
Average Cooled Area	ft^2	1,495	2009 RECS Data, North and South Carolina
Savings	%	4.7%	Multiple Smart Thermostat Studies as noted above
Energy Savings	**kWh**	**205.7**	**Calculated**
Summer Demand Savings	**kW**	**0.000**	**Deemed**
Winter Demand Savings	**kW**	**0.000**	**Deemed**
ISR	**Influence**	**Kit Info.**	**Persistence**
22%	83%	74%	28%
		Total Energy Savings:	**7.8 kWh**
		Total Summer Demand Savings:	**0.000 kW**
		Total Winter Demand Savings:	**0.000 kW**

*Totals may not sum to due to rounding

Summary of behavioral impacts

Table 3-35 below presents the total energy savings derived from the behavioral component of the program.

Table 3-35: Energy savings from behavioral impacts

Behavior	DEC kWh savings	DEP kWh savings
Turn off lights	0.4	0.4
Turn off electronics	4.1	4.6
Take shorter showers	6.3	5.0
Turn off furnace	1.2	1.4
Turn off AC	6.0	4.8
Use fan mode	7.3	6.0
Adjust thermostat set points	7.0	7.8
Total	**32.3**	**30.1**

*Total may not sum to due to rounding

3.5 Billing Regression Analysis

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 using an approach commonly referred to as billing analysis. After a thorough investigation, we concluded that, absent a randomized control trial (RCT), billing analysis was unable to reliably detect energy savings resulting from participation in the program. When the percent change in household energy use is small, as it is with the NTC program education and kit, the only reliable way to estimate energy savings using billing analysis is through a randomized control trial using large treatment and control groups and pre- and post-enrollment billing data. The most critical component of a well-designed RCT is to guarantee there are no differences between the treatment and control groups, other than the treatment of the program. This is a critical step to ensure that the analysis is able to accurately estimate the counterfactual – or what would have happened absent the treatment. If inherent differences exist between the treatment group and control group, any changes in the post-treatment period could be due to these differences, rather than the treatment itself. In order to verify that effects are purely the result of the treatment intervention, the two groups must be ostensibly identical in every way except for the intervention.

Guaranteeing homogeneity between treatment and control groups is not achievable with an opt-in enrollment. The fact that one group of customers chose to enroll in the program while the other did not implies that some intrinsic difference between them does exist. These differences may include:

- Behavioral preferences or predispositions for energy efficiency measures
- Information about the program that is not accessible to non-enrollees
- Higher energy needs and therefore a greater incentive to curb their consumption

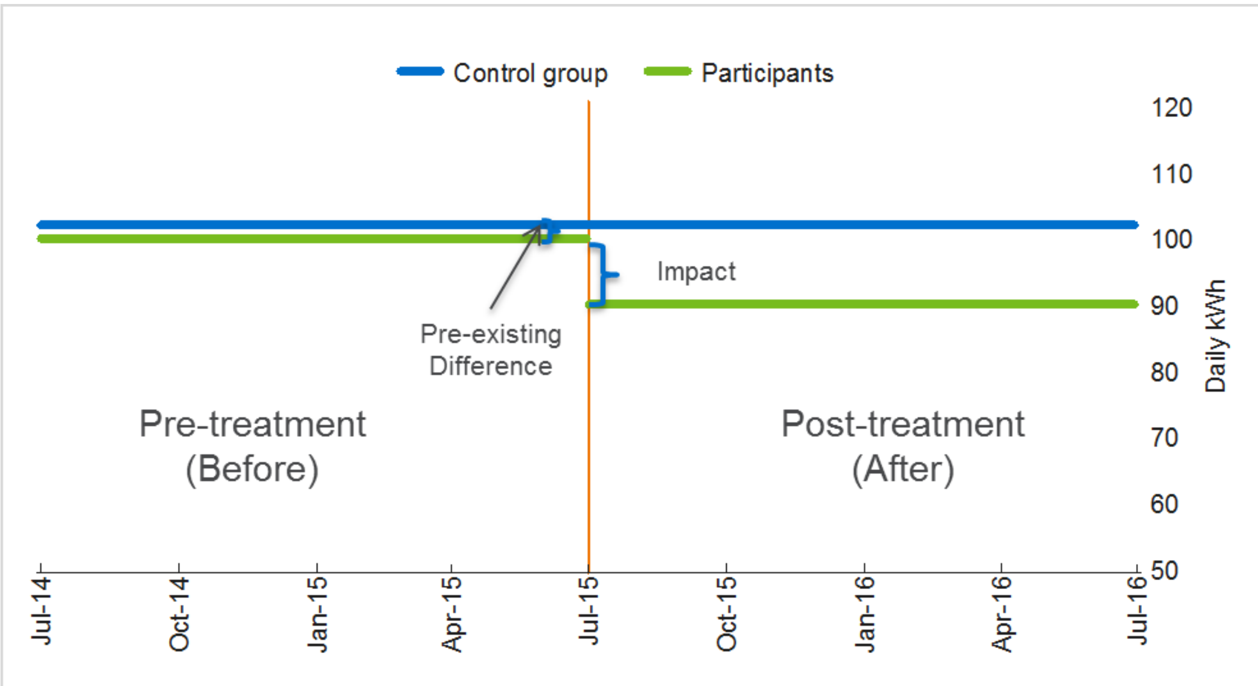
Any of these characteristics are likely to contribute to consumption responses or patterns that cannot be attributable to the program intervention. A well-designed RCT includes randomly selected customers in the treatment and control groups, thereby ensuring that the analysis avoids adverse effects of selection bias and/or lurking confounding variables. Due to these variables, RCTs are impracticable for opt-in programs. Thus, the evaluation team's recommendation is to rely on findings of the engineering analysis 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 program led to energy savings, it is necessary to systematically eliminate plausible alternative explanations for differences in electricity use patterns.

The basic framework for the analysis is illustrated in Figure 3-2 and relies on both a control group and pre- and post-enrollment billing data. The analysis is implemented via a difference-in-differences technique, which removes any pre-existing differences between the treatment and control groups. If the program's kit and behavioral changes lead to reductions in consumption, we should observe:

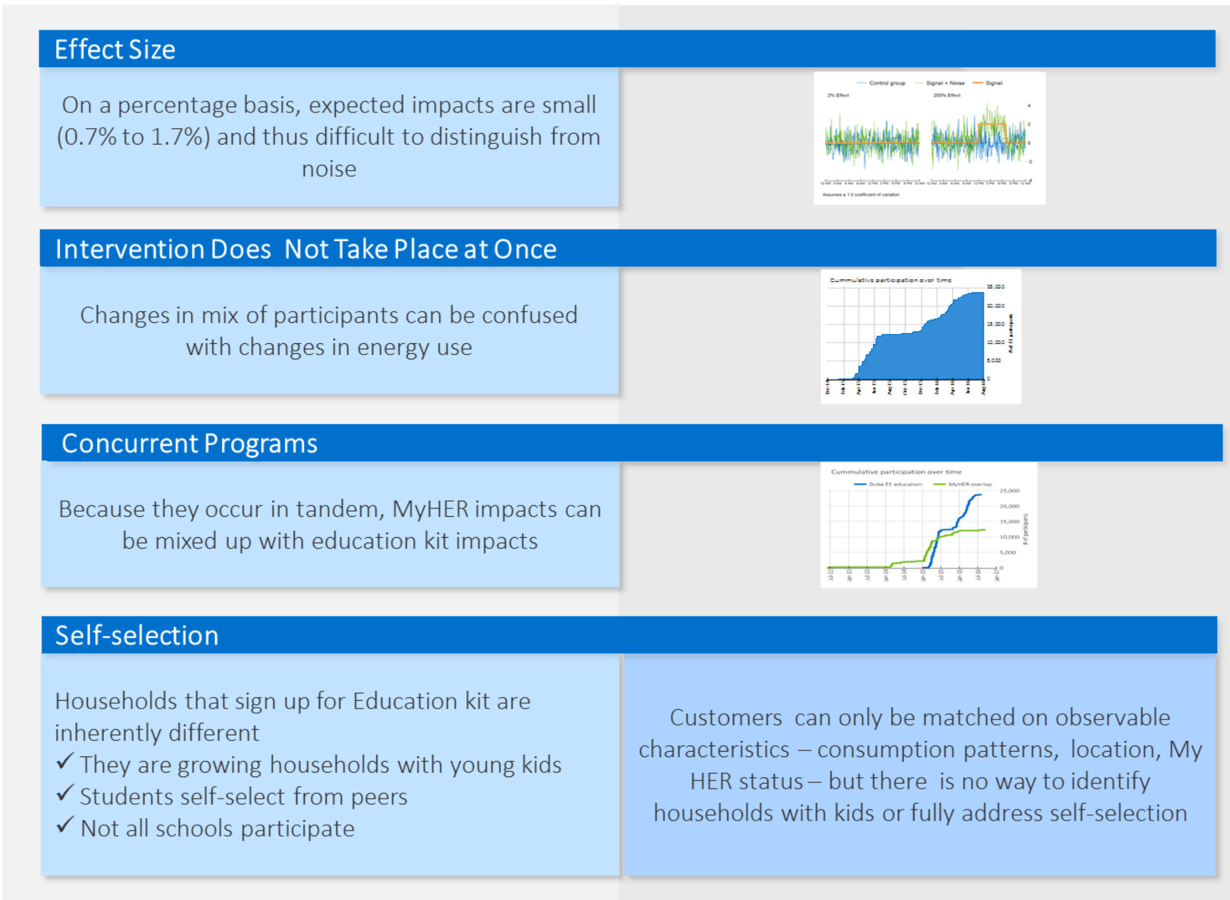
- A change in consumption for households that participated in the NTC program
- No similar change in consumption for the control group
- The timing of the change should coincide with the receipt of kits

Figure 3-2: Framework for Billing Analysis with Control Group, Pre-Post Data and Expected Results



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 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 the 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 a result, while the participant and comparison group may have had similar energy use patterns in the pre-treatment period, their energy use trajectories absent program participation were not necessarily the same due to differences in the household life cycles.

Figure 3-3: Billing Analysis Evaluation Challenges



In order to assess if the billing analysis produced reliable results, we implemented a series of placebo pressure tests. The approach consisted of simulating fake enrollments prior to actual participation in the program and assessing if the models detected an effect when using data from the false “pre” period to estimate the counterfactual for the false “post” period. Because enrollment dates were 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 tests and each participant’s enrollment date was simulated 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 fixed-effects pre-post panel regression model (using only treatment group data) and a difference-in-differences panel regression that made use of the matched comparison group.

Figure 3-4 shows the results from the pre-post placebo tests. Rather than produce zero impacts, the models estimated that the simulated enrollments 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 energy savings when impacts were in fact zero. 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 roughly 1% to 1.5% when no intervention had taken place. Hence, neither method produced reliable energy savings estimates.

Figure 3-4: Placebo Pressure Test Results (Pre-Post)

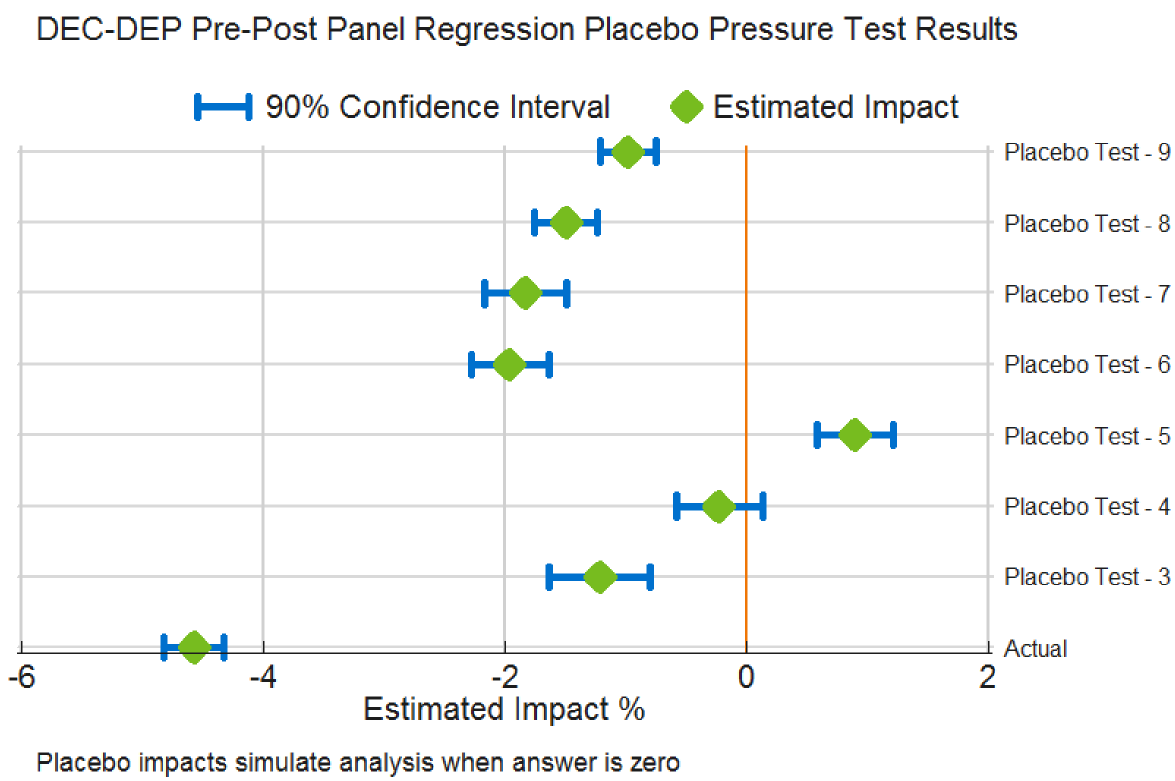
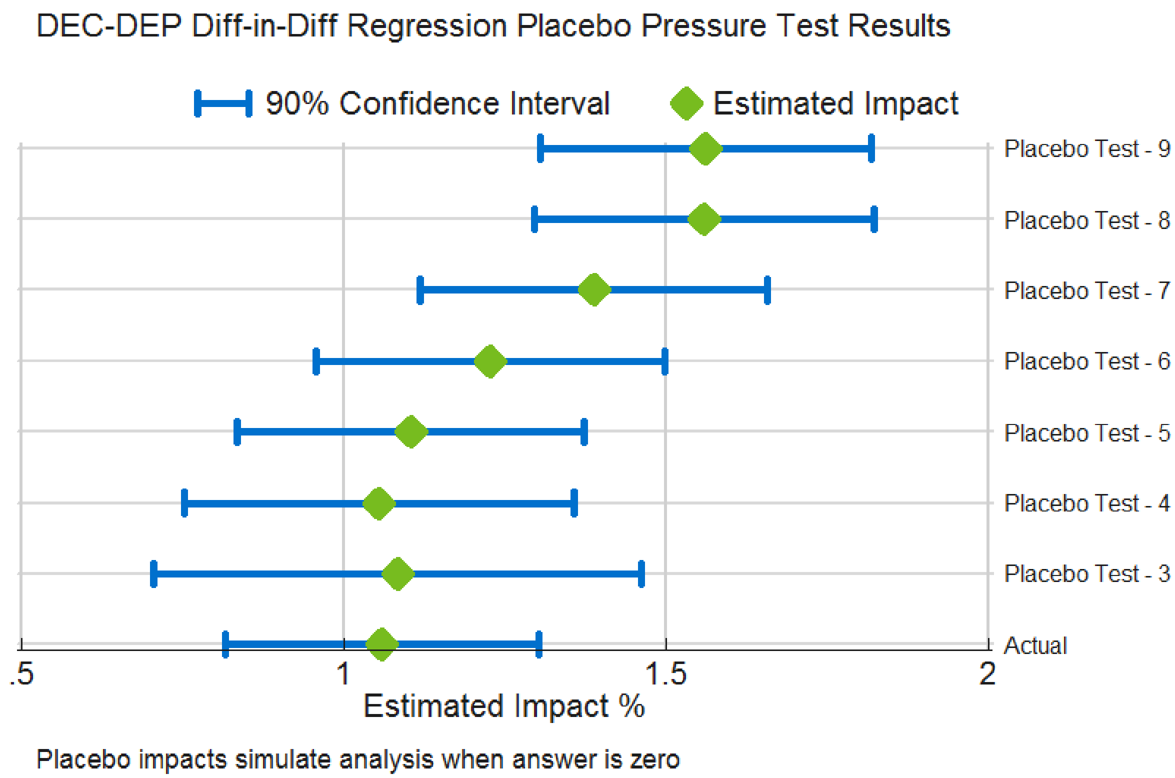


Figure 3-5: Placebo Pressure Test Results (Difference in Differences)



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 achieve this target through the combination of web-based and phone surveys to ultimately achieve a precision of +/- 4.5% and +/-6.2% at the 90% confidence level for DEC and DEP, respectively (Table 3-36).

Table 3-36: Targeted and Achieved Confidence and Precision

Program	Targeted Confidence/Precision	Achieved Confidence/Precision
DEC NTC	90/10.0	90/4.5
DEP NTC	90/10.0	90/6.2

3.7 Results

DEC measure-level and kit-level energy savings values are detailed in Figure 3-6 and Table 3-37.

Figure 3-6: 2017-2018 DEC NTC Gross Verified Energy Savings

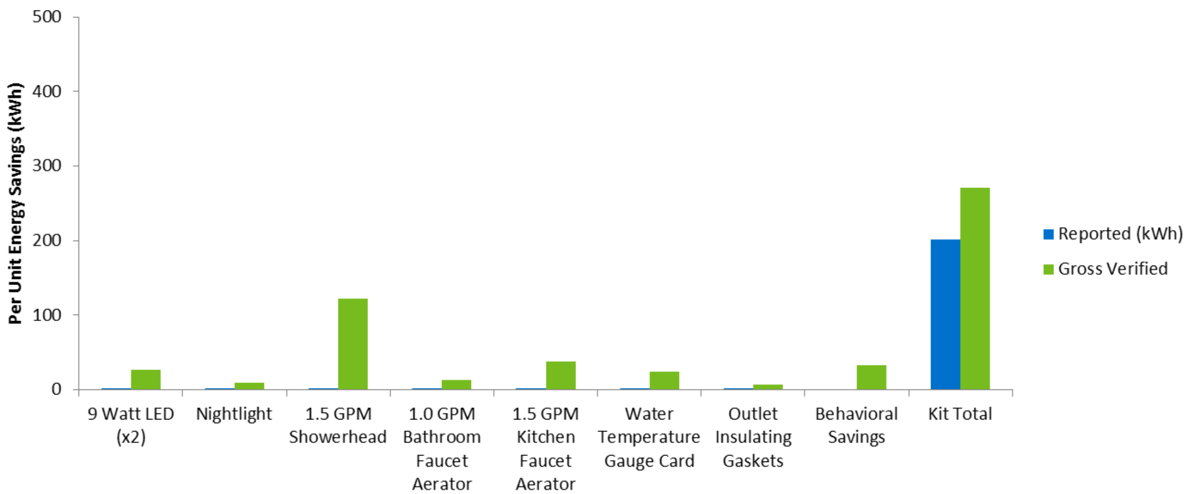


Table 3-37: DEC Measure-Level Reported and Verified Gross Energy Savings

Measure	Reported Gross Energy Savings, per unit (kWh)	Realization Rate	Verified Gross Energy Savings, per unit (kWh)	Total Verified Gross Energy Savings (kWh)
9 Watt LED*	N/A	N/A	27.0	624,555
Nightlight			9.8	226,717
Low-flow Showerhead			121.6	2,815,409
Low-flow Bathroom Aerator			12.4	287,880
Low-flow Kitchen Aerator			38.2	885,316
Water Heater Setback			23.7	549,490
Outlet Gaskets			6.3	146,847
Behavioral Changes			32.3	747,018
Total	**201.0**	**135.0%**	**271.3**	**6,283,232**

*Reflects savings for two 9 watt LEDs bulbs

DEP measure-level and kit-level energy savings values are detailed in and Figure 3-7 and Table 3-38.

Figure 3-7: 2017-2018 DEP NTC Gross Verified Energy Savings

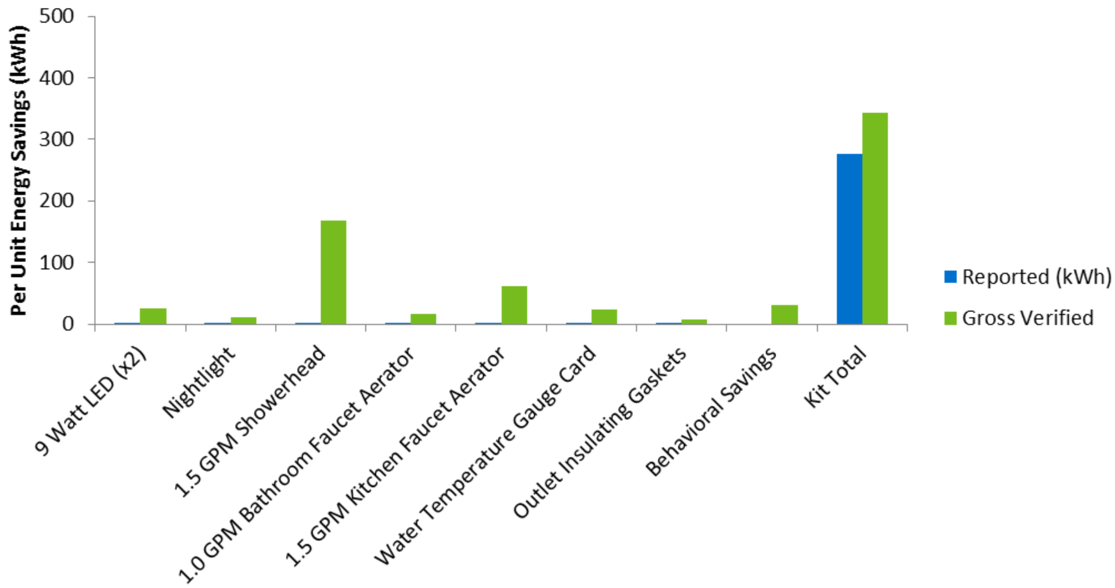


Table 3-38: DEP Measure-Level Reported and Verified Gross Energy Savings

Measure	Reported Gross Energy Savings, per unit (kWh)	Realization Rate	Verified Gross Energy Savings, per unit (kWh)	Total Verified Gross Energy Savings (kWh)
9 Watt LED*	N/A	N/A	25.4	229,261
Nightlight			10.9	98,409
Low-flow Showerhead			168.1	1,516,833
Low-flow Bathroom Aerator			16.4	148,343
Low-flow Kitchen Aerator			62.3	561,971
Water Heater Setback			23.5	212,411
Outlet Gaskets			6.8	61,268
Behavioral Changes			30.1	271,521
Total	**276.4**	**124.3%**	**343.5**	**3,100,016**

*Reflects savings for two 9 watt LEDs bulbs

Measure-level and kit-level summer demand savings are detailed in Table 3-39 and Table 3-40 for DEC and DEP, respectively.

Table 3-39: DEC Measure-Level Reported and Verified Summer Demand Gross Savings

Measure	Reported Gross Demand Savings, per unit (kW)	Realization Rate	Verified Gross Demand Savings, per unit (kW)	Total Verified Gross Demand Savings (kW)
9 Watt LED*	N/A	N/A	0.005	109.2
Nightlight			0.000	0.0
Low-flow Showerhead			0.010	225.6
Low-flow Bathroom Aerator			0.002	38.6
Low-flow Kitchen Aerator			0.005	118.6
Water Heater Setback			0.003	73.6
Outlet Gaskets			0.008	186.8
Behavioral Changes			0.001	25.3
Total	**0.054**	**61.7%**	**0.034**	**777.7**

*Reflects savings for two 9 watt LEDs bulbs

Table 3-40: DEP Measure-Level Reported and Verified Summer Demand Gross Savings

Measure	Reported Gross Demand Savings, per unit (kW)	Realization Rate	Verified Gross Demand Savings, per unit (kW)	Total Verified Gross Demand Savings (kW)
9 Watt LED*	N/A	N/A	0.004	40.4
Nightlight			0.000	0.0
Low-flow Showerhead			0.013	121.5
Low-flow Bathroom Aerator			0.002	19.9
Low-flow Kitchen Aerator			0.008	75.3
Water Heater Setback			0.003	28.5
Outlet Gaskets			0.009	77.9
Behavioral Changes			0.001	9.6
Total	**0.079**	**52.5%**	**0.041**	**373.1**

*Reflects savings for two 9 watt LEDs bulbs

Measure-level and kit-level winter demand savings are detailed in Table 3-41 and Table 3-42 for DEC and DEP, respectively.

Table 3-41: DEC Measure-Level Reported and Verified Winter Demand Gross Savings

Measure	Reported Gross Demand Savings, per unit (kW)	Realization Rate	Verified Gross Demand Savings, per unit (kW)	Total Verified Gross Demand Savings (kW)
9 Watt LED*	N/A	N/A	0.002	48.7
Nightlight			0.000	0.0
Low-flow Showerhead			0.027	631.9
Low-flow Bathroom Aerator			0.003	63.6
Low-flow Kitchen Aerator			0.008	195.5
Water Heater Setback			0.005	121.3
Outlet Gaskets			0.000	7.1
Behavioral Changes			0.002	45.2
Total	**N/A**	**N/A**	**0.048**	**1,113.4**

*Reflects savings for two 9 watt LEDs bulbs

Table 3-42: DEP Measure-Level Reported and Verified Winter Demand Gross Savings

Measure	Reported Gross Demand Savings, per unit (kW)	Realization Rate	Verified Gross Demand Savings, per unit (kW)	Total Verified Gross Demand Savings (kW)
9 Watt LED*	N/A	N/A	0.002	18.0
Nightlight			0.000	0.0
Low-flow Showerhead			0.038	340.4
Low-flow Bathroom Aerator			0.004	32.8
Low-flow Kitchen Aerator			0.014	124.1
Water Heater Setback			0.005	46.9
Outlet Gaskets			0.000	3.0
Behavioral Changes			0.002	15.7
Total	**N/A**	**N/A**	**0.064**	**581.0**

*Reflects savings for two 9 watt LEDs bulbs

The impact evaluation for the DEC 2017-2018 program resulted in a program energy realization rate of 135% and a demand realization rate of 62% as presented in Table 3-43.

Table 3-43: 2017-2018 DEC Energy Savings per Kit

Measurement	Reported	Realization Rate	Gross Verified*
Energy (kWh)	201.0	135.0%	271.3
Demand (kW)	0.054	61.7%	0.034
Winter Demand (kW)	N/A	N/A	0.048

*Values may appear inaccurate due to rounding errors

The impact evaluation for the DEP 2017-2018 program resulted in a program energy realization rate of 124% and a demand realization rate of 52% as presented in Table 3-44.

Table 3-44: 2017-2018 DEP Energy Savings per Kit

Measurement	Reported	Realization Rate	Gross Verified*
Energy (kWh)	276.4	124.3%	343.5
Summer Demand (kW)	0.079	52.5%	0.041
Winter Demand (kW)	N/A	N/A	0.064

*Values may appear inaccurate due to rounding errors

Table 3-45 and Table 3-46 present the reported and verified energy and demand savings for the 2017-2018 program year for DEC and DEP, respectively.

Table 3-45: 2017-2018 DEC Program Level Savings

Measurement	Reported per Kit	Kits Distributed	Program Reported*	Realization Rate	Program Gross Verified*
Energy (kWh)	201.0	23,161	4,655,361	135.0%	6,283,232
Summer Demand (kW)	0.054		1,260.7*	61.7%	777.7
Winter Demand (kW)	N/A		N/A	N/A	1,113.4

*Values may appear inaccurate due to rounding errors

Table 3-46: 2017-2018 DEP Program Level Savings*

Measurement	Reported per Kit	Kits Distributed	Program Reported*	Realization Rate	Program Gross Verified*
Energy (kWh)	276.4	9,025	2,494,510	124.3%	3,100,016
Summer Demand (kW)	0.079		711.0*	52.5%	373.1
Winter Demand (kW)	N/A		N/A	N/A	581.0

*Values may appear inaccurate due to rounding errors

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).[15] 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, infiltration 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 LEDs, the survey first asked whether the participant installed one, both, or neither. 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.

$$FR = FRC + FRI$$

[15] 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.

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 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 six 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:

- The fact that the items were free
- The fact that the items were sent to their home
- The chance to win cash prizes for their household and school
- Information in the kit about how the items would save energy
- Information that their child brought home from school
- Other information or advertisements from Duke Energy, including its website

Asking respondents to separately rate the influence of each of the six 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.

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.[16]

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, one for water saving measures, one for infiltration measures, and one 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.[17]
- 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.

Table 4-3 and Table 4-4 presents the end-use FR estimates.

[16] 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.

[17] Since respondents were only asked about program influence on their decision to install the light bulbs and water saving items, infiltration measures leveraged the average influence score (FRI) across those two end uses. However, the FRC score used for infiltration measures was specific to that end use.

Table 4-3: DEC End-Use-Level Free Ridership Scores

End-use	End-Use Free Ridership
Light bulbs	0.26
Water saving measures	0.15
Infiltration measures	0.12

Table 4-4: DEP End-Use-Level Free Ridership Scores

End-use	End-Use Free Ridership
Light bulbs	
Water saving measures	0.12
Infiltration measures	0.08

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 and Table 4-4. Overall free ridership for the NTC kits is an estimated 16% for DEC and 13% for DEP.

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 algorithms and parameter assumptions listed in the in the 2018 Mid-Atlantic TRM, 2016 Pennsylvania TRM, and outputs from this impact evaluation.

Lighting measures (namely, LEDs) 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 Savings Store (DEC only), 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, we adjusted lighting spillover savings to account for the proportion of respondents that said they used Duke Energy's website to find or purchase discounted lighting measures.

Participant measure spillover (PMSO) is calculated as follows:

$$PMSO = Deemed\ Measure\ Savings * Program\ Attributable\ Percentage$$

Table 4-5 and Table 4-6 exhibits the PMSO by measure category.

Table 4-5: DEC PMSO, by Measure Category

Measure Category	Total kWh for Category	Percent Share of kWh
LEDs	6,345	82%
CFLs	486	6%
Appliances	768	10%
Windows	160	2%
AC Filters	3	<1%
Total	**7,743**	**100%**

Table 4-6: DEP PMSO, by Measure Category

Measure Category	Total kWh for Category	Percent Share of kWh
LEDs	2,421	87%
CFLs	19	1%
Appliances	236	8%
Windows	29	1%
Outlet Gaskets	79	3%
Total	**2,783**	**100%**

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:

$$Program\ SO = \frac{\sum Program\ PMSO}{\sum Sample's\ Gross\ Program\ Savings}$$

These calculations produced a spillover estimate of 10% for DEC and 5% for DEP.

4.3 Net-to-Gross

Inserting the FR and SO estimates into the NTG formula (NTG = 1 – FR + SO) produces an NTG value of 0.94 for the DEC program (Table 4-7) and 0.92 for the DEP program (Table 4-8). The evaluation team applied the NTG ratios to verified gross savings to calculate NTC kit net savings.

Table 4-7: DEC Program Net-to-Gross Results

Free Ridership	Spillover	NTG
0.16	0.10	0.94

*Totals may not sum to due to rounding

Table 4-8: DEP Program Net-to-Gross Results

Free Ridership	Spillover	NTG
0.13	0.05	0.92

*Totals may not sum to due to rounding

5 DEC Process Evaluation

5.1 Summary of Data Collection Activities

The process evaluation is based on telephone and web interviews and 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	44	Unknown	90/17
Participating teacher follow-up interviews	Phone in-depth interview	5	Unknown	N/A
Student families who received DEC kit and are customers of DEC	Phone/Web survey	334*	23,161	95/5

*260 web surveys and 74 phone surveys

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.

In April and May 2018, the evaluation team surveyed 44 teachers who attended NTC performances between September 7, 2017 and March 16, 2018. Of the 44 teacher respondents, 34 taught elementary school and 10 taught middle school. We report elementary and middle school findings together unless a meaningful difference emerged between school types.

In May 2018, the evaluation team contacted teachers who completed the web survey and indicated interest in being interviewed about their experience. The evaluation team 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 and to provide additional details about their experience. The evaluation team completed interviews with five of these teachers. Two taught at elementary schools (one first grade teacher and one second) and three taught at middle schools (two sixth grade teachers and one seventh grade teacher).

5.1.2 Survey of Student Families Who Received the DEC Kit

In April and May 2018, the evaluation team surveyed 334 families who received energy efficiency kits from DEC between August 2017 and May 2018 (Table 5-2). During that period, DEC distributed a total of 5,587 kits to families who completed the kit request form their child brought home from school. The evaluation team attempted to contact a random sample frame of 12,515 households, sending email survey invitations to 11,449 households and attempting to call 1,066 households for which program records provided an email address and/or a phone number. Ultimately, the data collection effort achieved a 2.7% response rate, providing a sample with 95/5 confidence/precision. Comparisons with census data demonstrate that the sample is largely representative of income level and ownership status for the region. Respondents reported greater educational attainment and larger-sized households than typical of the region.[18]

Table 5-2: DEC Student Family Survey Response Rates

Mode	Population Size	Sample Frame Size	Completed Surveys	Response Rate	Confidence/ Precision
Web-based	23,161	11,629	260	2.3%	95/5
Phone		7,953	74	6.9%	
Total		**19,582**	**334**	**2.7%**	

5.2 Process Evaluation Findings

5.2.1 Awareness of DEC Sponsorship of the Program

Teachers and student families were largely aware of DEC's sponsorship of the program. A majority of teachers (84%) reported they were aware of DEC's sponsorship. The 37 teachers who knew of DEC's sponsorship most often learned about it through another staff member at their school (14) or DEC marketing materials (6) (Table 5-3).

Table 5-3: How Teachers Learned of DEC's Sponsorship (Multiple Responses Allowed; n=37)

Source	Number of Teachers
Another staff person at school	14
The National Theatre for Children staff	12
Duke Energy marketing materials	6
The National Theatre for Children materials	6
Prior performance at school	5
Duke Energy staff	1
Don't recall	4

[18] Region comparisons come from 2016 American Community Survey (Census) 5-year period estimates data for the state of North Carolina and South Carolina.

Awareness of DEC sponsorship among student families was also high, with most (94%) stating they knew the kit was sponsored by Duke Energy. Over half (59%) indicated they learned about Duke's sponsorship via the classroom materials their child brought home. Other common ways that families learned about Duke Energy sponsorship were material included in the kit (29%) and communications from their child's teacher or school (29%).

About one-third (31%) of student family respondents said they knew about the energy-related classroom activities and NTC performance at their child's school. Of those, most (77%) said they found out about the NTC activities from their child or from a teacher or school administrator (28%).

5.2.2 Parent Awareness of DEC Kit Opportunity

Classroom materials sent home with students were the key source of awareness of kits for families, with most student families (71%) hearing about the opportunity to receive a Duke Energy kit via this medium. Other respondents learned about the kits from various communications from the school (Table 5-4).

Table 5-4: Sources of Parental Awareness of Kits (Multiple Responses Allowed; n=334)

Source of Kit Awareness	Percent
Classroom materials	71%
School newsletter	17%
Email from teacher/school	14%
School website or web portal	6%
Conversations with teacher	4%
Poster at school	4%
After hour event at school	2%
Other	13%

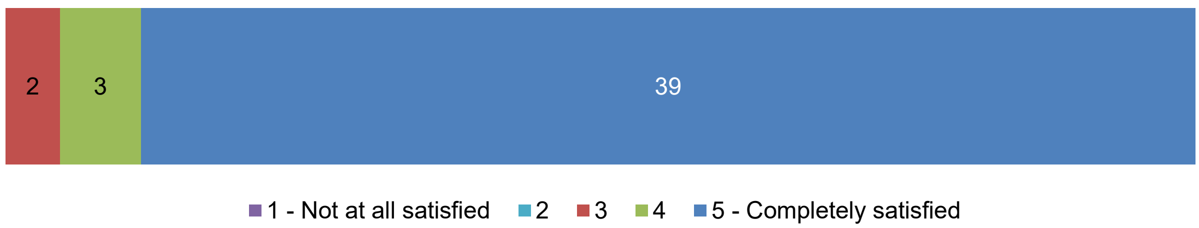
5.2.3 Teacher Experience with the Program

NTC Performance

Teachers were very pleased with the NTC performance. They specified that the content was age-appropriate and the performance itself was engaging, and they reported overall high satisfaction with it.

Overall, teachers were largely satisfied with the performance, with 95% (42 of 44) rating their satisfaction as a “4” or “5” on a one-to-five scale. The remaining two respondents were neither satisfied nor dissatisfied providing a response of “3” on the five-point scale (Table 5-1).

Figure 5-1: Overall Teacher Satisfaction with NTC Performance (n=44)



More than 90% of the surveyed teachers (40 of 44) said the explanation of energy-related concepts was “about right” for most of their students. Of the other four, three teachers (two first grade teachers and one elementary teacher that teaches several grades) reported the material was too advanced, while one sixth grade teacher said the material was too basic for their students.

Regarding age appropriateness, the comments from the interviewed teachers echoed the findings from the online survey. All five interviewed teachers said the performance was age appropriate and kept their students’ attention.

The interviewed teachers commented on the quality of the performance, specifically that the performance was engaging, and one noted that the performance gave students tangible actions to save energy.

Two surveyed teachers offered suggestions for improving the performance:

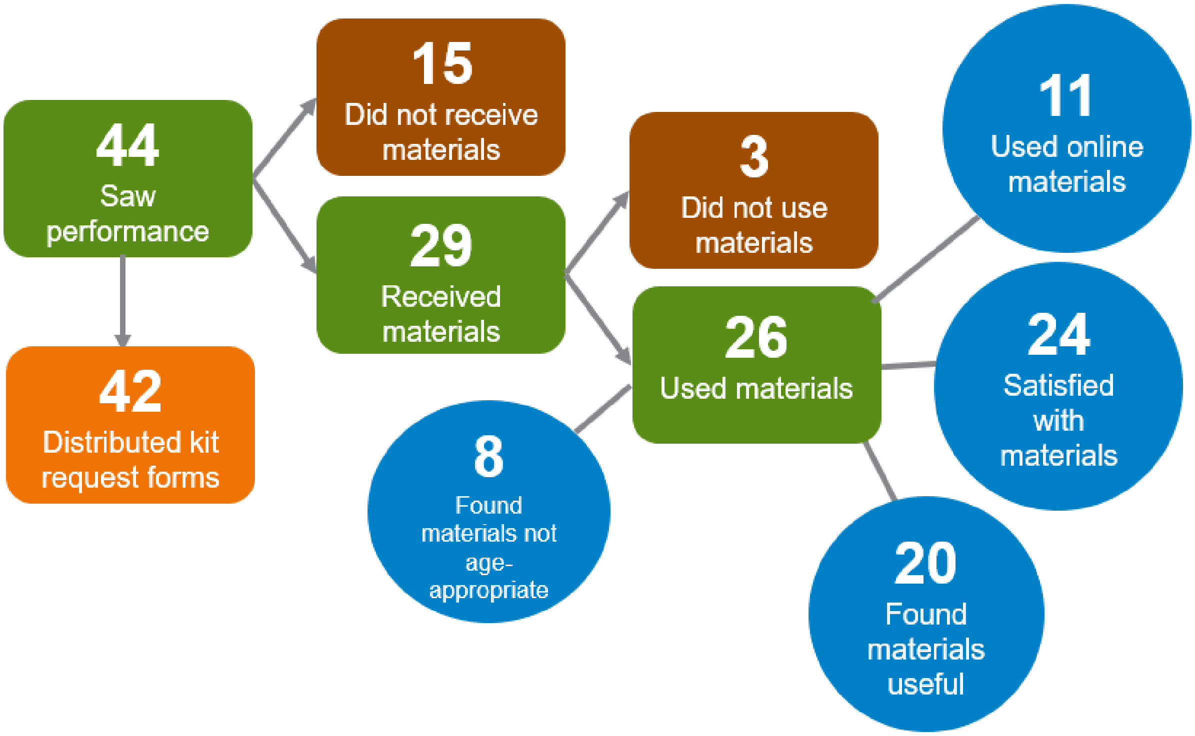
- Introduce vocabulary ahead of the performance. A first-grade teacher noted that having some key terms ahead of time would have allowed teachers to review them with students.
- Improve sound quality. A second-grade teacher noted that the it was hard to hear the performance in a large space. This teacher suggested the performers were not expecting have to perform in a large auditorium.

Curriculum and Instructional Materials

A notable percentage of teachers reported not receiving or using the curriculum materials, despite most reporting that they distributed kit request forms to their students (see Kit Request

Forms section below).[19] About two-thirds of teachers (29 of 44) reported receiving the curriculum and instructional materials, while fifteen said they did *not* receive the materials. Of the 29 who reported receiving the materials, three reported not using them "at all" because they did not have time to use them (2 mentions) or because state testing material took priority (Figure 5-2).

Figure 5-2: DEC Teachers Use of Forms and Instructional Materials



Twenty-six teachers reported use of the instructional materials and they reported on the materials' usefulness, age-appropriateness, alignment with state science standards, or concepts children had trouble understanding. From their comments, the following observations emerged:

- Use of materials was limited to moderate: Eight teachers characterized their use as "a little" and twelve used the materials "moderately." About 40% of respondents used the online aspect of the curriculum.
- Materials were useful: When asked to rate the usefulness of the materials, from 1 (not at all useful) to 5 (highly useful), most respondents rated the usefulness as a four (11) or five (9). The remaining six respondents scored the usefulness as a three.

[19] Kit request forms and curriculum materials are delivered to schools at the same time. The findings from this study are inconclusive as to whether teachers did not actually receive the instructional materials in the first place (for example: the school received them, but did not distribute them to the teachers), or if teachers did not remember receiving them due to a recency effect (in that, they did receive them but did not remember this event by the time of the survey, which seems particularly likely if the teacher did not distribute or use the materials despite receiving them).

- Materials were age-appropriate: Six reported the material was age-appropriate, while a fifth grade teacher reported it was somewhat too advanced.
- Most respondents said they varied in their thoughts about the alignment of materials with state science standards: Fourteen reported the curriculum "completely" (5) or "mostly" (9) aligned with state science standards, seven stated it "somewhat" aligned, and four did not know if the materials aligned. One fifth grade teacher reported there were no state science standards.
- One teacher reported abstract concepts such as electricity can be difficult for children to understand.

The eight teachers reporting "a little" use explained their rationale for limited use of the material. None of the comments focused on the quality of the materials per se. Rather, the reason for minimal use was because the materials did not align with their teaching priorities at that time (5 mentions) and concerns about the age appropriateness, with two kindergarten teachers saying the materials were too advanced and one sixth grade teacher reporting the materials were too basic.

No teacher specified any concepts the workbooks should have covered to make it more useful. Twenty-four of the 26 reported being satisfied with the materials (scored a "4" or "5" on a five-point scale) and two were neither satisfied or dissatisfied with the materials (scored a "3" on a five-point scale).

Two interviewed teachers said they used the curriculum materials. Of those, one used the workbooks in their classroom and one reported sending the materials home.

Kit Request Forms

As Figure 5-2 suggests, there was a disconnect among teachers between the kit request forms and the instructional materials. Teachers largely reported limited use of the instructional materials, with more than one-third indicating they never received the instructional materials. Yet nearly all reported distributing kit request forms to students, which are delivered to the school at the same time as the instructional materials. This suggests that teachers viewed the materials as tangential to the kit request forms.

Ninety-five percent of surveyed teachers distributed the kit request forms to their students and almost all took actions to encourage or promote the kits to their students. The interviewed teachers reported no challenges related to receiving or distributing the kit request forms and all noted ways they encouraged students to receive the kit (Table 5-5).

Table 5-5: Actions Taken to Encourage Students to Receive Kit (Multiple Responses Allowed)

Actions	Teacher Survey Responses (n=44)	Interview Mentions (n=55)
Encouraged students to take action	43	5

Engaged students	*41*	*3*
Vocally encouraged students	40	2
Explain that school will get award	-	1
Posted MyEnergyKit.org poster	17	-
Engaged parents	*24*	*4*
Electronic reminders to parents (email, text)	18	3
Used classroom web portal	*12*	-
Spoke with parents in person	8	1
Used newsletter	2	-

About a third of surveyed teachers (32%) reported following up with students to find out whether their household requested a kit. Of those, teachers estimated between 5% to 65% of families ordered a kit, demonstrating an average of 22% of student families that requested a kit.[20]

5.2.4 Student Family Experience with the Program

Installation and Use Rates

Almost all (93%) participants used at least one measure in the kit, installing an average of three measures from their kit. Most kit recipients installed the lighting measures including LEDs (95%) and nightlights (83%); far fewer used the insulator gaskets and water related measures (ranging from 33% to 35%). Water related measures were also uninstalled more often than lighting measures. Most of the respondents who chose to uninstall kit measures reported dissatisfaction with the measure performance.

The majority of those installing light bulbs (71%) said they installed both bulbs included in the kit and they typically replaced incandescent bulbs.

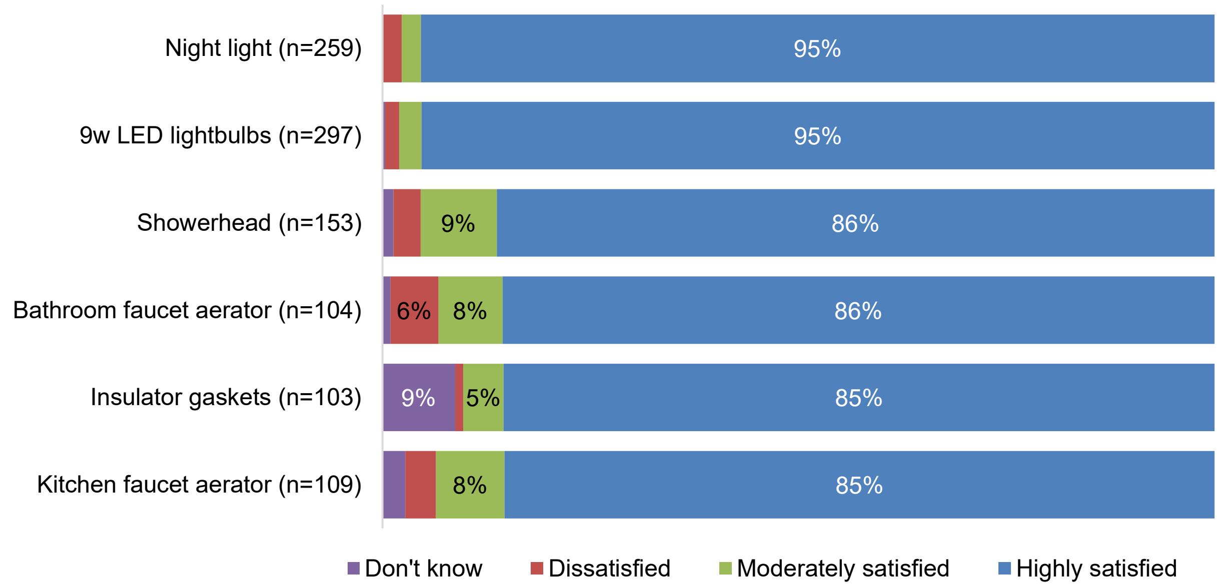
Of those who did not install all items in the kit, about a third (34%) said they do not plan to install any of the items they had not yet installed. Respondents said they would not install the remaining items because the currently installed item is still working, they already had an efficient measure installed, they tried it and it didn't fit, or they had not "gotten around to it."

Measure Satisfaction

Nearly all kit recipients reported high satisfaction with the items they installed from their kit (Figure 5-3). 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 explained that any dissatisfaction they had with water measures was due to low water pressure or that the measures did not fit properly.

[20] 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%.

Figure 5-3: Kit Recipient Satisfaction with Measures They 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

The Energy Efficiency Kit includes a Duke Energy-labeled Department of Energy (DOE) Energy Saver Booklet that includes educational information on saving energy at home. Most (73%) respondents said they read the booklet, most of whom (82%) found it highly helpful.[21] Those not finding the booklet helpful stated they already knew the information presented in the booklet or they wanted additional energy saving tips and more detailed information included.

Additional Energy Saving Actions

Parents and children reported adopting new energy-saving actions since their involvement in the program. Over half of parents reported taking an energy-saving action (51%) and over half (51%) reported their child has adopted new energy saving behaviors since receiving their kit. Parents most commonly said that their child now turns off lights when not using a room (37%) or that they changed their thermostat settings (22%) (Table 5-6). More than three-quarters (81%) of respondents reporting new energy saving behaviors said the DEC-sponsored kit and materials were “highly influential” on their adoption of those behaviors.[22]

[21] We asked respondents to rate the helpfulness of the Duke Energy-labeled DOE Energy Saver Booklet on a scale from 0 (“not at all helpful”) to 10 (“very helpful”). Eighty-two percent of respondents who reported reading the booklet gave a rating of 7 or higher. 16% gave ratings of 5 or 6, and 2% gave ratings of 0 through 4.

[22] We asked respondents to rate the influence of Duke Energy’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”). Eighty-one percent of respondents (or, 205 of 252) who reported behavior changes gave a rating of 7 or higher.

Table 5-6: New Behaviors Adopted by Parents and Children Since Receiving Kit (Multiple Responses Allowed; n=334)

New Behaviors Child Has Adopted	Parents	Children
Adopted new behaviors since receiving kit	51%	51%
Changed thermostat settings to use less energy	22%	-
Turn off electronics when not using them	16%	25%
Takes shorter shower	16%	19%
Using fans instead of air conditioning	15%	-
Turning off air conditioning when not home	12%	-
Turning off lights when not in a room	10%	37%
Turning water heater thermostat down	8%	-
Turning off furnace when not home	5%	-
Other reason	5%	2%
Refused	0%	1%

Receiving a kit may drive a desire to make additional energy efficiency improvements. Most student families reported a desire to receive more kit measures (90%), specifying interest in LEDs (78%), nightlights (58%), showerheads (24%), gasket insulators (15%), and bathroom and kitchen aerators (14%). Parents typically preferred requesting additional measures via the internet (74%) or pre-paid postcards (23%).

Many parent respondents reported they want to purchase additional energy saving products. More than half (58%) reported an interest in purchasing at least one of the products or services seen in Table 5-7.

Table 5-7: Parent Interest in Additional Products and Services (Multiple Responses Allowed; n=334)

Products and Services	Parents
New efficient lighting	40%
Air leak sealing	28%
Energy efficient appliances	23%
Connected or smart thermostats	19%
Energy efficient water heater	18%
Efficient heating or cooling equipment	16%
Efficient windows	16%
Adding insulation	16%
Sealing or insulating ducts	14%
Other	5%

The kit motivated some respondents to purchase energy efficient equipment or services (Table 5-8). More than one-quarter (28%) of respondents reported purchasing or installing additional energy efficiency measures since receiving their kit. Efficient light bulbs were the most commonly reported measure (mentioned by 67 respondents), with 59 respondents specifying LEDs and eight mentioning CFLs. Six respondents reported getting a Duke Energy rebate for their measure, four of whom said they received rebates for purchasing LEDs, one for CFLs, one for sealing air leaks, and another who received an incentive for their efficient heating or cooling equipment. Most (60 of 92) respondents said the Duke Energy schools program was at least partially influential on their decision to purchase and install additional energy saving measures.

Table 5-8: Additional Energy Saving Measures Purchased (Multiple Responses Allowed; n=334)

	Count of Respondents Reporting Purchases After Receiving the Kit	Count Reporting Duke Rebates for Measure	Count Reporting High Program Influence on Purchase*
At least one measure	92	6	60
Bought LEDs	59	4	33
Bought energy efficient appliances	26	0	18
Sealed air leaks	18	1	8
Installed an energy efficient water heater	12	0	6
Added insulation	10	0	3
Sealed ducts	8	0	3
Bought CFLs	8	1	4
Other	8	0	3
Bought efficient heating or cooling equipment	7	1	4
Bought efficient windows	4	0	1
Moved into an ENERGY STAR home	2	0	1

*Respondents that rated the influence of the DEC program as 7 or higher on 10-point scale, where 0 was not at all influential and 10 was extremely influential.

6 DEP Process Evaluation

6.1 Summary of Data Collection Activities

The process evaluation is based on telephone and web interviews and surveys with program and implementer staff, teachers, and student families who received a kit during the program evaluation year (Table 6-1).

Table 6-1: 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	29	Unknown	90/14
Participating teacher follow-up interviews	Phone in-depth interview	5	Unknown	N/A
Student families who received DEP kit and are customers of DEP	Phone/Web survey	172*	9,025	90/6

*102 web surveys and 70 phone surveys

6.1.1 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.

In April and May 2018, the evaluation team surveyed 29 teachers who attended NTC performances between September 18, 2018 and March 15, 2018. Of the 29 teacher respondents, 19 taught elementary school and 10 taught middle school. We report elementary and middle school findings together unless a meaningful difference emerged between school types.

In May 2018, the evaluation team contacted teachers who completed the web survey that had indicated interest in being interviewed about their experience. The evaluation team requested their participation in a follow-up in-depth interview (IDI) (n=5) 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 and to provide additional details about their experience. The evaluation team completed interviews with five of these teachers. Three taught at elementary schools (teaching kindergarten, fourth, and fifth grades, respectively) and two taught sixth grade at middle schools.

6.1.2 Survey of Student Families Who Received the DEP Kit

In April and May 2018, the evaluation team surveyed 172 families who received energy efficiency kits from DEP between September 2017 and May 2018. (Table 6-2). During that period, DEP distributed a total of 5,587 kits to families who completed the kit request form their child brought home from school. The evaluation team attempted to contact a random sample frame of 4,877 households, sending email survey invitations to 3,974 households and attempting to call 903 households for which program records provided an email address and/or a phone number. Ultimately, the data collection effort achieved a 3.5% response rate, providing a sample with 90/6 confidence/precision. Comparisons with census data demonstrate that the sample is largely representative of housing type, income level, and ownership status for the region. However, respondents reported greater educational attainment and more household members than typical for the region.[23]

Table 6-2: DEP Student Family Survey Response Rates

Mode	Population Size	Sample Frame Size	Completed Surveys	Response Rate	Confidence/ Precision
Web-based	9,025	3,974	102	2.6%	90/6
Phone		903	70	7.8%	
Total		**4,877**	**172**	**3.5%**	

6.2 Process Evaluation Findings

The subsequent sections discuss the key process evaluation findings, beginning with a review sponsorship awareness.

6.2.1 Awareness of DEP Sponsorship of the Program

Teachers and student families were mostly aware of DEP's sponsorship of the program. A majority of teachers (84%) reported they were aware of DEP's sponsorship. The 23 teachers who knew of DEP's sponsorship most often learned about it through Duke materials (8 mentions) or NTC staff (8 mentions) (Table 6-3).

[23] Region comparisons come from 2016 American Community Survey (Census) 5-year period estimates data for the states of North Carolina and South Carolina.

Table 6-3: How Teachers Learned of DEP's Sponsorship (Multiple Responses Allowed; n=23)

Source	Number of Teachers
Duke Energy marketing materials	8
The National Theatre for Children staff	8
Another staff person at school	7
The National Theatre for Children materials	7
Duke Energy staff	1

Awareness among student families was high, with 88% of respondents stating they knew the kit was sponsored by Duke Energy. Over half (57%) indicated they learned about Duke's sponsorship via the classroom materials their child brought home. Other common ways that families learned about Duke Energy sponsorship were communications from their child's teacher or school (30%) and informational material included in the kit (27%).

Only about one-quarter (24%) of respondents said they knew about the energy-related classroom activities and NTC performance at their child's school. Of those, most said they found out about the NTC activities from their child (67%) and/or from a teacher or school administrator (41%).

6.2.2 Parent Awareness of DEP Kit Opportunity

Classroom materials sent home with students were the key source of awareness of kits for families, with most student families (69%) hearing about the opportunity to receive a Duke Energy kit via this medium. Other respondents learned about the kits from various communications from the school (Table 6-4).

Table 6-4: Sources of Parental Awareness of Kits (Multiple Responses Allowed; n=172)

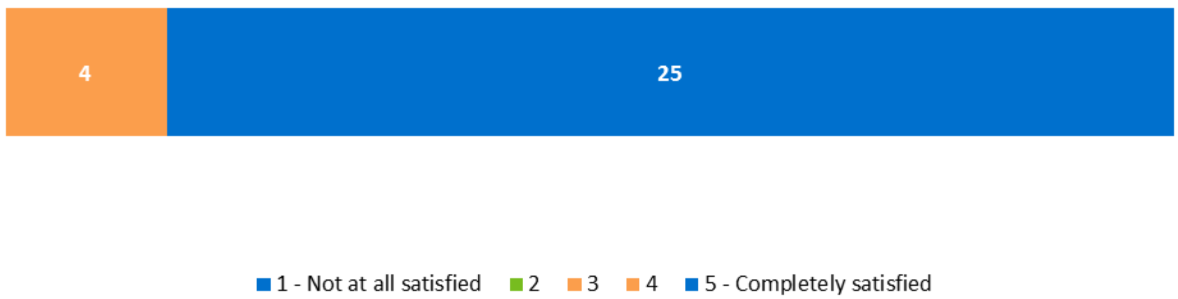
Kit Awareness	Percent
Classroom materials	69%
Email from teacher/school	13%
School newsletter	11%
School website or web portal	6%
Conversations with teacher	5%
Poster at school	3%
After hour event at school	1%
Other	18%

6.2.3 Teacher Experience with the Program

NTC Performance

Teachers were very pleased with the NTC performance. They specified that the content was age-appropriate and the performance itself was engaging, and they reported overall high satisfaction with it (Figure 6-1).

Figure 6-1: Overall Teacher Satisfaction with NTC Performance (n=29)



More than 90% of the surveyed teachers (27 of 29) said the explanation of energy-related concepts was “about right” for most of their students. The two remaining, one second grade teacher and one middle school teacher (who teaches grades 5 through 8), indicated the materials were “somewhat too advanced” for most students. Comments from the interviewed teachers echoed the findings from the online survey. Four of the five interviewed teachers – two elementary and two middle school teachers – said the performance was age appropriate and kept their students’ attention. By comparison, a kindergarten teacher reported that the material in the performance may have been better suited for older elementary students but indicated the performance still engaged the kindergarteners.

Five teachers commented on the quality of the performance, specifically that the performance was engaging, and the performers were humorous. One sixth grade teacher particularly liked that the performance was easy to understand and the other sixth grade teacher liked that the performance reinforced what they were covering in their classroom.

Only one of the surveyed teachers offered any improvements for the performance, suggesting that the NTC performance could include a list of advantages and disadvantages for renewable energy compared to nonrenewable energy.

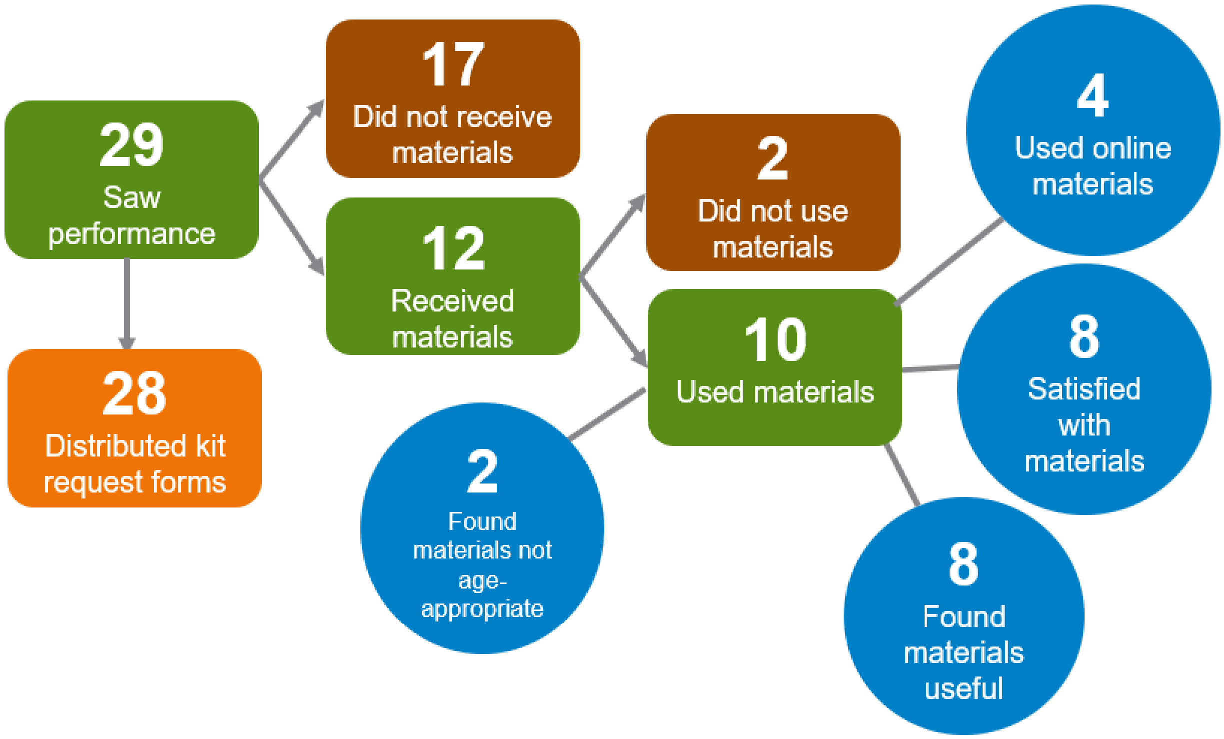
Curriculum and Instructional Materials

A notable percentage of teachers reported not receiving or using the curriculum materials. [24] About forty percent of teachers (12 of 29) reported receiving the curriculum and instructional

[24] Kit request forms and curriculum materials are delivered to schools at the same time. The findings from this study are inconclusive as to whether teachers did not actually receive the instructional materials in the first place (for example: the school received them, but did not distribute them to the teachers), or if teachers did not remember receiving them due to a recency effect (in that, they did receive them but did not remember this event by the time of the survey, which seems particularly likely if the teacher did not distribute or use the materials despite receiving them).

materials, while 17 said they did not receive the materials. Of the 12 who reported receiving the materials, two reported not using them "at all" because they did not have time to use them and integrate them into their existing curriculums (Figure 6-2).

Figure 6-2: DEP Teachers Use of Forms and Instructional Materials



The 10 teachers reporting use of the instructional materials made the following observations:

- Use of materials was limited: Two teachers characterized their use as "a little", and four used the materials "moderately" and four used them "a lot." Four respondents reported using the online aspect of the curriculum.
- Materials were useful: When asked to rate the usefulness of the materials, from 1 (not at all useful) to 5 (highly useful), two provided a score of three, five scored them a four, and three scored them the highest rating - five, extremely useful.
- Materials were age-appropriate: Seven reported the material was age-appropriate, while a kindergarten and a fifth-grade teacher reported the material was somewhat too advanced. One respondent did not know.
- Most respondents said the material aligned with state science standards: Seven reported the curriculum "completely" (1) or "mostly" (6) aligned with state science standards, and one said it "somewhat" aligned. Two did not know if the materials aligned with the standards.
- No teacher reported any specific concepts or topics children had trouble understanding.

The two teachers reporting "a little" use of the instructional materials explained their rationale for limited use of the material. One mentioned that the material was not part of their curriculum at the time and another teacher noted that they only received one workbook but "tons of materials telling the kids about the kit."

No teacher specified any concepts the workbooks should have covered to make it more useful. Eight reported being satisfied with the materials (scored a "4" or "5" on a five-point scale) and two were neither satisfied or dissatisfied with the materials (scored a "3" on a five-point scale).

Two of the five interviewed teachers said they used the curriculum materials. One of these respondents used the materials when teaching about the carbon cycle and another respondent noted using the materials when teaching about electricity.

Kit Request Forms

Figure 6-2 suggests, there was a disconnect among teachers between the kit request forms and the instructional materials. Teachers largely reported limited use of the instructional materials, with more than half indicating they never received the instructional materials. Yet nearly all reported distributing kit request forms to students, which are delivered to the school at the same time as the instructional materials. This suggests that teachers viewed the materials as tangential to the kit request forms.

Nearly all surveyed teachers distributed the kit request forms to their students and all took actions to encourage or promote the kits to their students.[25] The interviewed teachers reported no challenges related to receiving or distributing the kit request forms, with three of the five reporting receiving the forms ahead of the performance, and all noted ways they encouraged students to receive the kit (Table 6-5).

Table 6-5: Actions Taken to Encourage Students to Receive Kit (Multiple Responses Allowed)

Actions	Teacher Survey Responses (n=29)	Interview Mentions (n=5)
Encouraged students to take action	29	5
Engaged students	*26*	*4*
Vocally encouraged students	*24*	*4*
Awarded prizes to students that request kit	*1*	*-*
Posted MyEnergyKit.org poster	*13*	*-*
Assisted students with online application for kit	*-*	*1*
Engaged parents	*15*	*2*
Electronic reminders to parents (email, text)	*11*	*2*

[25] Note that one teacher respondent said they did not distribute kit request forms yet reported encouraging students to get a kit. Possible explanations for this discrepancy include that a different teacher distributed the forms, the teacher promoted online redemption instead, the respondent did not understand the question about distributing kit request forms, or the respondent accidentally selected the wrong response option.

Actions	Teacher Survey Responses (n=29)	Interview Mentions (n=5)
Spoke with parents in person	*5*	-
Used classroom web portal	*3*	-
Had school or principal send reminders	-	*1*
Used newsletter	*1*	-

About half (15 of 29) of surveyed teachers reported following up with students to find out whether their household requested a kit. Of those, 14 could estimate what percentage of student sent the forms to Duke Energy. Eleven estimated less than half of their families sent away for a kit and the remaining three reported more than half sent for a kit; on average, teachers reported that 34% of their students sent for a kit.[26]

6.2.4 Student Family Experience with the Program

Installation and Use Rates

Almost all participants used at least one measure in the kit, but installation of the measures varies by type. Ninety-three percent of the surveyed kit recipients installed at least one measure, installing an average of three measures from their kit. Most kit recipients installed the energy efficient LEDs (93%) and night lights (81%); far fewer installed the water related measures (38% to 54%) and insulator gaskets (34%). The majority of those installing light bulbs (69%) said they installed both included in the kit bulbs and they typically replaced incandescent bulbs.

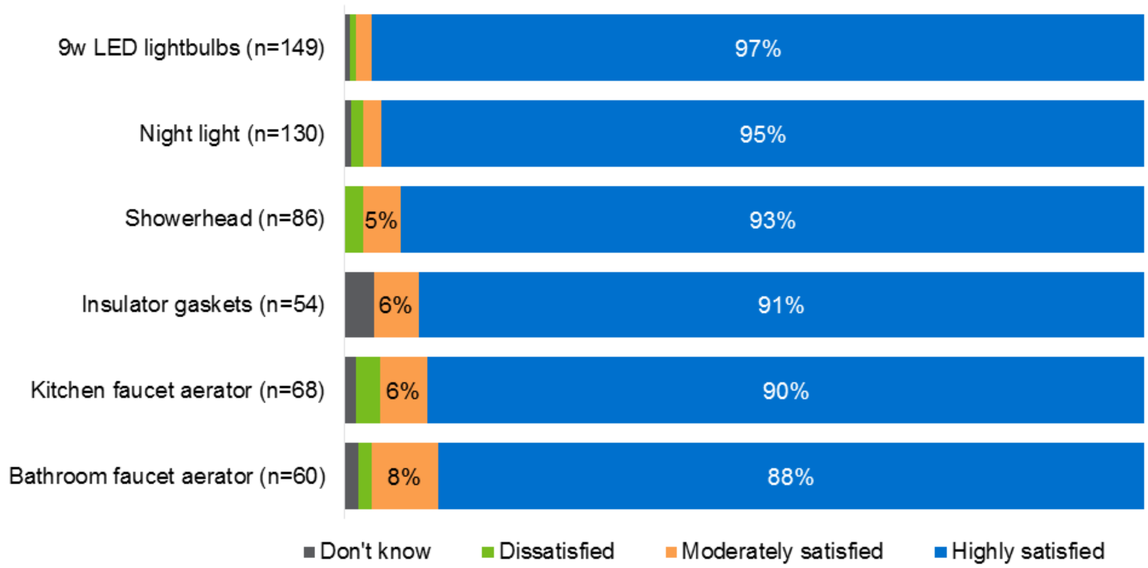
Of those who did not install all items in the kit, one-third said they do not plan to install any of the items they had not yet installed. Respondents said they would not install the remaining items because the currently installed item is still working, they already had an efficient measure installed, they had not “gotten around to it”, or they tried it and it didn’t fit or didn’t work as intended.

Measure Satisfaction

Nearly all kit recipients reported high satisfaction with the items they installed from their kit (Figure 6-3). 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 explained that any dissatisfaction they had with water measures was due to low water pressure.

[26] 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%.

Figure 6-3: Kit Recipient Satisfaction with Measures They 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

The Energy Efficiency Kit includes a Duke Energy-labeled Department of Energy (DOE) Energy Saver Booklet that includes educational information on saving energy at home. Most (74%) respondents said they read the booklet, most of whom (86%) found it highly helpful.[27] The other respondents rated the booklet as moderately helpful (11%) or not very helpful (2%). Those not finding the booklet helpful stated they already knew the information presented in the booklet and they were already doing what was recommended in their homes.

Additional Energy Saving Actions

Parents and children reported adopting new energy-saving actions since their involvement in the program. Around half of parents reported taking an energy-saving action (48%) and half of respondents reported their child has adopted new energy saving behaviors since receiving their kit. Parents most commonly said that their child now turns off lights when not using a room (32%), and parents reported changing thermostat settings (22%) (Table 6-6). The majority (86%) of respondents reporting new energy saving behaviors said the DEP-sponsored kit and materials were "highly influential" in their adoption of those behaviors.[28]

[27] We asked respondents to rate the helpfulness of the Duke Energy-labeled DOE Energy Saver Booklet on a scale from 0 ("not at all helpful") to 10 ("very helpful"). Eighty six percent of respondents who reported reading the booklet gave a rating of 7 or higher. 11% gave ratings of 5 or 6, and 2% gave ratings of 0 through 4.

[28] We asked respondents to rate the influence of Duke Energy'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"). Seventy-eight percent of respondents (or, 90 of 115) who reported behavior changes gave a rating of 7 or higher.

Table 6-6: New Behaviors Adopted by Parents and Children Since Receiving Kit (Multiple Responses Allowed; n=172)

New Behaviors Child Has Adopted	Parents	Children
Adopted new behaviors since receiving kit	48%	50%
Changed thermostat settings to use less energy	22%	-
Turn off electronics when not using them	19%	27%
Turn off lights when not in a room	13%	32%
Using fans instead of air conditioning	12%	-
Turning off air conditioning when not home	9%	-
Taking shorter showers	9%	16%
Turning water heater thermostat down	8%	-
Other	6%	6%
Turning off furnace when not home	5%	-
Refused	0%	1%

Receiving a kit may drive a desire to make additional energy efficiency improvements. Most student families reported a desire to receive more kit measures (89%), specifying interest in LEDs (82%), nightlights (60%), showerheads (27%), gasket insulators (19%), bathroom aerators (18%), and kitchen aerators (16%). Parents typically preferred requesting additional measures via internet (61%) or pre-paid postcards (29%).

Many respondents reported they want to purchase additional energy saving products. Two-thirds of respondents reported an interest in purchasing at least one of the products or services in (Table 6-7).

Table 6-7: Parent Interest in Additional Products and Services (Multiple Responses Allowed; n=172)

Products and Services	Parents
New efficient lighting	51%
Energy efficient appliances	28%
Efficient windows	17%
Air leak sealing	17%
Adding insulation	15%
Efficient heating or cooling equipment	14%
Connected or smart thermostats	13%
Energy efficient water heater	11%
Sealing or insulating ducts	9%
Other	9%

The kits also motivated some student families to purchase energy efficient equipment or services. More than a quarter (26%) of respondents reported purchasing or installing additional energy efficiency measures since receiving their kit. Efficient light bulbs were the most commonly reported measure (mentioned by 30 respondents), with 29 respondents specifying LEDs and one mentioning CFLs. Four respondents reported getting a Duke Energy rebate for their measure, two of whom said they received rebates for purchasing an energy efficient appliance, one who reported receiving a rebate for LEDs, and another who received an incentive for an unspecified measure. Most (31 of 45) respondents said the Duke Energy schools program was at least partially influential on their decision to purchase and install additional energy saving measures (Table 6-8)

Table 6-8: Additional Energy Saving Measures Purchased (Multiple Responses Allowed; n=172)

	Count of Respondents Reporting Purchases After Receiving the Kit	Count Reporting Duke Rebates for Measure	Count Reporting High Program Influence on Purchase*
At least one measure	45	4	31
Bought LEDs	29	1	19
Sealed air leaks	10	0	8
Bought energy efficient appliances	8	2	5
Added insulation	8	0	4
Other	8	1	3
Bought efficient heating or cooling equipment	4	0	0
Sealed ducts	3	0	3
Bought efficient windows	2	0	0
Moved into an ENERGY STAR home	2	0	2
Installed an energy efficient water heater	1	0	1
Bought CFLs	1	0	1

7 Conclusions and Recommendations

Based on evaluation findings, the evaluation team concluded the following and provides several recommendations for program improvement:

Conclusion 1: NTC performances satisfy teachers by engaging students. It is less clear that the performances are linked to classroom learning, awareness at home, or change in behavior. Teachers reported high satisfaction with the performance and recalled that the performance engaged students. However, curriculum materials were not always distributed or remembered by teachers, and those who used them did so in a limited way.

Parents were often not aware the performance occurred and about half of parents reported changes in their or their children's energy use behavior but those changes in behavior were limited.

> **Recommendation:** Consider exploring ways to increase teacher receipt and use of materials, such as:
>
> - Making sure teachers are aware that NTC aligns their materials with state science standards, and
> - Requesting that teachers align energy-focused lesson plans with performance timing

Conclusion 2: There is an opportunity to increase parental awareness of the kits and thus get more families to request and install kits. Currently, students bear the bulk of the burden of generating parental awareness of the kit opportunity. Although most teachers engage students on the kit request process, only about half engage parents. Parent surveys corroborate this lack of teacher to parent engagement on the kits; few parents mentioned their child's teacher or school as the source of awareness of the kit (instead, most parents learned about the kit from their child). Additionally, two-thirds of parents did not know kits were associated with a performance and instructional materials. Although about one-third of teachers follow-up with students to see if parents requested kits, there is great variation in how much emphasis teachers place on promoting the kits.

Further, the contests appear to have limited success in encouraging kit requests, as a) only one teacher mentioned using the contests to encourage kit requests, and b) the household- and school-level contests had particularly low influence on parent motivations to get a kit.

> **Recommendation:** Explore ways to increase parent awareness of and motivation for requesting the kits. For example: create a household-level contest that engages both students and their parents, so students are motivated to ask their parents to sign up and so parents are motivated to participate. For example, in addition to a cash prize drawing for parents, include a prize drawing aimed at students (e.g., toys, electronics, or other items

valued by students) or a guaranteed incentive such as a coupon for pizza (e.g., Book It model).

Conclusion 3: The program influences families to save energy. Families save energy they would not have saved without receiving the kits. Nearly all respondents installed at least one kit measure, and few would have installed the kit measures if they had not received them for free from the program (as evidenced by low free-ridership rates). About one-fifth of parent respondents reported making additional energy saving improvements, and over half of parent respondents said they or their children adopted new energy saving behaviors since receiving the kit.

Recommendation: Continue engaging student family households with the Education program.

Conclusion 4: The Education program could be a good "gateway" program to generate even more energy savings in Duke Energy territories. Kit recipients could be good targets for other Duke Energy efficiency program promotions, as they:

- Demonstrated willingness to save energy in their home
- Expressed interest in installing additional kit items or other energy saving measures (many of which Duke Energy currently incents)
- Are highly likely to read any information included with the kit
- Are commonly single family homeowners

Recommendations: Investigate the possibility of leveraging kits to promote other Duke Energy efficiency programs, such as targeting these households for direct mail campaigns or including information on Smart $aver in the kit.

Conclusion 5: Energy savings could be increased by encouraging partipants to install LED lamps in higher usage areas. LED lamp in-service rates (ISR) measured just below 80% for both DEC and DEP. This included some participants who store the LED kit lamp until a similar lamp in the home burns-out. Continue to encouraging participants to install the lamps as soon as the kit is received can increase LED lamp in-service rates and generate additional savings for the program.

Most kit lamps were installed in rooms with average (2 to 4 hour) dialy daily lighting usage, while very few lamps were installed in high use locations such as kitchens or exterior fixtures. Installation of lamps in high usage areas will results in higher energy savings (Table 7-1).

Table 7-1: Lamp HOU Installation Rates

Daily Lamp Use*	DEC Installation Rate	DEP Installation Rate
Low (< 2 hours)	43%	44%
Average (2-4 hours)	36%	32%

Daily Lamp Use*	DEC Installation Rate	DEP Installation Rate
High (> 4 hours)	21%	24%

*Based on the participant survey responses

Recommendations: Program should continue to encourage lamp installations as soon as possible informing them where their new lamps can save the most energy. Alternatively, consider swapping out one of the A-shape LEDs with a lamp, such as an LED PAR, that may be more applicable to higher use areas like the kitchen

Conclusion 6: Water-related measures drive savings, but installation rates are low. Water measures contributed the majority of verified savings (DEC 74%, DEP 80%), yet fewer than half of all participants installed an aerator or showerhead (Table 7-2).

Table 7-2: Water Measure In-Service Rates

Measure	DEC ISR	DEP ISR
Kitchen Faucet Aerator	30%	40%
Bathroom Faucet Aerator	30%	34%
Showerhead	42%	50%

*Based on the participant survey responses

Recommendations: Review water savings measures' satisfaction and dislikes as well as elicit feedback from Save Energy and Water Kit Program to determine if there are ways to improve the ISR for water measures.

Appendix A Summary Forms

DEC Summary Form

Description of program

The Energy Education in Schools Program is an energy efficiency program that 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. 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 from DEC and 2) lesson plans associated with the content in the student workbooks.

Date	October 15, 2018
Region(s)	North and South Carolina
Evaluation Period	August 1, 2017 – July 31, 2018
Annual Gross kWh Savings	6,283,232 kWh
Per Kit kWh Savings	271.3 kWh per kit
Annual Gross Summer kW Savings	777.7 kW
Annual Gross Winter kW Savings	1,113.4 kW
Net-to-Gross Ratio	0.94
Process Evaluation	Yes
Previous Evaluation(s)	Yes

Evaluation Methodology

Impact Evaluation Activities

- *334 telephone/web surveys and analysis of 8 unique measures.*

Impact Evaluation Findings

- *Realization rate = 135% for energy impacts; 61% for demand impacts*
- *Net-to-gross ratio = 0.94*

Process Evaluation Activities

- *334 telephone/web surveys with student families and analysis of 8 unique measures.*
- *44 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 parents aware of Duke Energy sponsorship of the kits*
- *Parents largely learning abut kits from materials from their children.*
- *Student families are highly satisfied with kit items.*
- *The NTC program is successfully influencing families to adopt energy saving behaviors*
- *Teachers are not using materials as much as previous years*

DEP Summary Form

Description of program

The Energy Education in Schools Program is an energy efficiency program that 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. 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 from DEP and 2) lesson plans associated with the content in the student workbooks.

Date	August 30, 2018
Region(s)	North and South Carolina
Evaluation Period	August 1, 2017 – May 31, 2018
Annual Gross kWh Savings	3,100,016 kWh
Per Kit kWh Savings	343.5 kWh per kit
Annual Gross Summer kW Savings	373.1 kW
Annual Gross Winter kW Savings	581.0 kW
Net-to-Gross Ratio	0.92
Process Evaluation	Yes
Previous Evaluation(s)	Yes

Evaluation Methodology

Impact Evaluation Activities

- *172 telephone/web surveys and analysis of 8 unique measures.*

Impact Evaluation Findings

- *Realization rate = 124% for energy impacts; 52% for demand impacts*
- *Net-to-gross ratio = 0.92*

Process Evaluation Activities

- *172 telephone/web surveys with student families and analysis of 8 unique measures.*
- *29 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 parents aware of Duke Energy sponsorship of the kits*
- *Parents largely learning abut kits from materials from their children.*
- *Student families are highly satisfied with kit items.*
- *The NTC program is successfully influencing families to adopt energy saving behaviors*
- *Teachers are not using materials as much as previous years*

Appendix B Measure Impact Results

Table B-1: DEC Program Year 2017-2018 per Unit Verified Impacts by Measure – Key Measure Parameters

Measure Category	Gross Energy Savings (kWh)	Gross Summer Demand (kW)	Gross Winter Demand (kW)	Realization Rate (Energy)	Free Ridership	Spillover	Net to Gross Ratio	M&V Factor (Energy) (RR x NTG)	Measure Life
9 Watt LEDs*	27.0	0.005	0.002	N/A	0.26	0.09	0.93	N/A	5
Nightlight	9.8	0.000	0.000	N/A	0.17			N/A	8
1.5 GPM Showerhead	121.6	0.010	0.027	N/A	0.16			N/A	10
1.0 GPM Bathroom Faucet Aerator	12.4	0.002	0.003	N/A	0.12			N/A	9
1.5 GPM Kitchen Faucet Aerator	38.2	0.005	0.008	N/A	0.13			N/A	9
Water Temperature Gauge Card	23.7	0.003	0.005	N/A	0.16			N/A	4
Outlet Insulating Gaskets	6.3	0.008	0.000	N/A	0.12			N/A	15
Behavioral Changes	32.3	0.001	0.002	N/A	-	-	1.00	N/A	0.3
Total	**271.3**	**0.034**	**0.048**	**135.0%**	**0.16**	**0.09**	**0.94**	**125.2%**	**-**

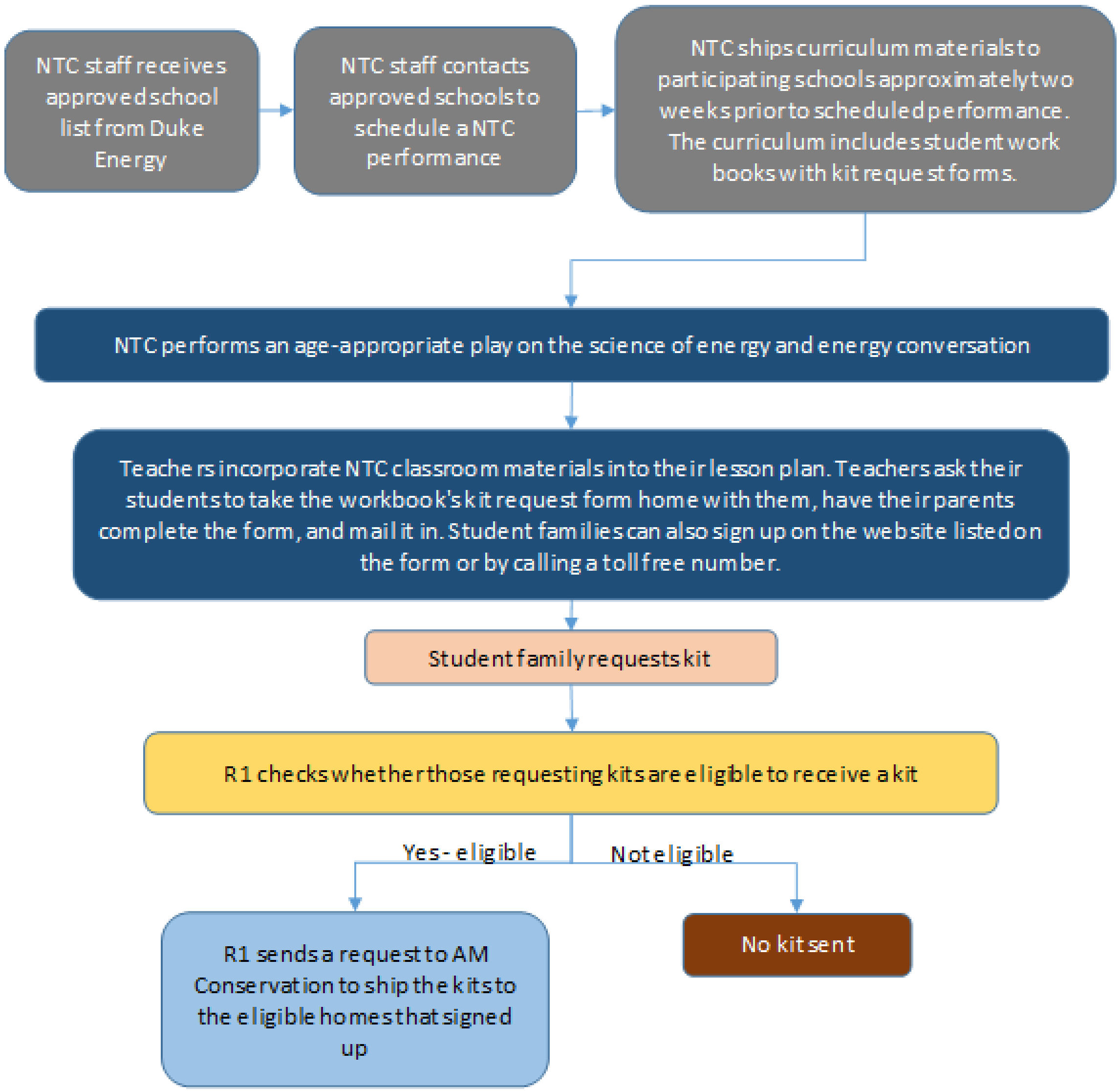
*Represents two 9 watt LEDs

Table B-2: DEP Program Year 2017-2018 per Unit Verified Impacts by Measure – Key Measure Parameters

Measure Category	Gross Energy Savings (kWh)	Gross Summer Demand (kW)	Gross Winter Demand (kW)	Realization Rate (Energy)	Free Ridership	Spillover	Net to Gross Ratio	M&V Factor (Energy) (RR x NTG)	Measure Life
9 Watt LEDs*	25.4	0.004	0.002	N/A	0.24	**0.05**	**0.92**	N/A	5
Nightlight	10.9	0.000	0.000	N/A	0.14			N/A	8
1.5 GPM Showerhead	168.1	0.013	0.038	N/A	0.14			N/A	10
1.0 GPM Bathroom Faucet Aerator	16.4	0.002	0.004	N/A	0.06			N/A	9
1.5 GPM Kitchen Faucet Aerator	62.3	0.008	0.014	N/A	0.10			N/A	9
Water Temperature Gauge Card	23.5	0.003	0.005	N/A	0.13			N/A	4
Outlet Insulating Gaskets	6.8	0.009	0.000	N/A	0.08			N/A	15
Behavioral Changes	30.1	0.001	0.002	N/A	-	-	1.00	N/A	0.3
Total	**343.5**	**0.041**	**0.064**	**124.3%**	**0.13**	**0.05**	**0.92**	**114.0%**	**-**

*Represents two 9 watt LEDs

Appendix C Program Process Flow Chart



Appendix D Program Performance Metrics

This appendix provides key program performance metrics, or PPIs. See Section 6.2 for the underlying results and more detailed findings.

Figure D-1: Program Experience PPIs – DEC

	Student Families		Teachers	
Awareness PPIs	**%**	**n**	**%**	**n**
Aware of DEC sponsorship	94%	334	84%	44
Learned of DEC sponsorship via program collateral	68%	334	32%	37
Learned of DEC sponsorship via teachers	28%	334	38%	37
Read Energy Saver Booklet	73%	334	-	
Rated Energy Saver Booklet as highly informative	82%	245		
Satisfaction PPIs				
NTC performance	-		95%	44
Usefulness of classroom materials	-		77%	26
Overall satisfaction with classroom materials	-		92%	26
Bathroom faucet aerator	86%	104	-	
Insulator gaskets	85%	103	-	
Night light	95%	259	-	
Light bulbs	95%	297	-	
Showerhead	86%	153	-	
Kitchen faucet aerator	85%	109	-	
Program influence on behavior PPIs				
Installed at least one kit measure	93%	334	-	
Plan to install measure[s] (of those that did not install any measures)	91%	22	-	
Respondents reporting spillover	19%	334	-	
Adopted new energy saving behaviors: parents	51%	334	-	
Adopted new energy saving behaviors: children	51%	334	-	
Challenges and opportunities for improvement PPIs				
Used NTC materials in classroom	-		59%	44
Suggested improvements to NTC performance	-		23%	44
Distributed kit forms to classroom	-		95%	44
Mentioned challenges/concerns with instructional materials	-		5%	44
Suggested curriculum improvements	-		14%	44

***Program collateral includes NTC materials and DEC marketing materials**

Figure D-2: Program Experience PPIs – DEP

	Student Families		Teachers	
Awareness PPIs	**%**	**n**	**%**	**n**
Aware of DEP sponsorship	88%	172	79%	29
Learned of DEP sponsorship via program collateral	63%	172	65%	23
Learned of DEP sponsorship via teachers	27%	172	30%	23
Read Energy Saver Booklet	74%	172	-	
Rated Energy Saver Booklet as highly informative	86%	128	-	
Satisfaction PPIs				
NTC performance	-		59%	29
Usefulness of classroom materials	-		80%	10
Overall satisfaction with classroom materials	-		80%	10
Bathroom faucet aerator	88%	60	-	
Insulator gaskets	91%	54	-	
Night light	95%	130	-	
Light bulbs	97%	149	-	
Showerhead	93%	86	-	
Kitchen faucet aerator	90%	68	-	
Program influence on behavior PPIs				
Installed at least one kit measure	93%	172	-	
Plan to install measure[s] (of those that did not install any measures)	100%	12	-	
Respondents reporting spillover	18%	172	-	
Adopted new energy saving behaviors: parents	48%	172	-	
Adopted new energy saving behaviors: children	50%	172	-	
Challenges and opportunities for improvement PPIs				
Used NTC materials in classroom	-		34%	29
Suggested improvements to NTC performance	-		10%	29
Distributed kit forms to classroom	-		97%	29
Mentioned challenges/concerns with instructional materials	-		0%	29
Suggested curriculum improvements	-		10%	29

***Program collateral includes NTC materials and DEP marketing materials**

Figure D-3: Student Family Demographics Reach PPIs

Duke Energy Carolinas

Housing Type

Detached	74%
Attached	16%
Mobile	11%

Ownership Status

Own	63%
Rent	35%
Occupy rent-free	1%

Household Size

One to two	14%
Three	20%
Four	35%
Five+	31%

Education

High school or less	22%
Some college	32%
Bachelors Degree	20%
Graduate Degree	22%
Refused / Don't know	4%

Income

< $30k	24%
$30k to < $60k	27%
$60k to < $75k	6%
$75k to < $100k	12%
$100k+	13%
Refused / Don't know	17%

Duke Energy Progress

Housing Type

Detached	60%
Attached	20%
Mobile	19%

Housing Type

Detached	60%
Attached	20%
Mobile	19%

Ownership Status

Own	65%
Rent	35%

Education

High school or less	24%
Some college	31%
Bachelors Degree	22%
Graduate Degree	22%
Refused / Don't know	1%

Education

High school or less	24%
Some college	31%
Bachelors Degree	22%
Graduate Degree	22%
Refused / Don't know	1%

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 false enrollment dates 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

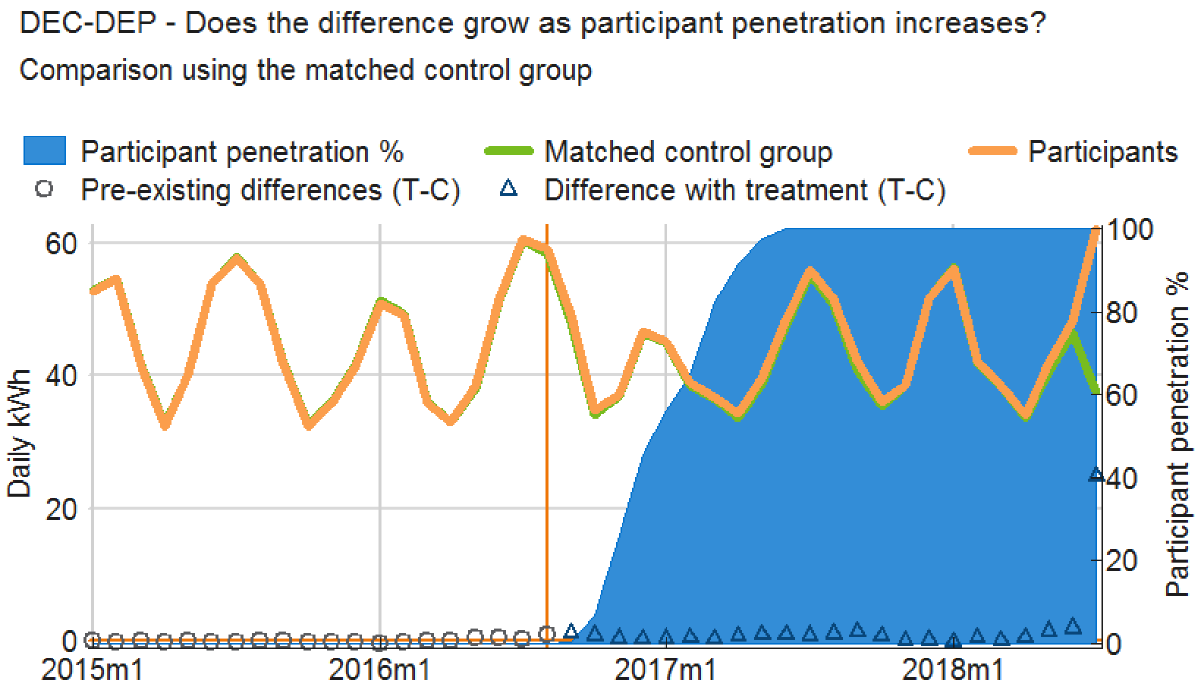
Table E-1: Side-by-side Comparison of Control and Treatment Groups

Year and month	Daily kWh		Diff	% Diff	Kit Penetration (%)	
	Control	Treated			Treat	Control
Aug-15	52.9	52.8	-0.11	-0.20%	0.0%	0.0%
Sep-15	54.8	54.6	-0.18	-0.34%	0.0%	0.0%
Oct-15	41.6	41.4	-0.15	-0.36%	0.0%	0.0%
Nov-15	32.5	32.3	-0.16	-0.50%	0.0%	0.0%
Dec-15	40.4	40.3	-0.13	-0.31%	0.0%	0.0%
Jan-16	53.9	53.8	-0.17	-0.32%	0.0%	0.0%
Feb-16	58.0	57.9	-0.19	-0.32%	0.0%	0.0%
Mar-16	53.9	53.8	-0.10	-0.19%	0.0%	0.0%
Apr-16	41.9	41.7	-0.15	-0.36%	0.0%	0.0%
May-16	32.5	32.3	-0.21	-0.66%	0.0%	0.0%
Jun-16	36.2	35.9	-0.27	-0.74%	0.0%	0.0%
Jul-16	41.8	41.5	-0.29	-0.69%	0.0%	0.0%
Aug-16	51.4	50.9	-0.44	-0.85%	0.0%	0.0%
Sep-16	49.4	49.1	-0.25	-0.51%	0.0%	0.0%
Oct-16	36.1	36.0	-0.11	-0.30%	0.0%	0.0%
Nov-16	33.0	33.1	0.06	0.18%	0.0%	0.0%
Dec-16	38.1	38.6	0.48	1.25%	0.0%	0.0%
Jan-17	51.4	51.7	0.34	0.67%	0.0%	0.0%
Feb-17	60.4	60.7	0.22	0.36%	0.0%	0.0%
Mar-17	58.4	59.3	0.85	1.45%	0.0%	0.0%
Apr-17	48.1	49.2	1.12	2.32%	0.0%	0.2%
May-17	34.1	34.8	0.69	2.03%	0.0%	6.5%
Jun-17	36.9	37.2	0.25	0.67%	0.0%	26.3%
Jul-17	46.5	46.7	0.15	0.32%	0.0%	45.6%

**Only includes customers with pre-treatment data from Aug 2015 to July 2016

*Billing periods were calendarized (calendar month)

Figure E-1: Visual Comparison of Control and Treatment Groups



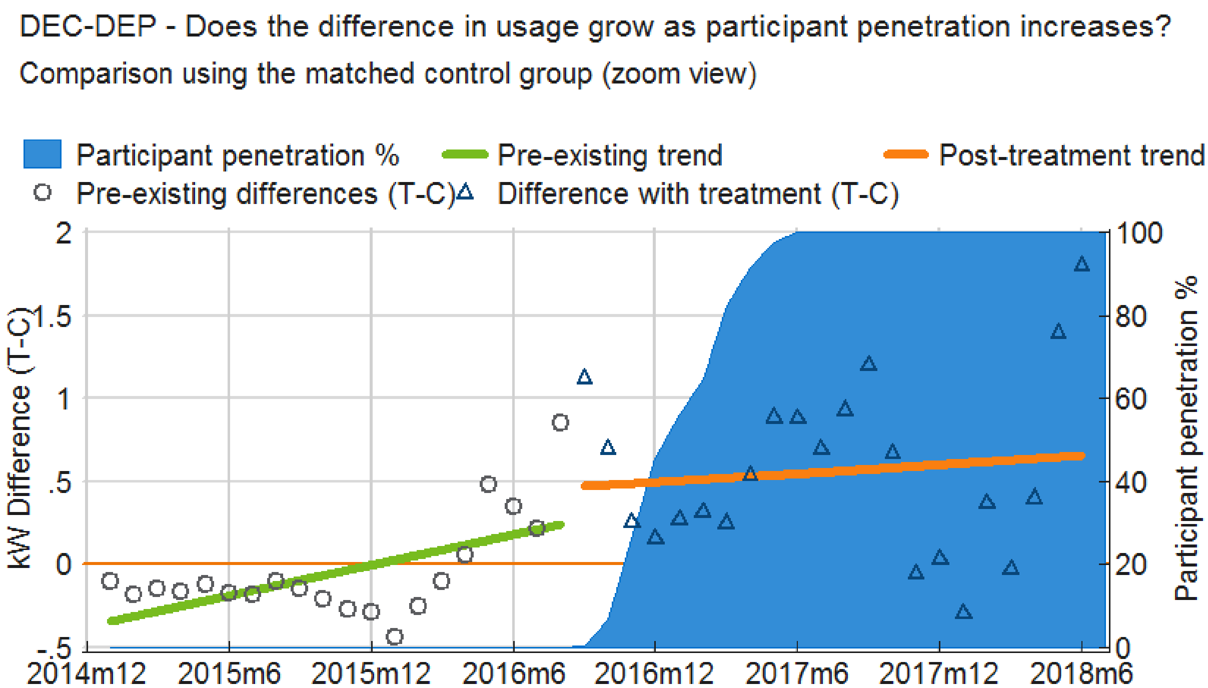


Figure E-2: Difference-in-Differences Panel Regression Model Placebo Test Results – 3 Months Prior

Linear regression, absorbing indicators

Number of obs	=	628258
F(27, 594755)	=	12265.82
Prob > F	=	0.0000
R-squared	=	0.7144
Adj R-squared	=	0.6983
Root MSE	=	12.2402

daily_kwh	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
pseudo3_post	-.5256702	.0923383	-5.69	0.000	-.7066503	-.3446901
pseudo3_partxpost	.474797	.1007961	4.71	0.000	.2772399	.6723541
daily_cdd	-.2624074	.020821	-12.60	0.000	-.3032158	-.2215991
daily_hdd	-.2409448	.0212211	-11.35	0.000	-.2825375	-.199352
moyr						
665	14.97549	.1756674	85.25	0.000	14.63119	15.31979
666	19.55672	.2106636	92.83	0.000	19.14383	19.96961
667	14.80155	.1643195	90.08	0.000	14.47949	15.12361
668	1.706849	.1002563	17.02	0.000	1.51035	1.903349
669	-7.909724	.2232815	-35.42	0.000	-8.347349	-7.4721
670	-3.208551	.315886	-10.16	0.000	-3.827677	-2.589425
671	2.497413	.3207077	7.79	0.000	1.868836	3.12599
672	15.58922	.6469555	24.10	0.000	14.3212	16.85723
673	12.54181	.5461112	22.97	0.000	11.47145	13.61217
674	-3.647916	.2698748	-13.52	0.000	-4.176861	-3.11897
675	-7.109081	.2069337	-34.35	0.000	-7.514665	-6.703498
676	-2.215585	.1125347	-19.69	0.000	-2.436149	-1.99502
677	12.51956	.17157	72.97	0.000	12.18328	12.85583
678	22.42831	.2298776	97.57	0.000	21.97776	22.87886
679	20.59289	.2123426	96.98	0.000	20.17671	21.00908
680	9.216912	.1433816	64.28	0.000	8.935889	9.497936
681	-6.136477	.1697139	-36.16	0.000	-6.469111	-5.803843
682	-1.411565	.3650647	-3.87	0.000	-2.12708	-.6960503
683	9.723139	.5300884	18.34	0.000	8.684183	10.7621
684	7.686554	.487174	15.78	0.000	6.731709	8.6414
685	.8500553	.3933818	2.16	0.031	.0790395	1.621071
686	-.8975118	.4275042	-2.10	0.036	-1.735406	-.0596172
687	-5.511773	.2879834	-19.14	0.000	-6.076211	-4.947335
_cons	41.93327	.1165433	359.81	0.000	41.70485	42.1617
account_id	F(33475, 594755) =		34.112	0.000	(33476 categories)	

Figure E-3: Difference-in-Differences Panel Regression Model Placebo Test Results – 4 Months Prior

```
Linear regression, absorbing indicators         Number of obs     =     659041
                                                F(  27, 625538)   =   13689.79
                                                Prob > F          =     0.0000
                                                R-squared         =     0.7165
                                                Adj R-squared     =     0.7013
                                                Root MSE          =    12.1196
```

daily_kwh	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
pseudo4_post	-.4247787	.0840387	-5.05	0.000	-.5894918	-.2600656
pseudo4_partxpost	.4851166	.0846007	5.73	0.000	.3193019	.6509313
daily_cdd	-.2654691	.020141	-13.18	0.000	-.3049448	-.2259935
daily_hdd	-.2354826	.0207305	-11.36	0.000	-.2761137	-.1948515
moyr						
664	8.183583	.1832708	44.65	0.000	7.824378	8.542788
665	23.18311	.3132845	74.00	0.000	22.56908	23.79713
666	27.77034	.3501534	79.31	0.000	27.08406	28.45663
667	23.00724	.3009306	76.45	0.000	22.41743	23.59705
668	9.896078	.2110981	46.88	0.000	9.482333	10.30982
669	.2304075	.1015936	2.27	0.023	.0312874	.4295276
670	4.905798	.166716	29.43	0.000	4.57904	5.232556
671	10.61005	.1711686	61.99	0.000	10.27457	10.94554
672	23.61627	.480162	49.18	0.000	22.67517	24.55737
673	20.59528	.3823227	53.87	0.000	19.84594	21.34462
674	4.478541	.1299933	34.45	0.000	4.223759	4.733324
675	1.033154	.0965464	10.70	0.000	.843926	1.222382
676	5.938123	.1368656	43.39	0.000	5.669871	6.206376
677	20.79924	.3093994	67.22	0.000	20.19283	21.40565
678	30.72265	.3700041	83.03	0.000	29.99745	31.44785
679	28.78262	.350431	82.13	0.000	28.09579	29.46946
680	17.32469	.271811	63.74	0.000	16.79195	17.85743
681	1.983447	.1159611	17.10	0.000	1.756167	2.210727
682	6.528178	.2243711	29.10	0.000	6.088418	6.967938
683	17.67602	.36939	47.85	0.000	16.95203	18.40002
684	15.79898	.3340732	47.29	0.000	15.1442	16.45375
685	8.773683	.2505606	35.02	0.000	8.282592	9.264774
686	7.24334	.2872157	25.22	0.000	6.680406	7.806273
_cons	33.76435	.1042117	324.00	0.000	33.5601	33.9686
account_id	F(33475, 625538) =		35.716	0.000	(33476 categories)	

Figure E-4: Difference-in-Differences Panel Regression Model Placebo Test Results – 5 Months Prior

Linear regression, absorbing indicators

Number of obs	=	687621
F(27, 654118)	=	13444.51
Prob > F	=	0.0000
R-squared	=	0.7106
Adj R-squared	=	0.6958
Root MSE	=	12.2627

daily_kwh	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
pseudo5_post	-.2841678	.0819632	-3.47	0.001	-.444813	-.1235227
pseudo5_partxpost	.5195482	.0770491	6.74	0.000	.3685345	.6705619
daily_cdd	-.4206152	.0186884	-22.51	0.000	-.4572439	-.3839866
daily_hdd	-.0656947	.0194092	-3.38	0.001	-.103736	-.0276534
moyr						
663	-9.246892	.2048831	-45.13	0.000	-9.648456	-8.845328
664	.2435606	.33841	0.72	0.472	-.4197121	.9068332
665	16.37426	.4606622	35.55	0.000	15.47138	17.27715
666	21.26268	.4942919	43.02	0.000	20.29388	22.23148
667	16.09737	.4494461	35.82	0.000	15.21647	16.97827
668	2.212501	.3655132	6.05	0.000	1.496107	2.928896
669	-9.344392	.1735278	-53.85	0.000	-9.684501	-9.004283
670	-5.481911	.1085518	-50.50	0.000	-5.694669	-5.269153
671	.1810658	.1061787	1.71	0.088	-.0270411	.3891727
672	10.49394	.275661	38.07	0.000	9.953652	11.03423
673	8.294643	.1902391	43.60	0.000	7.921781	8.667505
674	-5.512512	.1359901	-40.54	0.000	-5.779048	-5.245975
675	-8.374107	.1868889	-44.81	0.000	-8.740404	-8.007811
676	-2.477432	.2890254	-8.57	0.000	-3.043912	-1.910951
677	13.99713	.457528	30.59	0.000	13.10039	14.89387
678	24.32712	.512294	47.49	0.000	23.32304	25.3312
679	22.09522	.4942646	44.70	0.000	21.12648	23.06397
680	9.967723	.4222883	23.60	0.000	9.140051	10.79539
681	-7.01392	.2451765	-28.61	0.000	-7.494458	-6.533382
682	-4.366852	.132827	-32.88	0.000	-4.627189	-4.106516
683	5.525837	.200146	27.61	0.000	5.133557	5.918117
684	3.966411	.179768	22.06	0.000	3.614071	4.31875
685	-2.179574	.1592099	-13.69	0.000	-2.491621	-1.867528
_cons	42.38615	.2649444	159.98	0.000	41.86686	42.90543
account_id	F(33475, 654118) =		36.658	0.000	(33476 categories)	

Figure E-5: Difference-in-Differences Panel Regression Model Placebo Test Results – 6 Months Prior

```
Linear regression, absorbing indicators          Number of obs     =    710185
                                                 F(  27, 676682)   =  12262.54
                                                 Prob > F          =    0.0000
                                                 R-squared         =    0.6877
                                                 Adj R-squared     =    0.6723
                                                 Root MSE          =   13.1854
```

daily_kwh	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
pseudo6_post	-.2160949	.0867745	-2.49	0.013	-.3861702	-.0460197
pseudo6_partxpost	.5809622	.0778351	7.46	0.000	.428408	.7335165
daily_cdd	-.596042	.0194923	-30.58	0.000	-.6342462	-.5578377
daily_hdd	.0785573	.019962	3.94	0.000	.0394324	.1176821
moyr						
662	-11.93424	.3343578	-35.69	0.000	-12.58957	-11.27891
663	-19.77144	.5154094	-38.36	0.000	-20.78162	-18.76125
664	-8.98844	.6590042	-13.64	0.000	-10.28007	-7.696813
665	8.382719	.7835346	10.70	0.000	6.847017	9.918421
666	13.61014	.8173818	16.65	0.000	12.0081	15.21218
667	7.990053	.7722869	10.35	0.000	6.476396	9.50371
668	-6.742756	.6868977	-9.82	0.000	-8.089053	-5.396459
669	-20.17191	.4789355	-42.12	0.000	-21.1106	-19.23321
670	-17.00842	.3865308	-44.00	0.000	-17.766	-16.25083
671	-11.37184	.3814024	-29.82	0.000	-12.11937	-10.6243
672	-3.371243	.1145078	-29.44	0.000	-3.595675	-3.146812
673	-4.869892	.1803676	-27.00	0.000	-5.223406	-4.516377
674	-16.63903	.4312435	-38.58	0.000	-17.48426	-15.79381
675	-19.06178	.4947421	-38.53	0.000	-20.03146	-18.0921
676	-12.19545	.6068682	-20.10	0.000	-13.38489	-11.00601
677	5.935216	.7802705	7.61	0.000	4.405911	7.46452
678	16.68188	.8351525	19.97	0.000	15.045	18.31875
679	14.25023	.817349	17.43	0.000	12.64826	15.85221
680	1.592694	.7453375	2.14	0.033	.1318565	3.053531
681	-17.40192	.5527553	-31.48	0.000	-18.4853	-16.31854
682	-16.24748	.3630762	-44.75	0.000	-16.9591	-15.53587
683	-7.499445	.2351205	-31.90	0.000	-7.960273	-7.038616
684	-8.718828	.2718093	-32.08	0.000	-9.251566	-8.186091
_cons	52.4287	.5864711	89.40	0.000	51.27924	53.57817
account_id	F(33475, 676682) =		34.163	0.000	(33476 categories)	

Figure E-6: Difference-in-Differences Panel Regression Model Placebo Test Results – 7 Months Prior

Linear regression, absorbing indicators

Number of obs	=	730052
F(27, 696549)	=	11715.39
Prob > F	=	0.0000
R-squared	=	0.6776
Adj R-squared	=	0.6621
Root MSE	=	13.6259

daily_kwh	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
pseudo7_post	-.2046139	.0887691	-2.31	0.021	-.3785986	-.0306293
pseudo7_partxpost	.6511034	.076956	8.46	0.000	.5002723	.8019346
daily_cdd	-.6336218	.0198524	-31.92	0.000	-.6725317	-.5947118
daily_hdd	.0715356	.0200871	3.56	0.000	.0321655	.1109057
moyr						
661	1.614047	.1338197	12.06	0.000	1.351765	1.876329
662	-10.42732	.2601788	-40.08	0.000	-10.93726	-9.917377
663	-18.28754	.4388951	-41.67	0.000	-19.14776	-17.42732
664	-7.37477	.5835965	-12.64	0.000	-8.518601	-6.23094
665	10.23146	.7107887	14.39	0.000	8.838334	11.62458
666	15.53028	.7455107	20.83	0.000	14.0691	16.99145
667	9.812764	.6992321	14.03	0.000	8.442292	11.18324
668	-5.080311	.611999	-8.30	0.000	-6.279809	-3.880813
669	-18.69904	.4024735	-46.46	0.000	-19.48788	-17.91021
670	-15.51035	.3110742	-49.86	0.000	-16.12005	-14.90065
671	-9.86332	.3060847	-32.22	0.000	-10.46324	-9.263404
672	-1.774626	.1095627	-16.20	0.000	-1.989365	-1.559887
673	-3.233484	.1261926	-25.62	0.000	-3.480817	-2.986151
674	-15.18973	.3565045	-42.61	0.000	-15.88847	-14.49099
675	-17.60579	.4195775	-41.96	0.000	-18.42815	-16.78344
676	-10.6504	.5315033	-20.04	0.000	-11.69213	-9.60867
677	7.654997	.7077851	10.82	0.000	6.267762	9.042233
678	18.46994	.7642374	24.17	0.000	16.97206	19.96782
679	16.23986	.7468902	21.74	0.000	14.77598	17.70374
680	3.337503	.6722143	4.96	0.000	2.019985	4.655021
681	-15.97908	.4785406	-33.39	0.000	-16.917	-15.04115
682	-14.82792	.2934069	-50.54	0.000	-15.40299	-14.25285
683	-5.91968	.1847038	-32.05	0.000	-6.281694	-5.557667
_cons	51.02393	.508591	100.32	0.000	50.0271	52.02075
account_id	F(33475, 696549) =		33.802	0.000	(33476 categories)	

Figure E-7: Difference-in-Differences Panel Regression Model Placebo Test Results – 8 Months Prior

Linear regression, absorbing indicators

Number of obs	=	714019
F(26, 680517)	=	12483.04
Prob > F	=	0.0000
R-squared	=	0.6803
Adj R-squared	=	0.6646
Root MSE	=	13.5214

daily_kwh	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
pseudo8_post	-.2527771	.0879036	-2.88	0.004	-.4250653	-.0804889
pseudo8_partxpost	.7253856	.074626	9.72	0.000	.5791211	.8716502
daily_cdd	-.6138513	.0199662	-30.74	0.000	-.6529844	-.5747183
daily_hdd	.0639577	.0202341	3.16	0.002	.0242995	.1036159
moyr						
661	1.645427	.13356	12.32	0.000	1.383653	1.9072
662	-10.51839	.2614451	-40.23	0.000	-11.03081	-10.00597
663	-18.4631	.4416991	-41.80	0.000	-19.32882	-17.59739
664	-7.66233	.5874254	-13.04	0.000	-8.813665	-6.510996
665	9.811116	.7153954	13.71	0.000	8.408964	11.21327
666	15.07201	.7503207	20.09	0.000	13.60141	16.54261
667	9.405752	.7037725	13.36	0.000	8.02638	10.78512
668	-5.396655	.6160066	-8.76	0.000	-6.604007	-4.189302
669	-18.85279	.4049933	-46.55	0.000	-19.64656	-18.05901
670	-15.62536	.3128102	-49.95	0.000	-16.23845	-15.01226
671	-9.979628	.3077796	-32.42	0.000	-10.58287	-9.37639
672	-1.683788	.1102975	-15.27	0.000	-1.899968	-1.467609
673	-3.359955	.1290097	-26.04	0.000	-3.61281	-3.1071
674	-15.39415	.3595886	-42.81	0.000	-16.09893	-14.68937
675	-17.78332	.4224407	-42.10	0.000	-18.61129	-16.95535
676	-10.94766	.53508	-20.46	0.000	-11.9964	-9.89892
677	7.107528	.7126016	9.97	0.000	5.710852	8.504204
678	18.18085	.7703218	23.60	0.000	16.67104	19.69065
679	15.86131	.7514087	21.11	0.000	14.38857	17.33404
680	2.906622	.6767679	4.29	0.000	1.580179	4.233065
681	-16.19297	.4812871	-33.65	0.000	-17.13628	-15.24966
682	-14.87434	.2937033	-50.64	0.000	-15.44999	-14.29869
_cons	51.21454	.5121434	100.00	0.000	50.21075	52.21832
account_id	F(33475, 680517) =		33.117	0.000	(33476 categories)	

Figure E-8: Difference-in-Differences Panel Regression Model Placebo Test Results – 9 Months Prior

```
Linear regression, absorbing indicators          Number of obs     =    693985
                                                 F(  25, 660484)   =  12864.99
                                                 Prob > F          =    0.0000
                                                 R-squared         =    0.6806
                                                 Adj R-squared     =    0.6644
                                                 Root MSE          =   13.5794
```

daily_kwh	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
pseudo9_post	-.2994821	.0883002	-3.39	0.001	-.4725477	-.1264165
pseudo9_partxpost	.7426867	.0742484	10.00	0.000	.5971623	.8882111
daily_cdd	-.63676	.0206267	-30.87	0.000	-.6771878	-.5963323
daily_hdd	.0884283	.020969	4.22	0.000	.0473298	.1295268
moyr						
661	1.544798	.1358086	11.37	0.000	1.278618	1.810979
662	-10.22824	.2696294	-37.93	0.000	-10.7567	-9.699775
663	-17.94059	.4570697	-39.25	0.000	-18.83643	-17.04474
664	-6.94917	.6086018	-11.42	0.000	-8.14201	-5.756331
665	10.69082	.7415713	14.42	0.000	9.237364	12.14428
666	15.99617	.7778181	20.57	0.000	14.47167	17.52066
667	10.27052	.729504	14.08	0.000	8.840714	11.70032
668	-4.645794	.6383212	-7.28	0.000	-5.896883	-3.394706
669	-18.37783	.4189051	-43.87	0.000	-19.19888	-17.55679
670	-15.27227	.3231137	-47.27	0.000	-15.90556	-14.63898
671	-9.577161	.3183308	-30.09	0.000	-10.20108	-8.953243
672	-1.819487	.1145699	-15.88	0.000	-2.04404	-1.594934
673	-3.36976	.1332714	-25.28	0.000	-3.630968	-3.108552
674	-14.96729	.371883	-40.25	0.000	-15.69617	-14.23841
675	-17.28389	.4372255	-39.53	0.000	-18.14084	-16.42695
676	-10.34816	.5544759	-18.66	0.000	-11.43491	-9.261405
677	8.208008	.7400288	11.09	0.000	6.757575	9.65844
678	19.20255	.798279	24.05	0.000	17.63795	20.76715
679	16.73138	.7791	21.48	0.000	15.20437	18.25839
680	3.777532	.7010761	5.39	0.000	2.403445	5.151618
681	-15.57675	.4972935	-31.32	0.000	-16.55143	-14.60207
_cons	50.60445	.5303875	95.41	0.000	49.56491	51.64399
account_id	F(33475, 660484) =		32.031	0.000	(33476 categories)	

Figure E-9: Pre-Post Panel Regression Model Placebo Test Results – 3 Months Prior

Linear regression, absorbing indicators

Number of obs	=	113864
F(14, 97080)	=	5848.72
Prob > F	=	0.0000
R-squared	=	0.8027
Adj R-squared	=	0.7686
Root MSE	=	10.6273

daily_kwh	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
pseudo3_post	-.5314323	.1114073	-4.77	0.000	-.7497894	-.3130752
daily_cdd	-.3169182	.0425132	-7.45	0.000	-.4002436	-.2335929
daily_hdd	-.0590921	.0494516	-1.19	0.232	-.1560167	.0378326
month						
2	-5.511652	.3302651	-16.69	0.000	-6.158968	-4.864336
3	-7.344523	.3685627	-19.93	0.000	-8.066901	-6.622144
4	-10.10898	.8802062	-11.48	0.000	-11.83418	-8.383791
5	-6.835175	.9498222	-7.20	0.000	-8.696816	-4.973534
6	8.631092	1.343093	6.43	0.000	5.998646	11.26354
7	18.64833	1.461028	12.76	0.000	15.78474	21.51193
8	17.08849	1.420058	12.03	0.000	14.30519	19.87178
9	5.656242	1.254013	4.51	0.000	3.198392	8.114093
10	-10.81806	.8036582	-13.46	0.000	-12.39322	-9.242901
11	-8.042124	.3424341	-23.49	0.000	-8.713291	-7.370957
12	1.264436	.2383657	5.30	0.000	.7972415	1.73163
_cons	46.49572	.9312778	49.93	0.000	44.67042	48.32101
account_id	F(16769, 97080) =		18.288	0.000	(16770 categories)	

Figure E-10 Pre-Post Panel Regression Model Placebo Test Results – 4 Months Prior

Linear regression, absorbing indicators

Number of obs	=	130634
F(14, 113850)	=	7702.38
Prob > F	=	0.0000
R-squared	=	0.7963
Adj R-squared	=	0.7663
Root MSE	=	10.5521

daily_kwh	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
pseudo4_post	-.1019962	.1000816	-1.02	0.308	-.2981547	.0941622
daily_cdd	-.2495264	.037817	-6.60	0.000	-.3236471	-.1754057
daily_hdd	-.1536438	.0435237	-3.53	0.000	-.2389495	-.0683381
month						
2	-6.529509	.2999275	-21.77	0.000	-7.117362	-5.941655
3	-8.272702	.3264474	-25.34	0.000	-8.912534	-7.63287
4	-13.7987	.6396182	-21.57	0.000	-15.05234	-12.54505
5	-8.457698	.8622915	-9.81	0.000	-10.14778	-6.76762
6	6.275922	1.206549	5.20	0.000	3.911103	8.64074
7	16.04963	1.307554	12.27	0.000	13.48685	18.61242
8	14.40293	1.267052	11.37	0.000	11.91952	16.88633
9	3.200197	1.120023	2.86	0.004	1.004968	5.395425
10	-12.40505	.7229552	-17.16	0.000	-13.82203	-10.98807
11	-9.062039	.3227195	-28.08	0.000	-9.694565	-8.429514
12	1.292102	.2099939	6.15	0.000	.8805167	1.703686
_cons	48.17469	.8450344	57.01	0.000	46.51844	49.83095
account_id	F(16769, 113850) =		19.675	0.000	(16770 categories)	

Figure E-11: Pre-Post Panel Regression Model Placebo Test Results – 5 Months Prior

```
Linear regression, absorbing indicators          Number of obs     =    147404
                                                 F(  14, 130620)   =   8335.33
                                                 Prob > F          =    0.0000
                                                 R-squared         =    0.7833
                                                 Adj R-squared     =    0.7554
                                                 Root MSE          =   10.7176
```

daily_kwh	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
pseudo5_post	.4194159	.0891347	4.71	0.000	.2447135	.5941182
daily_cdd	-.3738546	.0305868	-12.22	0.000	-.4338041	-.313905
daily_hdd	-.0206818	.0302047	-0.68	0.494	-.0798825	.0385188
month						
2	-5.88248	.2519248	-23.35	0.000	-6.376248	-5.388711
3	-8.575499	.3207776	-26.73	0.000	-9.204218	-7.946781
4	-11.24155	.4305582	-26.11	0.000	-12.08543	-10.39766
5	-5.291916	.581889	-9.09	0.000	-6.432408	-4.151423
6	10.73817	.8377623	12.82	0.000	9.096175	12.38017
7	20.74429	.9219409	22.50	0.000	18.9373	22.55128
8	18.87646	.8943449	21.11	0.000	17.12356	20.62936
9	7.029936	.7837181	8.97	0.000	5.493863	8.56601
10	-9.87039	.5036506	-19.60	0.000	-10.85754	-8.883244
11	-8.10301	.2452054	-33.05	0.000	-8.583609	-7.622412
12	1.338839	.1979009	6.77	0.000	.9509568	1.726721
_cons	45.06678	.5613088	80.29	0.000	43.96663	46.16694
account_id	F(16769, 130620) =		20.732	0.000	(16770 categories)	

Figure E-12: Pre-Post Panel Regression Model Placebo Test Results – 6 Months Prior

Linear regression, absorbing indicators

Number of obs	=	164174
F(14, 147390)	=	6405.51
Prob > F	=	0.0000
R-squared	=	0.7329
Adj R-squared	=	0.7025
Root MSE	=	12.2721

daily_kwh	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
pseudo6_post	-.9050612	.0909866	-9.95	0.000	-1.083393	-.7267292
daily_cdd	-1.063065	.0274973	-38.66	0.000	-1.11696	-1.009171
daily_hdd	.6265702	.0196531	31.88	0.000	.5880505	.6650899
month						
2	-.3945862	.1888234	-2.09	0.037	-.7646763	-.024496
3	-3.983506	.2961308	-13.45	0.000	-4.563916	-3.403096
4	-3.870804	.3644687	-10.62	0.000	-4.585155	-3.156453
5	6.108178	.4574688	13.35	0.000	5.211549	7.004808
6	29.04072	.6475631	44.85	0.000	27.77151	30.30993
7	41.23932	.7144837	57.72	0.000	39.83894	42.63969
8	38.68867	.6880759	56.23	0.000	37.34005	40.03728
9	24.37551	.5916628	41.20	0.000	23.21586	25.53515
10	-.0603162	.3778493	-0.16	0.873	-.8008932	.6802609
11	-4.625116	.2321373	-19.92	0.000	-5.0801	-4.170131
12	-.2016072	.2094856	-0.96	0.336	-.6121949	.2089805
_cons	34.95556	.4414944	79.18	0.000	34.09024	35.82088
account_id	F(16769, 147390) =		18.564	0.000	(16770 categories)	

Figure E-13: Pre-Post Panel Regression Model Placebo Test Results – 7 Months Prior

Linear regression, absorbing indicators

Number of obs	=	180944
F(14, 164160)	=	5736.80
Prob > F	=	0.0000
R-squared	=	0.7117
Adj R-squared	=	0.6823
Root MSE	=	13.0199

daily_kwh	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
pseudo7_post	-.8407146	.095874	-8.77	0.000	-1.028626	-.6528037
daily_cdd	-1.141725	.0275736	-41.41	0.000	-1.195768	-1.087681
daily_hdd	.5698512	.0177381	32.13	0.000	.5350848	.6046175
month						
2	.0439932	.1488409	0.30	0.768	-.2477317	.3357181
3	-4.113582	.3049181	-13.49	0.000	-4.711215	-3.51595
4	-3.996618	.3745488	-10.67	0.000	-4.730726	-3.262511
5	5.926219	.4669832	12.69	0.000	5.010942	6.841496
6	29.21162	.6597604	44.28	0.000	27.9185	30.50474
7	41.49021	.7276829	57.02	0.000	40.06397	42.91645
8	39.25332	.6999674	56.08	0.000	37.8814	40.62524
9	24.52563	.5964482	41.12	0.000	23.35661	25.69466
10	-.4510099	.3884665	-1.16	0.246	-1.212396	.310376
11	-4.661574	.2371764	-19.65	0.000	-5.126434	-4.196713
12	.27908	.1831745	1.52	0.128	-.0799381	.6380981
_cons	35.67814	.4570338	78.06	0.000	34.78236	36.57391
account_id	F(16769, 164160) =		19.220	0.000	(16770 categories)	

Figure E-14: Pre-Post Panel Regression Model Placebo Test Results – 8 Months Prior

Linear regression, absorbing indicators

Number of obs	=	197714
F(14, 180930)	=	6483.45
Prob > F	=	0.0000
R-squared	=	0.7191
Adj R-squared	=	0.6931
Root MSE	=	12.6061

daily_kwh	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
pseudo8_post	-.6826227	.0717895	-9.51	0.000	-.8233285	-.5419168
daily_cdd	-1.109996	.02343	-47.37	0.000	-1.155918	-1.064073
daily_hdd	.5780858	.0111235	51.97	0.000	.556284	.5998875
month						
2	-.0808791	.1344885	-0.60	0.548	-.3444736	.1827153
3	-4.021167	.21272	-18.90	0.000	-4.438094	-3.604241
4	-3.895118	.2534334	-15.37	0.000	-4.391842	-3.398394
5	5.953745	.3119416	19.09	0.000	5.342347	6.565144
6	28.81599	.4565089	63.12	0.000	27.92124	29.71074
7	41.53259	.5171521	80.31	0.000	40.51899	42.5462
8	39.11434	.4945979	79.08	0.000	38.14493	40.08374
9	24.27672	.4197223	57.84	0.000	23.45408	25.09937
10	-.508134	.2831966	-1.79	0.073	-1.063193	.0469248
11	-4.77302	.2041849	-23.38	0.000	-5.173218	-4.372823
12	-.0497681	.1625679	-0.31	0.760	-.3683974	.2688612
_cons	35.50422	.2853676	124.42	0.000	34.9449	36.06353
account_id	F(16769, 180930) =		22.212	0.000	(16770 categories)	

Figure E-15 Pre-Post Panel Regression Model Placebo Test Results – 9 Months Prior

Linear regression, absorbing indicators

Number of obs	=	214484
F(14, 197700)	=	7887.48
Prob > F	=	0.0000
R-squared	=	0.7267
Adj R-squared	=	0.7035
Root MSE	=	12.2177

daily_kwh	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
pseudo9_post	-.4499133	.065228	-6.90	0.000	-.5777586	-.322068
daily_cdd	-1.043921	.021781	-47.93	0.000	-1.086611	-1.001231
daily_hdd	.5762994	.0107475	53.62	0.000	.5552346	.5973642
month						
2	-.2012934	.1329344	-1.51	0.130	-.4618416	.0592548
3	-3.977699	.2044698	-19.45	0.000	-4.378455	-3.576943
4	-3.984402	.2431879	-16.38	0.000	-4.461045	-3.50776
5	5.606003	.3005122	18.65	0.000	5.017007	6.195
6	28.40953	.4369316	65.02	0.000	27.55315	29.2659
7	40.61824	.4882978	83.18	0.000	39.66119	41.57529
8	38.03025	.4704454	80.84	0.000	37.10819	38.95231
9	23.54459	.400655	58.77	0.000	22.75932	24.32987
10	-.7655753	.2733795	-2.80	0.005	-1.301392	-.2297581
11	-5.323539	.1767645	-30.12	0.000	-5.669993	-4.977085
12	-.0229054	.1571798	-0.15	0.884	-.330974	.2851632
_cons	35.44876	.2723991	130.14	0.000	34.91486	35.98266
account_id	F(16769, 197700) =		24.813	0.000	(16770 categories)	

Appendix F Instruments

F.1 Program Staff In-Depth Interview Guide

Introduction

Today, we'll be discussing your role in the Energy Efficiency Education Program the Duke Energy Progress and Carolinas territories. We would like to learn about your experiences in administering this/these program(s) in the 2017-2018 school year.

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 Energy Efficiency Education Program.

Q2. How long have you been in this role?

Program Delivery

Q3. Next, I'd like to learn more about how this program was delivered in 2017-2018 school year. Last time we spoke with program staff we got a good understanding of the program delivery model. Have there been any changes in program delivery since the 2015-2016 school year?

[*IF NEEDED*:]

1. Did you adjust your marketing and outreach strategy since the 2015-2016 school year? If so, how?
2. In 2017-2018, was the program for elementary the same as the prior school year (Space Station Conservation)? Has the curriculum or performance changed at all? If so, was any of that at the direction of Duke program staff?
3. What was the program for middle schools last school year? I know in 2015-2016 it was "Conservation Crew" but I don't see that on the NTC website currently.
4. Do you have a copy of the 2017-2018 student and teacher materials you could send me?
5. Are new programs being implemented for the 2017-2018 school year? I see Kilowatt Kitchen and The E-Team on the NTC Playworks website for North and South Carolina.
6. When was the NTC Playworks website added to the program? What is its purpose? How has the changed the program delivery, goals, or success?

7. Are R1 and AM Conservation still acting as fulfillment contractors? Is their role any different from last year?
8. From the teacher and student family perspective, has the student family kit request process changed at all?

Kits

Let's talk about the kits a little bit. The kits includes:

- LED Bulbs
- LED Night Light
- Energy-Efficient Showerhead
- Kitchen Faucet Aerator
- Bathroom Faucet Aerator
- Water Flow Meter Bag
- Switch and Outlet Insulators
- Teflon Tape (used for installing the Showerhead and Faucet Aerators)
- Hot Water Gauge Card
- D.O.E. Energy Savers Booklet
- Glow Ring Toy
- Product Information/Instruction Sheet

Q4. Were there any changes to the items in the kit since 2015-2016 program year?

Q5. Do you know when the program switched from CFLs to LEDs? (Was it April 2016?)

Q6. They get two LEDs, twelve outlet gaskets, and one of each of the other items, right?

Q7. Is the product information sheet purely instructional, or does it have behavior tips on it? Can you email me a copy?

Q8. Is the DOE Energy Savers Booklet the 45-page booklet that is available online on the DOE's website?

We are almost done. I have a few more questions.

Wrap Up

Q9. The last evaluation revealed that the program curriculum may be targeting too wide of an age range to effectively teach all elementary grades. Also, some middle school teachers said the middle school content was too juvenile. However, this did not seem to affect kit distribution. How important is fine-tuning the educational component to Duke? Is that a priority?

Q10. What would you say are the greatest strengths of this program?

Q11. What would you say is the biggest challenge in administering this program?

Q12. Is there anything else about the program that we have not discussed that you feel should be mentioned?

Q13. 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 NTC Staff In-Depth Interview Guide

Introduction

Today, we'll be discussing your role in the Energy Efficiency Education Program in the Duke Energy Progress and Carolinas territories. We would like to learn about your experiences in administering this/these program(s) in the 2017-2018 school year.

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 NTC and your role in the Duke Energy Energy Efficiency Education Program.

Q2. How long have you been in this role?

Program Delivery

Q3. Next, I'd like to learn more about how this program was delivered in 2017-2018 school year. Last time we spoke with program staff we got a good understanding of the program delivery model. Have there been any changes in program delivery since the 2015-2016 school year?

[*IF NEEDED*:]

1. Did you adjust your marketing and outreach strategy since the 2015-2016 school year? If so, how?
2. In 2017-2018, was the program for elementary the same as the prior school year (Space Station Conservation)? Has the curriculum or performance changed at all? If so, was any of that at the direction of Duke program staff?
3. What was the program for middle schools last school year? I know in 2015-2016 it was "Conservation Crew" but I don't see that on the NTC website currently.
4. Do you have a copy of the 2017-2018 student and teacher materials you could send me?
5. Are new programs being implemented for the 2017-2018 school year? I see Kilowatt Kitchen and The E-Team on the NTC Playworks website for North and South Carolina.
6. When was the NTC Playworks website added to the program? What is its purpose? How has the changed the program delivery, goals, or success?
7. From the teacher and student family perspective, has the student family kit request process changed at all?

Wrap Up

Q4. The last evaluation revealed that the program curriculum may be targeting too wide of an age range to effectively teach all elementary grades. Also, some middle school teachers said the middle school content was too juvenile. However, this did not seem to affect kit distribution. How important is fine-tuning the educational component to NTC? Is that a priority?

Q5. What would you say are the greatest strengths of this program?

Q6. What would you say is the biggest challenge in administering this program?

Q7. Is there anything else about the program that we have not discussed that you feel should be mentioned?

Q8. What would you like to learn from the program evaluation?

Those are all of my questions. Thank you very much for your time.

F.3 Teacher Survey

Introduction to Survey (Once Survey is Opened)

Thank you for agreeing to take this survey. It starts with a few questions about what grades and subjects you teach, which we need for our analysis of the survey responses. The survey then asks for your feedback on various elements of the program.

Grades and Subjects Taught

Q1. What grade(s) of students do you teach? *Please select all that apply.*

[MULTIPLE RESPONSE]

1. Pre-K
2. Kindergarten
3. Grade 1
4. Grade 2
5. Grade 3
6. Grade 4
7. Grade 5
8. Grade 6
9. Grade 7
10. Grade 8
11. Grades 9-12
12. Other, please specify: [OPEN-ENDED RESPONSE]

[TERMINATE IF Kindergarten to Grade 8 (options 2-10) aren't selected]

[IF Q1=Kindergarten to Grade 5 AND Q1<> Grade 6 to Grade 8]

Q2. Are you a home room teacher?

[SINGLE RESPONSE]

1. Yes
2. No [→ TERMINATE]

[IF Q1=Grade 6 to Grade 8]

Q3. What subjects do you teach? *Please select all that apply*.

[MULTIPLE RESPONSE]

1. Math
2. Natural sciences
3. English/language arts
4. Social studies/social sciences/history
5. Music
6. Art

7. Physical education
8. Other – please specify: [OPEN-ENDED RESPONSE]

[IF Q3<>1 or 2]

Q4. Do you teach any topics on energy (electricity, gas, coal, etc.) generation, transformation, use, or conservation (including, but not limited to, topics/materials provided by the Energy Efficiency for Schools program)?

[SINGLE RESPONSE]

1. Yes
2. No [→ TERMINATE]

Performance Seen

[IF Performance_Name=Kilowatt Kitchen]

Q5. Did you see The National Theatre for Children performance for elementary school students called *Kilowatt Kitchen* on [PERFORMANCE_DATE]?

1. Yes [SKIP TO Q7]
2. No [→ TERMINATE]
98. Don't know/ Can't recall [→ TERMINATE]

[IF Performance_Name= The E-Team]

Q6. Did you see the National Theatre for Children performance for middle school students called *The E-Team* on [PERFORMANCE_DATE]?

1. Yes
2. No [→ TERMINATE]
98. Don't know/ Can't recall [→ TERMINATE]

[TERMINATION SCREEN TEXT: We have determined that you do not meet the qualification criteria for this study. Thank you for your time!]

Awareness of Duke Energy's Sponsorship

Q7. Before today, were you aware that Duke Energy sponsored the National Theatre for Children performance(s) in your school?

1. Yes
2. No
98. Don't know

[IF Q7 = 1 (YES)]

Q8. How did you learn of Duke Energy's involvement with the National Theatre for Children program? *Please select all that apply*.

[MULTIPLE RESPONSE]

1. Another teacher

2. Duke Energy marketing materials
3. Duke Energy staff
4. National Theatre for Children staff
5. National Theatre for Children materials
6. Other, please describe: [OPEN-ENDED RESPONSE]
98. Don't know

Program Experience and Satisfaction

The next few questions are about the performance(s) that National Theatre for Children presented at your school.

Q9. Thinking about how the school performance explained the energy-related concepts, would you say that, on the whole, the explanation was:

[SINGLE RESPONSE]

1. Far too advanced for most of your students
2. Somewhat too advanced for most of your students
3. About right for most of your students
4. Somewhat too basic for most of your students
5. Far too basic for most of your students
96. Other, please specify: [OPEN-ENDED RESPONSE]
98. Don't know

[IF Q9 = 1 OR 2]

Q10. What about the performance was too advanced for most of your students?

1. [OPEN ENDED]

Q11. Were there any concepts that the performance(s) did not cover that *should have been* covered?

1. Yes
2. No [SKIP TO Q13]
98. Don't know [SKIP TO Q13]

[IF Q11 = 1 (YES)]

Q12. What concepts were not covered that *should have been* covered?

1. [OPEN ENDED]

Q13. Please rate your overall satisfaction with the National Theatre for Children performance on the following scale. [SINGLE RESPONSE; INSERT 1-5 SCALE WHERE 1=NOT AT ALL SATISFIED AND 5=COMPLETELY SATISFIED WITH DK; LABEL ONLY THE END POINTS (1 AND 5) – SHOULD LOOK SOMETHING LIKE THIS:

1. 1 – Not at all satisfied
2. 2

3. 3
4. 4
5. 5 – Completely satisfied
98. Don't know]

The next few questions are about the curriculum or instructional materials that you may have received from the National Theatre for Children around the time of the performance.

Q14. Did you receive curriculum or instructional materials, such as student workbooks, related to energy and energy conservation from National Theatre for Children in the 2017-2018 school year?

1. Yes
2. No [SKIP TO Q24]
98. Don't know [SKIP TO Q24]

[IF Q14 = 1 (YES)]
Q15. To what degree did you use the curriculum or instructional materials in teaching your students about energy?

[SINGLE RESPONSE]

1. Not at all [SKIP TO Q23]
2. A little
3. Moderately
4. A lot
5. Extensively
98. Don't know [SKIP TO Q24]

[IF Q15 = 2 (A LITTLE)]
Q15a. Why did you only use the workbooks "a little" in teaching your students about energy?

1. [OPEN ENDED]

Q15b. Did you incorporate the National Theatre for Children's online component into your curriculum in the 2015-2016 school year? This is the official website that accompanies the performance and classroom curriculum; it has interactive games that reinforce the concepts taught in the performance and printed curriculum.

1. Yes
2. No
98. Don't know

[IF Q15B= 1 (YES)]
Q15c. How satisfied are you with that online component?

[SINGLE RESPONSE]

1. 1 – Not at all satisfied

2. 2
3. 3
4. 4
5. 5 – Completely satisfied
98. Don't know

[IF Q15 = 2 THROUGH 5]
Q16. Thinking about how the student workbooks explained energy-related concepts, would you say that the material was generally:

[SINGLE RESPONSE; READ EXCEPT OTHER, DK, AND REFUSED OPTIONS]

1. Far too advanced for most of your students
2. Somewhat too advanced for most of your students
3. About right for most of your students
4. Somewhat too basic for most of your students
5. Far too basic for most of your students
96. Other, please specify: [OPEN-ENDED RESPONSE]
98. Don't know
99. Refused / I'd rather not say

[IF Q15 = 2, 3, 4, OR 5]
Q17. Please rate how useful the materials were to you in teaching your students about energy. [SINGLE RESPONSE; INSERT 1-5 SCALE WHERE 1=NOT AT ALL USEFUL AND 5=EXTREMELY USEFUL WITH DK; LABEL ONLY END POINTS, 1 AND 5]

[IF Q15 = 2, 3, 4, OR 5]
Q17a. Please rate the degree to which the topics in the workbook aligned with your state's science standards for the grade(s) you teach.

1. Completely aligned
2. Mostly aligned
3. Somewhat aligned
4. Poorly aligned
5. Not aligned at all
6. N/A – no science standards for my grade(s)
98. Don't know
99. Refused / I'd rather not say

[IF Q15 = 2, 3, 4, OR 5]
Q18. Were there any concepts covered in the curriculum or instructional materials that your students had particular challenges with?

1. Yes
2. No
98. Don't know

99. Refused / I'd rather not say

[IF Q18 = 1 (YES)]
Q19. What concepts did your students have particular challenges with?

1. [OPEN ENDED]

[IF Q15 = 2, 3, 4, OR 5]
Q20. Were there any concepts that the materials did not cover that *should have been* covered?

1. Yes
2. No
98. Don't know
99. Refused / I'd rather not say

[IF Q20 = 1 (YES)]
Q21. What concepts were not covered that *should have been* covered?

1. [OPEN ENDED]

[IF Q15 = 2 THROUGH 5]
Q22. Please rate your overall satisfaction with curriculum or instructional materials you received from the National Theatre for Children program using the following scale.

[SINGLE RESPONSE; INSERT 1-5 SCALE WHERE 1=NOT AT ALL SATISFIED AND 5=COMPLETELY SATISFIED WITH DK; LABEL ONLY END POINTS (1 AND 5)]

[IF Q15 = 1 (NOT AT ALL)]
Q23. Why did you *not* use the curriculum or instructional materials in teaching your students about energy?

1. [OPEN ENDED]

Interactions with NTC Staff

Q24. Did you have any interactions with anyone from the National Theatre for Children regarding the curriculum or instructional materials?

1. Yes
2. No [SKIP TO Q27]
98. Don't know [SKIP TO Q27]

[IF Q24 = 1 (YES)]
Q25. What did those interactions address?

1. [OPEN ENDED]

[IF Q24 = 1 (YES)]
Q26. Using the scale provided, how satisfied were you with:

a. Your interactions with the National Theatre for Children staff, overall
b. The professionalism and courtesy of the National Theatre for Children staff
c. The National Theatre for Children staff's knowledge about the topics you discussed with them

[SINGLE RESPONSE; FOR EACH ITEM, INSERT 1-5 SCALE WHERE 1=NOT AT ALL SATISFIED AND 5=COMPLETELY SATISFIED WITH DK; LABEL ONLY THE END POINTS (1 AND 5)]

Encouragement of Students to Complete Survey, Receive Kit

In addition to the student workbooks provided by the National Theatre for Children there are materials directed at parents that instruct them on how to request a free energy saving kit from Duke Energy. The kit contains energy efficient light bulbs, low flow showerheads, and other items that students and their parents can install in their home to save energy.

Q27. Did you distribute the kit request materials to either your students or directly to their parents?

1. Yes
2. No
98. Don't recall

Q28. Were there any other ways in which you personally promoted the kits to your students and their families? If so, what were they? [*Select all that apply*]

1. Pinned up MyEnergyKit.org poster
2. Vocally encouraged students to sign up for a kit
3. Used my classroom web portal to encourage families to sign up for a kit
4. Emailed parents to encourage them to sign up for a kit
5. Spoke with parents in person to encourage them to sign up for a kit
6. Other (please specify)
7. No other actions taken [*EXCLUSIVE RESPONSE*]
98. Don't recall [*EXCLUSIVE RESPONSE*]

[IF Q27 = 1 (YES) OR Q28=1-6]
Q29. Did you follow up with students or parents later to find out if their household requested a kit?

1. Yes
2. No [SKIP TO Q32]
98. Don't know [SKIP TO Q32]

[IF Q29 = 1 (YES)]
Q30. In your best estimate, what percentage of your student households ordered the Duke Energy kit?

1. 0% to 10%

2. 11% to 20%
3. 21% to 30%
4. 31% to 40%
5. 41% to 50%
6. 51% to 60%
7. 61% to 70%
8. 71% to 80%
9. 81% to 90%
10. 91% to 100%
98. Don't know

[IF Q27 = 2 (NO)]
Q31. Why haven't you distributed the kit request materials to your students or their parents?

1. [OPEN-ENDED]

Challenges and Opportunities for Improvement

Q32. What suggestions do you have to improve the National Theatre for Children performance(s)?

1. [OPEN ENDED]

[IF Q14 = 1 (YES)]
Q33. What suggestions do you have to improve the classroom materials received from the National Theatre for Children?

1. [OPEN ENDED]

[ASK ALL]
Q34. In addition to this survey, we will be conducting 15-minute-long telephone interviews with five teachers, where we will ask them additional questions about their experience with the National Theatre for Children program. Interview participants will be compensated for their time. If selected, would you be willing to participate in a follow-up telephone interview about your experience with the program?

[SINGLE RESPONSE]

1. Yes, I am willing to be interviewed
2. No, I am not willing to be interviewed

That was the last question. Thank you for your time!

F.4 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.5 Student Parent Survey

Introduction/ Screening

Q1. [PHONE SURVEY] 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]

Q1. [WEB SURVEY] We are conducting surveys 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 [TERMINATE]

Q1_phone. [IF Q1=1 AND VERSION=PHONE]. Do you have a few minutes to answer some questions about the kit, even if you never opened it?

1. Yes
2. No [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 or middle 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

Q3a. How did you hear about the opportunity to receive the kit from Duke Energy? [Select all that apply]

1. Classroom materials brought home by child
2. School newsletter
3. Email from my child's teacher/school
4. School website or school web portal
5. In-person conversations with my child's teacher
6. Saw a poster at my child's school
7. After hours event at my child's school
8. 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?

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 Q7=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]

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) (LEDs)	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 LED light bulbs in the kit. Did you install one or both of the LED light bulbs in the kit?

[SINGLE RESPONSE]

1. Yes – I installed both LEDs
2. No – I installed only one LED light bulb
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 (LEDs)	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 (LEDs)
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 (LEDs)	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 (LEDs)
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 (LEDs)	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)
11. [DISPLAY IF Q21e was not selected] 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

[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)]

Q22a. Thinking of the items you installed, would you be interested in receiving any more of them from Duke Energy? If so, which ones?

[MULTIPLE RESPONSES]

1. [IF Q12a = 1 AND Q19.1 NOT SELECTED] Yes, I would like another energy-efficient showerhead
2. [IF Q12b = 1 AND Q19.2 NOT SELECTED] Yes, I would like another kitchen faucet aerator
3. [IF Q12c = 1 AND Q19.3 NOT SELECTED] Yes, I would like more bathroom faucet aerators
4. [IF Q12d = 1 AND Q19.4 NOT SELECTED Yes, I would like more energy-efficient night lights
5. [IF Q12e = 1 AND Q19.5 NOT SELECTED] Yes, I would like more energy-efficient light bulbs (LEDs)
6. [IF Q12f = 1 AND Q19.6 NOT SELECTED] Yes, I would like more switch/outlet gasket insulators
7. No, I am not interested in receiving any more of the items
98. Don't know
99. Refused

[IF Q22a=1-6]
Q22b. What would be your preferred way to request these additional items?

[MULTIPLE RESPONSES]

1. Internet
2. Telephone
3. Pre-paid postcard
4. Other, please specify: [OPEN-ENDED RESPONSE]
98. Don't know
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. Q39. If you had not received them for free in the kit, how many LED light bulbs would you have purchased?

1. One
2. Two
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
The chance to win cash prizes for your household and school	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
The chance to win cash prizes for your household and school	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, has your child adopted any **new** behaviors to help save energy in your home? This would only include new energy saving **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

Q45b. [IF Q45 =2-5] Before receiving the kit, was your child already…

[MATRIX QUESTION]

DISPLAY IF	DISPLAY:	ANSWERS
Q45.2 IS SELECTED	Turning off lights when not in a room	Yes, No, Don't know
Q45.3 IS SELECTED	Turning off electronics when not using them	Yes, No, Don't know
Q45.4 IS SELECTED	Taking shorter showers	Yes, No, Don't know
Q45.5 IS SELECTED	[Q45.5 VERBATIM TEXT]	Yes, No, Don't know

Q46. Since receiving your energy kit from Duke Energy, have you adopted any new behaviors to help save energy in your home? This would only include new energy saving**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

Q46b. [IF Q46 =2-10] Before receiving the kit, were you already…

[MATRIX QUESTION]

DISPLAY IF	DISPLAY:	ANSWERS
Q46.2 IS SELECTED	Turning off lights when not in a room	Yes, No, Don't know
Q46.3 IS SELECTED	Turning off furnace when not home	Yes, No, Don't know
Q46.4 IS SELECTED	Turning off air conditioning when not home	Yes, No, Don't know
Q46.5 IS SELECTED	Changing thermostat settings so heating or cooling system uses less energy	Yes, No, Don't know
Q46.6 IS SELECTED	Using fans instead of air conditioning	Yes, No, Don't know

Q46.7 IS SELECTED	Turning off electronics when not using them	Yes, No, Don't know
Q46.8 IS SELECTED	Taking shorter showers	Yes, No, Don't know
Q46.9 IS SELECTED	Turning water heat thermostat down	Yes, No, Don't know
Q46.10 IS SELECTED	[Q46.10 VERBATIM TEXT]	Yes, No, Don't know

[IF Q46 <> 1 or 98]

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

Q47a. Thinking of the near future, are you interested in purchasing any additional products or services to help save energy in your home?

1. Yes
2. No
98. Don't know
99. Refused

[IF Q47a=1]

Q47b. What additional products or services are you interested in purchasing?

[MULTIPLE RESPONSE]

1. Energy efficient appliances
2. Efficient heating or cooling equipment
3. Efficient windows
4. Adding insulation
5. Sealing air leaks
6. Sealing or insulating ducts
7. Efficient lighting (LEDs)
8. Energy efficient water heater
9. Internet connected "smart" thermostat
96. Other, please specify: ____________________
98. Don't know
99. Refused

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 2017, 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

Appendix G Survey Results

G.1 Teacher Survey - DEP

Q1. What grade(s) of students do you teach?

Response Option	Count	Percent (n=29)
Pre-K	0	0%
Kindergarten	4	14%
Grade 1	1	3%
Grade 2	3	10%
Grade 3	3	10%
Grade 4	6	21%
Grade 5	4	14%
Grade 6	5	17%
Grade 7	3	10%
Grade 8	8	28%
Grades 9 - 12	1	3%

Q2. Are you a home room teacher?

Response Option	Count	Percent (n=29)
Yes	19	66%
No	10	34%

Q3. What subjects do you teach?

Response Option	Count (n=10)
Math	2
Natural sciences	4
English/language arts	2
Social studies/social sciences/history	5
Music	0
Art	0
Physical education	0
Other	0

Q4. Do you teach any topics on energy (electricity, gas, coal, etc.) generation, transformation, use, or conservation (including, but not limited to, topics/materials provided by the Energy Efficiency for Schools program)?

Response Option	Count	Percent (n=29)
Yes	24	83%
No	5	17%

Q5. Did you see The National Theatre for Children performance for elementary school students called *Kilowatt Kitchen* on [PERFORMANCE_DATE]?

Response Option	Count	Percent (n=29)
Yes	19	66%
No	10	34%

Q6. Did you see the National Theatre for Children performance for middle school students called *The E-Team* on [PERFORMANCE_DATE]?

Response Option	Count	Percent (n=44)
Yes	10	34%
No	19	66%

Q7. Before today, were you aware that Duke Energy sponsored the National Theatre for Children performance(s) in your school?

Response Option	Count	Percent (n=44)
Yes	23	79%
No	6	21%
Don't know	0	0%

Q8. How did you learn of Duke Energy's involvement with the National Theatre for Children program?

Response Option	Count	Percent (n=23)
Another teacher	7	30%
Duke Energy marketing materials	8	35%
Duke Energy staff	1	4%
The National Theatre for Children staff	8	35%
The National Theatre for Children materials	7	30%
Other	0	0%

Don't know	0	0%

Q9. Thinking about how the school performance explained the energy-related concepts, would you say that, on the whole, the explanation was:

Response Option	Count	Percent (n=29)
Far too advanced for most of your students	0	0%
Somewhat too advanced for most of your students	2	7%
About right for most of your students	27	93%
Somewhat too basic for most of your students	0	0%
Far too basic for most of your students	0	0%
Other	0	0%
Don't know	0	0%

Q10. What about the performance was too advanced for most of your students?

Response Option	Count (n=2)
Pre-k through second grade attends the performance and some of the vocabulary is over their head and not explained thoroughly or is done too quickly	1
Some of the concepts about energy the students may not have understood.	1

Q11. Were there any concepts that the performance(s) did not cover that *should have been* covered?

Response Option	Count	Percent (n=29)
Yes	1	3%
No	26	90%
Don't know	2	7%

Q12. What concepts were not covered that *should have been* covered?

Response Option	Count (n=1)
Advantages/disadvantages of renewable and nonrenewable resources.	1

Q13. Please rate your overall satisfaction with the National Theatre for Children performance on the following scale.

Response Option	Count	Percent (n=29)
1 - Not at all satisfied	0	0%

2	0	0%
3	0	0%
4	4	14%
5 - Completely satisfied	25	86%
Don't know	0	0%

Q14. Did you receive curriculum or instructional materials, such as student workbooks, related to energy and energy conservation from National Theatre for Children in the 2017-2018 school year?

Response Option	Count	Percent (n=29)
Yes	12	41%
No	11	38%
Don't know	6	21%

Q15. To what degree did you use the curriculum or instructional materials in teaching your students about energy?

Response Option	Count	Percent (n=12)
Not at all	2	17%
A little	2	17%
Moderately	4	33%
A lot	4	33%
Extensively	0	0%
Not at all	0	0%
Don't know	2	0%

Q15a. Why did you only use the workbooks "a little" in teaching your students about energy?

Response Option	Count (n=2)
This is not part of our curriculum so we could only touch on it.	1
We only received one workbook, but a ton of materials telling the kids about the kit. If I had enough workbooks for my entire class I would have definitely used them. We study electricity and magnetism in 4th grade and it would be a great addition to the curriculum.	1

Q15b. Did you incorporate the National Theatre for Children's online component into your curriculum in the 2015-2016 school year? This is the official website that accompanies the performance and classroom curriculum; it has interactive games that reinforce the concepts taught in the performance and printed curriculum.

Response Option	Count	Percent (n=10)
Yes	4	40%
No	6	60%

Q16. Thinking about how the student workbooks explained energy-related concepts, would you say that the material was generally:

Response Option	Count	Percent (n=10)
Far too advanced for most of your students	0	0%
Somewhat too advanced for most of your students	2	20%
About right for most of your students	7	70%
Somewhat too basic for most of your students	0	0%
Far too basic for most of your students	0	0%
Other	0	0%
Don't know	1	10%
I'd rather not say	0	0%

Q17. Please rate how useful the materials were to you in teaching your students about energy.

Response Option	Count	Percent (n=10)
1 - Not at all useful	0	0%
2	0	0%
3	2	20%
4	5	50%
5 - Extremely useful	3	30%
Don't know	0	0%

Q17a. Please rate the degree to which the topics in the workbook aligned with your state's science standards for the grade(s) you teach.

Response Option	Count	Percent (n=10)
Completely aligned	1	10%
Mostly aligned	6	60%
Somewhat aligned	1	10%
Not aligned at all	0	0%
Don't know	2	20%

Q18. Were there any concepts covered in the curriculum or instructional materials that your students had particular challenges with?

Response Option	Count	Percent (n=10)
No	10	100%

Q20. Were there any concepts that the materials did not cover that *should have been* covered?

Response Option	Count	Percent (n=10)
Yes	0	0%
No	9	90%
Don't know	1	10%

Q22. Please rate your overall satisfaction with curriculum or instructional materials you received from the National Theatre for Children program using the following scale.

Response Option	Count	Percent (n=9)
1 - Not at all satisfied	0	0%
2	0	0%
3	2	20%
4	3	30%
5 - Completely satisfied	5	50%
Don't know	0	0%

Q23. Why did you *not* use the curriculum or instructional materials in teaching your students about energy?

Response Option	Count (n=2)
I just don't have the time in the day and I'm a Science Teacher. If the materials aren't related to a standard, I don't teach it.	1
Not enough time to add in on top of our own curriculum materials	1

Too low a level.	1

Q24. Did you have any interactions with anyone from the National Theatre for Children regarding the curriculum or instructional materials?

Response Option	Count	Percent (n=29)
Yes	3	10%
No	21	72%
Don't know	5	17%

Q25. What did those interactions address?

Response Option	Count
Not applicable	0

Q26. Using the scale provided, how satisfied were you with:

Response Option	Count	Percent (n=9)
1 - Not at all satisfied	0	0%
2	0	0%
3	0	0%
4	0	0%
5 - Completely satisfied	3	100%
Don't know	0	0%

Q27. Did you distribute the kit request materials to either your students or directly to their parents?

Response Option	Count	Percent (n=19)
Yes	28	97%
No	1	3%
Don't know	0	0%

Q28. Were there any other ways in which you personally promoted the kits to your students and their families? If so, what were they?

Response Option	Count	Percent (n=29)
MyEnergyKit.org poster	13	45%
Vocally encouraged students to sign up for a kit	24	83%
Used my classroom web portal to encourage families to sign up for a kit	3	10%
Emailed parents to encourage them to sign up for a kit	11	38%

Spoke with parents in person to encourage them to sign up for a kit	5	17%
Other	2	7%
No other actions taken	0	0%
Don't recall	2	7%

Q29. Did you follow up with students or parents later to find out if their household requested a kit?

Response Option	Count	Percent (n=29)
Yes	15	52%
No	13	45%
Don't know	1	3%

Q30. In your best estimate, what percentage of your student households ordered the Duke Energy kit?

Response Option	Count	Percent (n=15)
0% to 10%	3	20%
11% to 20%	2	13%
21% to 30%	2	13%
31% to 40%	3	20%
41% to 50%	1	7%
51% to 60%	1	7%
61% to 70%	0	0%
71% to 80%	0	0%
81% to 90%	1	7%
91% to 100%	1	7%

Q32. What suggestions do you have to improve the National Theatre for Children performance(s)?

Response Option	Count (n=29)
Is it possible for the performers to have a mic? It is very difficult to hear in the back even though the actors project their voice.	1
Share info about kits before coming to school and preforming.	1
The performers were a little late (coming from a distant school), and the limited time they had forced them to either skip or rush through certain portions - pace was very quick. With more time devoted, the material would be better reinforced.	1

Response Option	Count (n=29)
None	26

Q33. What suggestions do you have to improve the classroom materials received from the National Theatre for Children?

Response Option	Count
I teach 5th grade, but we are at a Middle school so if materials for elementary are available, it might be more appropriate	1
Provide standards to go along with instructional materials.	1
We were sent way too many.	1
None	26

Q34. In addition to this survey, we will be conducting 15-minute-long telephone interviews with five teachers, where we will ask them additional questions about their experience with the National Theatre for Children program. Interview participants will be compensated for their time. If selected, would you be willing to participate in a follow-up telephone interview about your experience with the program?

Response Option	Count	Percent (n=29)
Yes, I am willing to be interviewed	14	48%
No, I am not willing to be interviewed	15	52%

G.2 Teacher Survey - DEC

Q1. What grade(s) of students do you teach?

Response Option	Count	Percent (n=44)
Pre-K	0	0%
Kindergarten	10	23%
Grade 1	6	14%
Grade 2	8	18%
Grade 3	3	7%
Grade 4	5	11%
Grade 5	10	23%
Grade 6	8	18%
Grade 7	4	9%
Grade 8	1	2%
Grades 9 - 12	1	2%

Q2. Are you a home room teacher?

Response Option	Count	Percent (n=44)
Yes	33	75%
No	11	25%

Q3. What subjects do you teach?

Response Option	Count (n=11)
Math	5
Natural sciences	6
English/language arts	1
Social studies/social sciences/history	3
Music	0
Art	0
Physical education	0
Other	2

Q4. Do you teach any topics on energy (electricity, gas, coal, etc.) generation, transformation, use, or conservation (including, but not limited to, topics/materials provided by the Energy Efficiency for Schools program)?

Response Option	Count	Percent (n=44)
Yes	35	80%
No	9	20%

Q5. Did you see The National Theatre for Children performance for elementary school students called *Kilowatt Kitchen* on [PERFORMANCE_DATE]?

Response Option	Count	Percent (n=44)
Yes	34	77%
No	10	23%

Q6. Did you see the National Theatre for Children performance for middle school students called *The E-Team* on [PERFORMANCE_DATE]?

Response Option	Count	Percent (n=44)
Yes	10	23%
No	34	77%

Q7. Before today, were you aware that Duke Energy sponsored the National Theatre for Children performance(s) in your school?

Response Option	Count	Percent (n=44)
Yes	37	84%
No	7	16%
Don't know	0	0%

Q8. How did you learn of Duke Energy's involvement with the National Theatre for Children program?

Response Option	Count	Percent (n=37)
Another teacher	14	38%
Duke Energy marketing materials	6	16%
Duke Energy staff	1	3%
The National Theatre for Children staff	12	32%
The National Theatre for Children materials	6	16%
Other	0	0%

Don't know	5	14%

Q9. Thinking about how the school performance explained the energy-related concepts, would you say that, on the whole, the explanation was:

Response Option	Count	Percent (n=44)
Far too advanced for most of your students	0	0%
Somewhat too advanced for most of your students	3	7%
About right for most of your students	40	91%
Somewhat too basic for most of your students	1	2%
Far too basic for most of your students	0	0%
Other	0	0%
Don't know	0	0%

Q10. What about the performance was too advanced for most of your students?

Response Option	Count (n=3)
First grade standards are limited to recycling and natural resources.	1
Some of the vocabulary and jokes were above their heads, but it's first grade so I expect that to happen.	1
The performance was great. However, I teach very low level special needs students, so the fast pace and large group they were in made things over their heads. I know it would be time consuming, but a program a little slower paced with special needs children in mind would be amazing.	1

Q11. Were there any concepts that the performance(s) did not cover that *should have been* covered?

Response Option	Count	Percent (n=44)
Yes	2	5%
No	35	80%
Don't know	7	16%

Q12. What concepts were not covered that *should have been* covered?

Response Option	Count (n=2)
All were covered	1
Natural resources	1

Q13. Please rate your overall satisfaction with the National Theatre for Children performance on the following scale.

Response Option	Count	Percent (n=44)
1 - Not at all satisfied	0	0%
2	0	0%
3	2	5%
4	3	7%
5 - Completely satisfied	39	89%
Don't know	0	0%

Q14. Did you receive curriculum or instructional materials, such as student workbooks, related to energy and energy conservation from National Theatre for Children in the 2017-2018 school year?

Response Option	Count	Percent (n=44)
Yes	29	66%
No	11	25%
Don't know	4	9%

Q15. To what degree did you use the curriculum or instructional materials in teaching your students about energy?

Response Option	Count	Percent (n=12)
Not at all	3	10%
A little	8	28%
Moderately	12	41%
A lot	4	14%
Extensively	2	7%
Not at all	0	0%
Don't know	3	10%

Q15a. Why did you only use the workbooks "a little" in teaching your students about energy?

Response Option	Count (n=8)
It is difficult for them to use due to lack of reading skills	1
Limited class time. Plus some of it repeated the curriculum we had already covered	1
The information in the workbooks was a bit above the kindergarten grade level. I used the books as a review and allowed students to take them home to do with the help of a parent.	1
The only available date for our area was in February but me covered the material in October. Our school has been impressed by the performances and was willing to wait until February to see it this year. The performance also provided our students with a review of our lesson	1
They were a little too elementary for my 6th graders.	1

Time factor	1
Timing was off	1
We cover those subjects in the Spring so at the time of the program performance I did not use the resources very much.	1

Q15b. Did you incorporate the National Theatre for Children's online component into your curriculum in the 2015-2016 school year? This is the official website that accompanies the performance and classroom curriculum; it has interactive games that reinforce the concepts taught in the performance and printed curriculum.

Response Option	Count	Percent (n=26)
Yes	11	42%
No	18	58%

Q16. Thinking about how the student workbooks explained energy-related concepts, would you say that the material was generally:

Response Option	Count	Percent (n=26)
Far too advanced for most of your students	1	4%
Somewhat too advanced for most of your students	5	19%
About right for most of your students	18	69%
Somewhat too basic for most of your students	1	4%
Far too basic for most of your students	1	4%
Other	0	0%
Don't know	0	0%
I'd rather not say	0	0%

Q17. Please rate how useful the materials were to you in teaching your students about energy.

Response Option	Count	Percent (n=10)
1 - Not at all useful	0	0%
2	0	0%
3	6	23%
4	11	42%
5 - Extremely useful	9	35%
Don't know	0	0%

Q17a. Please rate the degree to which the topics in the workbook aligned with your state's science standards for the grade(s) you teach.

Response Option	Count	Percent (n=26)
Completely aligned	5	19%
Mostly aligned	9	35%
Somewhat aligned	7	27%
Not aligned at all	1	4%
Don't know	4	15%

Q18. Were there any concepts covered in the curriculum or instructional materials that your students had particular challenges with?

Response Option	Count	Percent (n=10)
Yes	2	8%
NO	20	77%
Don't know	4	15%

Q19. What concepts did your students have particular trouble with?

Response Option	Count (n=2)
Speed of presentation	1
The concept of saving energy because it is not a physical thing that they can hold or truly see, they sometimes have a hard time with abstract concepts.	1

Q20. Were there any concepts that the materials did not cover that *should have been* covered?

Response Option	Count	Percent (n=10)
Yes	1	4%
No	19	73%
Don't know	6	23%

Q21. What concepts were not covered that should have been covered?

Response Option	Count (n=2)
If there could be more information on how energy travels that would be great! There's a lot in our curriculum about energy waves.	1

Q22. Please rate your overall satisfaction with curriculum or instructional materials you received from the National Theatre for Children program using the following scale.

Response Option	Count	Percent (n=26)
1 - Not at all satisfied	0	0%
2	0	0%
3	2	8%
4	9	35%
5 - Completely satisfied	15	58%
Don't know	0	0%

Q23. Why did you *not* use the curriculum or instructional materials in teaching your students about energy?

Response Option	Count (n=3)
I have other state tested material that takes priority in math	1
No time	1
We did not receive the materials until the last minute.	1

Q24. Did you have any interactions with anyone from the National Theatre for Children regarding the curriculum or instructional materials?

Response Option	Count	Percent (n=44)
Yes	6	14%
No	35	80%
Don't know	3	7%

Q25. What did those interactions address?

Response Option	Count
Not applicable	0

Q26. Using the scale provided, how satisfied were you with:

Response Option	Count	Percent (n=0)
1 - Not at all satisfied	0	0%
2	0	0%
3	0	0%
4	0	0%
5 - Completely satisfied	0	0%
Don't know	0	0%

Q27. Did you distribute the kit request materials to either your students or directly to their parents?

Response Option	Count	Percent (n=44)
Yes	42	95%
No	1	2%
Don't know	1	2%

Q28. Were there any other ways in which you personally promoted the kits to your students and their families? If so, what were they?

Response Option	Count	Percent (n=44)
MyEnergyKit.org poster	17	39%
Vocally encouraged students to sign up for a kit	40	91%
Used my classroom web portal to encourage families to sign up for a kit	12	27%
Emailed parents to encourage them to sign up for a kit	18	41%
Spoke with parents in person to encourage them to sign up for a kit	8	18%
Other	0	0%
No other actions taken	1	2%
Don't recall	0	0%

Q29. Did you follow up with students or parents later to find out if their household requested a kit?

Response Option	Count	Percent (n=44)
Yes	15	34%
No	29	66%
Don't know	0	0%

Q30. In your best estimate, what percentage of your student households ordered the Duke Energy kit?

Response Option	Count	Percent (n=15)
0% to 10%	5	33%
11% to 20%	3	20%
21% to 30%	3	20%
31% to 40%	0	0%
41% to 50%	1	7%
51% to 60%	1	7%

61% to 70%	1	7%
71% to 80%	0	0%
81% to 90%	0	0%
91% to 100%	0	0%
Don't know	1	7%

Q32. What suggestions do you have to improve the National Theatre for Children performance(s)?

Response Option	Count (n=44)
Fewer students per presentation. Pre/Post Test	1
For the performance to be at a slower pace	1
Get the students more involved in the performance.	1
Have performers speak slowly. Many of our English Language Learners couldn't understand them because they were talking so fast.	1
Hearing them was an issue. Not sure if it were because of them or the equipment.	1
It may be that another teacher was provided the information prior to the performance, but I felt a bit uninformed regarding what topics the performance was about. Also, really wish I had been given the workbooks/comics (whatever materials I was supposed to be able to give to students).	1
Just what I stated earlier. Have a program geared toward special needs students, providing the same information, just in a format more suitable to them, because the program was great!	1
More at-home materials to show parents what students learned	1
None	36

Q33. What suggestions do you have to improve the classroom materials received from the National Theatre for Children?

Response Option	Count (n=44)
Change the content a little more from year to year so that the kids aren't bored of the items.	1
Include more worksheet activities on 6th grade level for independent work time.	1
Make them more related to the NC Standards by grade level. Or, we could simply have the science teacher responsible for it.	1
Maybe get the kids more involved with the show more.	1
Sometimes, we use the program as an introduction to our Energy Unit, other years we have used it as a culminating activity. We we use it as an introduction, it would be nice to see it prior to the program and before our teaching begins, so we can plan more efficiently.	1
You could likely save paper by using online only materials.	1

Response Option	Count (n=44)
None	38

Q34. In addition to this survey, we will be conducting 15-minute-long telephone interviews with five teachers, where we will ask them additional questions about their experience with the National Theatre for Children program. Interview participants will be compensated for their time. If selected, would you be willing to participate in a follow-up telephone interview about your experience with the program?

Response Option	Count	Percent (n=44)
Yes, I am willing to be interviewed	25	57%
No, I am not willing to be interviewed	19	43%

G.3 Student Parent Survey - DEP

Q2. Before today, did you know the kit you received was sponsored by Duke Energy?

Response Option	Count	Percent (n=172)
Yes	151	88%
No	21	12%
Don't know	0	0%

Q3. How did you learn that the kit was sponsored by Duke Energy? [Select all that apply]

Response Option	Count	Percent (n=151)
Classroom materials brought home by child	86	57%
My child's teacher/school	46	30%
Information material included in/on the kit	40	26%
Other	18	12%
Don't know	3	2%

Q3. Other…

Response Option	Count
Bill	1
By information we received before we received the kit	1
Email from School	1
Granddaughter is a student at the school.	1
Grandson brought home brochure from school	1
Grandson told me about the program	1
Mail	1
Mail flyer	1
My child spoke about it	1
Received packages from Duke	1
Saw it on a paper my grandson got	1
Someone called me to verify that I received it	1
The school sent paperwork home with my kids containing material about the program.	1
We had an in-home energy efficiency rep come to our house.	1
Wife is active in the PTA	1
Word of mouth from daughter (School secretary)	1
Word of mouth from family	1
Written on box and a paper brought home with it	1

Q3a. How did you hear about the opportunity to receive the kit from Duke Energy? [Select all that apply]

Response Option	Count	Percent (n=172)
Classroom materials brought home by child	118	69%
School newsletter	19	11%
Email from my child's teacher/school	23	13%
School website or school web portal	10	6%
In-person conversations with my child's teacher	9	5%
Saw a poster at my child's school	5	3%
After hours event at my child's school	1	1%
Other (please specify in the box below)	31	18%
Don't know	7	4%

Q3a. Other…

Response Option	Count
Ad on Facebook	1
Bill	1
Daughter mentioned it	3
Daughter works for the school	1
Duke Energy had sent me a post card in the mail that explained all about the kit.	1
Duke site	3
Email also	1
Flyer came in mail	1
Form from school	1
From my daughter's school, they sent it in their packet	1
From the school	1
From the school, a brochure	1
I received a phone call	1
It just came	1
Kids told me	1
Mail flyer	1
My child spoke about it	1
Paper sent home with child	1
Provided by grandchild	1
PTA meeting at the school	1

Response Option	Count
Relatives who work at the school	1
School	2
School Facebook Page.	1
Southern Academy Promoted it	1
The principle informed her	1
The school PTA	1
Wife works for PTA	1
Word of mouth	1
Word of mouth from daughter	2

Q4. Did you read the information about how to save energy in the booklet that came in the kit?

Response Option	Count	Percent (n=172)
Yes	128	74%
No	31	18%
Don't know	13	8%

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?

Response Option	Count	Percent (n=128)
0	0	0%
1	0	0%
2	0	0%
3	2	2%
4	0	0%
5	6	5%
6	8	6%
7	18	14%
8	23	18%
9	17	13%
10 - Very helpful	52	41%
Don’t know	2	2%

Q6. What might have made the information more helpful?

Response Option	Count
I didn't read all of the booklet	1
I have already seen and understood most of the things that were there. I have used energy-saving aerators and LED bulbs. If I was looking for something useful, I would consider solar energy (even though I live in the woods) and insulation for my house.	1
I thought is was a good learning tool. I just already understood most of the info	1
If it was true and accurate	1
If there was more information for log cabins old or new.	1
More specifics, but that's difficult for a variety of houses.	1
Nothing many of the things listed we already knew about or do.	1
Nothing. I'm very aware of most of the topics	1
Quick summary of 44-page energy saving tips	1
Was more of a refresher than new information being brought up. Already has a lot of the suggestions in place in the home.	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?

Response Option	Count	Percent (n=172)
Yes	42	24%
No	128	74%
Don't know	2	1%

Q9. Where did you hear about this program?

Response Option	Count	Percent (n=42)
From my child/children	28	67%
From a teacher/school administrator	17	41%
On the Duke Energy website	0	0%
Other	6	14%
Don't remember	0	0%

Q9a. Other…

Response Option	Count
From my grandson	1
From the school	1

From your child	1
Included with the information, probably in the initial form	1
PTA	1
Weekly information call from school	1

Q10. Have you or anyone else installed any of those items in your home, even if they were taken out later?

Response Option	Count	Percent (n=172)
Yes	160	93%
No	12	7%
Don't know	0	0%

Q12. Which of the items did you install, even if they were taken out later?

Response Option	Count	Percent (n=160)
Showerhead	86	54%
Kitchen faucet aerator	68	43%
Bathroom faucet aerator	60	38%
Night light	130	81%
Energy efficient light bulb(s) (LEDs)	149	93%
Insulator gaskets for light switches and electricity outlets	54	34%
I never installed any of the items from the kit	0	0%

Q13. In addition to the night light, there were two LED light bulbs in the kit. Did you install one or both of the LED light bulbs in the kit?

Response Option	Count	Percent (n=149)
Yes - I installed both LEDs	119	80%
No - I installed only one LED light bulb	28	19%
Don't know	2	1%

Q15. How many of the light switch gasket insulators from the kit did you [*if needed: or anyone else*] install in your home?

Response Option	Count	Percent (n=54)
None	0	0%
One	5	9%

Two	19	35%
Three	3	6%
Four	25	46%
Don't know	2	4%

Q16. How many electrical outlet gasket insulators from the kit did you [*if needed: or anyone else*] install in your home?

Response Option	Count	Percent (n=54)
None	2	4%
One	2	4%
Two	20	37%
Three	1	2%
Four	7	13%
Five	0	0%
Six	3	6%
Seven	2	4%
Eight	11	20%
Don't know	6	11%

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...

	0	1	2	3	4	5	6	7	8	9	10	Don't know	Total
Showerhead	0%	0%	1%	1%	1%	3%	0%	10%	13%	8%	62%	0%	86
Kitchen faucet aerator	0%	1%	0%	1%	0%	3%	3%	6%	7%	9%	68%	1%	68
Bathroom faucet aerator	0%	0%	0%	2%	5%	2%	2%	8%	10%	10%	60%	2%	60
Night light	1%	0%	0%	1%	1%	1%	1%	4%	5%	5%	82%	1%	130

Energy efficient light bulbs (LEDs)	1%	0%	0%	0%	1%	0%	1%	3%	4%	7%	83%	1%	149
Insulator gaskets	0%	0%	0%	0%	0%	6%	0%	4%	13%	7%	67%	4%	54

Q17a. Can you please explain any dissatisfaction you had with the showerhead?

Response Option	Count
Decreased water output	1
Doesn’t give much power	1
Leaked	1
The pressure is so low	1
The showerhead is a water waster. So much water comes out so quickly that it drains our water heater. We have to put less pressure on the faucet so that less water comes out to be able to use it, in other words--not at capacity.	1

Q17b. Can you please explain any dissatisfaction you had with the kitchen faucet aerator?

Response Option	Count
Because the water comes out very slow	1
Didn’t fit well	1
The water flow is terrible, very slow	1

Q17c. Can you please explain any dissatisfaction you had with the bathroom faucet aerator?

Response Option	Count
Bulb is super bright. Faucet piece leaked	1
Didn’t fit well	1
I had to take the guts out of the aerator and put them in the casing that was already on my faucet	1
Slow	1
Water barely come out	1

Q17d. Can you please explain any dissatisfaction you had with the night light?

Response Option	Count
It didn't work and only one led light	1

Response Option	Count
It's very low. The light is not enough.	1
Stopped working after a few days	1

Q17e. Can you please explain any dissatisfaction you had with the energy efficient light bulbs (LEDs)?

Response Option	Count
Did not work	1
I'm not dissatisfied, it's just like any other light	1
My bill went up. I usually pay $30 a month but after changing the it is $50 a month.	1
Still stuck on the old light bulbs. These need to "warm" up before getting good lighting	1

Q17f. Can you please explain any dissatisfaction you had with the insulator gaskets?

Response Option	Count
Our home was built in the last 4 years and most already had some outlets were difficult to put back. It really had nothing to do with the insulators more that I took off covers and they already had so i wasted a lot of time.	1
There wasn't an equal amount in each pack	1

Q18. Have you since uninstalled any of the items from the kit that you had previously installed?

Response Option	Count	Percent (n=160)
Yes	3	2%
No	157	98%
Don't know	0	0%

Q19. Which of the items did you uninstall?

Response Option	Count
Showerhead	0
Kitchen faucet aerator	0
Bathroom faucet aerator	1
Night light	1
Energy efficient light bulbs (LEDs)	1
Insulator gaskets	0
Don't know	0

Q20. Why were those items uninstalled? Let's start with…

Q20a. the showerhead?

Response Option	Count
It was broken	0
Didn't like how it worked	0
Didn't like how it looked	0
Don't know	0

Q20b. the kitchen faucet aerator?

Response Option	Count
It was broken	0
Didn't like how it worked.	0
Didn't like how it looked.	0
Don't know	0

Q20c. the bathroom faucet aerator?

Response Option	Count
It was broken	0
Didn't like how it worked	0
Didn't like how it looked	1
Don't know	0

Q20d. the night light?

Response Option	Count
It was broken	1
Didn't like how it worked.	0
Didn't like how it looked.	0
Don't know	0

Q20e. the energy efficient light bulbs (LEDs)?

Response Option	Count
It was broken	0
Didn't like how it worked.	0
Didn't like how it looked.	0
Other – Because it was super bright	1
Don't know	0

Q20f. the insulator gaskets?

Response Option	Count
It was broken	0
Didn't like how it worked.	0
Didn't like how it looked.	0
Don't know	0

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?

Response Option	Count	Percent (n=150)
Showerhead	37	25%
Kitchen faucet aerator	40	27%
Bathroom faucet aerator	48	32%
Night light	24	16%
Energy efficient lightbulbs (LEDs)	16	11%
Insulator gaskets	50	33%
Im not planning on installing any of these in the next three months.	50	33%

Q22. What's preventing you from installing those items? Let's start with….

Q22. Showerhead…

Response Option	Count	Percent (n=49)
Didn't know what that was	1	2%
Tried it, didn't fit	7	14%
Tried it, didn't work as intended (please explain in the box below)	5	10%
Haven't gotten around to it	2	4%
Current one is still working	11	22%
Takes too much time to install it / No time / Too busy	0	0%
Too difficult to install it, don't know how to do it	0	0%
Don't have the tools I need	0	0%
Don't have the items any longer (threw away, gave away)	1	2%
Already have an efficient showerhead	18	37%
Other (please specify in the box below)	12	24%
Don't know	1	2%

Q22. Kitchen faucet aerator…

Response Option	Count	Percent (n=64)
Didn't know what that was	2	3%
Tried it, didn't fit	11	17%
Tried it, didn't work as intended (please explain in the box below)	5	8%
Haven't gotten around to it	14	22%
Current one is still working	11	17%
Takes too much time to install it / No time / Too busy	1	2%
Too difficult to install it, don't know how to do it	2	3%
Don't have the tools I need	2	3%
Don't have the items any longer (threw away, gave away)	1	2%
Already have an efficient kitchen faucet aerator	11	17%
Other (please specify in the box below)	10	16%
Don't know	3	5%

Q22. Bathroom faucet aerator…

Response Option	Count	Percent (n=64)
Didn't know what that was	4	6%
Tried it, didn't fit	10	16%
Tried it, didn't work as intended (please explain in the box below)	4	6%
Haven't gotten around to it	11	17%
Current one is still working	14	22%
Takes too much time to install it / No time / Too busy	1	2%
Too difficult to install it, don't know how to do it	3	5%
Don't have the tools I need	3	5%
Don't have the items any longer (threw away, gave away)	1	2%
Already have an efficient bathroom faucet aerator	11	17%
Other (please specify in the box below)	11	17%
Don't know	4	6%

Q22. Energy efficient lightbulbs (LEDs)…

Response Option	Count	Percent (n=7)
Didn't know what that was	0	0%

Tried it, didn't fit	0	0%
Tried it, didn't work as intended (please explain in the box below)	0	0%
Haven't gotten around to it	1	14%
Current one is still working	1	14%
Takes too much time to install it / No time / Too busy	0	0%
Too difficult to install it, don't know how to do it	1	14%
Don't have the tools I need	0	0%
Don't have the items any longer (threw away, gave away)	0	0%
Already have LEDs	1	14%
Other (please specify in the box below)	3	43%
Don't know	0	0%

Q22. Night lights…

Response Option	Count	Percent (n=16)
Didn't know what that was	0	0%
Tried it, didn't fit	0	0%
Tried it, didn't work as intended (please explain in the box below)	1	6%
Haven't gotten around to it	3	19%
Current one is still working	4	25%
Takes too much time to install it / No time / Too busy	0	0%
Too difficult to install it, don't know how to do it	0	0%
Don't have the tools I need	0	0%
Don't have the items any longer (threw away, gave away)	0	0%
Other (please specify in the box below)	7	44%
Don't know	2	17%

Q22. Insulator gaskets…

Response Option	Count	Percent (n=66)
Didn't know what that was	7	11%
Tried it, didn't fit	3	5%
Tried it, didn't work as intended (please explain in the box below)	0	0%
Haven't gotten around to it	23	35%
Current one is still working	9	14%

Takes too much time to install it / No time / Too busy	3	5%
Too difficult to install it, don't know how to do it	0	0%
Don't have the tools I need	1	2%
Don't have the items any longer (threw away, gave away)	1	2%
Other (please specify in the box below)	13	20%
Don't know	7	11%

Q22a. Thinking of the items you installed, would you be interested in receiving any more of them from Duke Energy? If so, which ones?

Response Option	Count	Percent (n=161)
Yes, I would like another energy-efficient showerhead	43	27%
Yes, I would like another kitchen faucet aerator	25	16%
Yes, I would like more bathroom faucet aerators	29	18%
Yes, I would like more energy-efficient night lights	97	60%
Yes, I would like more energy-efficient light bulbs (LEDs)	132	82%
Yes, I would like more switch/outlet gasket insulators	31	19%
No, I am not interested in receiving any more of the items	17	11%
Don't know	0	0%

Q22b. What would be your preferred way to request these additional items?

Response Option	Count	Percent (n=144)
Internet	88	61%
Telephone	26	18%
Pre-paid postcard	42	29%
Other, please specify	3	2%
Don't know	3	2%

Q26. You said you installed the night light. Did the night light replace an existing night light?

Response Option	Count	Percent (n=129)
Yes	88	68%
No	41	32%
Don't know	0	0%

Q27. Did the old nightlight have a bulb that you could take out and replace once it burned out?

Response Option	Count	Percent (n=88)
Yes	64	73%
No	20	23%
Don't know	4	5%

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?

Response Option	Count	Percent (n=148)
All incandescent (old fashioned light bulb - likely purchased more than two years ago)	59	40%
All halogen (looks like an incandescent, but has a glass tube inside of the bulb)	7	5%
All CFL (spiral or twisty shaped bulb that fits into ordinary light fixtures)	67	45%
All LED (new bulb type that uses little electricity and lasts a long time)	5	3%
Some combination of bulb types (please specify which ones in the box below)	6	4%
Don’t know	4	3%

Q29. In what rooms did you install the energy efficient lightbulbs that were included in the kit?

Response Option	Count	Percent (n=148)
Living room	59	40%
Dining room	13	9%
Bedroom	60	41%
Kitchen	28	19%
Bathroom	16	11%
Den	3	2%
Garage	3	2%
Hallway	13	9%
Basement	0	0%
Outdoors	2	1%
Other area (please specify in the box below)	4	3%
Don’t Know	2	1%

Q30. Have you adjusted the temperature of your water heater based on the Hot Water Gauge Card included in your kit?

Response Option	Count	Percent (n=172)
Yes	25	15%
No	111	65%
Don't recall seeing the Hot Water Gauge Card	26	15%
Don't know	10	6%

Q31. Do you know what the old temperature setting on your hot water heater was?

Response Option	Count	Percent (n=25)
Yes	3	12%
No	22	88%

Q31a. Temperature setting...

Response Option	Count
110	1
135	1
20 or 50-something	1

Q32. And what was the new temperature setting you set your hot water heater to?

Response Option	Count
70	1
100	1
120	2
125	1
130	1
176	1

Q33. Is the new water heater temperature setting still in place?

Response Option	Count	Percent (n=25)
Yes	22	88%
No	2	8%
Don't know	1	4%

Q34. Why did you change the water heater temperature a second time?

Response Option	Count
Customer says it was not too hot	1
We had an element that went out. We put it back and it will be replaced next week.	1

Q35. What is the fuel type of your water heater?

Response Option	Count	Percent (n=172)
Electricity	134	78%
Natural Gas	28	16%
Other (please specify in the box below)	2	1%
Don't know	8	5%

Q36. How old is your water heater?

Response Option	Count	Percent (n=172)
Less than five years old	49	29%
Five to nine years old	38	22%
Ten to fifteen years old	24	14%
More than fifteen years old	13	8%
Don't know	48	28%

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?

Response Option	Count	Percent (n=159)
Yes	60	38%
No	70	44%
Don't know	29	18%

Q38. What items would you have purchased and installed within the next year?

Response Option	Count	Percent (n=58)
Energy-Efficient Showerhead	11	19%
Kitchen faucet aerator	7	12%
Bathroom faucet aerator	2	3%
Energy-Efficient Night light	20	35%
Energy efficient lightbulbs (LEDs)	53	91%
Switch/Outlet Gasket Insulators	3	5%

No I would not have purchased any of the items	0	0%
Other	0	0%
Don't know	1	2%

Q39. If you had not received them for free in the kit, how many LED light bulbs would you have purchased?

Response Option	Count	Percent (n=45)
One	2	4%
Two	34	76%
Don't know	9	20%

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…

	0	1	2	3	4	5	6	7	8	9	10	Don't know	Total
The fact that the items were free	4%	0%	0%	1%	1%	3%	3%	7%	8%	6%	67%	1%	106
The fact that the items were mailed to your house	1%	0%	0%	0%	0%	3%	2%	4%	5%	7%	79%	0%	106
The chance to win cash prizes for your household and school	8%	2%	2%	2%	1%	6%	6%	4%	7%	8%	53%	4%	106
Information in the kit about how the items would save energy	0%	0%	0%	1%	2%	4%	6%	6%	10%	9%	60%	2%	106
Information that your child brought home from school	3%	0%	1%	1%	0%	5%	7%	8%	11%	9%	52%	2%	106
Other information or advertisements from Duke Energy, including its website	8%	1%	0%	4%	3%	8%	5%	10%	15%	5%	37%	4%	106

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…

	0	1	2	3	4	5	6	7	8	9	10	Don't know	Total
The fact that the items were free	1%	0%	0%	0%	1%	4%	1%	5%	5%	4%	79%	1%	148
The fact that the items were mailed to your house	0%	0%	0%	1%	1%	2%	1%	3%	7%	5%	80%	1%	148
The chance to win cash prizes for your household and school	7%	2%	1%	3%	1%	9%	4%	3%	6%	3%	57%	4%	148
Information in the kit about how the items would save energy	1%	0%	0%	1%	3%	8%	3%	6%	11%	6%	59%	1%	148
Information that your child brought home from school	5%	1%	0%	1%	3%	7%	3%	7%	9%	6%	53%	3%	148
Other information or advertisements from Duke Energy, including its website	11%	1%	1%	3%	5%	8%	3%	7%	7%	8%	41%	4%	148

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?

Response Option	Count	Percent (n=110)
Yes	90	82%
No	13	12%
Don't know	7	6%

Q43. How often do you read those Home Energy Reports?

Response Option	Count	Percent (n=90)
Never	1	1%
Sometimes	25	28%
Always	64	71%
Don't know	0	0%

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]

Response Option	Count
Nothing	29
Purchased energy saving products for my home and received a Duke Energy rebate	8
Purchased energy saving products for my home but did not receive a Duke Energy rebate	9
Made energy saving modifications to my home (example: installed insulation or windows)	18
Adjusted how or when I use energy in my home	33
Looked for additional information on how to save energy	9
Other (please specify in the box below)	7
Don't know	4

Q45. Since your child learned about energy conservation at school and signed up for your energy kit from Duke Energy, has your child adopted any **new** behaviors to help save energy in your home? This would only include new energy saving **behaviors** that your child adopted since receiving the kit. [*IF NEEDED: like turning off the lights when room is unoccupied*]

Response Option	Count
Not applicable - no new behaviors	48
Turn off lights when not in a room	97
Turn off electronics when not using them	65
Take shorter showers	35
Other	17
Don’t know	8

Q45a. Other…

Response Option	Count
I don't have any children	1
I really haven't noticed anything.	1
Make sure all the doors and windows are closed	1
My child just turned 3. She doesn't really understand about it yet, but we've raised her to always turn off lights when they're not being used.	1
My daughter is now aware of saving electricity and encourages recycling.	1
Not that I know of, because she's only six.	1
Saving/not wasting water	3
She lectures everyone about turning lights off and closing the refrigerator and turning off electronics	1
Turning off water while brushing teeth	3
Turns off the water.	1
Unplugging computers and TV's when leaving the house.	1
Unplugs nightlight when not using it.	1
Using less water.	1

Q45b. [IF Q45 =2-5] Before receiving the kit, was your child already…

Response Option	Count	Percent (n=54)
Turning off lights when not in a room	42	78%
Turning off electronics when not using them	18	33%
Taking shorter showers	7	13%
Other	5	9%

Q46. Since receiving your energy kit from Duke Energy, have you adopted any new behaviors to help save energy in your home? This would only include new energy saving **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?"*]

Response Option	Count
Not applicable - no new behaviors	41
Turning off lights when not in a room	85
Turning off furnace when not home	19
Turning off air conditioning when not home	33
Changed thermostat settings to use less energy	72
Using fans instead of air conditioning	55
Turning off electronics when we are not using them	62
Taking shorter showers	28
Turning water heat thermostat down	18
Other (please specify in the box below)	16
Don't know	1

Q46a. Other…

Response Option	Count
Adjusted the thermostat	1
Buy LEDs when lights go out.	4
Consider using more LED bulbs	1
I installed more things for the a/c area.	1
I'm leaving the new LED bulb in the hallway on 24 hours a day so I can see how much energy LED's save.	1
Installed LED bulbs	1
More mindful of the use meter	1
Try not to do but 1 load of laundry a day	1
Turn off the a/c when we go to bed	1
Turning hot water heater down and checking it	1
Use LEDs	1
Using energy-efficient appliances	1
Wash clothes later on at night	1
Washer machine unplugged	1
Watching the thermostat and making adjustments when needed	1
We keep everything unplugged when we're not using them.	1

Q46b. [IF Q46 =2-10] Before receiving the kit, were you already…

Response Option	Count	Percent (n=89)
Turning off lights when not in a room	60	67%
Turning off furnace when not home	10	11%
Turning off air conditioning when not home	17	19%
Changing thermostat settings so heating or cooling system uses less energy	31	35%
Using fans instead of air conditioning	35	39%
Turning off electronics when not using them	29	33%
Taking shorter showers	12	13%
Turning water heat thermostat down	4	4%
Other	6	7%

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].

Response Option	Count	Percent (n=130)
0 – Not at all influential	4	3%
1	0	0%
2	1	1%
3	2	2%
4	0	0%
5	7	5%
6	3	2%
7	21	16%
8	17	13%
9	10	8%
10 - Extremely influential	64	49%
Don't know	1	1%

Q47a. Thinking of the near future, are you interested in purchasing any additional products or services to help save energy in your home?

Response Option	Count	Percent (n=172)
Yes	115	67%
No	30	17%
Don't know	27	16%

Q47b. What additional products or services are you interested in purchasing?

Response Option	Count
Energy efficient appliances	48
Efficient heating or cooling equipment	24
Efficient windows	30
Adding insulation	25
Sealing air leaks	30
Sealing or insulating ducts	15
Efficient lighting (LEDs)	87
Energy efficient water heater	19
Internet connected “smart” thermostat	23
Other	16
Don't know	7

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?

Response Option	Count	Percent (n=172)
Yes	46	27%
No	120	70%
Don't know	6	4%

Q49. What **products** have you purchased and installed to help save energy in your home? [MULTIPLE RESPONSE]

Response Option	Count
Bought energy efficient appliances	8
Moved into an ENERGY STAR home	2
Bought efficient heating or cooling equipment	4
Bought efficient windows	2
Added insulation	8
Sealed air leaks	10
Sealed ducts	3
Bought LEDs	29
Bought CFLs	1
Installed an energy efficient water heater	1
None – no other actions taken	0
Other (please specify in the box below)	8
Don’t know	1

Q49a. Other…

Response Option	Count
Added a smart thermostat	1
Air Conditioning Service, making sure it is properly maintained to save on energy costs	1
Bought and installed a new heat pump	1
Dish Washer, Refrigerator and Stove	1
Drapes for blackouts so that the sun doesn't heat up the rooms during Summer	1
Just the a/c things	1
Solar panels	1
Upgraded A/C filters	1

Q50. Did you get a rebate from Duke Energy for any of those products or services? If so, which ones?

Response Option	Count
Bought energy efficient appliances	2
Moved into an ENERGY STAR home	0
Bought efficient heating or cooling equipment	0
Bought efficient windows	0
Bought additional insulation	0
Sealed air leaks	0
Sealed ducts	0
Bought LEDs	1
Bought CFLs	0
Installed an energy efficient water heater	0
Other	1
I did not get any Duke Rebates	36
Don't know	5

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…

	0 - Not at all influential	1	2	3	4	5	6	7	8	9	10 - Extremely influential	Don’t Know	Total
Buy energy efficient appliances	0%	0%	13%	0%	13%	0%	13%	13%	13%	0%	38%	0%	14
Move into an ENERGY STAR home	0%	0%	0%	0%	0%	0%	0%	0%	50%	0%	50%	0%	1
Buy efficient heating or cooling equipment	50%	0%	0%	0%	25%	25%	0%	0%	0%	0%	0%	0%	5
Buy efficient windows	50%	0%	50%	0%	0%	0%	0%	0%	0%	0%	0%	0%	5
Add insulation	25%	0%	0%	0%	0%	13%	13%	0%	13%	13%	25%	0%	12
Seal air leaks	10%	0%	0%	0%	0%	0%	10%	0%	20%	10%	50%	0%	6
Seal ducts	0%	0%	0%	0%	0%	0%	0%	0%	0%	33%	67%	0%	1
Buy LEDs	3%	0%	0%	7%	3%	10%	7%	0%	17%	7%	41%	3%	28
Buy CFLs	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	1
Install an energy efficient water heater	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	3
Other	38%	0	0	0	0	1	0	0	1	0	25%	13	10

		%	%	%	%	3 %	%	%	3 %	%		%	

Q52. What kinds of appliance(s) did you buy?

Response Option	Count
Refrigerator	4
Stand-alone Freezer	0
Dishwasher	3
Clothes washer	5
Clothes dryer	6
Oven	0
Microwave	1
Other	0
Don’t know	0

Q53. Was the [INSERT Q52 RESPONSE] an ENERGY STAR or high-efficiency model?

Response Option	Count	Percent (n=7)
Refrigerator	4	57%
Stand-alone Freezer	0	0%
Dishwasher	2	29%
Clothes washer	4	57%
Clothes dryer	5	71%
Oven	0	0%
Microwave	1	14%
Other	0	0%

Q54. Does the new clothes dryer use natural gas?

Response Option	Count
Yes- it uses natural gas	1
No – does not use natural gas	5
Don’t know	0

Q55. What type of heating or cooling equipment did you buy?

Response Option	Count	Percent (n=2)
Central air conditioner	1	50%
Window/room air conditioner unit	0	0%
Wall air conditioner unit	0	0%
Air source heat pump	0	0%
Geothermal heat pump	0	0%
Boiler	0	0%

Response Option	Count	Percent (n=2)
Furnace	0	0%
Wifi-enabled thermostat	0	0%
Other (please specify in the box below)	0	0%
Don't know	1	50%

Q55a. Other…

Response Option	Count
Not applicable	0

Q56. Does the new [INSERT Q55 RESPONSE] use natural gas?

Response Option	Count
Not applicable	0

Q57. Was the [INSERT Q55 RESPONSE] an ENERGY STAR or high-efficiency model?

Response Option	Count	Percent (n=1)
Central air conditioner	1	100%
Window/room air conditioner unit	0	0%
Wall air conditioner unit	0	0%
Air source heat pump	0	0%
Geothermal heat pump	0	0%
Boiler	0	0%
Furnace	0	0%
Wifi-enabled thermostat	0	0%
Other (please specify in the box below)	0	0%
Don't know	0	0%

Q58. How many windows did you install?

Response Option	Count
10	1

Q59. Did you add insulation to your attic, walls, or below the floor? [MULTIPLE RESPONSE]

Response Option	Count
Attic	5
Walls	3
Below the floor	1
Don't know	0

Q60a. Approximately what proportion of the attic space did you add insulation?

Response Option	Count
50	1
50%	1
90%	1
Don’t know	0

Q60b. Approximately what proportion of the wall space did you add insulation?

Response Option	Count
3	1
50%	1
Don’t know	0

Q60c. Approximately what proportion of the below the floor space did you add insulation?

Response Option	Count
50%	1

Q61. Do you know how many of LEDs you installed at your property?

Response Option	Count
Yes	25
Don't know	3

Q61a. How many of LEDs did you install in your property?

Response Option	Count
2	2
3	1
4	2
5	1
6	7
8	1
8 plus 2 from the box	1
10	2
12	1
15	1
20	4
25	1

Response Option	Count
30	1
Don't know	0

Q62. How many of CFLs did you install in your property?

Response Option	Count
Yes	1
Don't know	1

Q62. Number of CFLS installed…

Response Option	Count
2	1

Q63. Does the new water heater use natural gas?

Response Option	Count
Yes - it uses natural gas	1
No – does not use natural gas	0
Don't know	0

Q64. Which of the following water heaters did you purchase?

Response Option	Count
A traditional water heater with a large tank that holds the hot water	0
A tankless water heater that provides hot water on demand	1
A solar water heater	0
Other	0
Don't' know	0

Q65. Is the new water heater an ENERGY STAR model?

Response Option	Count
Yes	1
No	0
Don't know	0

Q66. Which of the following types of housing units would you say best describes your home? It is . . .?

Response Option	Count	Percent (n=172)
Single-family detached house	102	59%
Single-family attached home (such as a townhouse or condo)	9	5%
Duplex, triplex or four-plex	3	2%
Apartment or condominium in a building with 5 units or more	22	13%
Manufactured or mobile home	32	19%
Other	2	1%
Don't know	1	1%

Q66. Other…

Response Option	Count
Buying own house soon and will want to make more energy efficient	1
Single family log cabin	1

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)?

Response Option	Count	Percent (n=172)
Less than 500 square feet	1	1%
500 to under 1,000 square feet	12	7%
1,000 to under 1,500 square feet	42	24%
1,500 to under 2,000 square feet	20	12%
2,000 to under 2,500 square feet	22	13%
2,500 to under 3,000 square feet	16	9%
Greater than 3,000 square feet	17	10%
Don't know	42	24%

Q68. Do you or members of your household own your home, or do you rent it?

Response Option	Count	Percent (n=172)
Own / buying	111	65%
Rent / lease	61	36%
Occupy rent-free	0	0%

Don't know	0	0%

Q69. Including yourself, how many people currently live in your home year-round?

Response Option	Count	Percent (n=172)
I live by myself	8	5%
Two people	25	15%
Three people	42	24%
Four people	54	31%
Five people	30	17%
Six people	9	5%
Seven people	3	2%
Eight or more people	1	1%
Don't know	0	0%

Q70. What was your total annual household income for 2017, before taxes?

Response Option	Count	Percent (n=172)
Under $20,000	27	16%
$20,000 to under $30,000	19	11%
$30,000 to under $40,000	18	10%
$40,000 to under $50,000	14	8%
$50,000 to under $60,000	11	6%
$60,000 to under $75,000	9	5%
$75,000 to under $100,000	19	11%
$100,000 to under $150,000	20	12%
$150,000 to under $200,000	9	5%
$200,000 or more	3	2%
Don't know	4	2%
Prefer not to say	19	11%

Q71. What is the highest level of education achieved among those living in your household?

Response Option	Count	Percent (n=172)
Less than high school	1	1%
Some high school	7	4%
High school graduate or equivalent (such as GED)	33	19%
Trade or technical school	4	2%
Some college (including Associate degree)	50	29%

Response Option	Count	Percent (n=172)
College degree (Bachelor's degree)	38	22%
Some graduate school	5	3%
Graduate degree, professional degree	32	19%
Doctorate	1	1%
Don't know	0	0%
Prefer not to say	1	1%

G.4 Student Parent Survey - DEC

Q2. Before today, did you know the kit you received was sponsored by Duke Energy?

Response Option	Count	Percent (n=334)
Yes	313	94%
No	19	6%
Don't know	2	1%

Q3. How did you learn that the kit was sponsored by Duke Energy? [Select all that apply]

Response Option	Count	Percent (n=313)
Classroom materials brought home by child	183	58%
My child's teacher/school	92	29%
Information material included in/on the kit	92	29%
Other	33	11%
Don't know	6	2%

Q3. Other…

Response Option	Count
A friend	1
Advertisement sent home from school that we signed up for	1
By a letter	1
contest sponsored at daughter's school	1
Duke Energy	1
Flyer	1
Friend told me	1
From Duke Power.	1
Had to fill something out online and it was on the box as well	1

Response Option	Count
Heard some of the parents talking about it.	1
I signed up for it online.	1
I use to work as a substitute teacher part time.	1
I work for Duke HEHC Program	1
In the papers that came with it	1
Informed by neighbors on the next door app	1
Internet	1
My daughter shared her experiences with me prior to receiving the materials	1
My wife teaches at the middle school level.	1
Neighbor is a retired Duke Employee.	1
Network neighborhood site	1
Online	2
Pervious Experience	1
Previous participation in the LED kit.	1
PTO promotion of kit!	1
Requested it when I moved into my house	1
Saw information about the kit online	1
School's Social Media	1
Teacher told me	1
Website	3
When it arrived I was told by my grandson it was from Duke	1

Q3a. How did you hear about the opportunity to receive the kit from Duke Energy? [Select all that apply]

Response Option	Count	Percent (n=334)
Classroom materials brought home by child	238	71%
School newsletter	57	17%
Email from my child's teacher/school	46	14%
School website or school web portal	20	6%
In-person conversations with my child's teacher	14	4%
Saw a poster at my child's school	12	4%
After hours event at my child's school	8	2%
Other (please specify in the box below)	44	13%
Don't know	10	3%

Q3a. Other…

Response Option	Count
A friend	1
Assembly sponsored by Duke Energy.	1
Call from my child's school	1
Class Dojo message from school	1
Contest at my daughter's school	1
Duke Energy Website	1
Either something we filled out or something that came home with the kids from school	1
Facebook	1
Flyer from school	2
Friend told me.	1
From my niece Stacey Johnson	1
From the school	1
Grand daughter brought home a card	1
Heard about it from another child’s parent	1
Heard some of the parents talking about it.	1
I saw it on my light bill.	1
It just came in the mail	1
Letter from the school	1
Monthly Bill	1
My child	1
My child told me.	1
My wife teaches at the school.	1
Neighbors posted on nextdoor app	1
Network neighborhood site	1
Once it arrived	1
Pervious Experience	1
Room Parent emails PTO newsletter PTO Facebook posts	1
Saw it on Facebook	1
School	1
School Facebook page	1
School sent me a brochure	1
Social media from school	1
Supporter of saving the environment, step daughter brought home paper from school	1
The school may have given us flyers	1
Was told by my child	1

Response Option	Count
Website	3
When it arrived I was told it was from Duke by my grandson	1
Word of mouth from family	1
Work for duke	1

Q4. Did you read the information about how to save energy in the booklet that came in the kit?

Response Option	Count	Percent (n=334)
Yes	245	73%
No	62	19%
Don't know	27	8%

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?

Response Option	Count	Percent (n=245)
0	1	0%
1	1	0%
2	0	0%
3	2	1%
4	5	2%
5	17	7%
6	17	7%
7	42	17%
8	43	18%
9	24	10%
10 - Very helpful	93	38%
Don't know	0	0%

Q6. What might have made the information more helpful?

Response Option	Count
A chart of the options and other ways to save.	1
Adding more statistical data to prove that what's actually stated is true	1
Better as video than booklet.	1
Could have used more specific info on insulating pipes.	1

Response Option	Count
Different ways to save energy.	1
I already knew the info. I'm sure it would be helpful to someone who didn't already know.	1
I did this line of work for a living so I already knew the info	1
I don't know but it was stuff I already knew	1
I was pretty much aware of all the ways to save energy. I am very conservative with everything.	1
Including information to help renters	1
It was kind of confusing, need more detail	1
It was too long	1
It was very helpful. We rent so there is only so much we can do.	1
Just didn't apply to me	1
Low income resources	1
More ideas on savings.	1
More incentive to use the items... Example rebates...note with power bill telling how much your own home saved after using the items make it more personal not a average	1
More info for energy savings in a mobile home	1
More options and more detailed information and instructions.	1
More pictures. More info	1
Sleep	1
Tell how to really save energy	1
The reading	1
Tips	1
We tend to try our best at club conservation, so I'm not the best to think of with changing minds.	1
Well the showerheads need to be a little bigger for my shower	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?

Response Option	Count	Percent (n=334)
Yes	104	31%
No	228	68%
Don't know	2	1%

Q9. Where did you hear about this program?

Response Option	Count	Percent (n=104)
From my child/children	80	77%
From a teacher/school administrator	29	28%
On the Duke Energy website	15	14%
Other	5	5%
Don't remember	2	2%

Q9a. Other…

Response Option	Count
From the school	1
Network neighborhood site	1
PTO	1
School's website.	1
Through the school newsletter	1

Q10. Have you or anyone else installed any of those items in your home, even if they were taken out later?

Response Option	Count	Percent (n=334)
Yes	312	93%
No	22	7%
Don't know	0	0%

Q12. Which of the items did you install, even if they were taken out later?

Response Option	Count	Percent (n=312)
Showerhead	153	49%
Kitchen faucet aerator	109	35%
Bathroom faucet aerator	104	33%
Night light	259	83%
Energy efficient light bulb(s) (LEDs)	297	95%
Insulator gaskets for light switches and electricity outlets	103	33%
I never installed any of the items from the kit	0	0%

Q13. In addition to the night light, there were two LED light bulbs in the kit. Did you install one or both of the LED light bulbs in the kit?

Response Option	Count	Percent (n=297)
Yes - I installed both LEDs	237	80%
No - I installed only one LED light bulb	50	17%
Don't know	10	3%

Q15. How many of the light switch gasket insulators from the kit did you [*if needed: or anyone else*] install in your home?

Response Option	Count	Percent (n=103)
None	3	3%
One	11	11%
Two	31	30%
Three	7	7%
Four	44	43%
Don't know	7	7%

Q16. How many electrical outlet gasket insulators from the kit did you [*if needed: or anyone else*] install in your home?

Response Option	Count	Percent (n=103)
None	4	4%
One	6	6%
Two	29	28%
Three	5	5%
Four	20	19%
Five	2	2%
Six	5	5%
Seven	1	1%
Eight	18	17%
Don't know	13	13%

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...

	0	1	2	3	4	5	6	7	8	9	10	Don't know	Total

Showerhead	1%	1%	1%	1%	1%	5%	3%	13%	13%	10%	50%	1%	153
Kitchen faucet aerator	2%	0%	1%	1%	1%	5%	3%	7%	8%	3%	67%	3%	109
Bathroom faucet aerator	2%	1%	0%	3%	0%	5%	3%	9%	9%	7%	62%	1%	104
Night light	0%	1%	0%	1%	0%	1%	1%	3%	10%	8%	75%	0%	259
Energy efficient light bulbs (LEDs)	1%	0%	0%	1%	0%	0%	2%	3%	5%	10%	77%	0%	297
Insulator gaskets	0%	0%	0%	1%	2%	2%	1%	6%	14%	7%	59%	9%	103

Q17a. Can you please explain any dissatisfaction you had with the showerhead?

Response Option	Count
Absolutely no water pressure. Takes forever to rinse soap off. Had another water saver head and it had tons of pressure. Uninstalled the free one after 2 days. I was itchy because soap would not rinse off without leaving the water on forever. I feel I used more water using this head because I had to leave the water on longer.	1
I wish there was flow from the center of the shower head as well as the circle. It makes washing longer hair a little harder to get the shampoo out.	1
It was not like the one we already had installed. The one we had was flatter and spread more water.	1
It's a dumb criticism, but it doesn't look as cool as it could.	1
Live in apartment it isn’t dissatisfaction with the shower head but with the general water pressure at apartment	1
Pressure was very poor	1
Shower head leaks water	1
The water flow is different and we have to get used to it.	1
Too slow	1
Very slow	1

Response Option	Count
Water flow pressure was very low. Took longer to wash out soap or to clean off!	1

Q17b. Can you please explain any dissatisfaction you had with the kitchen faucet aerator?

Response Option	Count
Came out to slow	1
Didn't properly fit right on the sink.	1
It kept leaking even when the water was shut off so i had to put the old one back on.	1
It made water squirt out everywhere	1
It was too large for my faucet, it needed an additional adapter	1
Just don't like the loss of flow	1
Low water pressure. Very hard to rinse off dishes and takes longer!	1
Not saving	1
the only con is the kitchen water doesn't have as much water power/pressure when washing as it used to	1
There was not enough pressure	1
We couldn’t install it correctly. Wasn’t matching the sink I believe.	1

Q17c. Can you please explain any dissatisfaction you had with the bathroom faucet aerator?

Response Option	Count
Cut back too much water	1
Didn't properly fit right.	1
It didn’t fit our faucet correctly	1
Low water pressure and so wouldn't even wash tooth paste off tooth brushes!! Removed them all.	1
Made water squirt out everywhere	1
Not saving	1
Sprays water out	1

Q17d. Can you please explain any dissatisfaction you had with the night light?

Response Option	Count
I'd prefer it to have an on/off switch	1
I'm not really sure what the nightlight does or how it will save me energy at this time.	1
It is not bright enough.	1
It's not very bright	1

Response Option	Count
No just wasn't needed.	1
Not bright enough for my needs	1
Not saving	1
Nothing but an energy user with little helping of light	1
very happy with the night light	1
Wasn't bright enough for my child	1

Q17e. Can you please explain any dissatisfaction you had with the energy efficient light bulbs (LEDs)?

Response Option	Count
Blink sometimes	1
Not a huge fan of the type of lighting they provide	1
Not enough	1
Not saving	1
There are not as bright. I brought lights that were brighter.	1
They were not bright enough for the area	1
They were too dim and it took a long time to actually get bright	1

Q17f. Can you please explain any dissatisfaction you had with the insulator gaskets?

Response Option	Count
I have an older home built in 1986. I have not noticed a difference in my home insulation since installing these. I installed them only on exterior walls.	1
I still feel air coming through.	1
Not saving	1

Q18. Have you since uninstalled any of the items from the kit that you had previously installed?

Response Option	Count	Percent (n=312)
Yes	30	10%
No	279	89%
Don't know	3	1%

Q19. Which of the items did you uninstall?

Response Option	Count (n=30)
Showerhead	13

Response Option	Count (n=30)
Kitchen faucet aerator	10
Bathroom faucet aerator	4
Night light	8
Energy efficient light bulbs (LEDs)	5
Insulator gaskets	1
Don't know	1

Q20. Why were those items uninstalled? Let's start with…

Q20a. the showerhead?

Response Option	Count
It was broken	1
Didn't like how it worked	8
Didn't like how it looked	2
Other – Leaks water	1
Other – Switched to handheld shower	1
Other – Wanted to install the one with the water line	1
Don't know	0

Q20b. the kitchen faucet aerator?

Response Option	Count
It was broken	1
Didn't like how it worked.	5
Didn't like how it looked.	0
Other – Couldn't install it correctly	1
Other – Did not have an adapter	1
Other – Had to install a filter Brita system	1
Other – Water kept leaking out of it even when the water was turned off.	1
Don't know	0

Q20c. the bathroom faucet aerator?

Response Option	Count
It was broken	0
Didn't like how it worked	2
Didn't like how it looked	0
Other – Didn't fit correctly	1

Response Option	Count
Other – Sprays water out instead of the normal	1
Don't know	0

Q20d. the night light?

Response Option	Count
It was broken	2
Didn't like how it worked.	0
Didn't like how it looked.	1
Other – Child removed and lost the light	1
Other – To keep my lamps off	1
Other – Too bright	1
Other – Wasn't needed	1
Other – We had to move the night light to a different outlet.	1
Don't know	0

Q20e. the energy efficient light bulbs (LEDs)?

Response Option	Count
It was broken	2
Didn't like how it worked.	1
Didn't like how it looked.	1
Other – They went out	1
Other – Was not bright enough in the area but we did install into just a simple lamp	1
Don't know	0

Q20f. the insulator gaskets?

Response Option	Count
It was broken	0
Didn't like how it worked.	0
Didn't like how it looked.	1
Don't know	0

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?

Response Option	Count	Percent (n=314)
Showerhead	63	20%

Kitchen faucet aerator	68	22%
Bathroom faucet aerator	82	26%
Night light	40	13%
Energy efficient lightbulbs (LEDs)	26	8%
Insulator gaskets	92	29%
Im not planning on installing any of these in the next three months.	106	34%

Q22. What's preventing you from installing those items? Let's start with….

Q22. Showerhead…

Response Option	Count	Percent (n=118)
Didn't know what that was	2	2%
Tried it, didn't fit	9	8%
Tried it, didn't work as intended (please explain in the box below)	6	5%
Haven't gotten around to it	11	9%
Current one is still working	33	28%
Takes too much time to install it / No time / Too busy	3	3%
Too difficult to install it, don't know how to do it	2	2%
Don't have the tools I need	1	1%
Don't have the items any longer (threw away, gave away)	1	1%
Already have an efficient showerhead	45	38%
Other (please specify in the box below)	21	18%
Don't know	2	2%

Q22. Kitchen faucet aerator…

Response Option	Count	Percent (n=156)
Didn't know what that was	9	6%
Tried it, didn't fit	32	21%
Tried it, didn't work as intended (please explain in the box below)	8	5%
Haven't gotten around to it	28	18%
Current one is still working	26	17%
Takes too much time to install it / No time / Too busy	2	1%
Too difficult to install it, don't know how to do it	4	3%
Don't have the tools I need	1	1%

Don't have the items any longer (threw away, gave away)	2	1%
Already have an efficient kitchen faucet aerator	34	22%
Other (please specify in the box below)	23	15%
Don't know	3	2%

Q22. Bathroom faucet aerator…

Response Option	Count	Percent (n=148)
Didn't know what that was	13	9%
Tried it, didn't fit	30	20%
Tried it, didn't work as intended (please explain in the box below)	6	4%
Haven't gotten around to it	32	22%
Current one is still working	15	10%
Takes too much time to install it / No time / Too busy	1	1%
Too difficult to install it, don't know how to do it	1	1%
Don't have the tools I need	3	2%
Don't have the items any longer (threw away, gave away)	2	1%
Already have an efficient bathroom faucet aerator	24	16%
Other (please specify in the box below)	25	17%
Don't know	4	3%

Q22. Energy efficient lightbulbs (LEDs)…

Response Option	Count	Percent (n=11)
Didn't know what that was	0	0%
Tried it, didn't fit	1	9%
Tried it, didn't work as intended (please explain in the box below)	0	0%
Haven't gotten around to it	1	9%
Current one is still working	2	18%
Takes too much time to install it / No time / Too busy	0	0%
Too difficult to install it, don't know how to do it	0	0%
Don't have the tools I need	0	0%
Don't have the items any longer (threw away, gave away)	0	0%
Already have LEDs	3	27%
Other (please specify in the box below)	3	27%

Don't know	1	9%

Q22. Night lights…

Response Option	Count	Percent (n=35)
Didn't know what that was	0	0%
Tried it, didn't fit	1	3%
Tried it, didn't work as intended (please explain in the box below)	2	6%
Haven't gotten around to it	10	29%
Current one is still working	5	14%
Takes too much time to install it / No time / Too busy	0	0%
Too difficult to install it, don't know how to do it	0	0%
Don't have the tools I need	0	0%
Don't have the items any longer (threw away, gave away)	1	3%
Other (please specify in the box below)	13	37%
Don't know	3	9%

Q22. Insulator gaskets…

Response Option	Count	Percent (n=139)
Didn't know what that was	12	9%
Tried it, didn't fit	7	5%
Tried it, didn't work as intended (please explain in the box below)	4	3%
Haven't gotten around to it	48	35%
Current one is still working	19	14%
Takes too much time to install it / No time / Too busy	10	7%
Too difficult to install it, don't know how to do it	9	6%
Don't have the tools I need	3	2%
Don't have the items any longer (threw away, gave away)	2	1%
Other (please specify in the box below)	27	19%
Don't know	9	6%

Q22a. Thinking of the items you installed, would you be interested in receiving any more of them from Duke Energy? If so, which ones?

Response Option	Count	Percent (n=326)

Yes, I would like another energy-efficient showerhead	79	24%
Yes, I would like another kitchen faucet aerator	45	14%
Yes, I would like more bathroom faucet aerators	47	14%
Yes, I would like more energy-efficient night lights	190	58%
Yes, I would like more energy-efficient light bulbs (LEDs)	254	78%
Yes, I would like more switch/outlet gasket insulators	49	15%
No, I am not interested in receiving any more of the items	32	10%
Don't know	79	24%

Q22b. What would be your preferred way to request these additional items?

Response Option	Count	Percent (n=293)
Internet	218	74%
Telephone	35	12%
Pre-paid postcard	66	23%
Other, please specify	5	2%
Don't know	7	2%

Q26. You said you installed the night light. Did the night light replace an existing night light?

Response Option	Count	Percent (n=251)
Yes	167	67%
No	83	33%
Don’t know	1	0%

Q27. Did the old nightlight have a bulb that you could take out and replace once it burned out?

Response Option	Count	Percent (n=167)
Yes	113	68%
No	50	30%
Don't know	4	2%

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?

Response Option	Count	Percent (n=292)
All incandescent (old fashioned light bulb - likely purchased more than two years ago)	132	45%

All halogen (looks like an incandescent, but has a glass tube inside of the bulb)	8	3%
All CFL (spiral or twisty shaped bulb that fits into ordinary light fixtures)	123	42%
All LED (new bulb type that uses little electricity and lasts a long time)	12	4%
Some combination of bulb types (please specify which ones in the box below)	13	4%
Don't know	4	1%

Q29. In what rooms did you install the energy efficient lightbulbs that were included in the kit?

Response Option	Count	Percent (n=292)
Living room	131	45%
Dining room	20	7%
Bedroom	104	36%
Kitchen	56	19%
Bathroom	59	20%
Den	8	3%
Garage	4	1%
Hallway	25	9%
Basement	4	1%
Outdoors	5	2%
Other area (please specify in the box below)	11	4%
Don't Know	6	2%

Q30. Have you adjusted the temperature of your water heater based on the Hot Water Gauge Card included in your kit?

Response Option	Count	Percent (n=334)
Yes	57	17%
No	222	66%
Don't recall seeing the Hot Water Gauge Card	45	13%
Don't know	10	3%

Q31. Do you know what the old temperature setting on your hot water heater was?

Response Option	Count	Percent (n=57)
Yes	16	28%
No	41	72%

Q31a. Temperature setting...

Response Option	Count
120	2
128	1
130	3
140	4
155	1
160	1
Actually, it was not hot enough to read	1
The recommended for you	1
Very hot	1

Q32. And what was the new temperature setting you set your hot water heater to?

Response Option	Count
72	1
100	1
105	1
110	1
118	1
120	8
130	2
140	1
180	1
Low	1

Q33. Is the new water heater temperature setting still in place?

Response Option	Count	Percent (n=57)
Yes	51	90%
No	2	4%
Don't know	4	7%

Q34. Why did you change the water heater temperature a second time?

Response Option	Count
It was too cold for showers	1
Not hot enough	1

Q35. What is the fuel type of your water heater?

Response Option	Count	Percent (n=334)
Electricity	213	64%
Natural Gas	106	32%
Other (please specify in the box below)	3	1%
Don't know	12	4%

Q36. How old is your water heater?

Response Option	Count	Percent (n=334)
Less than five years old	111	33%
Five to nine years old	62	19%
Ten to fifteen years old	50	15%
More than fifteen years old	19	6%
Don't know	92	28%

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?

Response Option	Count	Percent (n=309)
Yes	119	39%
No	105	34%
Don't know	85	28%

Q38. What items would you have purchased and installed within the next year?

Response Option	Count	Percent (n=117)
Energy-Efficient Showerhead	24	21%
Kitchen faucet aerator	8	7%
Bathroom faucet aerator	7	6%
Energy-Efficient Night light	38	33%
Energy efficient lightbulbs (LEDs)	101	86%
Switch/Outlet Gasket Insulators	7	6%
No I would not have purchased any of the items	0	0%
Other	0	0%
Don't know	1	1%

Q39. If you had not received them for free in the kit, how many LED light bulbs would you have purchased?

Response Option	Count	Percent (n=83)
One	3	4%
Two	58	70%
Don't know	22	27%

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…

	0	1	2	3	4	5	6	7	8	9	10	Don't know	Total
The fact that the items were free	3%	0%	1%	1%	1%	6%	4%	5%	8%	6%	64%	2%	191
The fact that the items were mailed to your house	1%	0%	1%	1%	0%	4%	1%	4%	7%	5%	76%	1%	191
The chance to win cash prizes for your household and school	8%	1%	3%	2%	2%	9%	3%	4%	5%	5%	57%	4%	191
Information in the kit about how the items would save energy	1%	0%	0%	2%	2%	7%	5%	6%	12%	13%	50%	3%	191
Information that your child brought home from school	1%	0%	2%	4%	2%	9%	3%	5%	13%	9%	48%	4%	191
Other information or advertisements from Duke Energy, including its website	8%	1%	1%	5%	2%	10%	6%	10%	11%	7%	37%	3%	191

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…

	0	1	2	3	4	5	6	7	8	9	10	Don't know	Total
The fact that the items were free	3%	0%	1%	1%	1%	4%	1%	4%	7%	9%	70%	1%	292
The fact that the items were mailed to your house	2%	0%	0%	1%	0%	3%	2%	5%	6%	8%	73%	0%	292
The chance to win cash prizes for your household and school	10%	2%	1%	1%	3%	7%	3%	4%	7%	7%	52%	3%	292
Information in the kit about how the items would save energy	5%	0%	2%	2%	1%	8%	5%	11%	11%	11%	44%	1%	292
Information that your child brought home from school	7%	0%	2%	3%	2%	8%	4%	10%	12%	8%	42%	3%	292
Other information or advertisements from Duke Energy, including its website	12%	2%	2%	3%	2%	13%	5%	9%	11%	7%	30%	2%	292

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?

Response Option	Count	Percent (n=187)
Yes	158	85%
No	22	12%
Don't know	7	4%

Q43. How often do you read those Home Energy Reports?

Response Option	Count	Percent (n=158)
Never	0	0%
Sometimes	37	23%
Always	121	77%
Don't know	0	0%

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]

Response Option	Count
Nothing	27
Purchased energy saving products for my home and received a Duke Energy rebate	6
Purchased energy saving products for my home but did not receive a Duke Energy rebate	28
Made energy saving modifications to my home (example: installed insulation or windows)	34
Adjusted how or when I use energy in my home	85
Looked for additional information on how to save energy	35
Other (please specify in the box below)	10
Don't know	5

Q45. Since your child learned about energy conservation at school and signed up for your energy kit from Duke Energy, has your child adopted any **new** behaviors to help save energy in your home? This would only include new energy saving **behaviors** that your child adopted since receiving the kit. [*IF NEEDED: like turning off the lights when room is unoccupied*]

Response Option	Count
Not applicable - no new behaviors	84
Turn off lights when not in a room	209
Turn off electronics when not using them	133
Take shorter showers	89
Other	21
Don't know	11

Q45a. Other…

Response Option	Count
Addressing the television being left on.	1
He was very excited to get the kit and loved installing the new things.	1
I don't know how to answer this, because my child doesn't live with me.	1
I was always taught to be aware of cutting off lights etc. so I've always felt my children to do the same thing.	1
Keep the doors shut	1
No but they were already aware of energy savings	1
No child in family - wife is teacher at the school	1
Reminds others not to waste water when brushing teeth	1
She has increased awareness	1
She's 6.	1
Turn off water when brushing teeth or washing hands	1
Turns water off while brushing teeth	7
Using less water	1
Using the night light	1
When she brushes her teeth, she turns the water off. She opens up the blinds to use sunlight instead of lights.	1

Q45b. [IF Q45 =2-5] Before receiving the kit, was your child already…

Response Option	Count	Percent (n=108)
Turning off lights when not in a room	81	75%
Turning off electronics when not using them	44	41%

Taking shorter showers	23	21%
Other	11	10%

Q46. Since receiving your energy kit from Duke Energy, have you adopted any new behaviors to help save energy in your home? This would only include new energy saving **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?"*]

Response Option	Count
Not applicable - no new behaviors	75
Turning off lights when not in a room	157
Turning off furnace when not home	42
Turning off air conditioning when not home	74
Changed thermostat settings to use less energy	151
Using fans instead of air conditioning	109
Turning off electronics when we are not using them	126
Taking shorter showers	80
Turning water heat thermostat down	40
Other (please specify in the box below)	29
Don't know	7

Q46a. Other…

Response Option	Count
Closing blinds during the day	1
Cut down on use of electronics as well as cut down on how much light we use per room	1
Do not let the water run when cooking	1
Doing laundry less frequently. Using solar lighting for exterior.	1
For the heater, put 1 down, instead of at 68, put at 67.	1
Girls will use natural lights instead of overhead electrical lights	1
I don't know of any, we are pretty efficient anyway.	1
I was already very conscious on saving energy to save money	1
I'm trying to get my trailer under bin to help save energy, especially during the winter to save on heating costs.	1
Installing energy-efficient equipment	1
More aware of electricity usage, bought more LED's	1
No running a half-full washer	1
Opening the blinds to use sunlight.	1

Response Option	Count
Purchasing and installing new energy efficient appliances including an a/c	1
Replacing all light bulbs for LEDs	1
Switched to energy-efficient lightbulbs	1
Trying to be more energy conscience and installed energy efficient windows	1
Turn off water when brushing teeth or cooking	1
Turning off the water when not using it.	1
Turning off water while brushing teeth	1
Turning water on for less time	1
Using electron appliances at night.	1
Using energy-efficient lighting	1
Using open windows instead of air conditioner. Using energy-efficient equipment	1
Using the toilet water gauges to consume less water	1
Watch how much water we use	1
Water conservation	1
We were already doing these things	1

Q46b. [IF Q46 =2-10] Before receiving the kit, were you already…

Response Option	Count	Percent (n=183)
Turning off lights when not in a room	121	66%
Turning off furnace when not home	25	14%
Turning off air conditioning when not home	33	18%
Changing thermostat settings so heating or cooling system uses less energy	75	41%
Using fans instead of air conditioning	60	33%
Turning off electronics when not using them	72	39%
Taking shorter showers	27	15%
Turning water heat thermostat down	13	7%
Other	11	6%

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].

Response Option	Count	Percent (n=252)
0 – Not at all influential	5	2%

1	1	0%
2	0	0%
3	1	0%
4	3	1%
5	14	6%
6	22	9%
7	41	16%
8	49	19%
9	18	7%
10 - Extremely influential	97	38%
Don't know	1	0%

Q47a. Thinking of the near future, are you interested in purchasing any additional products or services to help save energy in your home?

Response Option	Count	Percent (n=334)
Yes	195	58%
No	65	19%
Don't know	74	22%

Q47b. What additional products or services are you interested in purchasing?

Response Option	Count
Energy efficient appliances	76
Efficient heating or cooling equipment	54
Efficient windows	54
Adding insulation	54
Sealing air leaks	92
Sealing or insulating ducts	47
Efficient lighting (LEDs)	134
Energy efficient water heater	60
Internet connected “smart” thermostat	63
Other	18
Don't know	6

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?

Response Option	Count	Percent (n=334)

Yes	92	28%
No	226	68%
Don't know	16	5%

Q49. What **products** have you purchased and installed to help save energy in your home? [MULTIPLE RESPONSE]

Response Option	Count
Bought energy efficient appliances	26
Moved into an ENERGY STAR home	2
Bought efficient heating or cooling equipment	7
Bought efficient windows	4
Added insulation	10
Sealed air leaks	18
Sealed ducts	8
Bought LEDs	59
Bought CFLs	8
Installed an energy efficient water heater	12
None – no other actions taken	0
Other (please specify in the box below)	8
Don’t know	0

Q49a. Other…

Response Option	Count
Added window tinting	1
I purchased more foam that goes behind the light switches.	1
Installed a storm door	1
one energy efficient a/c	1
programmable thermostat	1
Smart thermostat	1
Water leakage tape	1
Water Program.	1

Q50. Did you get a rebate from Duke Energy for any of those products or services? If so, which ones?

Response Option	Count
Bought energy efficient appliances	0
Moved into an ENERGY STAR home	0
Bought efficient heating or cooling equipment	1

Response Option	Count
Bought efficient windows	0
Bought additional insulation	0
Sealed air leaks	1
Sealed ducts	0
Bought LEDs	4
Bought CFLs	1
Installed an energy efficient water heater	0
Other	0
I did not get any Duke Rebates	79
Don't know	7

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…

	0 - Not at all influential	1	2	3	4	5	6	7	8	9	10 - Extremely influential	Don’t Know	Total
Buy energy efficient appliances	8%	0%	0%	4%	8%	12%	0%	15%	15%	8%	31%	0%	26
Move into an ENERGY STAR home	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	50%	50%	2
Buy efficient heating or cooling equipment	29%	0%	0%	0%	0%	0%	0%	29%	0%	0%	29%	14%	7
Buy efficient windows	25%	0%	25%	0%	0%	25%	0%	0%	0%	0%	25%	0%	4
Add insulation	40%	10%	0%	10%	0%	10%	0%	0%	0%	10%	20%	0%	10
Seal air leaks	0%	6%	6%	0%	6%	22%	17%	6%	0%	6%	33%	0%	18
Seal ducts	0%	0%	13%	0%	0%	50%	0%	0%	0%	0%	38%	0%	8
Buy LEDs	10%	2%	0%	3%	0%	12%	14%	10%	10%	7%	29%	2%	59
Buy CFLs	0%	0%	0%	0%	0%	25%	25%	25%	0%	0%	25%	0%	8
Install an energy efficient water heater	8%	0%	8%	0%	0%	8%	8%	0%	0%	0%	50%	17%	12

Other	50%	13%	0%	0%	0%	0%	0%	13%	0%	0%	25%	0%	8

Q52. What kinds of appliance(s) did you buy?

Response Option	Count
Refrigerator	7
Stand-alone Freezer	5
Dishwasher	10
Clothes washer	12
Clothes dryer	9
Oven	8
Microwave	7
Other	1
Don't know	1

Q53. Was the [INSERT Q52 RESPONSE] an ENERGY STAR or high-efficiency model?

Response Option	Count	Percent (n=16)
Refrigerator	5	31%
Stand-alone Freezer	3	19%
Dishwasher	8	50%
Clothes washer	10	63%
Clothes dryer	8	50%
Oven	6	38%
Microwave	3	19%
Other	0	0%

Q54. Does the new clothes dryer use natural gas?

Response Option	Count
Yes- it uses natural gas	1
No – does not use natural gas	8
Don't know	0

Q55. What type of heating or cooling equipment did you buy?

Response Option	Count	Percent (n=5)
Central air conditioner	2	40%
Window/room air conditioner unit	0	0%
Wall air conditioner unit	0	0%
Air source heat pump	2	40%
Geothermal heat pump	0	0%
Boiler	0	0%

Response Option	Count	Percent (n=5)
Furnace	1	20%
Wifi-enabled thermostat	1	20%
Other (please specify in the box below)	0	0%
Don't know	0	0%

Q55a. Other…

Response Option	Count
Not applicable	0

Q56. Does the new [INSERT Q55 RESPONSE] use natural gas?

Response Option	Count
Yes	1

Q57. Was the [INSERT Q55 RESPONSE] an ENERGY STAR or high-efficiency model?

Response Option	Count	Percent (n=4)
Central air conditioner	2	50%
Window/room air conditioner unit	0	0%
Wall air conditioner unit	0	0%
Air source heat pump	2	50%
Geothermal heat pump	0	0%
Boiler	0	0%
Furnace	1	25%
Wifi-enabled thermostat	0	0%
Other (please specify in the box below)	0	0%
Don't know	0	0%

Q58. How many windows did you install?

Response Option	Count
3	1
6	1
8	1

Q59. Did you add insulation to your attic, walls, or below the floor? [MULTIPLE RESPONSE]

Response Option	Count
Attic	3
Walls	2

Response Option	Count
Below the floor	3
Don’t know	0

Q60a. Approximately what proportion of the attic space did you add insulation?

Response Option	Count
Not applicable	0

Q60b. Approximately what proportion of the wall space did you add insulation?

Response Option	Count
Not applicable	0

Q60c. Approximately what proportion of the below the floor space did you add insulation?

Response Option	Count
Not applicable	0

Q61. Do you know how many of LEDs you installed at your property?

Response Option	Count
Yes	48
Don't know	5

Q61a. How many of LEDs did you install in your property?

Response Option	Count
2	2
3	1
4	1
5	6
6	2
7	1
8	5
9	1
10	3
12	4
15	4
17	2
18	1
20	7

Response Option	Count
25	2
30	1
36	1
38	1
40	2
50	1
Don't know	0

Q62. How many of CFLs did you install in your property?

Response Option	Count
Yes	6
Don't know	2

Q62. Number of CFLS installed…

Response Option	Count
4	2
5	1
8	1
15	1
36	1

Q63. Does the new water heater use natural gas?

Response Option	Count
Yes - it uses natural gas	4
No – does not use natural gas	7
Don't know	0

Q64. Which of the following water heaters did you purchase?

Response Option	Count
A traditional water heater with a large tank that holds the hot water	10
A tankless water heater that provides hot water on demand	0
A solar water heater	0
Other	0
Don't' know	0

Q65. Is the new water heater an ENERGY STAR model?

Response Option	Count
Yes	10
No	0
Don't know	1

Q66. Which of the following types of housing units would you say best describes your home? It is . . .?

Response Option	Count	Percent (n=334)
Single-family detached house	245	73%
Single-family attached home (such as a townhouse or condo)	11	3%
Duplex, triplex or four-plex	6	2%
Apartment or condominium in a building with 5 units or more	36	11%
Manufactured or mobile home	35	10%
Other	0	0%
Don't know	1	0%

Q66. Other…

Response Option	Count
Not applicable	0

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)?

Response Option	Count	Percent (n=334)
Less than 500 square feet	8	2%
500 to under 1,000 square feet	37	11%
1,000 to under 1,500 square feet	82	25%
1,500 to under 2,000 square feet	66	20%
2,000 to under 2,500 square feet	49	15%
2,500 to under 3,000 square feet	22	7%
Greater than 3,000 square feet	36	11%
Don't know	34	10%

Q68. Do you or members of your household own your home, or do you rent it?

Response Option	Count	Percent (n=333)

Own / buying	211	63%
Rent / lease	117	35%
Occupy rent-free	5	2%
Don't know	0	0%

Q69. Including yourself, how many people currently live in your home year-round?

Response Option	Count	Percent (n=334)
I live by myself	9	3%
Two people	39	12%
Three people	66	20%
Four people	117	35%
Five people	68	20%
Six people	25	7%
Seven people	7	2%
Eight or more people	2	1%
Don't know	1	0%

Q70. What was your total annual household income for 2017, before taxes?

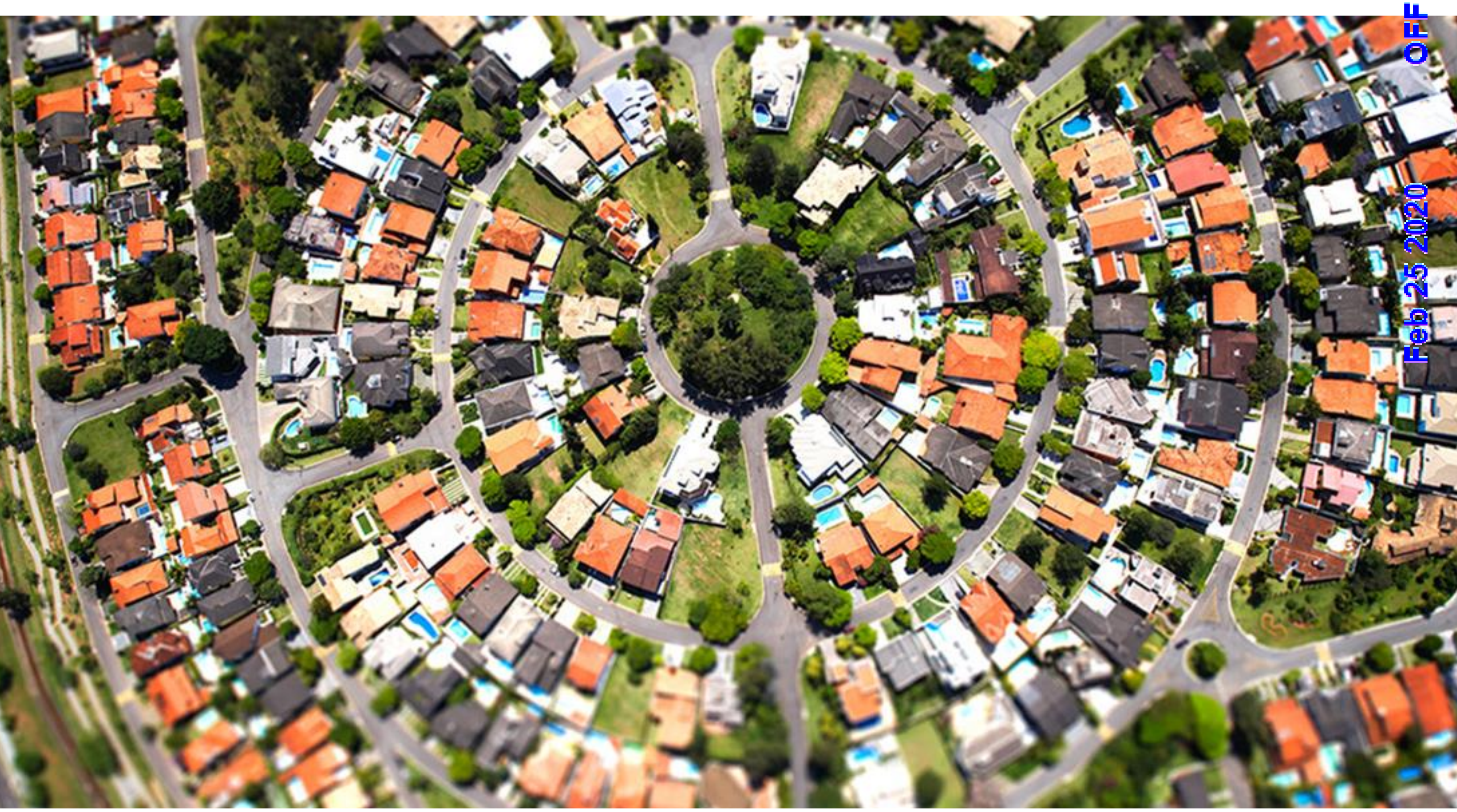
Response Option	Count	Percent (n=334)
Under $20,000	41	12%
$20,000 to under $30,000	39	12%
$30,000 to under $40,000	35	10%
$40,000 to under $50,000	31	9%
$50,000 to under $60,000	24	7%
$60,000 to under $75,000	21	6%
$75,000 to under $100,000	41	12%
$100,000 to under $150,000	28	8%
$150,000 to under $200,000	10	3%
$200,000 or more	7	2%
Don't know	7	2%
Prefer not to say	50	15%

Q71. What is the highest level of education achieved among those living in your household?

Response Option	Count	Percent (n=334)
Less than high school	7	2%
Some high school	6	2%

Response Option	Count	Percent (n=334)
High school graduate or equivalent (such as GED)	59	18%
Trade or technical school	18	5%
Some college (including Associate degree)	89	27%
College degree (Bachelor's degree)	67	20%
Some graduate school	5	1%
Graduate degree, professional degree	57	17%
Doctorate	11	3%
Don't know	0	0%
Prefer not to say	15	5%

REPORT



Smart $aver Evaluation Report — May 1, 2016 – April 30, 2017

Submitted to Duke Energy Carolinas
in partnership with Research into Action

March 15, 2019

Principal authors:
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1 Executive Summary

1.1 Program Summary

The Smart $aver program offers Duke Energy Carolina (“Duke” or “DEC”) existing and new construction residential customers incentives for improving their home’s energy efficiency through the installation of energy efficient heating, ventilating, and air conditioning (HVAC) units, smart thermostats, water heating equipment, pool pump, duct sealing and insulation, and attic insulation with air sealing[1]. A tiered incentive structure offers larger rebates for higher efficiency units. Quality install and smart thermostat incentives are not offered as standalone incentives; customers must receive a rebate for a new HVAC system to be eligible for these additional incentives. The program is provided through independent, prequalified contractors who install the eligible energy efficiency measures consistent with the program standards and guidelines, and submit the rebate application documentation on behalf of the customer.

1.2 Evaluation Objectives and Results

This report presents the results and findings of evaluation activities for the Smart $aver program conducted by the evaluation team, collectively Nexant Inc. and our subcontracting partner, Research into Action, in the evaluation period of May 1, 2016 – April 30, 2017.

1.2.1 Impact Evaluation

We conducted this evaluation of the Smart $aver program to estimate gross and net energy, summer demand, and winter demand savings for the entire program and for each major measure type. The evaluation team reviewed available program databases to help inform the design of the evaluation effort and sampling approach. Activities included an in-situ metering study (n=44) to estimate operational hours of air source heat pumps and central air conditioners paired with engineering desk analyses to estimate gross savings for all measures in the program during the evaluation period of May 1, 2016 – April 30, 2017. Net savings are a reflection of the degree to which the gross impacts are a result of the program-specific efforts and incentives. Therefore, we implemented attribution surveys with program participants and contractors to estimate the rates of free ridership and spillover. Program level results for the Smart $aver program are provided in Table 1-1.

[1] HVAC tune-ups were also included in the program offering; however, there was no participation for this service during the evaluation timeframe.

Table 1-1: Program Impact Results

Measurement	Reported	Realization Rate	Gross Verified	Net-to-Gross Ratio	Net Verified
Energy (kWh)	9,593,312	83.0%	7,960,401	66.7%	5,308,068
Summer Demand (MW)	2.95	70.5%	2.08		1.38
Winter Demand (MW)	1.30	196.8%	2.50		1.67

In the evaluation period of May 1, 2016 – April 30, 2017, the program provided rebates for 21,817 measures installed in single family homes, resulting in 7,960 MWh in gross verified energy savings. The program primarily incentivized HVAC equipment and related add-on measures (quality installation and smart thermostats), which accounted for 80% of rebated measures and 76% of verified energy savings, as shown in Figure 1-1 and Figure 1-2.

Figure 1-1: Smart $aver Rebated Measures

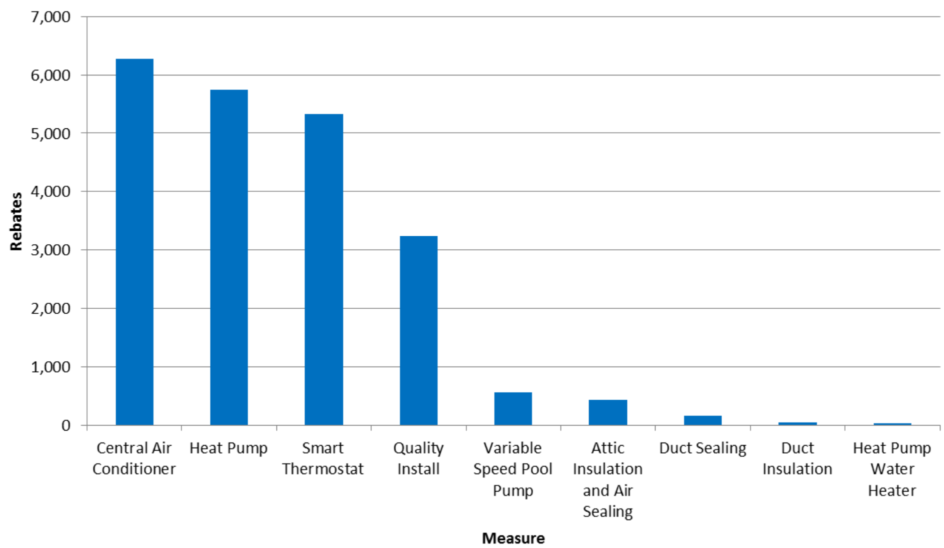


Figure 1-2: Smart $aver Verified Energy Savings

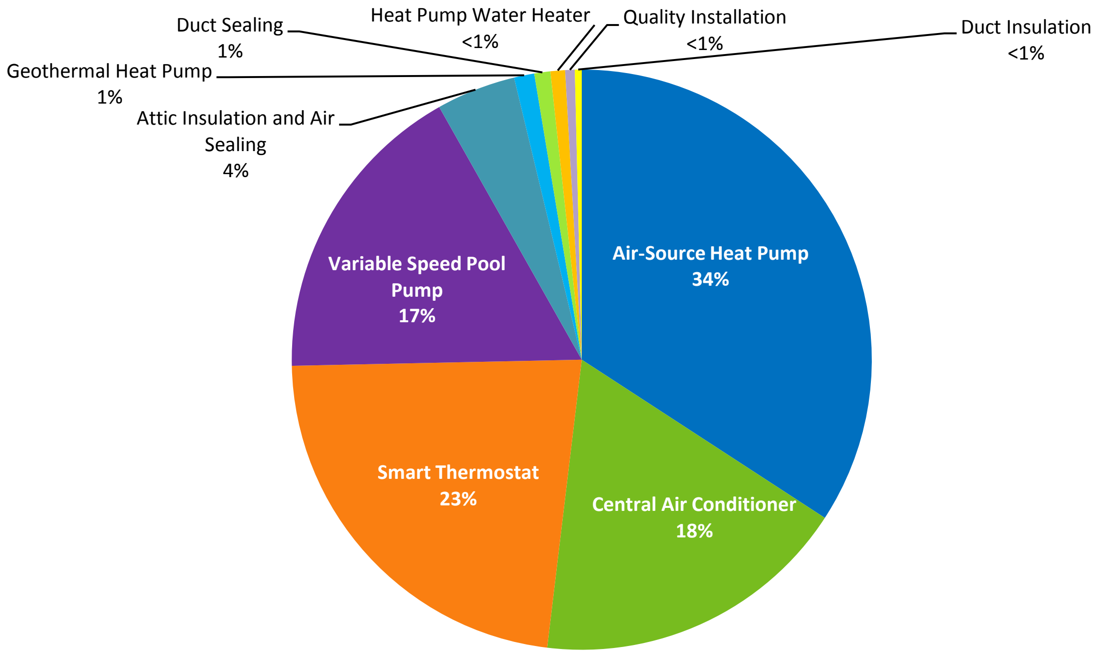


Table 1-2 presents per unit verified gross energy and demand savings with the calculated net-to-gross ratio for each rebated measure.

Table 1-2: Program Verified Impacts by Measure

Measure	Reported Energy Savings per unit (kWh)	Realization Rate	Verified Gross Energy Savings per unit (kWh)	Reported Summer Coincident Demand Savings per unit (kW)	Realization Rate	Verified Gross Summer Coincident Demand per unit (kW)	Reported Winter Coincident Demand Savings per unit (kW)	Realization Rate	Verified Gross Winter Coincident Demand per unit (kW)	Net to Gross Ratio
Central Air Conditioner*	320	70.2%	225	0.195	63.0%	0.123	0.032	516.0%	0.167	66.7%
Heat Pump**	416	117.7%	490	0.139	107.5%	0.149	0.122	174.3%	0.213	
Quality Install	376	3.5%	13	0.133	3.8%	0.005	0.084	5.0%	0.004	
Smart Thermostat	377	90.1%	340	0.000	100.0%	0.000	0.000	100.0%	0.000	
Attic Insulation and Air Sealing	1,163	70.9%	824	0.184	120.1%	0.221	0.194	205.8%	0.399	
Variable Speed Pool Pump	2,342	103.8%	2,430	0..590	89.3%	0.527	0.000	100.0%	0.000	
Heat Pump Water Heater	1,616	100.0%	1,616	0.124	100.0%	0.124	0.000	100.0%	0.000	
Duct Sealing	350	125.1%	438	0.291	55.5%	0.162	0.000	100.0%	0.153	
Duct Insulation	688	92.1%	634	0.573	40.9%	0.234	0.000	100.0%	0.222	

*All values are a weighted average of Tiers 1, 2, and 3. Per unit verified savings for each Tier is provided in Section 3.
** All values are a weighted average of Tiers 1, 2, and 3 with air source heat pumps combined with geothermal heat pumps. The evaluation team assessed savings separately for each technology type and tier and presents these findings in Section 3. References to "heat pump" in subsequent tables and figures in this evaluation report reflect the combined findings for air source and geothermal heat pumps unless otherwise noted.

1.2.2 Process Evaluation

This process evaluation assessed why and how rebated energy saving measures were implemented through Smart $aver and identified ways to improve the program design and implementation. To answer these research questions, the evaluation team interviewed program and implementer staff (n=2) and "high volume" trade allies (n=5), and surveyed stratified random samples of trade allies (n=58) and participants (n=73).[1]

Program Successes

The DEC Smart $aver Program found success in the following areas.

Overall, participants are highly satisfied with Smart $aver. Participants were especially satisfied with their contractors, their upgrade project, and the program overall.

Smart $aver influences energy efficiency contracting services in DEC service territory. Trade allies reported that participating in Smart $aver influenced them to recommend and implement qualifying measures and has increased their knowledge of energy efficient technologies.

Trade allies are Smart $aver's most successful marketing channel. Participant surveys demonstrated that trade allies are the primary source of program awareness (Table 1-3) and are the most influential factor on the customer's decision to implement rebated measures.

Table 1-3: Source of Program Awareness (Multiple Responses Allowed; n=73)

Source of Program Awareness	Percent
Trade ally	77%
Online	11%
Mailer	8%
Other	3%
Don't know	6%

Program Challenges

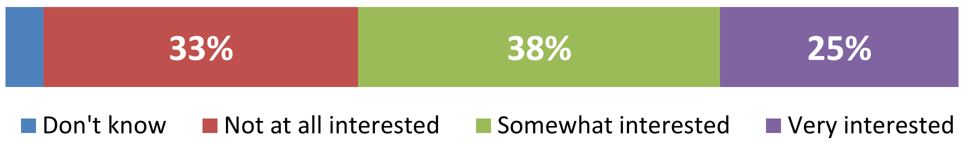
The following concerns were highlighted by trade allies and participants.

Smart $aver is not a strong gateway program. About one-third (29%) of participants reported awareness of other DEC programs, and 41% of those participated (12% of total sample). Since receiving Smart Saver rebates, 30% of participants reported purchasing other products or services to help save energy in their homes. However, very little of this resulted in attributable spillover savings as most (16 of 22) said Smart $aver had no influence on their subsequent energy upgrades.

[1] High volume trade allies are companies in the top 20% of trade allies in terms of number of rebated measures, for a given campaign, in 2016.

Trade allies could benefit from additional sales training. Most trade allies expressed interest in training to help them sell qualified measures (Figure 1-3).

Figure 1-3: Trade Ally Interest in Sales Training (n=58)



The transition to the online portal has been challenging for trade allies. The portal was the biggest sticking point for trade allies, with 71% reporting problems or frustrations with the new rebate application process. Trade allies most commonly reported the following issues:

- data entry and form upload problems (which causes them to resubmit forms)
- reasons for rebate rejections are vague or unknown
- the application process takes too much time
- resolving application issues tend to be an onerous task

However, nearly three-fourths of trade allies said portal issues have gotten at least somewhat better over time.

Quality installation has caused dissatisfaction among many trade allies. While most trade allies said they were already doing all of the techniques on the quality install checklist, only one mentioned all of the primary components of the checklist when asked to list the specific techniques. When asked if they had any suggestions for improving quality install, many trade allies noted their frustration with and criticism of the measure. Trade allies were most dissatisfied with the cumbersome process of the quality installation checklist and many either suggested eliminating the requirement or compensating the trade ally for their time completing the quality installation.

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: Trade allies are the driving force of the program, but there may be opportunities to improve their program experience and effectiveness. Trade allies are the primary mechanism for bringing participants into the program, as they often upsell energy efficient systems to customers who have no prior awareness of the program during a time of immediate heating or cooling needs. However, trade ally satisfaction with certain program elements is relatively low, particularly: the application process and portal, program training, and the quality installation process and requirements.

- **Recommendation: Look for ways to increase trade ally satisfaction and rebate volumes.** Trade allies are vital to the program's success, DEC should work with Blackhawk Engagement Solutions, the program implementer, to improve the trade ally experience and look for ways to increase trade ally effectiveness in the field.
- Potential strategies for increasing trade ally effectiveness (and simultaneously increasing trade ally satisfaction):
  - Provide marketing materials to trade allies, such as co-op marketing
  - Attempt to increase trade ally participation in training events. Potential strategies:
    - Align training offerings with trade ally content requests, particularly: sales, quality install, portal/application process, and program changes
    - Ensure training sessions occur during convenient periods during the year (i.e., non-peak seasons) and convenient times (breakfast meetings can be particularly successful).
- Potential strategies for improving Trade Ally (TA) satisfaction:
  - Continue improving portal system and simplifying the application process
  - Consider splitting incentives with TAs to compensate TAs for their time spent on Duke Energy processes. Shifting a small portion of the incentive to the trade ally is unlikely to negatively impact participation levels, as participants were only marginally influenced by the rebate and were instead mainly influenced by their contractor's recommendation (a finding which underscores the need to retain a strong trade ally network).

Conclusion 2: Approximately 60% of sampled quality install sheets included issues. Trade allies complete quality install sheets detailing system measurements taken while on site. Upon review of a sample of quality install sheets, the evaluation team found several issues including:

- Math errors
- Calculated capacities below program requirement
- Rule of thumb CFM estimates instead of actual measurements
- Testing in sub-optimal conditions

These issues compromise the validity of the impact of quality installation and therefore the associated energy and demand savings cannot be verified.

- **Recommendations:**
  - Establish additional internal QA/QC processes when reviewing submitted quality install sheets.
  - Work with trade allies to better understand issues encountered with the quality install sheets and to improve quality install reporting.

Conclusion 3: The quality installation measure may have experienced some growing pains in its infancy. Many trade allies expressed frustration with the 'complex and time consuming' quality install form, especially since they receive no compensation for completing it. These concerns may have limited the initial growth of the new measure:

- Tier 1 (which requires QI) was the least installed HVAC tier, amounting to about one-tenth of all HVAC units in the program.
- Less than one-third of Tier 2 and Tier 3 HVAC units received a QI rebate.
  - **Recommendation: As DEC matures the quality installation measure, look for ways to retain, expand, and improve trade ally quality install practices.**
  - Potential strategies for retaining and expanding trade ally quality installation practices:
    - <u>Shift the quality install rebate to trade allies</u>: trade ally dissatisfaction with the process may be mitigated by compensation.
    - <u>Hold a round table meeting with trade allies to collaborate on a revised quality install process that better serves the needs of both parties:</u> for DEC to generate cost-effective savings from the measure, the process must be minimally burdensome for trade allies so that they actively and accurately complete it

Conclusion 4: New HVAC rebates and requirements are generating additional energy savings that would not have occurred naturally. The new HVAC program components have resulted in increased trade ally sales of high SEER HVAC units and smart thermostats. Although comparatively less successful, quality installation rebates and requirements have encouraged a minority of trade allies to adopt new quality install techniques.

- **Recommendation 1:** <u>Continue offering the new incentives</u>:
  - tiered HVAC incentives
  - smart thermostats incentives
  - QI incentives (however, shift the rebate to trade allies)
- **Recommendation 2:** <u>Continue looking for new program offerings that could generate additional savings</u>.

2 Introduction and Program Description

2.1 Program Description

The Smart $aver program offers Duke Energy Carolinas ("Duke" or "DEC") existing and new construction residential customers incentives for improving their home's energy efficiency through the installation of energy efficient heating, ventilating, and air conditioning (HVAC) units, smart thermostats, water heating equipment, pool pump, duct sealing and insulation, and attic insulation with air sealing[1]. A tiered incentive structure offers larger rebates for higher efficiency units. Quality install and smart thermostat incentives are not offered as standalone incentives; customers must receive a rebate for a new HVAC system to be eligible for these additional incentives.

The program is provided through independent prequalified contractors – called "trade allies" – who install the eligible energy efficiency measures consistent with the program standards and guidelines, and submit the rebate application documentation on behalf of the customer. Trade allies receive no monetary incentives for measures they install in existing buildings, but builders are eligible to receive rebates for qualified HVAC equipment installed in residential new construction projects.

2.1.1 Energy Efficiency Measures

Energy efficiency measures included in the Smart $aver program are summarized in Table 2-1.

[1] HVAC tune-ups were also included in the program offering; however, there was no participation for this service during the evaluation timeframe.

Table 2-1: Smart $aver Measures and Incentives

Measures		Rebate Amount	Details
Central Air Conditioner		Tier 1: $250 Tier 2: $250 Tier 3: $300	Tier 1: 14 SEER, ECM fan on indoor unit, quality installation required Tier 2: 15 and 16 SEER, with ECM Tier 3: 17 SEER or greater, with ECM
Heat Pump*	*Air Source*	Tier 1: $250 Tier 2: $250 Tier 3: $300	Tier 1: 14 SEER, ECM fan on indoor unit, quality installation required Tier 2: 15 and 16 SEER, with ECM Tier 3: 17 SEER or greater, with ECM
	Geothermal	Tier 3: $300	Tier 3: 19 SEER or greater, with ECM
Smart Thermostat		$100	Add-on incentive for HVAC participants
Quality Installation		$60	Required on Tier 1 HVAC (no add-on incentive provided), add-on incentive for Tier 2 and Tier 3 HVAC participants
Attic Insulation & Air Seal		$250	R-19 or below to R-30 or greater; decrease home air leakage by 5% or more
Variable Speed Pool Pump		$300	Equipment must be an ENERGY STAR® qualified variable-speed pool pump for use with main filtration of in-ground residential swimming pool; applications for motor replacements only are not eligible.
Heat Pump Water Heater		$350	ENERGY STAR® qualified units. Must have an EF ≥ 2
Duct Sealing		$100/duct system	Decrease air duct leakage by 12% or more
Duct insulation*		$75/duct system	For unconditioned attic: R-4.2 to R-19 or greater; for unconditioned crawl space or basement: R-0 to R-6 or greater

*The Smart$aver program filing stipulates heat pumps as a certified measure. However, because the program rebated both air source and geothermal heat pumps during the evaluation period, the evaluation team assessed savings separately for each technology type. References to “heat pump” in subsequent tables and figures in this evaluation report reflect the combined findings for air source and geothermal heat pumps unless otherwise noted.

2.2 Program Implementation

The Smart $aver program is chiefly implemented by Blackhawk Engagement Solutions (BES). BES manages the trade ally registration process, incentive application submission and fulfillment, the trade ally online portal, and the program call center. As part of the prequalification process, all contractors who wish to participate are required to enter into a Letter of Agreement or Prequalified Contractor Participation Agreement for participation in the program. Contractors who meet program requirements are included in a prequalified contractor listing on the program website. Prequalified contractors have permission to promote Smart $aver program measures and identify themselves as a program contractor.

Upon selection by the customer, contractors will complete the requested installation in accordance with all Smart $aver Program standards and guidelines, and all applicable building codes. Contractors use the online portal to submit incentive applications. Paper format incentive applications are also accepted, but discouraged. Prequalified contractors provide itemized invoices with sufficient detail describing what was installed.

Upon receipt of the application, BES verifies that the application is complete and accurate, and will follow up with customers or contractors to resolve any discrepancies. DEC staff conduct quality control inspections on a small share of installed measures.[2] Inspections are to be shared across all contractors, with new contractors and those who have had quality issues being inspected at a higher rate. Upon approval of applications, incentives are issued to participating customers (and, when applicable, builders or trade allies) for the incentive value.

DEC provides marketing through several channels, including: direct mail campaigns, utility website, participating contractor outreach and advertising, and contractor associations. DEC also performs trade ally outreach and training services.

Eligibility

DEC residential account holders residing in DEC electric service territory are eligible for the Smart $aver rebates. All customers participating in the program must be on a DEC residential electric rate. The program is open to existing residential electric service customers living in single-family homes, condominiums, mobile homes, townhomes and duplexes. Builders may also apply for HVAC rebates for their residential new construction projects.

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:

[2] DEC staff inspects the first five projects completed by new trade allies. Further, DEC staff randomly inspects 10% of projects for each measure category.

"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.

2.3.1 Impact

Over-arching project impact evaluation processes followed standard industry protocols and definitions, where applicable, and include the Department of Energy Uniform Methods Protocol, as an example. As part of evaluation planning, the evaluation team outlined the following activities for this program evaluation:

- Quantify accurate and supportable energy (kWh) and demand (kW) savings for energy efficient measures and equipment implemented in participants' homes;
- Assess the rate of free riders from customer and contractor perspective and determine spillover effects;
- Benchmark verified measure level energy impacts to applicable technical reference manuals (TRMs) and other Duke-similar programs in other jurisdictions;
- Consider and verify that measure installation vintage aligns with measure baseline definitions, i.e. early replacement, burnout on failure, etc.; and,
- To the extent possible for the purposes of program planning, the evaluation team will seek to provide estimated per-unit savings by measure.

2.3.2 Process

The process evaluation was designed to support organizational learning and program adaptation. To this end, the evaluation team sought to research several elements of the program delivery and customer experience as outlined below:

- **Awareness and Engagement:** How aware are customers of the Smart $aver program? What are the primary sources of information (e.g., trade allies, program website, bill inserts) that customers use to learn more about the program? How do customers typically learn about energy efficient technologies? How are trade allies engaged in the Smart $aver program, and what is the most effective engagement source (e.g., implementer, program website). Is there a need to conduct any additional marketing of the program and/or provide marketing support to trade allies?

- **Program Satisfaction:** How satisfied are participants with the overall program experience, their contractor and the quality of the installation, incentive turnaround, energy savings after the work was performed, and Duke Energy? How satisfied are trade allies with the program?
- **Program Influence:** Does the program influence participants to engage in other Duke Energy energy-efficiency programs? Does the program increase contractor's knowledge of energy-efficient technologies? Does the program increase how often participating contractors promote energy-efficient equipment and services to their customers?
- **Challenges and opportunities for improvement:** Are there any inefficiencies or challenges with the application, incentive turnaround, or trade allies? What training opportunities could be offered to trade allies to help them more effectively sell rebated equipment? How engaged are trade allies in using the implementer web portal or other program resources?
- **Participant characteristics and potential:** What are the demographic characteristics of those participating in the program? Are there segments of the population that are not participating but have high participation potential and should be reached?
- **Code Changes:** New Seasonal Energy Efficiency Ratio (SEER) standards were enforced for heat pumps and air conditioners manufactured or distributed on or after January 1, 2015. What are trade ally perspectives on how this change will affect the market and the program?

2.4 Evaluation Overview

The evaluation team divided the approach into key tasks to meet the goals outlined:

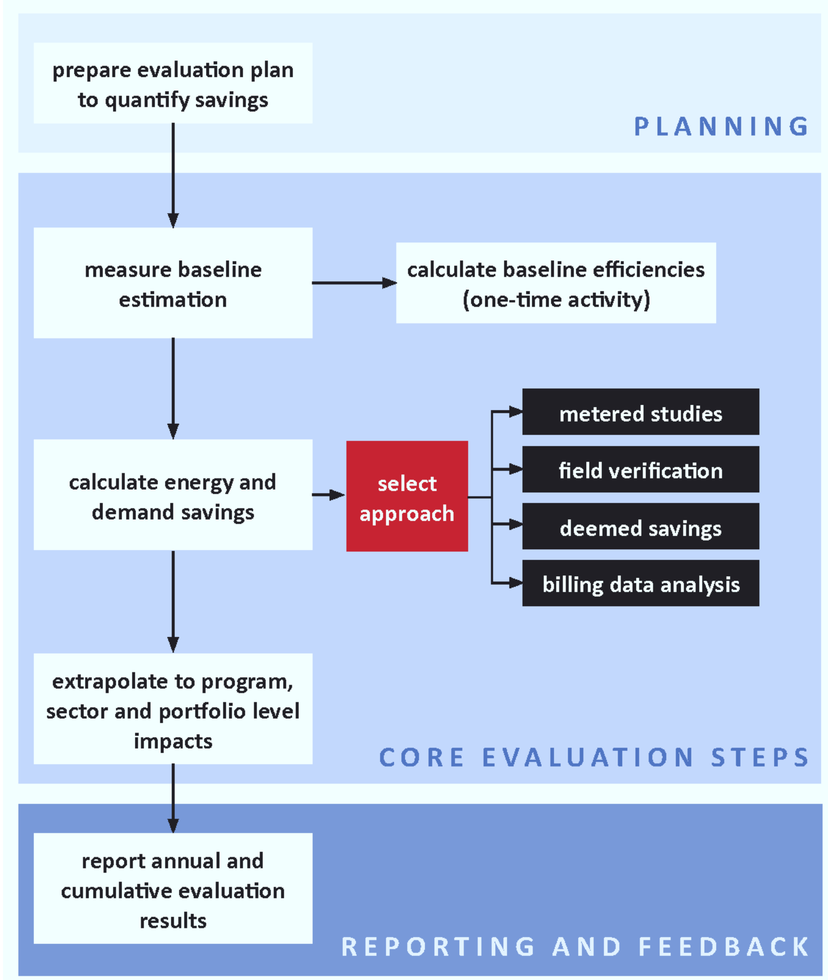
- **Task 1 –** Develop and manage evaluation plan to describe the processes that will be followed to complete the evaluation tasks outlined in this project;
- **Task 2 –** Conduct a process review to determine how successfully the program is being delivered to market and identify opportunities for improvement;
- **Task 3 –** Verify gross and net energy and peak demand savings resulting from the Smart $aver program through on-site measurements and verification activities of a sample of program participants and projects.

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, include on-site inspections and measurements, telephone surveys, database review, best practice review, and interviews with implementation staff, trade allies, and program participants.

Figure 2-1 demonstrates the principle evaluation steps organized through planning, core evaluation activities, and final reporting.

Figure 2-1: Impact Evaluation Process



The evaluation team targeted sample sizes for on-site activities based upon the evaluation team's understanding of the expected significance (or magnitude) of expected participation, the level of certainty of savings, and the variety of measures.

The evaluation generally comprised the following steps, which are described in further detail throughout this report:

- **Design the Sample for Measurement and Verification (M&V):** The review, measurement, and verification of all implemented projects is not plausible or cost-effective given the size of this program. Consequently, a sample of projects was established for M&V. In order to provide the most cost-effective sample, the evaluation team employed a Value of Information (VOI) approach. VOI is used to balance cost and rigor and follows a process to allocate the bulk of the evaluation funds to programs and projects with high impact and high uncertainty.
- **Develop Measure-Specific M&V Plans**: Upon review of the program documents, a unique M&V plan was developed for each program and measure, including a metering protocol, as applicable. M&V methods were developed with adherence to

the International Performance Measurement and Verification Protocol (IPMVP) and other well-established engineering analysis procedures.

- **Participant Surveys and On-site Inspections:** The database review provided the necessary information to design a sample of projects to review. All sampled projects received a telephone survey with the participant. Additionally, a portion of the sampled projects received on-site measurement and verification to further detail the information obtained during the database review and ultimately used to calculate energy savings. Table 2-2, in Section 2.4.3 below summarizes the number of surveys and on-site inspections completed. The samples were drawn to meet a 90% confidence and 10% precision at the program level.
- **Calculate Impacts and Analyze Load Shapes:** Data collected via the on-site visits, database reviews and telephone surveys enabled the evaluation team to calculate gross verified energy and demand savings for each project or measure. Hourly load shapes are important in calculating system on-peak demand savings, especially when the measures installed have daily and seasonal variations in the operating schedule.
- **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 for each project in the impact sample utilizing 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 applied scaling factor to the reported savings.

2.4.2 Process Evaluation

Process evaluation tells the qualitative story behind the quantitative impact evaluation by understanding the program in its unique context. The goal of process evaluation is to perform a systematic assessment of an energy efficiency program by generating feedback that achieves the following outcomes:

- Document program operations
- Recommend improvements to increase the program's efficiency and effectiveness
- Assess stakeholder satisfaction

These outcomes can inform program planning, existing program implementation, or efforts to redesign a program. Process evaluations typically cover all aspects of a program including its design, implementation, marketing and outreach, data tracking, quality assurance, customer and stakeholder feedback, and market conditions. By evaluating the broad context in which a program operates, evaluators can recommend realistic improvements. Evaluators typically examine program aspects through the following mechanisms:

- Database and document review
- Interviews with program staff and key stakeholders, such as trade allies
- Surveys with customers

- Benchmarking research
- Marketing review

Information gathered from participating customers and trade allies through process evaluation activities can be measured and analyzed to form the basis of a NTG ratio. For example, participant surveys used to assess participant satisfaction also provide opportunity to ask participants about their motivations for participating and the influence of the program on their decisions, both of which are key components of a free ridership calculation. Similarly, the participant surveys are used to assess whether participants installed additional energy savings measures, which could be attributed to spillover.

2.4.3 Summary of Activities

Techniques we utilized to conduct the evaluation, measurement, and verification (EM&V) activities, and to meet the goals for this evaluation, included field inspection and metering, telephone surveys with program participants, program database reviews and in-depth interviews (IDI) with utility staff, implementer, and trade allies. Table 2-2 provides a summary of the activities Nexant conducted as part of the Smart $aver program process and impact evaluation for the period of May 1, 2016 – April 30, 2017.

Table 2-2: Summary of Evaluation Activities

Target Group	Population	Sample	Method
Central Air Conditioner and Air Source Heat Pump	11,976	46	Field inspection and metering
Participants (rebated measures)	9,841	73	Telephone Survey
Duke Energy Program Staff	N/A	1	In-depth interview (IDI)
Implementer Staff	N/A	1	IDI
Most Active Trade Allies	~20	5	IDI
Trade Allies	624	58	Telephone survey

2.5 Sample and Estimation

The gross and net verified energy and demand savings estimates presented for the majority of the Smart $aver program participation were generally determined through the observation of key measure parameters among a sample of program participants. A census evaluation would involve surveying, measuring, or otherwise evaluating the entire population of projects within a population. Although a census approach would eliminate the sampling uncertainty for an entire program, the reality is that M&V takes many resources both on the part of the evaluation team and the program participants who agree to be surveyed or have site inspections conducted in their home. When a sample of projects is selected and analyzed, the sample statistics can be extrapolated to provide a reasonable estimate of the population parameters. Therefore, when used effectively, sampling can improve the overall quality of an evaluation study but at a lower cost. By limiting resource-intensive data collection and analysis to a random sample of all projects, more attention can be devoted to each project surveyed.

The nuances and tradeoffs considered by the evaluation team when developing sampling approaches varied by measure across the program and are discussed in more detail in Section 3 and Section 4. However, several common objectives were shared across measures and research objectives. The most important sampling objective was representativeness – that is that the projects selected in the evaluation were representative of the population they were selected from and would produce unbiased estimates of population parameters. A second key sampling objective was to consider the value of information being collected and align sample allocations accordingly. This effort generally involves considering the size (contribution to program savings) and uncertainty associated with the measure being studied and making a determination about the appropriate level of evaluation resources to allocate.

The evaluation team relied primarily on mean-per-unit estimation for the Smart $aver program and separated the program population into a series of homogenous measure categories. This approach works well for residential programs that include a large number of rebates for similar equipment types where the evaluation objective is to determine an average kWh savings per rebated measure. With mean-per-unit estimation, the average kWh savings and NTG ratio observed within the sample is applied to all projects in the population. For several measures the characteristics observed within the evaluation sample were supplemented with parameter values that were available for all members of the population in the program database. For example, the program database stores the capacity (BTU/hour) for every rebated air source heat pump so the evaluation team used the population mean capacity when calculating average per-unit energy savings rather than the sample mean.

2.5.1 Stratification

The evaluation team used sample stratification for the gross impact, net impact, and process evaluation sampling. Stratification is a departure from simple random sampling, where each sampling unit (customer/project/rebate/measure) has an identical likelihood of being selected in the sample. Stratified random sampling refers to the designation of two or more sub-groups (strata) from within a program population prior to the selection process. The evaluation team felt that stratification was advantageous and utilized this approach in the sample design for a variety of reasons across the program, including:

- Increased precision of the within-stratum variability was expected to be small compared to the variability of the population as a whole. Stratification in this case allows for increased precision or smaller total sample sizes, which lowered evaluation costs.
- Ensured a minimum number of units within a particular stratum will be verified. For example, Smart $aver participation in the defined evaluation period was dominated by air source heat pump and central air conditioner installations. A simple random sample would have likely returned zero heat pump water heaters or pool pump

samples. The evaluation team felt it was important to develop primary research results for less common offerings; therefore, separate strata were created.

- Allowed for a value-of-information approach to be implemented through which the largest measures are sampled at a much higher rate than smaller projects by creating size-based strata.

2.5.2 Presentation of Uncertainty

There is an inherent risk, or uncertainty, that accompanies sampling, because the projects selected in the evaluation sample may not be representative of the program population as a whole with respect to the parameters of interest. As the proportion of projects in the program population that are sampled increases, the amount of sampling uncertainty in the findings decreases. The amount of variability in the sample also affects the amount of uncertainty introduced by sampling. A small sample drawn from a homogeneous population will provide a more reliable estimate of the true population characteristics than a small sample drawn from a heterogeneous population. Variability is expressed using the coefficient of variation (C_v) for programs that use simple random sampling, and an error ratio for programs that use ratio estimation. The C_v of a population is equal to the standard deviation (σ) divided by the mean (μ) as shown in Equation 2-1.

Equation 2-1: Coefficient of Variation

$$\boldsymbol{C_v} = \frac{\boldsymbol{\sigma}}{\mu}$$

Equation 2-2 shows the formula used to calculate the required sample size for each evaluation sample, based on the desired level of confidence and precision. Notice that the C_v term is in the numerator, so the required sample size will increase as the level of variability increases. For programs that rely on ratio estimation error ratio replaces the C_v term in Equation 2-2. Results of the previous Duke Energy evaluations and Nexant evaluations from other jurisdictions were the primary source of error ratio and C_v assumptions for the 2016 Smart $aver evaluation.

Equation 2-2: Required Sample Size

$$\boldsymbol{n_0} = \left(\frac{\boldsymbol{z} * \boldsymbol{C_v}}{\boldsymbol{D}}\right)^2$$

Where:

n_0	=	*The required sample size before adjusting for the size of the population*
Z	=	*A constant based on the desired level of confidence (equal to 1.645 for 90% confidence two-tailed test)*
C_v	=	*Coefficient of variation (error ratio for ratio estimation)*
D	=	*Desired relative precision*

The sample size formula shown in Equation 2-2 assumes that the population of the program is infinite and that the sample being drawn is reasonably large. In practice, this assumption is not always met. For sampling purposes, any population greater than approximately 7,000 may be considered infinite for the purposes of sampling. For smaller, or finite, populations, the use of a finite population correction factor (FPC) is warranted. This adjustment accounts for the extra precision that is gained when the sampled projects make up more than about 5% of the program savings. Multiplying the results of Equation 2-2 by the FPC formula shown in Equation 2-3 will produce the required sample size for a finite population.

Equation 2-3: Finite Population Correction Factor

$$fpc = \sqrt{\frac{N - n_0}{N - 1}}$$

Where:

N = *Size of the population*

n_0 = *The required sample size before adjusting for the size of the population*

The required sample size (n) after adjusting for the size of the population is given by Equation 2-4.

Equation 2-4: Application of the Finite Population Correction Factor

$$n = n_0 * fpc$$

Verified savings estimates always represent the point estimate of total savings, or the midpoint of the confidence interval around the verified savings estimate for the program. Equation 2-5 shows the formula used to calculate the margin of error for a parameter estimate.

Equation 2-5: Error Bound of the Savings Estimate

$$Error\ Bound = se * (z - statistic)$$

Where:

se = *The standard error of the population parameter of interest (proportion of customers installing a measure, realization rate, total energy savings, etc.) This formula will differ according to the sampling technique utilized.*

$z - statistic$ = *Calculated based on the desired confidence level and the standard normal distribution.*

The 90% confidence level is a widely accepted industry standard for reporting program-level uncertainty in evaluation findings. The z-statistic associated with 90% confidence is 1.645.

When evaluators or regulators use the term "90/10", the 10 refers to the relative precision of the estimate. The formula for relative precision shown in Equation 2-6:

Equation 2-6: Relative Precision of the Savings Estimate

$$Relative\ Precision_{Verified\ Savings} = \frac{Error\ Bound_{(kWh\ or\ kW)}}{Verified\ Impact_{(kWh\ or\ kW)}}$$

An important attribute of relative precision to consider when reviewing achieved precision values is that it is "relative" to the impact estimate. Therefore measures with low realization rates are likely to have larger relative precision values because the error bound (in kWh or kW) is being divided by a smaller number. This means two measures with exactly the same reported savings and sampling error in absolute terms, will have very different relative precision values, as shown in Table 2-3.

Table 2-3: Relative Precision Example

Program	Reported kWh	Realization Rate	Error Bound (kWh)	Verified kWh	Relative Precision (90%)
Measure #1	4,000,000	0.5	400,000	2,000,000	± 20%
Measure #2	4,000,000	1.0	400,000	4,000,000	± 10%

To calculate a Smart $aver program-level savings estimate requires summation of the verified savings estimates from several strata. In order to calculate the relative precision for these program-level savings estimates, the Evaluation Team used Equation 2-7 to estimate the error bound for the program as a whole from the stratum-level error bounds.

Equation 2-7: Combining Error Bounds across Strata

$$Error\ Bound_{Program} = \sqrt{Error\ Bound_{Stratum1}^2 + Error\ Bound_{Stratum2}^2 + Error\ Bound_{Stratum3}^2}$$

Using this methodology, the evaluation team developed verified savings estimates for the program and an error bound for that estimate. The relative precision of the verified savings for the program is then calculated by dividing the error bound by the verified savings estimate.

3 Impact Evaluation

3.1 Methodology

An impact evaluation was performed to evaluate energy and demand savings attributable to the Smart $aver program. The evaluation was divided into two research areas; determining gross and net savings (or impacts). Gross impacts are energy and demand savings found at a participant's home that are the direct result of a measure installed and rebated through the program. 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 Smart $aver program by conducting the following impact evaluation activities:

- Database and ex ante savings review.
- Sampling of participating measures.
- Performing on-site metering for air source heat pump and central air conditioner replacements to estimate hours of operation and associated amperage.
- Estimating gross verified savings using data collected in previous tasks.
- Comparing the DEC ex ante savings to gross-verified savings to determine program- and measure-level realization rates.
- Applying attribution surveys to estimate net-to-gross ratios and net-verified savings at the program level.

The impact evaluation activities result in the calculation of an adjustment factor called a realization rate, which is applied to the reported savings documented in the program tracking records. The realization rate is the ratio of the savings determined from the site inspections, M&V activities, or engineering calculations to the program-reported savings. The adjusted savings obtained by multiplying the realization rate by the program-reported savings are termed the verified gross savings and they reflect the direct energy and demand impact of the program's operations.

3.2 Database and Ex Ante Review

Review of the program database provided details that informed all evaluation activities. The scope of the evaluation was oriented based on information referenced from the program database, including; the rebate count for each measure and measure specific installation details. These data were considered when designing approaches and methods to evaluate the program. For example, the database included baseline efficiencies for existing equipment; however, it did not include details regarding the working condition of that equipment. Therefore, the participant survey included questions to understand the condition of participants' original equipment to inform the type of baseline the evaluation should use when calculating savings (i.e., early replacement or burnout).

The evaluation team also conducted a review of ex ante savings values, i.e., program reported savings, for each measure rebated during the evaluation period. This review consisted of benchmarking the ex ante value against other evaluation results of similar programs from nearby Duke Energy jurisdictions as well as against regional technical reference manuals (TRMs). This review allowed the evaluation team to understand if the program's assumed savings values are or are not in line with expectations. The details of the ex ante review are referenced in Table 3-1.

This benchmarking exercise exposed concerns regarding the program's two most active measures: central air conditioners and air source heat pumps. Both of these measures had significantly larger ex ante values for Tier 1 efficiencies when compared to each TRM as well as a recently completed evaluation for a very similar HVAC program in Duke Energy Progress. Tiers 2 and 3 ex ante values for central air conditioners and air source heat pumps, however, were more aligned with the benchmarked values. Due to this variation, additional emphasis was placed these measures during the evaluation.

Table 3-1: Comparison of DEC Smart $aver Energy Savings Estimates to Peer Group Estimates

Measure	DEC Smart $aver 2016 PY Deemed Savings (kWh)	DEP HEIP 2014 PY Evaluation (kWh)	Georgia Power 2014 Evaluation (kWh)[1]	Ohio 2010 TRM (kWh)[2]	Texas 2017 TRM (kWh)[3]	Mid-Atlantic 2016 TRM (kWh)[4]
Attic Insulation & Air Seal	1,163	364	461	100/2,183*	443/2,045*	187/2,086*
Central Air Conditioner	-	299	525	-	-	-
Tier 1	464[5]	n/a	-	181	156	195
Tier 2	283	n/a	-	328	299	304
Tier 3	404	n/a	-	485	894	444
Air Source Heat Pump	-	865	875	-	-	-
Tier 1	702[5]	n/a	-	279	394	210
Tier 2	350	n/a	-	764	686	553
Tier 3	496	n/a	-	1,497	1,757	1,074
Ground Source Heat Pump	n/a	1,725	2,744	2,744	1,836	2,698
Smart Thermostat	377	n/a	n/a	n/a	n/a	n/a
Quality Installation	376	n/a	n/a	n/a	n/a	n/a
Variable Speed Pool Pump	2,342	n/a	n/a	1,170	n/a	594
Duct Sealing	350	336	353	68	205/383*	248/592*
Heat Pump Water Heater	1,616	1,978	1,477	2,076/1,297*	1,737	1,511/1,362*

* Values separated by a slash show the estimated savings for homes with AC and gas heating and those with Air Source Heat Pumps. Central AC homes are shown first with Heat Pump homes shown second

1 July 2015 Evaluation Report Public Filing

2 State of Ohio Energy Efficiency Technical Reference Manual. August 6, 2010; Dayton location chosen for weather dependent measures

3 Texas Technical Reference Manual, version 4.0, Volume 2 Residential Measures. November 1, 2016. Amarillo location chosen for weather dependent measures

4 Mid-Atlantic Technical Reference Manual, version 6.0, May 2016. Washington DC location chosen for weather dependent measures

5 Tier 1 Central Air Conditioner and Air Source Heat Pump Savings include savings from mandatory Quality Installation and ECM

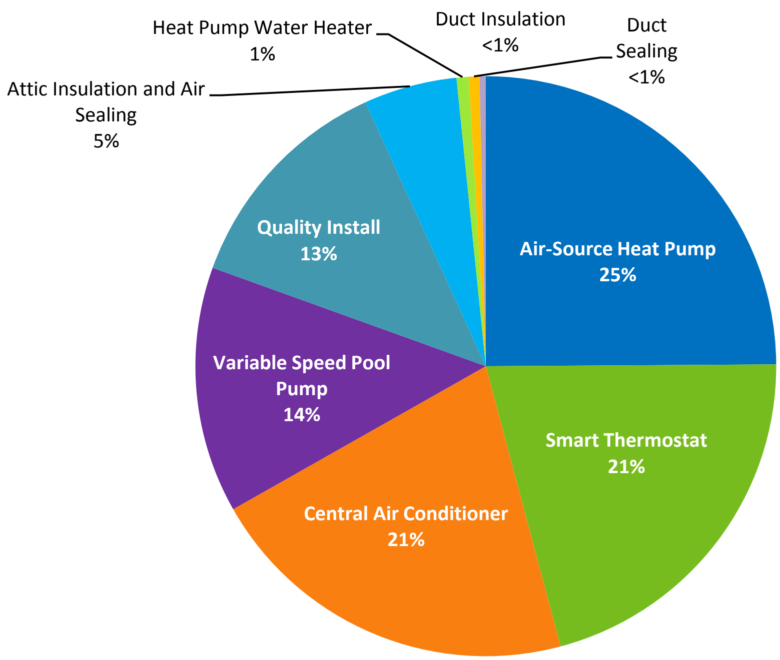
3.3 Sampling Plan and Achievement

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.

For the evaluation period of May 1, 2016 – April 30, 2017, rebated air source heat pumps and central air conditioners were the largest measure contributors for both reported energy and demand savings. Therefore, these measures received the largest share of research activities and the highest level of rigor with on-site equipment measurement.

The evaluation team requested a participation database extract of 2016 and 2017 program results, which included counts and details on installed measures. The distribution of ex ante energy savings based on measure counts from the participation database, shown in Figure 3-1, provided insight to measures with greater influence on total program savings.

Figure 3-1: Reported Energy Savings



Central air conditioners, heat pumps, and bundled measures (smart thermostat, quality install) accounted for 80% of reported energy savings. The sampling plan designed for the evaluation period is included in Table 3-2.

Table 3-2: Impact Sampling Plan

Measure	Metering and/or Verification Sites		Phone Survey	
	Achieved	Targeted	Achieved	Targeted
Central Air Conditioner				
Tier 1	1	1	3	2
Tier 2	23	16	24	24
Tier 3	4	4	6	6
Air Source Heat Pump				
Tier 1	3	3	3	3
Tier 2	11	14	20	20
Tier 3	4	4	6	5
Geothermal Heat Pump	n/a	n/a	1	1
Smart Thermostat*	n/a	n/a	31	29
Quality Install*	n/a	n/a	27	31
Attic Insulation & Air Seal	n/a	n/a	3	2
Variable Speed Pool Pump	n/a	n/a	4	4
Duct Sealing	n/a	n/a	1	1
Duct Insulation	n/a	n/a	1	1
Heat Pump Water Heater	n/a	n/a	1	1
Total	**46**	**42**	**73***	**70***

*Targeted and achieved phone sample size counts for Smart Thermostat and Quality Install are imbedded within phone sample size counts for Central Air Conditioner and Air Source Heat Pump.

3.4 Description of Analysis

The evaluation team applied varying analysis techniques depending on the measure, the measure's prominence within the program, and the availability of data on baseline and retrofit savings. A database of program participation provided useful information about measures installed, participants, as well as additional inputs that varied by measure and informed the analysis. Table 3-3 shows the type of analysis applied to each measure.

Table 3-3: Analysis Approach

Measure	Achieved
Central Air Conditioner	Metering study and desk analysis
Air Source Heat Pump	Metering study and desk analysis
Geothermal Heat Pump	Desk analysis
Smart Thermostat	Desk analysis and secondary research
Quality Install	Metering study and desk analysis
Attic Insulation & Air Seal	Desk analysis
Variable Speed Pool Pump	Desk analysis
Duct Sealing	Desk analysis
Heat Pump Water Heater	Deemed

*Energy savings for the Quality Install measure were based on metering data collected for the EFLH Study

3.4.1 Metering study

Given that a large share of overall program savings is derived from air source heat pumps and central air conditioners, an end-use metering approach was applied for the analysis of these two measures. There are three primary inputs needed to calculate residential HVAC savings. The units' heating/cooling efficiencies and capacities were provided by the program database. The third input, hours of operation, has the highest level of uncertainty and the metering study enabled us to estimate cooling and heating Equivalent Full Load Hours (EFLH) for the program. The methodology used for the metering study follows the Uniform Methods Project (UMP) and most closely resembles IPMVP Option A: Partial Retrofit Isolation/Metered Equipment.

3.4.1.1 Data Collection

To complete the metering study, field engineers were dispatched to the homes of Smart $aver participants who received a rebate for an air source heat pump or central air conditioner replacement. Participants who took part in the metering study were provided a $75 incentive divided across two visits to their home. Forty-six sites were metered across all the DEC territory. Two data sets were dropped due to data quality and ultimately 44 sites, including 28 central air conditioners and 16 air source heat pumps, were used in the analysis. All meters were installed in February 2017 and collected in July 2017 ensuring that ample data was available during both the cooling and heating seasons.

During site visits, field engineers performed various data collection activities. Voltage, amperage, and power factor spot measurements were taken on each unit while in operation. Unit specifications, including capacity, were obtained from each system's nameplate information. Finally, a HOBO CTV-A current transducer (CT) was connected on the conductors supplying electricity to the condensing unit located on the exterior of the home to record electrical current measurements. The CT was paired with a U12-006 data logger that stored current data at 10 minute intervals. The result was a trended data log of electrical current between February and July.

Data collected during the metering study was used in a regression analysis that supplied an estimated EFLH for both cooling and heating periods.

3.4.2 Analysis, Regression, EFLH Calculation

Three primary inputs are required to estimate annual cooling and heating savings for air source heat pumps and central air conditioners:

1. Capacity - the size (kBtuh) of the efficient unit
2. Efficiency - the SEER or Heating Seasonal Performance Factor (HSPF) value of the efficient unit
3. Equivalent Full Load Hours (EFLH) - how often the unit is in operation at full capacity

EFLH is an effective measure for estimating the cooling and heating requirement for a specific region and provides a comparison of energy use between regions and equipment types. The general form for the EFLH term is shown in Equation 3-1.

Equation 3-1: Effective Full Load Hours

$$EFLH_{cool} = \sum_{h=1}^{8760} \frac{Estimated\ Hourly\ Load\ (kW)}{Connected\ Load\ (kW)}$$

Where:

Estimated Hourly Load = Electric demand of the unit in hour h
Connected Load = Electric demand draw of the unit when operating at full power

The evaluation team assigned a connected load to each unit in the sample using nameplate size, efficiency, and spot measurements of voltage and power factor collected on-site. Hourly load was obtained from the logger data and was divided by the connected load to calculate the unit's runtime for each hour in the evaluated period.

The evaluation team collected hourly weather records for the full metering period (February 2017 through July 2017) from six weather stations in North and South Carolina, and assigned each sampled customer to one of six weather stations based on proximity, in order to develop a relationship between observed HVAC system usage runtimes and outdoor temperature. In addition, the evaluation team obtained data for typical meteorological year (TMY3) weather for each location and applied the observed relationship between runtimes and weather to the TMY3 data to estimate annual $EFLH_{heat}$ and $EFLH_{cool}$ for a typical year.

The evaluation team originally intended to utilize the program database to segment the sample based on customer tier levels and estimate EFLH separately for each tier group. However, due to an unbalanced sample, as well as restrictions related to small sample sizes within a segmented dataset, we were not able to confidently estimate EFLH separately by tier. Instead, the evaluation team used an aggregated EFLH value across all tiers. The assumption that EFLH is consistent across different tiers is based on the fact that the heating or cooling load for a home is independent of the efficiency of the HVAC system that conditions the space. A higher efficiency air conditioner may run additional hours during the day, but it does so by consuming energy at a level below full load and removing heat from the home at a slower rate. This system saves energy by operating below full load for longer periods of time but the EFLH, a product of hours operating at given power level, remains constant.

As mentioned above, units were metered from February through July 2017. Because the metering period covered both cooling, heating, and shoulder seasons, and the regression analysis was performed twice to estimate annual $EFLH_{cool}$ and annual $EFLH_{heat}$ separately. The evaluation team split the meter data into two separate datasets. The first dataset contained only observations where average daily temperatures exceeded the base temperature of 65°F, or where temperatures indicated cooling. The second dataset contained observations where average daily temperatures fell below the base temperature of 65°F, or where outdoor temperatures indicated heating.

The evaluation team developed weather-normalized estimates of $EFLH_{cool}$ for each unit in the sample using a linear regression model of observed runtimes as a function of the observed cooling degree days (base 65°F) during the cooling season. Figure 3-2 shows the relationship between average daily runtimes (hours) and cooling degree days. Each blue + represents the average air conditioning runtime in hours for each day in the cooling dataset, i.e. each day with an average temperature exceeding 65°F.

Figure 3-2: Cooling Runtime as a Function of Temperature

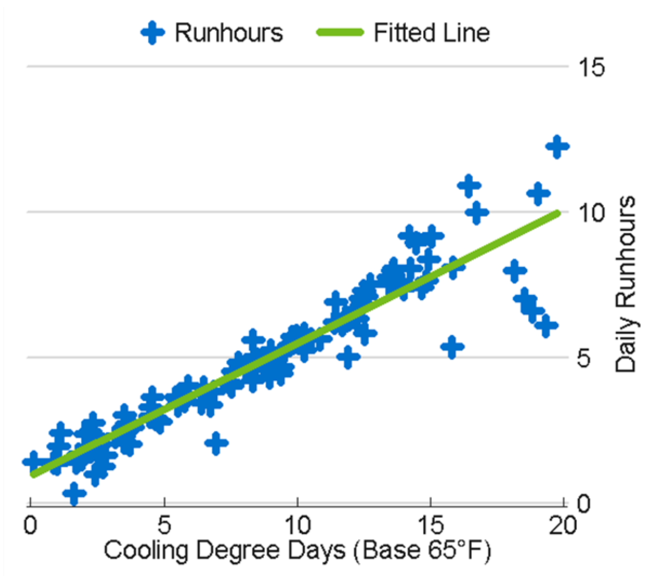


Table 3-4 shows the regression output for the relationship described in Figure 3-2. The key value to consider is the Cooling Degree Day (CDD) coefficient of 0.54. This term indicates that DEC customers use an average of 0.54 hours, or approximately 33 minutes, of additional cooling per CDD.

Table 3-4: $EFLH_{cool}$ Regression Output

Model Term	Coefficient	Std. Err.	t-stat	P-value	[90% Confidence Interval]
CDD	0.54	0.005	104.71	0.000	± 1.6%

The evaluation team ran a similar linear regression model to develop weather-normalized estimates of $EFLH_{heat}$ for each air source heat pump unit. The key difference is that instead of CDD, the model estimated runtimes as a function of observed Heating Degree Days (HDD) during the heating season.

Figure 3-3 shows the relationship between average daily runtimes and heating degree days. Each blue + represents the average air source heat pump runtime in hours for each day in the heating dataset, i.e. each day with an average daily temperature below 65°F.

Figure 3-3: Heating Runtime as a Function of Temperature

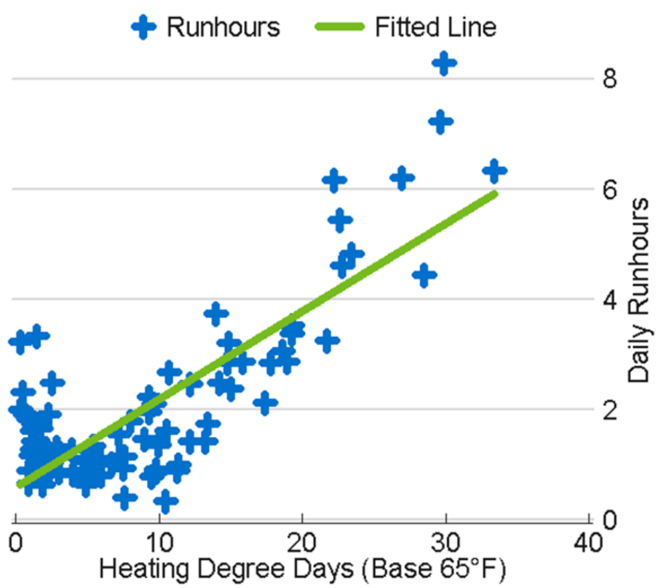


Table 3-5 shows the regression output for the relationship described in Figure 3-3. The coefficient term 0.19 indicates that DEC customers use an average of 0.19 hours, or approximately 12 minutes, of additional heating per HDD.

Table 3-5: $EFLH_{heat}$ Regression Output

Model Term	Coefficient	Std. Err.	t-stat	P-value	[90% Confidence Interval]
HDD	0.19	0.006	33.70	0.000	± 4.9%

The evaluation team utilized hourly TMY3 data for Carolina weather stations to calculate annual CDD and HDD and used those values to estimate $EFLH_{cool}$ and $EFLH_{heat}$ for each customer region. Table 3-6 shows regression coefficients, annual CDD, annual HDD, and estimated EFLH values for each season. $EFLH_{cool}$ and $EFLH_{heat}$ were calculated by multiplying each term's regression coefficient by the average CDD and HDD values determined by TMY3 data.

Table 3-6: EFLH Calculations

Term	Regression Coefficient	Annual CDD (Base 64°F)	Annual HDD (Base 65°F)	$EFLH_{cool}$ (hours)	$EFLH_{heat}$ (hours)
CDD	0.54	1,393	-	752	-
HDD	0.19	-	3,674		698

The field data collected by Nexant also provided the peak summer cooling demand coincidence factor (CF_{summer}). Just as EFLH is a necessary component of the annual energy savings calculation, peak coincidence factor is a necessary component of the peak demand savings calculation. Peak demand coincidence factor is defined here as the probability that the cooling equipment is operating during system peak hours. The basic form for the CF term is a ratio of hourly load to full load during a given hour of the day, and is shown in Equation 3-2.

Equation 3-2: Coincidence Factor

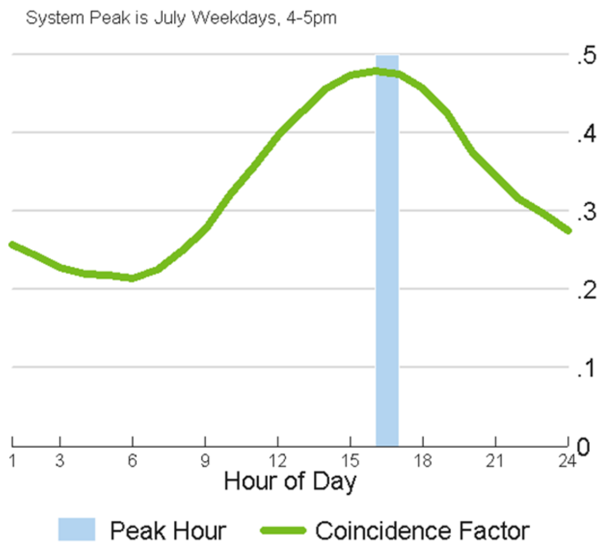
$$CF_h = \frac{Hourly\ Load_h\ (kW)}{Full\ Load\ (kW)}$$

Where:

Hourly Load = *Electric demand of the unit at hour h*
Full Load = *Electric demand draw of the unit when operating at full power*

The evaluation team calculated the peak demand coincidence factor to estimate peak demand savings for the sample. A system's peak demand period refers to the period during which the highest level of power is needed to satisfy its electric demand requirement. DEC defines its summer peak period as July weekdays between 4:00pm and 5:00pm (hour ending 17). Figure 3-4 shows the average CF_{summer} load curve for each weekday of July 2017 for the metered sample. The system's peak period is highlighted in light blue. The CF_{summer} during the system peak is 0.47.

Figure 3-4: Summer Peak Demand Coincidence Factor



A winter peak coincidence factor (CF_{winter}) was not able to be estimated through the metering study because the metering period did not coincide with the timeframe during which DEC's winter peak is defined. DEC defines its winter peak period as January weekdays between 7:00am and 8:00am (hour ending 8). However, due to the evaluation schedule, loggers were installed in early February and we were unable to collect January usage information to estimate winter demand coincidence factor for the Carolinas territory. Since we were unable to estimate a program specific winter demand CF, the evaluation team applied the estimated CF_{winter} found through a similar 2016 metering study performed in DEP territory in order to calculate winter demand (kW) savings. Although the Duke Energy Progress (DEP) and Carolinas service territories boarder each other, differences in geography like mountains or coastal regions result in varying HVAC needs across the two territories. Applying the CF_{winter} found in the DEP evaluation is a strong approximation of performance in DEC, but the uncertainty is increased due to variations in program participants and their location.

3.4.2.1 Central Air Conditioner and Air Source Heat Pump Savings Calculation

Energy and demand savings for central air conditioners and air source heat pumps were determined by engineering algorithms shown in Table 3-7 using the inputs provided in Table 3-8 and Table 3-12.

Table 3-7: Algorithms for HVAC Energy and Demand Savings

Calculation	Equation
Summer Cooling Energy Savings	$\Delta kWh_{cool} = EFLH_{cool} \times Cap_{cool} \times \left(\frac{1}{SEER_{base}} - \frac{1}{SEER_{ee}}\right)$
Summer Cooling Demand Savings	$\Delta kW_{cool} = Cap_{cool} \times \left(\frac{1}{SEER_{base}} - \frac{1}{SEER_{ee}}\right) \times CF_{cool}$
Winter Heating Energy Savings	$\Delta kWh_{heat} = EFLH_{heat} \times Cap_{heat} \times \left(\frac{1}{HSPF_{base}} - \frac{1}{HSPF_{ee}}\right)$
Winter Heating Demand Savings	$\Delta kW_{heat} = Cap_{heat} \times \left(\frac{1}{HSPF_{base}} - \frac{1}{HSPF_{ee}}\right) \times CF_{heat}$
Algorithm Reference	Mid-Atlantic TRM, v6.0, May 2016

Table 3-8: Inputs for Central AC Energy and Demand Savings

Input	Units	Tier	Value	Source
$EFLH_{cool}$	Hours	All	752	Metering study
$Capacity_{cool}$	kBtuh	1	33.8	Population average
		2	32.0	
		3	32.8	
$SEER_{base}$	SEER	All	14[1]	Code minimum
$SEER_{ee}$	SEER	1	14.2	Population average
		2	15.7	
		3	18.1	
CF_{summer}	n/a	All	0.475	Metering study
CF_{winter}	n/a	All	0.588	Metering study

Electrically Commutated Motor Savings

For participants who received an electrically commutated motor (ECM) as part of their central air conditioner replacement, the evaluation team estimated the savings impacts resulting from the fan operation in conjunction with a furnace during the heating season. To estimate this impact, we leveraged primary ECM metered data collected previously by the evaluation team in Duke Energy's Progress territory as well as secondary research to establish baseline conditions. The ECM metered data provided five minute amperage intervals which we used in combination with recorded voltage and power factor measurements to estimate the average power draw of an

[1] The results of the participant survey found no existing central air conditioners were in good working condition when replaced. Therefore, an early replacement adjustment was not applicable.

ECM in operating mode. Our secondary research[2] found that ECMs use half the energy of a standard fan motor when used in residential furnace applications. This insight was applied to estimate baseline fan usage.

To calculate savings, we applied an estimated annual effective full load hours (EFLH) for furnaces to our estimated baseline and ECM power draw. The evaluation team calculated the ECM savings as the difference in consumption between the baseline and ECM fans. We further adjusted the estimated ECM savings by applying the percentage of customers in the program who received an ECM with their new system (86%) as well as by the saturation of residential customers with central air conditioners and forced air furnaces (52%) based on Duke Energy's 2013 residential appliance saturation study (RASS). The algorithm applied to estimate ECM fan savings during the heating season (Table 3-9) along with DEC centric inputs (Table 3-10) are included below.

Table 3-9: Algorithm for ECM Fan Energy and Demand Savings

Calculation	Equation
ECM Fan, furnace, energy savings	$\Delta kWh_{furnace} = EFLH_{furnace} \times Power_{ECM} \times System\ Type\ Adj \times Program\ ECM\ Adj$

Table 3-10: Inputs for Central AC Energy and Demand Savings

Input	Units	Tier	Value	Source
$EFLH_{furnace}$	Hours	All	359	Metering study
$Power_{ECM}$	kW	All	0.191	DEP metering study
System Type Adj	%	All	52%[3]	2013 Duke RASS
Program ECM Adj	%	All	86%[4]	DEC Program Database

Energy and demand savings for central air conditioners are presented in Table 3-11.

2 Pigg, Scott and Talerico, Tom. 2004. "Electricity Savings from Variable-Speed Furnaces in Cold Climates" in *ACEEE 2004 Summer Study on Energy Efficiency in Buildings*, *Panel 1, Paper 23*, http://aceee.org/files/proceedings/2004/data/papers/SS04_Panel1_Paper23.pdf

3 Penetration of central AC systems paired with forced air furnaces in Duke Progress territory per the 2013 RASS

4 Accounts for participants who only replaced the central AC condensing unit and cooling coil without improving the blower section of the HVAC system

Table 3-11: Central AC Gross Verified Savings

Season	Tier	Energy Savings (kWh)*	Summer Demand Savings (kW)	Winter Demand Savings (kW)
Cooling	1	36[5]	0.022[3]	0
	2	182	0.115	
	3	395	0.250	
Heating	All	31	0	0.167
Total	**1**	**66[3]**	**0.022[3]**	**0.167**
	2	**212**	**0.115**	
	3	**426**	**0.250**	

*Rounding error present

Savings for air source heat pumps (Table 3-12 and Table 3-14) apply a split baseline, based on participant responses to the process survey. For this evaluation 6.9% of air source heat pump participants stated their systems were "in good working order" and "not old", and received early replacement energy savings based on a 10 SEER and 6.8 HSPF baseline heat pump.

[5] Tier 1 energy and demand savings include savings associated with program-required quality installation.

Table 3-12: Inputs for Air Source Heat Pump Energy and Demand Savings

Input	Units	Tier	Value	Source
$EFLH_{cool}$	Hours	All	752	Metering study
$EFLH_{heat}$	Hours	All	698	Metering study
$Capacity_{cool\ and\ heat}$	kBtuh	1	29.7	Population average
		2	30.2	
		3	32.8	
Early Replacement (ER%)	%	All	6.9%	Process Survey
$SEER_{base\ ,early\ replacement}$	SEER	All	10[6]	Mid-Atlantic TRM
$SEER_{base,replace\ on\ failure}$	SEER	All	14	Code minimum
$SEER_{ee}$	SEER	1	14.2	Population average
		2	15.5	
		3	18.3	
$HSPF_{base}$	HSPF	All	6.8/8.2[4]	Code minimum
$HSPF_{ee}$	HSPF	1	8.4	Population average
		2	8.8	
		3	9.7	
CF_{summer}	n/a	All	0.475	Metering study
CF_{winter}	n/a	All	0.588	Metering study

Calculation of savings related to spilt baselines considers each scenario (early replacement and replace on failure) separately, and then calculates a spilt baseline by multiplying each component by the percentage of units that meet the conditions of a given scenario (Table 3-13).

[6] The results of the participant survey found 6.9% of Air Source Heat Pump Replacement participants considered their previous system was “in good working order”. An early replacement baseline of 10 SEER and 6.8 HSPF was applied to 6.9% of the population to reflect this finding.

Table 3-13: Algorithm for Split Baseline Savings

Calculation	Equation
Early Replacement, Cooling Energy Savings	$\Delta kWh_{cool,ER} = EFLH_{cool} \times Cap_{cool} \times \left(\frac{1}{SEER_{base,ER}} - \frac{1}{SEER_{ee}}\right)$
Replace on Failure, Cooling Energy Savings	$\Delta kWh_{cool,ROF} = EFLH_{cool} \times Cap_{cool} \times \left(\frac{1}{SEER_{base,ROF}} - \frac{1}{SEER_{ee}}\right)$
Heat Pump, Cooling Energy Savings	$\Delta kWh_{cool,\ split\ baseline} = \Delta kWh_{cool,ER} \times ER\% + \Delta kWh_{cool,ROF} \times (1 - ER\%)$

Table 3-14: Air Source Heat Pump Gross Verified Savings

Season	Tier	Energy Savings (kWh)	Summer Demand Savings (kW)	Winter Demand Savings (kW)
Cooling	1	73[7]	0.046[5]	0
	2	199	0.126	
	3	463	0.293	
Heating	1	98[5]	0	0.082[5]
	2	216		0.182
	3	463		0.390
Total	**1**	**171**[5]	0.046[5]	0.082[5]
	2	**415**	0.126	0.182
	3	**926**	0.293	0.390

3.4.2.2 Geothermal Heat Pump Savings Calculation

Geothermal heat pumps make use of constant ground temperature to provide heating and cooling and operate at higher efficiency levels than air source heat pumps. The Smart $aver Program provides incentives for these systems to encourage participants to install higher efficiency HVAC systems in their homes. Geothermal heat pumps were excluded from the EFLH metering study; however, the evaluation team estimated savings based on the assumption that heating and cooling EFLH for a geothermal heat pump are equivalent to an air source heat pump.

[7] Tier 1 energy and demand savings include savings associated with program required quality installation

Table 3-15: Algorithms for Geothermal Heat Pump Energy and Demand Savings

Calculation	Equation
Summer Cooling Energy Savings	$\Delta kWh_{cool} = EFLH_{cool} \times Cap_{cool} \times \left(\frac{1}{SEER_{base}} - \frac{1}{SEER_{ee}}\right)$
Summer Cooling Demand Savings	$\Delta kW_{cool} = Cap_{cool} \times \left(\frac{1}{SEER_{base}} - \frac{1}{SEER_{ee}}\right) \times CF_{cool}$
Winter Heating Energy Savings	$\Delta kWh_{heat} = EFLH_{heat} \times Cap_{heat} \times \left(\frac{1}{HSPF_{base}} - \frac{1}{COP_{retrofit} \times 3.412}\right)$
Winter Heating Demand Savings	$\Delta kW_{heat} = Cap_{heat} \times \left(\frac{1}{HSPF_{base}} - \frac{1}{COP_{retrofit} \times 3.412}\right) \times CF_{heat}$
Algorithm Reference	Mid-Atlantic TRM, v6.0, May 2016

Table 3-16: Inputs for Geothermal Heat Pump Gross Verified Savings

Input	Units	Value	Source
$EFLH_{cool}$	Hours	752	Metering study
$EFLH_{heat}$	Hours	698	Metering study
$Capacity_{cool\ and\ heat}$	kBtuh	49.6	Population average
$SEER_{base}$	SEER	14	Program minimum
$SEER_{ee}$	SEER	24.2	Population average
$HSPF_{base}$	HSPF	8.2	Program minimum
$COP_{retrofit}$	COP	3.7	Assumed
CF_{cool}	N/A	0.475	Metering study
CF_{heat}	N/A	0.588	Metering study

Table 3-17: Geothermal Heat Pump Gross Verified Savings

Season	Energy Savings (kWh)	Summer Demand Savings (kW)	Winter Demand Savings (kW)
Cooling	1,124	0.710	1.274
Heating	1,513		
Total	**2,637**		

3.4.2.3 Quality Installation Energy Savings

The Quality Installation (QI) measure provides HVAC technicians a process to ensure that new equipment is properly tuned and operating at a high efficiency level when installed. The QI process includes:

- Measuring the sub-cool or superheat charge of the condenser
  - System must be allowed to run for at least 15 minutes prior to measuring charge
- Measuring the liquid and suction line pressures
- Completing a return and supply enthalpy conversion
- Measuring static pressure in the return and supply ducts
- Measuring the system level airflow.

The HVAC technician uses these measurements to calculate a cooling capacity for the unit while in operation. The QI requires that the system performance achieve at least 90% of the net capacity as rated by the Air-conditioning, Heating, & Refrigeration Institute (AHRI).

QI is required for all Tier 1 HVAC units rebated through the Smart $aver Program. For Tiers 2 and 3, an additional incentive is offered if the contractor completed the QI process.

The evaluation team based its verification of QI energy and demand savings estimates on a review of contractor submitted QI data collection sheets and metering data from the Duke Energy Carolinas EFLH study. Along with the program specific steps, secondary research was completed to provide an industry estimate for the level of energy savings expected when a QI process is implemented during the installation of new residential HVAC equipment.

The evaluation team completed a review of 210 QI data collection sheets from the program (70 each from the tier) provided by DEC. These sheets tracked the inputs and calculations completed by HVAC technicians as they installed a participant's new HVAC system and progressed through the QI process. The evaluation focused on the accuracy of the inputs and calculations on the QI data collection sheets to determine if the process was properly applied. Based on the review of these QI data sheets, 60% contained one or more of the following issues:

- Failure to achieve a calculated operational cooling capacity inside the 90%-110% range
- Application of an industry rule of thumb (airflow = 400 cfm/tom) instead of directly measuring the parameter
- Measurements taken below 60° F ambient air temperature on standard QI data collection forms

Based on this review the evaluation de-rated savings from the measure by 60% to reflect the issues discovered (Table 3-18).

Table 3-18: Summary of Quality Installation De-rate Components

Quality Installation Measurement	Count
Cooling Capacity Outside of 90-110%	71
Airflow Rule of Thumb Applied	65
QI Performed Below 60 °F	48
Total QI Sheets with Issues	122[8]
QI Data Sheets for Comparison	202
Savings De-rate Percentage	**60%**

Additionally, the evaluation team found 11% of the QIs were completed as 'Cold Weather Quality Installations' which is a simplified QI data collection process applied when ambient temperatures are below 70° F. Because the accuracy of charge readings of HVAC systems decreases as the ambient temperature falls below 70° F, the HVAC technician is not able to collect the charge data to needed to calculate the operating capacity of the system. Therefore, systems installed in these weather conditions cannot qualify for the program's QI process. Ultimately the evaluation team determined 11% of QIs were completed in these conditions. This finding did not influence the per unit energy and demand savings for QI measure, but the evaluation team did reduce the reported count of QI participants by 11% to reflect systems installed during cold weather (Table 3-19).

Table 3-19: Summary of Quality Installation Cold Weather Installs

Quality Installation Data Type	Count
Cold Weather Sheets Removed	25
Total QI Data Sheet Reviewed	227
QI Participation Reduction	**11%**

The evaluation team based the verification of savings attributable to the QI measure on meter data collected during the Duke Energy Carolinas EFLH study. We estimated and compared the efficiency level (based on the ratio of kW/ton) of systems with and without QI and calculated improvements in efficiency from systems that received QI were attributed to the measure. This analysis found a SEER efficiency improvement of 1.37%, which when reduced by 60% (based on issues discovered on the QI data collection forms) provided a measure-level savings estimate of 0.54%. To quantify the impact this increased efficiency had on energy and demand savings, the evaluation team defined a QI efficiency level by increasing the program-level SEER and HSPF values by 0.54% and calculated the savings impact relative to the non-QI SEER and HSPF as detailed in Table 3-20 below.

[8] Some Quality Install data sheets included multiple issues so the values above do not sum to 122

Table 3-20: Algorithms for Quality Installation Energy and Demand Savings

Calculation	Equation
Summer Cooling Energy Savings	$\Delta kWh_{cool} = EFLH_{cool} \times Cap_{cool} \times \left(\frac{1}{SEER_{ee}} - \frac{1}{(1+ESF_{QI}) \times SEER_{ee}}\right)$
Summer Cooling Demand Savings	$\Delta kW_{cool} = Cap_{cool} \times \left(\frac{1}{SEER_{ee}} - \frac{1}{(1+ESF_{QI}) \times SEER_{ee}}\right) \times CF_{cool}$
Winter Heating Energy Savings	$\Delta kWh_{heat} = EFLH_{heat} \times Cap_{heat} \times \left(\frac{1}{HSPF_{ee}} - \frac{1}{(1+ESF_{QI}) \times HSPF_{ee}}\right)$
Winter Heating Demand Savings	$\Delta kW_{heat} = Cap_{heat} \times \left(\frac{1}{HSPF_{ee}} - \frac{1}{(1+ESF_{QI}) \times HSPF_{ee}}\right) \times CF_{heat}$
Algorithm Reference	Modified from Mid-Atlantic TRM, v6.0, May 2016

Table 3-21: Inputs for Quality Installation Energy and Demand Savings

Input	Units	Tier	Value	Source
$EFLH_{cool}$	Hours	All	752	Metering study
$EFLH_{heat}$	Hours	All	698	Metering study
ESF_{QI}	%	All	0.54%	Metering study
$Capacity_{cool\ and\ heat}$	kBtuh	1	29.7	Population average
		2	30.2	
		3	32.8	
$SEER_{base}$	SEER	All	14	Code minimum
$SEER_{ee}$	SEER	1	14.2	Population average
		2	15.5	
		3	18.3	
$HSPF_{base}$	HSPF	All	8.2	Code minimum
$HSPF_{ee}$	HSPF	1	8.4	Population average
		2	8.8	
		3	9.7	
CF_{summer}	n/a	All	0.475	Metering study
CF_{winter}	n/a	All	0.588	Metering study

Table 3-22: Quality Installation Verified Savings

System	Tier	Energy Savings (kWh)	Summer Demand Savings (kW)	Winter Demand Savings (kW)
Central Air Conditioner	1	10	0.006	0.000
	2 and 3	8	0.005	0.000
Heat Pump	1[9]	13	0.005	0.011
	2 and 3	21	0.005	0.011

3.4.2.4 Smart Thermostat Energy Savings

Customers who installed an eligible central air conditioner or heat pump had the opportunity to receive a rebate for a qualifying smart thermostat. Because the thermostats were included only in conjunction with a rebated HVAC system, the evaluation team opted to analyze the energy savings impacts for thermostats based on an engineering algorithm informed by the metering analysis and secondary data. The evaluation developed its savings analysis based on estimating the cooling and heating consumption of the retrofitted HVAC system and applying an estimated energy savings factor (ESF) that accounts for the amount of reduced consumption caused by the smart thermostat. This same method and algorithm is provided in the 2015 Indiana TRM (see Table 3-23). The evaluation team did review the Mid-Atlantic TRM; however, that resource specified deemed savings rather than an algorithm that could leverage the primary data collected from the metering study.

Table 3-23: Algorithms for Smart Thermostat Energy Savings

Calculation	Equation
Summer Cooling Energy Savings	$\Delta kWh_{cool} = EFLH_{cool} \times Cap_{cool} \times \left(\frac{1}{SEER_{ee}}\right) \times ESF_{cool}$
Winter Heating Energy Savings	$\Delta kWh_{heat} = EFLH_{heat} \times Cap_{heat} \times \left(\frac{1}{HSPF_{ee}}\right) \times ESF_{heat}$
Algorithm Reference	Indiana TRM version 2.1, July 2015

As detailed in Table 3-24, the evaluation team applied system capacities, SEER and HSPF values, and EFLH based on the data collected from the metering study as well as from the participant database. The ESF was sourced from the 2015 Indiana TRM. The evaluation team consulted the 2017 Arkansas TRM due to its similar climate zone to the DEC territory; however, the sources used to calculate savings in the Arkansas TRM ultimately rely on similar sources cited in the Indiana TRM. Moreover, the evaluation team felt the savings algorithm suggested in the Indiana TRM was more robust and allowed us to leverage more participant data in calculating the estimated impact. Therefore, we chose that document to estimate the verified impacts for smart thermostats. Based on these assumptions, we estimated the savings impact of the smart thermostats as illustrated in Table 3-25.

Table 3-24: Inputs for Smart Thermostat Savings

Input	Units	Tier	Value	Source
$EFLH_{cool}$	Hours	All	752	Metering study
$EFLH_{heat}$	Hours	All	698	Metering study
ESF_{cool}	%	All	13.9%	2015 Indiana TRM
ESF_{heat}	%	All	12.5%	2015 Indiana TRM
$Capacity_{cool\ and\ heat}$	kBtuh	1	29.7	Population average
		2	30.2	
		3	32.8	
$SEER_{ee}$	SEER	1	14.2	Population average
		2	15.5	
		3	18.3	
$HSPF_{ee}$	HSPF	1	8.4	Population average
		2	8.8	
		3	9.7	

Table 3-25: Smart Thermostat Verified Savings

System	Tier	Energy Savings (kWh)	Weighted Average Energy Savings (kWh)
Smart Thermostat - Central Air Conditioner	1	248	211
	2	214	
	3	190	
Smart Thermostat - Heat Pump	1	530	499
	2	503	
	3	483	

3.4.3 Engineering Analysis

3.4.3.1 Attic Insulation and Air Sealing

The evaluation considered attic insulation and air sealing data provided by the program database to inform savings calculations. Inputs for the insulation component of the measure included baseline and retrofit insulation R-values and attic area. HVAC system efficiency was assumed to be either SEER 13 or 10 and was modeled using a split baseline, determined by data in the 2016 Duke Energy RASS, to approximate system age across the DEC service area and apply a lower efficiency rating for older units. Validation of the estimated square footage data point showed many input that were inconsistent with the available attic area for a given home. This data appears to be inconsistently provided and for many projects the total home square footage is listed instead of attic insulation area. In order to adjust for this issue potential attic area was verified through the review of publically available housing information.

Adjustments were made by dividing the total home area by the number of stories and reducing attic area by a measure level adjustment factor.

To estimate the impacts of the attic insulation component of this measure, the evaluation team reviewed the savings algorithm from the Mid-Atlantic TRM; however, we found the stipulated algorithm provided lower results that are inconsistent with our expectations of savings from this measure. The evaluation team instead applied the algorithm provided by the Illinois TRM with weather data based on typical meteorological year (TMY3) in Charlotte, NC.

Table 3-26: Algorithms for Attic Insulation Energy and Demand Savings

Calculation	Equation
Cooling Energy Savings	$\Delta kWh_{cool} = CDD \times 24 \times Area \times DUA \times (1 - FramingFactor_{attic}) \times \left(\frac{1}{Rvalue_{base}} - \frac{1}{Rvalue_{retrofit}}\right) \times \frac{1}{\eta_{cool} \times 1000}$
Heating Energy Savings	$\Delta kWh_{heat} = HDD \times 24 \times Area \times (1 - FramingFactor_{attic}) \times ADJ_{attic} \times \left(\frac{1}{Rvalue_{base}} - \frac{1}{Rvalue_{retrofit}}\right) \times \frac{1}{COP \times 3412} \times Ratio_{ASHP}$
Summer Demand Savings	$\Delta kW_{summer} = \frac{\Delta kWh_{cool}}{EFLH_{cool}} \times CF_{summer}$
Winter Demand Savings	$\Delta kW_{winter} = \frac{\Delta kWh_{heat}}{EFLH_{heat}} \times CF_{winter}$
Algorithm Reference	Illinois TRM, v5.0, June 2016

Table 3-27: Inputs for Attic Insulation Energy and Demand Savings

Input	Units	Value	Source
R_{base}	R-value	12.5	Program database average
$R_{retrofit}$	R-value	40.1	Program database average
Area	ft^2	1,268	Program database average; secondary research
CDD	CDD	1,765	TMY3 data
HDD	HDD	2,389	TMY3 data
η_{cool}	SEER	10/13	TRM
COP	COP	1.7/1.9	TRM
HVAC Age Ratio, >10 years	%	32%	Duke Energy Carolinas 2016 RASS
HVAC Age Ratio, <=10 years	%	68%	Duke Energy Carolinas 2016 RASS
ADJ_{attic}	%	80%	TRM
DUA	%	75%	TRM
Framing Factor	%	7%	TRM
air source heat pump Ratio	%	47.8%	DEC program database ratio
CF_{summer}	N/A	0.475	Metering study
CF_{winter}	N/A	0.588	Metering study

Table 3-28: Attic Insulation Gross Verified Savings

Season	Energy Savings(kWh)	Summer Demand Savings (kW)	Winter Demand Savings (kW)
Cooling	179	0.113221	0.211
Heating	251		
Total	**430**		

All participants who installed attic insulation were also required to air seal the attic plane to reduce air leakage from conditioned areas of the home. Savings for this component of the measure are separated from the insulation improvement and calculated using pre- and post-retrofit blower door results provided by the program database. Overall the program achieved an average air leakage reduction of 21% (Table 3-31) in-line with other Duke Energy territories (DEO – 24%, DEI – 21%). Air sealing improvements typically exhibit energy savings greater than the attic insulation portion of the measure, but that's not to the result for this evaluation. Given similar blower door inputs the variation is due to differences in energy savings algorithms provided by the regional TRM applied in each jurisdiction.

Table 3-29: Algorithms for Air Sealing Energy and Demand Savings

Calculation	Equation
Cooling Energy Savings	$\Delta kWh_{\ cool} = CDH \times DUA \times 60 \times 0.018 \times LM \times \frac{CFM50_{base} - CFM50_{retrofit}}{n - Factor} \times \frac{1}{\eta_{cool} \times 1000}$
Heating Energy Savings	$\Delta kWh_{\ heat} = HDD \times 60 \times 24 \ \times 0.018 \times \left(CFM50_{base} - CFM50_{retrofit}\right) \times \frac{1}{COP \times 3412} \times Ratio_{ASHP} \times \frac{1}{n - Factor}$
Summer Demand Savings	$\Delta kW_{summer} = \frac{\Delta kWh_{\ cool}}{EFLH_{cool}} \times CF_{summer}$
Winter Demand Savings	$\Delta kW_{winter} = \frac{\Delta kWh_{\ heat}}{EFLH_{heat}} \times CF_{winter}$
Algorithm Reference	Mid-Atlantic TRM, v6.0, May 2016

Table 3-30: Inputs for Air Sealing Energy and Demand Savings

Input	Units	Value	Source
CFM_{base}	CFM_{50}	3,733	Program database average
$CFM_{retrofit}$	CFM_{50}	2,941	Program database average
n-Factor	N/A	16.7	Secondary research
CDH	CDH	12,948	TMY3 data
HDD	HDD	2,389	TMY3 data
DUA	Unitless	0.75	Mid-Atlantic TRM
η_{cool}	SEER	10/13	Code minimum
COP	COP	1.7/1.9	Mid-Atlantic TRM
HVAC Age Ratio, >10 years	%	32%	Duke Energy Carolinas 2016 RASS
HVAC Age Ratio, <=10 years	%	68%	Duke Energy Carolinas 2016 RASS
Air source heat pump Ratio	%	47.8%	DEC program database ratio
CF_{summer}	N/A	0.475	Metering study
CF_{winter}	N/A	0.588	Metering study

Table 3-31: Air Sealing Gross Verified Savings

Season	Energy Savings (kWh)	Summer Demand Savings (kW)	Winter Demand Savings (kW)
Cooling	172		
Heating	223	0.108	0.188
Total	**395**		

Table 3-32: Combined Attic Insulation and Air Sealing Gross Verified Savings

Season	Energy Savings (kWh)	Summer Demand Savings (kW)	Winter Demand Savings (kW)
Cooling	350	0.221	0.399
Heating	474		
Total	**824**		

3.4.3.2 Variable Speed Pool Pumps

Variable speed pool pumps save the participant energy by reducing flow rates through a pump and achieving significant energy savings. Reducing pump flow by 50% is expected to save 87% of the energy needed to operate the system. The algorithm use by the evaluation team and the associated parameters are presented in Table 3-33 and Table 3-34. Final verified gross savings are provided in Table 3-35.

While the Mid-Atlantic TRM provides deemed savings values for the variable speed pool pump measure, the evaluation team chose to apply data provided by the Duke Energy Carolinas Smart $aver Program database to reduce the assumptions used and provide more accurate, program specific savings results. To apply this primary program data, we used the algorithm provided by the 2015 Indiana TRM estimates the consumption of a standard single speed pool pump, which applies an energy savings factor (ESF) based on expected usage of a variable speed motor.

Table 3-33: Algorithms for Variable Speed Pool Pump Energy and Demand Savings

Calculation	Equation
Summer Cooling Energy Savings	$\Delta kWh = \frac{HP \times LF \times 0.746}{\eta_{pump}} \times \frac{Hrs}{Day} \times \frac{Days}{Year} \times ESF$
Summer Demand Savings	$\Delta kW_{summer} = \frac{\Delta kWh}{\frac{Hrs}{Day} \times \frac{Days}{Year}} \times CF_{summer}$
Algorithm Reference	Indiana TRM v2.1, July 15, 2015

Table 3-34: Inputs for Variable Speed Pool Pump Gross Verified Savings

Input	Units	Value	Source
HP	Horsepower	2.02	Program database average
Load Factor	%	66%	IN TRM
Pump Efficiency (ηpump)	%	33%	IN TRM
Hours of Use per Day, single speed pump	Hours	6.0	IN TRM
Days of Use per Year	Days	154	Survey responses
Energy Savings Factor	%	91%	IN TRM
CF_{summer}	N/A	0.20	IN TRM

Table 3-35: Variable Speed Pool Pump Gross Verified Savings

Energy Savings (kWh)	Summer Demand Savings (kW)	Winter Demand Savings (kW)
2,430	0.53	0.000

3.4.3.3 Duct Sealing

Duct sealing improves the distribution efficiency of a heating or cooling system by patching any openings in the duct system that prevent conditioned air from reaching its intended destination. This results in savings from an HVAC system that can operate less often and still maintain the consistent, comfortable temperature desired by the homeowner. The algorithms used by the evaluation team and the associated parameters are presented in Table 3-36 and Table 3-37. Final verified gross savings are provided in Table 3-38.

Table 3-36: Algorithms for Duct Sealing Energy and Demand Savings

Calculation	Equation
Summer Cooling Energy Savings	$\Delta kWh_{cool} = EFLH_{cool} \times Cap_{cool} \times \frac{\Delta CFM25_{DL}}{System\ CFM} \times \frac{1}{\eta_{cool}}$
Summer Cooling Demand Savings	$\Delta kWh_{heat} = EFLH_{heat} \times Cap_{heat} \times \frac{\Delta CFM25_{DL}}{System\ CFM} \times \frac{1}{COP \times 3{,}412} \times Ratio_{ASHP}$
Winter Heating Energy Savings	$\Delta kW_{summer} = \frac{\Delta kWh_{cool}}{EFLH_{cool}} \times CF_{summer}$
Winter Heating Demand Savings	$\Delta kW_{winter} = \frac{\Delta kWh_{heat}}{EFLH_{heat}} \times CF_{winter}$
Algorithm Reference	Mid-Atlantic TRM, v6.0, May 2016

Table 3-37: Inputs for Duct Sealing Gross Verified Savings

Input	Units	Value	Source
ΔCFM_{25}	CFM_{25}	134.6	Program database
System CFM	CFM	1,063	Program database
$EFLH_{cool}$	Hours	752	Metering study
$EFLH_{heat}$	Hours	698	Metering study
$Capacity_{cool\ and\ heat}$	kBtuh	31.9	Program database
SEER	SEER	10/13	Mid-Atlantic TRM
COP	COP	2.0/2.3	Mid-Atlantic TRM
HVAC Age Ratio, >10 years	%	32%	Duke Energy Carolinas 2016 RASS
HVAC Age Ratio, <=10 years	%	68%	Duke Energy Carolinas 2016 RASS
CF_{cool}	N/A	0.475	Metering study
CF_{heat}	N/A	0.588	Metering study

Table 3-38: Duct Sealing Gross Verified Savings

Season	Energy Savings (kWh)	Summer Demand Savings (kW)	Winter Demand Savings (kW)
Cooling	256	0.162	0.153
Heating	182		
Total	**438**		

3.4.3.4 Duct Insulation

Duct insulation reduces the thermal transfer of energy between the conditioned air in the duct system and the surrounding conditions, and reduces HVAC system operation. All the duct insulation measures are considered to be in the attic, outside conditioned space, where all heat transferred into or away from the conditioned air is considered outside the thermal envelope of the home. The algorithms used by the evaluation team and the associated parameters are presented in Table 3-39 and Table 3-40. Final verified gross savings are provided in Table 3-41.

Table 3-39: Algorithms for Duct Insulation Energy and Demand Savings

Calculation	Equation
Cooling Energy Savings	$\Delta kWh_{cool} = EFLH_{cool} \times \text{Capacity} \times Area \times \left(\frac{1}{Rvalue_{base}} - \frac{1}{Rvalue_{retrofit}}\right) \times \frac{1}{\eta_{cool} \times 1000}$
Heating Energy Savings	$\Delta kWh_{heat} = EFLH_{heat} \times \text{Capacity} \times Area \times \left(\frac{1}{Rvalue_{base}} - \frac{1}{Rvalue_{retrofit}}\right) \times \frac{1}{COP \times 3412} \times Ratio_{ASHP}$
Summer Demand Savings	$\Delta kW_{summer} = \frac{\Delta kWh_{cool}}{EFLH_{cool}} \times CF_{summer}$
Winter Demand Savings	$\Delta kW_{winter} = \frac{\Delta kWh_{heat}}{EFLH_{heat}} \times CF_{winter}$
Algorithm Reference	Mid-Atlantic TRM, v6.0, May 2016

Table 3-40: Inputs for Duct Insulation Gross Verified Savings

Input	Units	Value	Source
R_{base}	R-value	1	Program database average
$R_{retrofit}$	R-value	8	Program database average
Duct Diameter	ft	0.667	Engineering assumption
Duct Length	ft	100	Engineering assumption
Area	ft^2	209	Calculated
Capacitycool and heat	kBtuh	31.9	Program database
$EFLH_{cool}$	hours	752	Metering study
$EFLH_{heat}$	hours	698	Metering study
η_{cool}	SEER	10/13	Mid-Atlantic TRM
COP	COP	2.0/2.3	Mid-Atlantic TRM
HVAC Age Ratio, >10 years	%	32%	Duke Energy Carolinas 2016 RASS
HVAC Age Ratio, <=10 years	%	68%	Duke Energy Carolinas 2016 RASS
air source heat pump Ratio	%	47.8%	DEC program database ratio
CF_{summer}	N/A	0.475	Metering study
CF_{winter}	N/A	0.588	Metering study

Table 3-41: Duct Insulation Gross Verified Savings

Season	Energy Savings (kWh)*	Summer Demand Savings (kW)	Winter Demand Savings (kW)
Cooling	370	0.234	0.222
Heating	263		
Total	**634**		

*rounding error present

3.4.4 Deemed Analysis

Due to low uncertainty on measure savings and low program participation the evaluation team applied deemed savings from the previous evaluation for the heat pump water heater.

3.4.4.1 Heat Pump Water Heater

Energy and demand savings for heat pump water heaters are provided in Table 3-42.

Table 3-42: Heat Pump Water Heater Gross Verified Savings

Energy Savings (kWh)	Summer Demand (kW)	Winter Demand (kW)
1,616	0.124	0.178

3.5 Targeted and Achieved Confidence and Precision

The Smart $aver evaluation plan was developed with the goal of achieving a target goal of 10% relative precision at the 90% confidence interval for the program as a whole. As the program is composed of different measures, and the energy savings estimation approach varies by measure, the evaluation team assigned sampling, verification, and impact estimate effort among the program measures in accordance with the measures' contribution to total reported Smart $aver savings. The evaluation team calculated the relative precision for each of these samples and combined the error bound to calculate a program-level relative precision. As presented in Table 3-43, the evaluation team reported confidence and precision for the program is +/- 9.6% at the 90% confidence level.

Table 3-43: Targeted and Achieved Confidence and Precision

Program	Targeted Confidence/Precision	Achieved Confidence/Precision
Smart $aver	90/10.0	90/9.6

3.6 Results

Measure level, per unit energy savings values are detailed in Figure 3-5, Figure 3-6, Figure 3-7, and Table 3-44. The program's two most active measures in terms of participation, central air conditioners and air source heat pumps, realized a substantially lower per unit savings compared to the reported values. Also, the program did not provide a reported savings estimate for ground source heat pumps. Therefore, the evaluation team deemed a 100% realization rate for this measure.

Figure 3-5: HVAC Replacement Per Unit Energy Savings

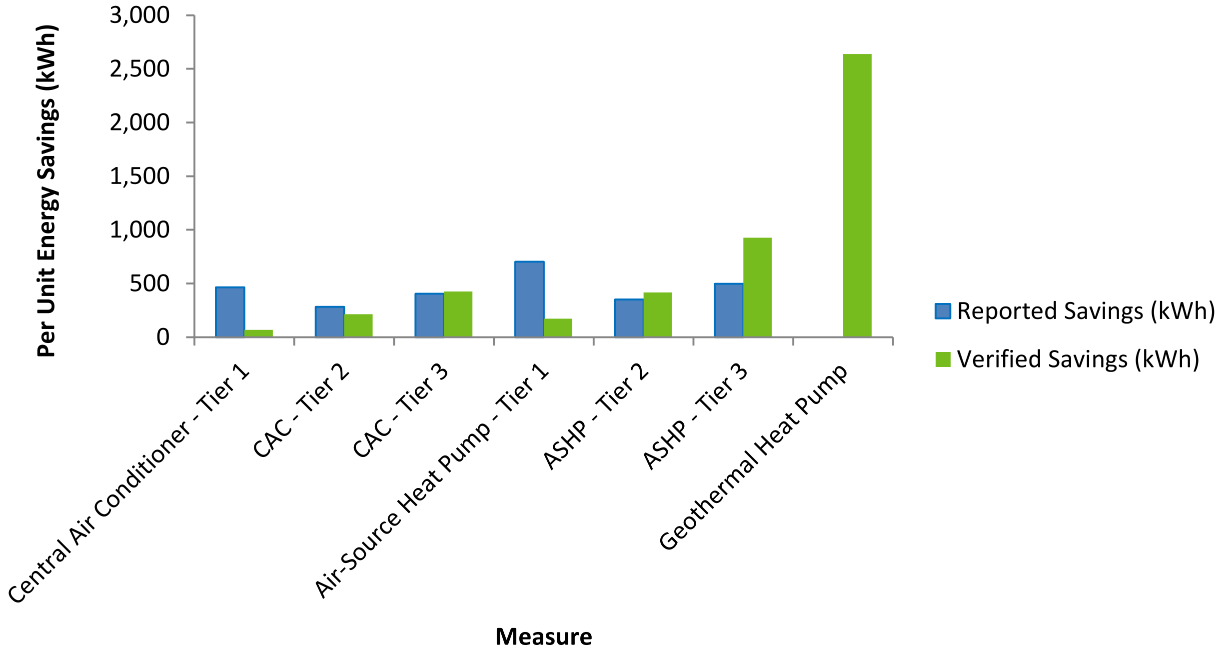


Figure 3-6: HVAC Add-on Per Unit Energy Savings

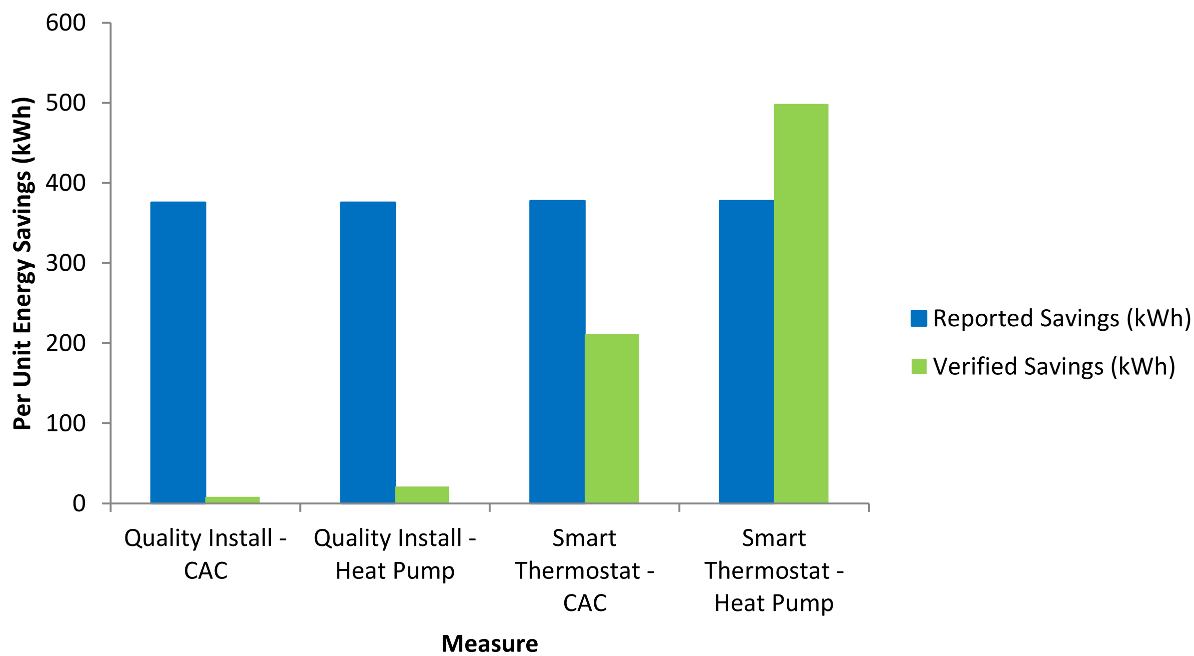


Figure 3-7: Other Measures Per Unit Energy Savings

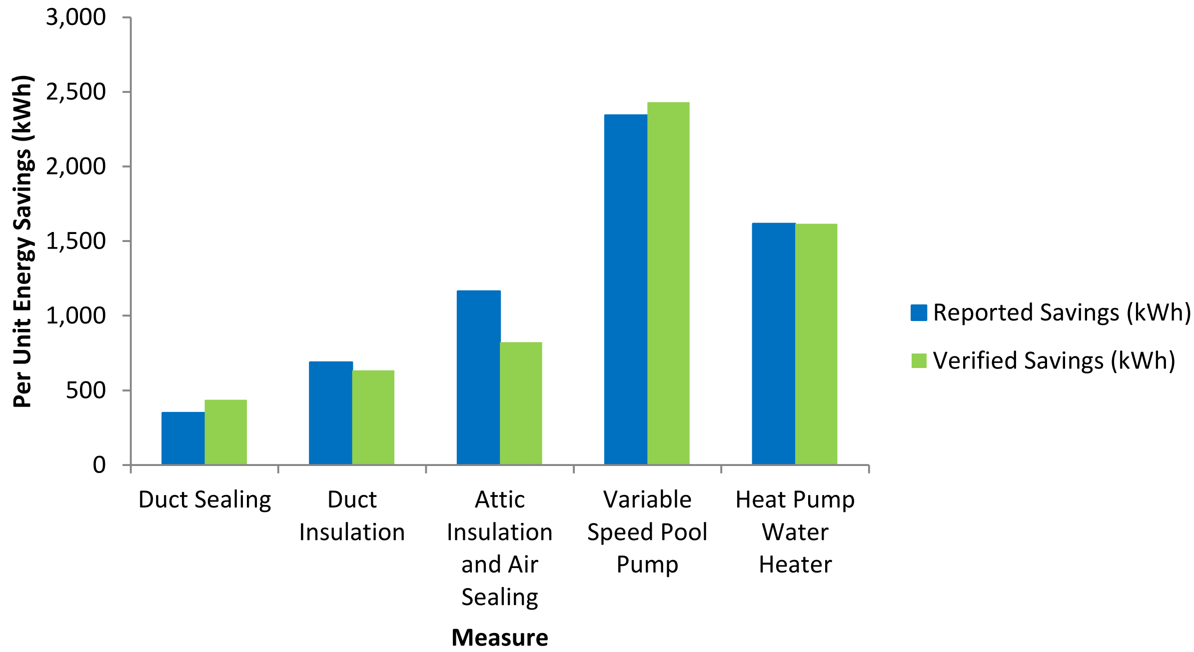


Table 3-44: Measure-Level Reported and Verified Gross Energy Savings

Measure	Tier	Rebated Measures	Reported Energy Savings, per unit (kWh)	Realization Rate	Gross Verified Energy Savings, per unit (kWh)	Total Gross Verified Energy Savings (MWh)
Central Air Conditioner	1	723	464	14.3%	66	47,900
	2	4,679	283	75.1%	212	993,420
	3	867	404	105.5%	426	369,470
Air Source Heat Pump	1	692	702	24.3%	171	118,164
	2	3,996	350	118.8%	415	1,659,605
	3	1,019	496	186.6%	926*	943,158
Geothermal Heat Pump	n/a	34	0	100.0%	2,637*	89,659
Quality Install - CAC	2 and 3	1,989	376	2.2%	8	16,189
Quality Install - Heat Pump	2 and 3	1,251	376	5.6%	21	26,268
Smart Thermostat - CAC	n/a	2,938	377	56.0%	211	620,751
Smart Thermostat - ASHP	n/a	2,388	377	132.1%	499	1,194,014
Variable Speed Pool Pump	n/a	562	2,342	103.8%	2,430	1,365,841
Attic Insulation & Air Seal	n/a	428	1,163	70.9%	824	352,838
Duct Sealing	n/a	163	350	125.1%	438	71,367
Duct Insulation	n/a	48	688	92.1%	634	30,420
Heat Pump Water Heater	n/a	40	1,616	100.0%	1,616	64,640
Total		**21,817**		**83.0%**		**7,960,401**

*The Smart $aver program rebates geothermal heat pumps under Tier 3 HP. As a result, the planning kWh value for Tier 3 HP also includes savings from the Geothermal HP measure; calculated as the total kWh for Tier 3 HP + Total kWh for Geothermal HP divided by the total Tier 3 participation + total Geothermal HP participation = 980.8 kWh

The program realization rate of 83% is driven by a substantial reduction in savings for the quality installation measure. This issue also impacted the Tier 1 central air conditioners and Tier 1 air source heat pumps which include quality installation savings in their reported values and verified savings.

Table 3-45 and Table 3-46 provide the per unit and total verified gross demand savings for the summer and winter seasons. The program realization rates for summer and winter were 70.6% and 196.8%, respectively.

Table 3-45: Measure-Level Reported and Verified Summer Demand Gross Savings[9]

Measure	Tier	Rebated Measures	Reported Summer Demand Savings, per unit (kW)	Realization Rate	Gross Verified Summer Demand Savings, per unit (kW)	Total Gross Verified Summer Demand Savings (MW)
Central Air Conditioner	1	723	0.248	9.0%	0.022	16.25
	2	4,679	0.172	66.7%	0.115	537.02
	3	867	0.274	91.2%	0.250	216.66
Air Source Heat Pump	1	692	0.216	21.4%	0.046	31.96
	2	3,996	0.117	107.5%	0.126	502.57
	3	1,019	0.176	165.8%	0.293*	298.06
Geothermal Heat Pump	n/a	34	0.000	100.0%	0.710*	24.16
Quality Install - CAC	2 and 3	1,989	0.133	3.9%	0.005	10.23
Quality Install - Heat Pump	2 and 3	1,251	0.133	3.8%	0.005	6.31
Smart Thermostat - CAC	n/a	2,938	0.000	100.0%	0.000	0.00
Smart Thermostat - ASHP	n/a	2,388	0.000	100.0%	0.000	0.00
Variable Speed Pool Pump	n/a	562	0.590	89.3%	0.527	296.21
Attic Insulation & Air Seal	n/a	428	0.184	120.0%	0.221	94.74
Duct Sealing	n/a	163	0.291	55.5%	0.162	26.36
Duct Insulation	n/a	48	0.573	40.9%	0.234	11.24
Heat Pump Water Heater	n/a	40	0.124	100.0%	0.124	4.96
Total		**21,817**		**70.6%**		**2,076.7**

*The Smart $aver program rebates geothermal heat pumps under Tier 3 HP. As a result, the planning Summer kW value for Tier 3 HP also includes savings from the Geothermal HP measure; calculated as the total Summer kW for Tier 3 HP + Total Summer kW for Geothermal HP divided by the total Tier 3 participation + total Geothermal HP participation = 0.306 kW

[9] Summer demand savings for all HVAC dependent measures are based on the summer coincident peak determined by the EFLH study.

Table 3-46: Measure-Level Reported and Verified Winter Demand Gross Savings

Measure	Tier	Rebated Measures	Reported Winter Demand Savings, per unit (kW)	Realization Rate	Gross Verified Winter Demand Savings, per unit (kW)	Total Gross Verified Winter Demand Savings (MW)
Central Air Conditioner	1	723	0.046	362.1%	0.167	120.44
	2	4,679	0.038	438.4%	0.167	779.47
	3	867	-0.010	n/a	0.167	144.43
Air Source Heat Pump	1	692	0.251	32.8%	0.082	56.93
	2	3,996	0.144	126.4%	0.182	728.09
	3	1,019	-0.046	n/a	0.390*	397.18
Geothermal Heat Pump	n/a	34	0.000	100.0%	1.274*	43.33
Quality Install - CAC	2 and 3	1,989	0.084	0.0%	0.000	0.00
Quality Install - Heat Pump	2 and 3	1,251	0.084	13.0%	0.011	13.71
Smart Thermostat - CAC	n/a	2,938	0.000	100.0%	0.000	0.00
Smart Thermostat - ASHP	n/a	2,388	0.000	100.0%	0.000	0.00
Variable Speed Pool Pump	n/a	562	n/a	100.0%	0.000	0.00
Attic Insulation & Air Seal	n/a	428	0.194	205.8%	0.399	170.94
Duct Sealing	n/a	163	0.000	100.0%	0.153	24.98
Duct Insulation	n/a	48	0.000	100.0%	0.222	10.65
Heat Pump Water Heater	n/a	40	0.178	100.0%	0.178	7.12
Total		**21,817**		**196.8%**		**2,497.1**

*The Smart $aver program rebates geothermal heat pumps under Tier 3 HP. As a result, the planning Winter kW value for Tier 3 HP also includes savings from the Geothermal HP measure; calculated as the total Winter kW for Tier 3 HP + Total Winter kW for Geothermal HP divided by the total Tier 3 participation + total Geothermal HP participation = 0.418 kW

Table 3-47 and Table 3-48 present the reported and verified energy and demand savings for 2016.

Table 3-47: 2016 Program Level Energy Savings

Measures Installed	Reported Energy (kWh)	Realization Rate	Gross Verified Energy (kWh)	Net-to-Gross Ratio	Net Verified Energy (kWh)
21,817	9,598,932	83.0%	7,960,401	66.7%	5,308,068

Table 3-48: 2016 Program Level Demand Savings

Measurement	Reported Demand (MW)	Realization Rate	Gross Verified Demand (MW)	Net-to-Gross Ratio	Net Verified Demand (MW)
Summer Demand	2.94	70.6%	2.08	66.7%	1.38
Winter Demand	1.27	196.8%	2.50		1.67

4 Net-to-Gross Methodology and Results

The evaluation team calculated the net savings, which are the amount of savings that occurred as a direct result of influence attributable to the program, by applying net-to-gross (NTG) adjustments to the gross savings. The evaluation team determined the NTG adjustment value via data collected from participant and trade ally surveys.

To calculate net savings, a NTG ratio must first be established. NTG consists of free ridership (FR) and spillover (SO). 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).[1] Spillover refers to the program-induced adoption of measures by non-participants and participants who did not receive financial incentives or technical assistance for installations of measures supported by the program (U.S. DOE, 2014). The evaluation team used the following formula to calculate a NTG ratio:

$$NTG = 1 - FR + SO$$

Once the NTG ratio is established, the evaluation team used the following formula to calculate net savings:

$$Net\ Savings = Gross\ Savings * NTG$$

The evaluation team estimated nonparticipant spillover and quality install free ridership from trade ally survey data and estimated participant free ridership and spillover from participant surveys. The following sections describe how the evaluation team estimated participant free ridership and spillover values.

4.1 Free Ridership

Free ridership estimates how much the program influenced participants to make the energy saving improvements that the program incents, which is then used to adjust gross savings by the level of attribution the program is able to claim. Free ridership ranges from 0 to 1, with 0 being no free ridership (or, total program attribution), 1 being total free ridership (or, no program attribution) and values in between represent varying degrees of partial free ridership. The evaluation team used participant and trade ally survey data to inform free ridership estimates. Since an individual's free ridership may differ between different measure types, free ridership was first calculated individually for each measure associated with each participant survey respondent. Free ridership for the quality install measure was calculated in a similar respondent-level manner for trade allies. The evaluation team then used the respondent-measure-level free ridership values to derive a program-level free ridership estimate. This chapter describes this process.

1 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

4.1.1 Participant-Measure-Level Free Ridership

Participant-measure-level free ridership consists of two components – change (FRC) and influence (FRI) – which both range from 0 to .5.[2] The following formula uses these two components to calculate participant-measure-level free ridership:

$$FR = FRC + FRI$$

4.1.1.1 Free Ridership Change

Free ridership change demonstrates what the participant would have likely done if the program had not provided an incentive for their energy upgrade. To determine this, the evaluation team asked participant survey respondents FRC questions specific to the measures they installed. The generic example below exemplifies how the evaluation team collected FRC data (see Appendix C for the measure-specific FRC questions in the participant survey).

Q1. If you had not received a Duke Energy incentive for your [PIPE IN INCENTED MEASURE], which of the following is most likely: Would you have…? [READ ALL, SELECT ONE]

1. *Not purchased a [PIPE IN INCENTED MEASURE]*
2. *Delayed purchasing a new [PIPE IN INCENTED MEASURE] for at least a year*
3. *Purchased a new [PIPE IN INCENTED MEASURE] but a less efficient or less expensive model*
4. *Bought the exact same [PIPE IN INCENTED MEASURE] anyway, and paid the full cost yourself*
5. *Or done something else, specify:_______*

98. *Don't know*
99. *Refused*

[2] Since most quality install rebate participants were unaware of the quality installation rebates, we used trade ally survey data to estimate free ridership for the measure. See section 4.1.1.3 for quality install free ridership estimation methods.

For insulation[3] and replacement equipment with less efficient options,[4] the evaluation team asked a follow up question to respondents that reported the third response option above (purchased a less efficient or less expensive measure), as exemplified below:

Q2. [ASK IF Q1=3] You said you would have bought a [PIPE IN INCENTED MEASURE] that was less expensive or less energy efficient if you had not received the rebate or information from Duke Energy. Do you think it is more likely that you would have bought equipment that was…?

1. *Almost as efficient as the one you bought, or*
2. *Significantly less efficient than the one you bought*
98. *Don't know*
99. *Refused*

The evaluation team then assigned the following FRC values to each respondent for each rebated measure, based on their response to the questions above, as shown in the Table 4-1.

Table 4-1: Free Ridership Change Values

Q1 Response	Q2 Response	FRC Value
Not purchased a [MEASURE]		0.0
Delayed purchasing a new [MEASURE] for at least a year		0.0
Purchased a new [MEASURE] but a less efficient or less expensive model	Almost as efficient as the one you bought	0.375*
	Significantly less efficient than the one you bought	0.125*
	Don't know / Refused	0.25*
Bought the exact same [MEASURE] anyway, and paid the full cost yourself		0.50
Or done something else		FRC values assigned on a case by case basis, depending on which pre-coded response item they most resemble
Don't know / Refused		Measure average

* Since the less efficient version would be a standard efficiency model (which serves as the baseline from which savings are claimed), these values are set to 0 for smart thermostats and pool pumps. Additionally, the values vary for ASHPs and CACs, based on replacement condition and incentive tier (Table 4-2).

3 Respondents that report they would have installed less insulation will then be asked to report how much less insulation they would have purchased in a percentage format (e.g.: 50% less). This reported value will be subtracted from 100% and then divided in half; the result will serve as their FRC value.

4 Since duct sealing is a service measure, as compared to an equipment measure, there is no less efficient version. Thus, the counterfactual for service measures would be to either: 1) not purchase the service, 2) wait a year or more to purchase the service, or 3) purchase the service without the assistance of a rebate. Accordingly, FRC values for service measures are either 0 (would have not purchased or would have waited a year or more to purchase) or .5 (would have purchased without assistance of a rebate). Also, since the less efficient/expensive version of pool pumps and wi-fi thermostats would be the baseline, 'purchased a different unit' responses result in a FRC value of 0.

Participants who replaced a broken HVAC system pose a particular challenge to NTG (or FRC, specifically): because there is an immediate space heating or cooling need, it is possible that free ridership could be higher for some in this group, as "replacement upon burnout" participants may be less likely to report they would not purchase or would delay purchasing a replacement measure (which are responses that traditionally garner FRC scores of 0). These issues expose the possibility of higher free ridership scores for "replacement upon burnout" participants when using the algorithm in Table 4-1. Since the counterfactual of taking no action is not a realistic scenario for "replacement upon burnout" participants, we used a special FRC algorithm for air source heat pump and central air conditioner participants that assigns FRC scores of 0 to certain "replacement upon burnout" participants that indicated they would bought a less expensive or less energy efficient heating or cooling system as their counterfactual response (Table 4-2). This is the most prudent approach since:

1) Tier 1 incentives are effectively ECM incentives, since Tier 1 only requires the code minimum for SEER standards.

2) Savings are calculated based on a code SEER level baseline assumption.

3) For "replacement upon burnout" participants, the most realistic counterfactual that would result in the least efficient outcome is installing a less efficient unit than the one they installed through the program – which would be a code unit in certain counterfactual scenarios.

As seen in Table 4-2, this unique FRC algorithm takes SEER level of the incented unit into account. "Replacement upon burnout" participants who installed units exceeding minimum program requirements that said they would have installed an "almost as efficient" unit reveal that the program did not motivate them to purchase a unit above code in the first place, but rather motivated them purchase an even more efficient unit than they would have otherwise. Thus, these "replacement upon burnout" participants are partial free riders (given that their counterfactual outcome would likely still be above code) and garner a FRC value of 0.375.

Table 4-2: FRC Follow Up Values for Air-Source Heat Pumps and Central Air Conditioners

Follow Up Response	Incentive Tier	Replacement Upon Burnout*	FRC Value
Almost as efficient as the one you bought	1	Yes	0
		No	0.375
	2 or 3	Yes or No	0.375
Significantly less efficient than the one you bought	All	Yes	0
		No	0.125
Don't know / Refused	1	Yes	0
	2 or 3	Yes or No	0.25

* Replacement upon burnout represents respondents who indicated they replaced an "old" or "broken" unit.

The following tables show the count of respondents for each measure that chose each option in Table 4-1 or Table 4-2, as well as the resulting mean FRC value for each measure.

Table 4-3: Free Ridership Change Values: Geothermal Heat Pump (n=1)

Q1 Response	Q2 Response	FRC Value	Count Choosing Option
Not purchased a geothermal heat pump		0.0	0
Delayed purchase for at least one year		0.0	0
Bought a less expensive or less energy efficient heating and cooling system	Almost as efficient as the one you bought	0.375	0
	Significantly less efficient than the one you bought	0.125	0
	Don't know / Refused	0.25	0
Bought the exact same geothermal heat pump anyway, and paid the full cost yourself		0.50	1
Or done something else		Assigned on a case by case basis	0
Don't know / Refused		Measure average	0
Mean FRC value: geothermal heat pump		**0.50**	

Table 4-4: Free Ridership Change Values: Air Source Heat Pump (n=29)

Q1 Response	Q2 Response	Incentive Tier	Replacement Upon Burnout	FRC Value	Count Choosing Option
Not purchased an air source heat pump	N/A	N/A	Yes or No	0.0	0
Delayed purchase for at least a year	N/A	N/A	Yes or No	0.0	4
Bought a less expensive or less energy efficient heating and cooling system	Almost as efficient as the one you bought	1	Yes	0.0	1
			No	0.375	0
		2 or 3	Yes or No	0.375	2
	Significantly less efficient than the one you bought	All	Yes	0.0	0
			No	0.125	1
	Don't know / Refused	1	Yes	0.0	0
		2 or 3	Yes or No	0.25	0
Bought the exact same air source heat pump anyway, and paid the full cost yourself	N/A	N/A	Yes or No	0.50	21

Q1 Response	Q2 Response	Incentive Tier	Replacement Upon Burnout	FRC Value	Count Choosing Option
Or done something else	N/A	N/A	Yes or No	Assigned on a case by case basis	0
Don't know / Refused	N/A	N/A	Yes or No	Measure average	0
Mean FRC value: air source heat pump				**0.39**	

Table 4-5: Free Ridership Change Values: Central Air Conditioner (n=33)

Q1 Response	Q2 Response	Incentive Tier	Replacement Upon Burnout	FRC Value	Count Choosing Option
Not purchased a central air conditioner	N/A	N/A	Yes or No	0.0	0
Delayed purchase for at least a year	N/A	N/A	Yes or No	0.0	2
Bought a less expensive or less energy efficient cooling system	Almost as efficient as the one you bought	1	Yes	0.0	1
			No	0.375	0
		2 or 3	Yes or No	0.375	2
	Significantly less efficient than the one you bought	All	Yes	0.0	1
			No	0.125	0
	Don't know / Refused	1	Yes	0.0	0
		2 or 3	Yes or No	0.25	0
Bought the exact same central air conditioner anyway, and paid the full cost yourself	N/A	N/A	Yes or No	0.50	23
Or done something else	N/A	N/A	Yes or No	Assigned on a case by case basis	1
Don't know / Refused	N/A	N/A	Yes or No	Measure average	3
Mean FRC value: central air conditioner				**0.42**	

Table 4-6: Free Ridership Change Values: Heat Pump Water Heater (n=1)

Q1 Response	Q2 Response	FRC Value	Count Choosing Option
Not installed a heat pump water heater		0.0	0
Postponed the purchase for at least one year		0.0	0
Purchased a new heat pump water heater, but a less efficient or less expensive model	Almost as efficient as the one you bought	0.375	0
	Significantly less efficient than the one you bought	0.125	0
	Don't know / Refused	0.25	0
Bought the exact heat pump water heater anyway, and paid the full cost yourself		0.50	1
Or done something else		Assigned on a case by case basis	0
Don't know / Refused		Measure average	0
Mean FRC value: heat pump water heater		**0.50**	

Table 4-7: Free Ridership Change Values: Attic Insulation (n=5)

Q1 Response	Q2 Response	FRC Value	Count Choosing Option
Would not have done the attic insulation		0.0	0
Postponed attic insulation for at least one year		0.0	3
Would have added less insulation	% less they would have added	reported value subtracted from 100% and then divided in half	0
Done the exact same upgrade, and paid the full cost yourself		0.50	2
Or done something else		Assigned on a case by case basis	0
Don't know / Refused		Measure average	0
Mean FRC value: attic insulation		**0.20**	

Table 4-8: Free Ridership Change Values: Duct Sealing (n=1)

Q1 Response	FRC Value	Count Choosing Option
Would not have done the duct sealing project	0.0	0
Postponed duct sealing project for at least one year	0.0	1
Done the exact same upgrade, and paid the full cost yourself	0.50	0
Or done something else	Assigned on a case by case basis	0
Don't know / Refused	Measure average	0
Mean FRC value: duct sealing	**0.00**	

Table 4-9: Free Ridership Change Values: Pool Pump (n=4)

Q1 Response	FRC Value	Count Choosing Option
Not installed/replaced a pool pump	0.0	0
Postponed the purchase for at least one year	0.0	0
Would have bought a less expensive or less energy efficient pool pump	0.0	2
Bought the exact pool pump anyway, and paid the full cost yourself	0.50	2
Or done something else	Assigned on a case by case basis	0
Don't know / Refused	Measure average	0
Mean FRC value: pool pump	**0.25**	

Table 4-10: Free Ridership Change Values: Smart Thermostat (n=32)

Q1 Response	FRC Value	Count Choosing Option
Not purchased wi-fi thermostat	0.0	3
Postponed the purchase for at least one year	0.0	0
Would have bought a different type of thermostat	0.0	12
Bought the exact wi-fi thermostat anyway, and paid the full cost yourself	0.50	14
Or done something else	Assigned on a case by case basis	2
Don't know / Refused	Measure average	1
Mean FRC value: pool pump	**0.24**	

4.1.1.2 Free Ridership Influence

Free ridership influence demonstrates how much influence the program had on a participant's decision to perform the incented energy upgrade. To determine this, the evaluation team asked participant survey respondents the following question, repeating this battery for each unique rebated measure associated with the respondent:

I'm going to read a list of factors that might have influenced your decision to make the energy saving improvements to your property we have been talking about. For each factor, please indicate how influential it was in your decision, using a scale from 0 to 10, where 0 means "not at all influential" and 10 means "extremely influential."

[INTERVIEWER NOTE: 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]

[PROGRAMMER: For each factor below input 0-10 scale and don't know and refused options.]

a. *The rebate received*
b. *Information or advertisements from Duke Energy, including their website*
c. *Recommendation from your contractor*
d. *Did anything else influence you? If so, please specify: _______________ [INTERVIEWER: PROBE IF UNCLEAR. RECORD VERBATIM RESPONSE]*

The evaluation team then selected the highest rated program-attributable item for each respondent and assigned the following FRI scores, depending on their high score value (Table 4-11).

Table 4-11: Free Ridership Influence Values

Max Influence Rating	FRI Value
0	0.5
1	0.45
2	0.4
3	0.35
4	0.3
5	0.25
6	0.2
7	0.15
8	0.1
9	0.05
10	0
Don’t know / Refused	Measure average

Table 4-12 shows the count of respondents for each measure associated with each max influence rating and FRI value in Table 4 11, as well as the resulting mean max influence and FRI values for each measure.

Table 4-12: Free Ridership Influence Values, by Measure

Max Influence Rating	FRI Value	Count with Max Influence Rating/FRI Value							
		Heat Pump (Air Source) (n=29)	Attic Insulation and Air Sealing (n=5)	Central Air Conditioner (n=33)	Duct Sealing (n=1)	Heat Pump (Geothermal) (n=1)	Heat Pump Water Heater (n=1)	Pool Pump (n=4)	Smart Thermostat (n=32)
0	0.5	0	0	0	0	0	0	0	1
1	0.45	0	0	0	0	0	0	0	0
2	0.4	0	0	0	0	0	0	0	0
3	0.35	0	0	0	0	0	0	0	0
4	0.3	0	0	0	0	0	0	0	0
5	0.25	0	0	0	0	0	0	0	2
6	0.2	1	0	0	0	0	1	0	1
7	0.15	2	1	4	0	0	0	0	0
8	0.1	6	1	7	0	0	0	2	8
9	0.05	5	0	6	0	0	0	0	5
10	0	15	3	16	1	1	0	2	15
Don't know / Refused	Measure average	0	0	0	0	0	0	0	0
Mean max influence		**9**	**9**	**9**	**10**	**10**	**6**	**9**	**9**
Mean FRI score		**0.05**	**0.05**	**0.05**	**0.00**	**0.00**	**0.20**	**0.05**	**0.07**

4.1.1.3 Quality Install Free Ridership

As seen in the Process Evaluation Findings chapter, participants were largely unaware of that they received a rebate for the quality installation service. Given this finding and the measure's goal of influencing trade ally installation practices (as compared to consumer purchasing decisions), we used trade ally surveys to estimate free ridership for quality install. To inform free ridership estimates, we asked trade allies that performed quality installations the following questions:

[Base: IF PERFORMED QUALITY INSTALLS]
Q15. As you may know, Duke Energy recently added "quality install" requirements for installations of heat pumps and air conditioners? Were you already doing all the techniques on the quality install check list prior to Duke requiring them?

1. Yes
2. No
98. Don't know
99. Refused

[Base: IF Q15=1]
Q16. Prior to using Duke's quality install checklist, did you have a system in place to document that your installers were following these same quality install techniques?

1. Yes
2. No
98. Don't know
99. Refused

[Base: IF Q15=1]
Q17. Prior to using Duke's quality install checklist, what specific quality install techniques were you using? Please be as specific as possible.

[Multiple response, do not read]
1. System capacity
2. Airflow / static pressure
3. System CFM (cubic feet per minute)
4. Condenser measurements
5. Enthalpy conversion
6. Blower door tests
7. Duct blaster tests
96. Other, please specify: [OPEN-ENDED RESPONSE]
98. Don't know
99. Refused

Much like the participant-based free ridership algorithm, we used a two-component approach to estimate free ridership for quality install. Respondent-level free ridership is the result of summing FR_A and FR_B, both of which range from 0 to .5 (Figure 4-1). Trade allies that did not indicate they were using all the Duke Energy quality install techniques prior to the introduction of the Smart $aver quality install measure (Q15) received scores of 0 for both FR_A and FR_B, resulting in 0% free ridership for the measure. Trade allies that said yes to Q15 were scored as partial to full free riders, depending on their answers to Q16-Q17.

Figure 4-1: Quality Installation Free Ridership Algorithm

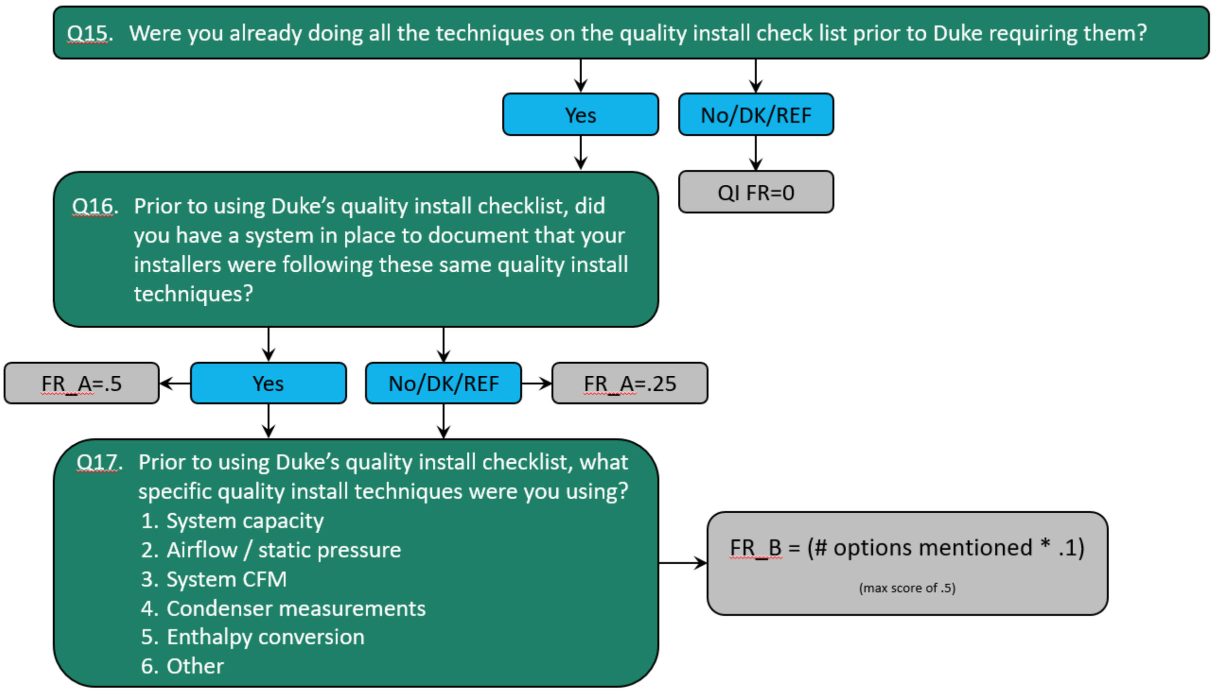


Table 4-13 shows the count of respondents associated with each FR_A score in Figure 4-1, as well as the resulting mean FR_A value for Quality Installation.

Table 4-13: Quality Install FR_A Values (n=28)

Q15 Response	Q16 Response	FR_A Value	Count Choosing Option
No		0.0	5
Don't know / Refused		0.0	1
Yes	Yes	0.5	19
	No	0.25	3
	Don't know / Refused	0.25	0
Mean QI FR_A value		**0.37**	

Table 4-14 shows the count of respondents associated with each FR_B score in Figure 4-1, as well as the resulting mean FR_B value for Quality Installation.

Table 4-14: Quality Install FR_B Values (n=28)

Q17 Response	FR_B Value	Count Choosing Option
System capacity	+.1	4
Airflow / static pressure	+.1	8
System CFM (cubic feet per minute)	+.1	1
Condenser measurements	+.1	4
Enthalpy conversion	+.1	3
Other	+.1	8
Q15=No / Don't know / Refused	0	6
Mean QI FR_B value	**0.10**	

The algorithm seen in Figure 4-1 resulted in free ridership scores for each trade ally that performed the quality installation measure. We then calculated a weighted average of the respondent-level scores to inform free ridership at the program level. We weighted respondent scores by the number of quality installation jobs each trade ally performed during the evaluation timeframe, resulting in a 0.63 FR score for the Quality Installation measure.

4.1.2 Measure-Level Free Ridership

To provide additional insight and transparency into the free ridership analysis, the evaluation team summed the measure-specific FRC and FRI scores for each respondent resulting in participant-measure-level free ridership (FR) scores. The evaluation team used the participant-measure-level FR scores to calculate an average FR score for each measure type. Table 4-15 exhibits the resulting mean measure-level FR scores, and the number of respondents associated with each mean FR score.

While the measure-level FR scores provide additional detail behind the free ridership analysis, we note that the evaluation was not designed to provide statistically significant measure-level results but rather provide a program-level FR score based on data collected on all program measures (see section 4.1.3 below). Therefore, the measure-level FR scores presented in Table 4-15 should be interpreted as potentially indicative of the rate of FR present but with the caveat of large error bounds due to the low sample sizes. This is particularly applicable to geothermal heat pumps, attic insulation and air sealing, variable speed pool pumps, heat pump water heaters, and duct sealing. These measures comprised a very small percentage of overall program participation and savings and consequently fewer evaluation resources were dedicated to data collection for these measures. As these measures continue to mature in the program and increase their overall share to the impact of the program, additional evaluation resources should be dedicated to assessing the level of free ridership.

Table 4-15: Measure-Level Free Ridership Scores

Measure		Count of respondents with measure	Mean FRC Score	Mean FRI Score	Mean FR Score
Central air conditioner		33	0.42	0.05	0.47
Heat pump	*Air Source*	29	0.39	0.05	0.43
	Geothermal	1	0.50	0.00	0.50
Attic insulation and air sealing		5	0.20	0.05	0.25
Variable speed pool pump		4	0.25	0.05	0.30
Heat pump water heater		1	0.50	0.20	0.70
Duct sealing		1	0.00	0.00	0.00
Smart Thermostat		32	0.24	0.07	0.31
Quality Install*		28	0.37	0.10	0.63

* Unlike other measures that report count of participants with the measure, Quality Install denotes Trade Ally sample size. Quality Install FR_A is reported in the FRC column and FR_B is reported in the FRI column. Note that FR_A and FR_B are unweighted, whereas the mean FR score is weighted by number of QI rebates. Thus, the simple sum of FR_A and FR_B does not equal the mean FR score for the measure.

4.1.3 Program-Level Free Ridership

Next, the evaluation team combined the measure-level FR scores into a program-level FR score. Table 4-16 shows the savings weights used to calculate the program-level FR score. Savings weights were calculated as follows:

$$Savings\ Weight = \frac{Population\ N * Verified\ Savings}{Gross\ Program\ Savings}$$

Table 4-16: Measure-Level Free Ridership Scores and Savings Weights

Measure		Population N	Verified Savings (kWh)	Savings Share (weight)	Mean FR Score
Central air conditioner		6,269	225	18%	0.47
Heat pump	*Air Source*	5,707	477	34%	0.43
	Geothermal	34	2,637	1%	0.50
Attic insulation and air sealing		428	824	4%	0.25
Variable speed pool pump		562	2,430	17%	0.30
Heat pump water heater		40	1,616	1%	0.70
Duct sealing		163	438	1%	0.00
Smart Thermostat		5,326	340	23%	0.31
Quality Install*		3,240	13	1%	0.63

The resulting program-level free ridership is 0.38. Given that the sampling strategy aimed to achieve a representative sample with 90/10 confidence/precision at the program level, the program-level free ridership score was applied to each measure.

4.2 Spillover

Spillover estimates energy savings from non-rebated energy improvements made outside of the program that are influenced by the program, and is used to adjust gross savings by the additional energy savings garnered and the level of attribution the program is able to claim for these non-rebated measures. Spillover ranges from 0 to infinity, with 0 being no spillover and values greater than 0 demonstrating the existence and magnitude of spillover.[1] The evaluation team used participant survey data and trade ally interview and survey data to estimate spillover: participants to inform participant spillover (PSO) and trade allies to inform nonparticipant spillover (NPSO). These two estimates are summed to calculate total program spillover (SO):

$$SO = PSO + NPSO$$

4.2.1 Participant Spillover

The evaluation team asked participant survey respondents to indicate what energy saving measures or services they had implemented since participating in the program to identify potential spillover (see the Participant Survey in Appendix C for the spillover battery). The evaluation team then asked participants to use a 1 to 10 scale, where 1 means “not at all influential” and 10 means “extremely influential,” to indicate how much influence Smart $aver had on their decision to purchase these energy saving measures. This question was repeated for each non-rebated measure category a respondent reported implementing. Table 4-17 exhibits how much program influence, ranging from 0% to 100%, is associated with each scale response to the spillover influence question.

Table 4-17: Participant Spillover Program Influence Values

Reported Smart $aver Influence	Influence Value
0	0.0
1	0.1
2	0.2
3	0.3
4	0.4
5	0.5
6	0.6
7	0.7
8	0.8
9	0.9
10	1.00
Don’t know / Refused	0.00

[1] Spillover values can be interpreted as percentages, where 1=100%. Thus, a spillover value of .5 demonstrates a savings value of 50% of gross program savings.

The evaluation team used the measure-specific influence value to calculate the participant measure spillover (PMSO) for each measure that each participant reported. Participant measure spillover is calculated as follows:[2]

$$PMSO = Deemed\ Measure\ Savings * Number\ Installed * Influence\ Value$$

The evaluation team then summed all PMSO values and divided them by the participant sample's gross program savings to calculate the participant spillover estimate:

$$Participant\ SO = \frac{\sum PMSO}{Participant\ Sample\ Gross\ Program\ Savings}$$

This calculation resulted in a Participant SO (PSO) value of 0.02.

4.2.2 Nonparticipant Spillover

Nonparticipant spillover refers to non-rebated program measures implemented by nonparticipants that were directly or indirectly influenced by the program. The evaluation team surveyed 58 trade allies to identify and measure nonparticipant spillover. The evaluation team asked trade allies how many non-rebated measures that they installed in program territory since August. The program savings attributed to these non-rebated measures were discounted by the trade ally's reported level of program influence on their practice of recommending these measures (Table 4-18), and the proportion of their clients with non-rebated measures that were not influenced by their recommendations. Nonparticipant spillover was calculated individually for each of the top three program-qualified measures that each surveyed trade ally installed during the evaluation timeframe.

Table 4-18: Trade Ally Influence Values

Program Influence Rating	Influence Value
0	0.0
1	0.1
2	0.2
3	0.3
4	0.4
5	0.5
6	0.6
7	0.7
8	0.8
9	0.9
10	1.0
Don't know / Refused	Measure level average

[2] Deemed savings for non-program spillover measures were referenced from the 2016 Mid-AtlanticTRM.

Thus, nonparticipant measure spillover is calculated as follows:[3]

$$NP\ Measure\ SO = Number\ of\ unrebated\ units\ installed * Program\ Influence * (1 - \%\ of\ respondents\ not\ influenced\ by\ TA\ recommendation)$$

The evaluation team then summed all nonparticipant measure spillover values and divided them by the trade ally sample's gross program savings to calculate the program-level nonparticipant spillover estimate:

$$NPSO = \frac{\sum NP\ Measure\ SO}{Sample\ Program\ Savings}$$

This calculation resulted in a NPSO value of 0.03.

4.2.3 Program-Level Spillover

The evaluation team summed the PSO and NPSO values to calculate the program-level SO value. This calculation resulted in program-level SO of 0.05.

4.3 Net-to-Gross

After combining all FR and SO estimates, NTG for the program is 0.67 (Table 4-19). The evaluation team applied the NTG ratio of 0.67 to program-wide verified gross savings to calculate DEC Smart $aver net savings.

Table 4-19: Net-to-Gross Results

Free Ridership	Spillover	NTG
0.38	0.05	66.7%

[3] NP Measure SO = nonparticipant spillover for a given measure type for a given trade ally. NRMC = non-rebated measure count installed in DEC territory since August 2016. %NRM = percent of non-rebated measures.

5 Process Evaluation

5.1 Summary of Data Collection Activities

The process evaluation is based on telephone interviews and surveys with program and implementer staff, trade allies, and participants (Table 5-1).

Table 5-1: Summary of Process Evaluation Data Collection Activities

Target Group	Method	Sample Size	Confidence/Precision
Program and implementer staff	Phone in-depth interview	2	N/A
High volume trade allies[a]	Phone in-depth interview	5	N/A
Trade allies (various rebate volumes)	Phone survey	58	90/10.3
Participants	Phone survey	73	90/9.6

[a] High volume trade allies are companies in the top 20% of trade allies in terms of number of rebated measures, for a given campaign.

5.1.1 Program and Implementer Staff

The evaluation team conducted interviews with the Smart $aver Program Manager and a senior manager from the implementation staff in order to understand how the program was working and to capture their insights about the program's operations, challenges, expectations, and interactions with market actors.

5.1.2 Trade Allies

Participating contractors – called "trade allies" – are the primary program delivery channel for Smart $aver. In December of 2016, the evaluation team conducted five in-depth interviews with high volume Smart $aver trade allies. The in-depth interviews primarily served to pre-test some questions designed for the subsequent trade ally surveys and to see if any additional unforeseen topics emerged that warranted inclusion in participant or trade ally surveys. After interviewing five trade allies and making some corresponding adjustments to the survey guide, the evaluation team surveyed 58 trade allies in February 2017, asking them about various program topics such as satisfaction with the program and program-related challenges (Table 5-2).

Table 5-2: Trade Ally Research Objectives

Research Objectives
Assess Trade Ally engagement with the program and how they and their customers heard of the program
Assess program satisfaction
Document Trade Ally program experience, including any challenges and opportunities for improving the program
Document Trade Ally perspective about the code changes and the future of the program
Gather data for Net-to-Gross spillover
Ask about Trade Ally firmographics and customer characteristics
Document program influence

The evaluation team contends that trade ally specializations (such as insulation, for example) can significantly shape trade ally experience with the program. The evaluation team monitored the measures that surveyed trade allies had experience with to ensure that the sample was diverse and representative in terms of measure experience. The distribution of the trade ally sample's measure experience generally reflects that of the larger trade ally population (Table 5-3).

Table 5-3: Trade Ally Experience with Smart $aver Measures in 2016

Measure	Number installed in evaluation timeframe	Number installed by TA survey sample	Number TA installers in survey sample
Central Air Conditioner	6,269	831	44
Air-Source Heat Pump	5,707	753	48
Geothermal Heat Pump	428	11	4
Attic Insulation and Air Sealing	428	72	6
Variable Speed Pool Pump	562	72	5
Heat Pump Water Heater	40	2	2
Duct Sealing	163	9	2
Duct Insulation	48	4	3
Smart Thermostat	5,326	905	42
Quality Install (Tier 2 and 3)	3,240	490	22

5.1.3 Participants

In July of 2017, the evaluation team surveyed 73 Smart $aver participants who received rebates through the program. The purpose of this data collection activity was to obtain a more detailed understanding of the customer experience with the program, identify potential areas for program improvement, and collect data to inform NTG estimates. Table 5-4 documents the specific research objectives of the participant survey.

Table 5-4: Participant Research Objectives

Research Objectives
Assess program outreach and marketing
Document customer experience with the program
Document reasons for participation and program influence
Gather feedback needed to estimate Net-to-Gross ratio
Assess population segments the program is reaching

To ensure the results were applicable to the larger participant population, the evaluation team stratified the sample by measure type, thus ensuring that sampled participants were representative of the measures in the population (Table 5-5). Central air conditioners and air-source heat pumps were the most commonly installed measures, accounting for nearly all (90%) installations in the program. Aside from survey respondents that received add-on HVAC measures (smart thermostat or quality install), only one survey respondent received rebates for more than one measure. This respondent received rebates for attic insulation/air sealing and duct sealing, and was asked measure-specific questions for all measures they received rebates for.

Table 5-5: Measures Installed by Participant Sample

Measure Installed	Sample % (n=73)	Participant Population %
Central Air Conditioner	45%	47%
Air-Source Heat Pump	40%	43%
Attic Insulation & Air Sealing	7%	3%
Pool Pump	6%	4%
Geothermal Heat Pump	1%	<1%
Heat Pump Water Heater	1%	<1%
Duct Sealing	1%	1%
Smart Thermostat	45%	62%
Quality Install	38%	38%

5.2 Process Evaluation Findings

The following subsections describe program successes and challenges as well as opportunities for program improvement.

5.2.1 Trade Ally Perspective

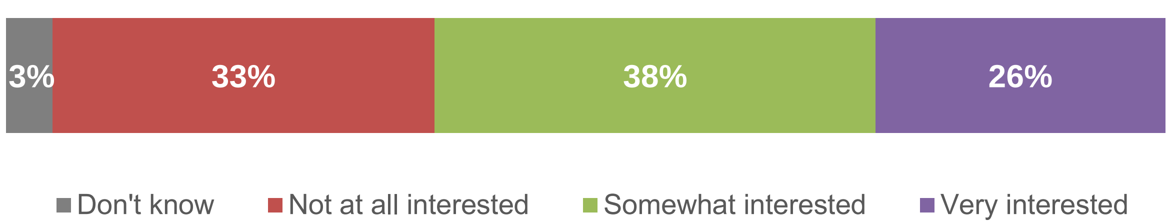
This section reports the results from trade ally surveys regarding their experience participating in the Smart $aver program in the Duke Energy Carolinas jurisdiction.

5.2.1.1 Training

We asked trade allies about their satisfaction with program training, as well as their suggestions for future training opportunities. Overall, trade allies were somewhat dissatisfied with program training opportunities (see Figure 5-10), with trade allies indicating they were dissatisfied because they had not received any program training.

When asked an open-ended question about what other training types they would be interested in, less than half (40%) of surveyed trade allies reported they would be interested in additional training opportunities. Specific training requests varied widely, including training about new rebates and programs offered by Duke Energy and how to fill out required paperwork. When specifically asked to use a 0 to 10 scale to demonstrate their interest in a training course on how to more effectively sell high efficiency equipment, the majority (64%) expressed at least minor interest in sales training (Figure 5-1).

Figure 5-1: Interest in Sales Training (n=58)*

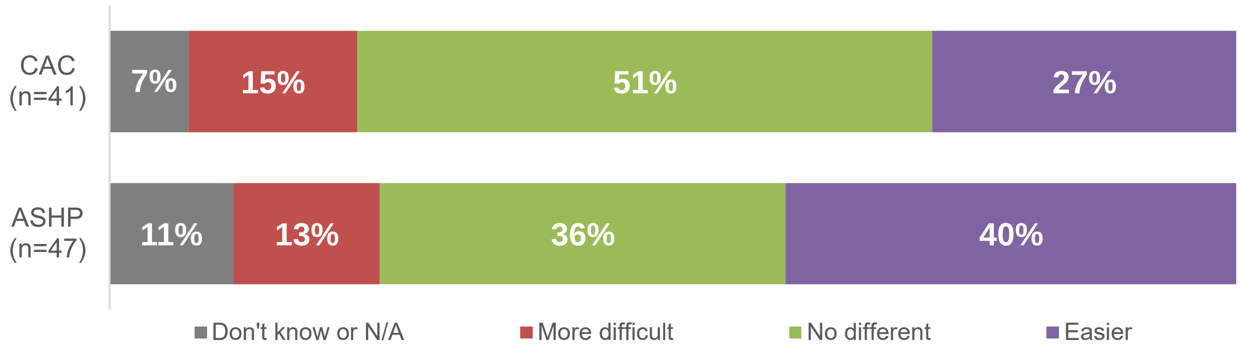


* Respondents used a 0 to 10 scale, where 0 meant “Not at all interested” and 10 meant “Extremely interested.” In the figure above, “Not very interested” represents those selecting “0” through “2”, “Somewhat interested” represents those selecting “3” through “7,” and “Very interested” represents those selecting “8” through “10.”

5.2.1.2 Code Changes

The U.S. Department of Energy revised the efficiency standard for air source heat pumps and central air conditioners; the new standard requires split system air source heat pumps and air conditioners to achieve a 14 SEER minimum for systems manufactured after January 1st, 2015. The revised standards for air source heat pumps and central air conditioners appear to have had moderate effect on sales in the region. About half (51%) of trade allies that installed central air conditioners said it is no easier or more difficult to sell 15 SEER central air conditioners following this code change. However, 40% (19 of 47) of surveyed trade allies that installed air source heat pumps through the program said that it is at least somewhat easier to sell 15 SEER air source heat pumps following the increases in minimum standards (Figure 5-2).

Figure 5-2: Difference in Ease or Difficulty in Selling 15 SEER Central Air Conditioners & Air-Source Heat Pumps Since Code Change*

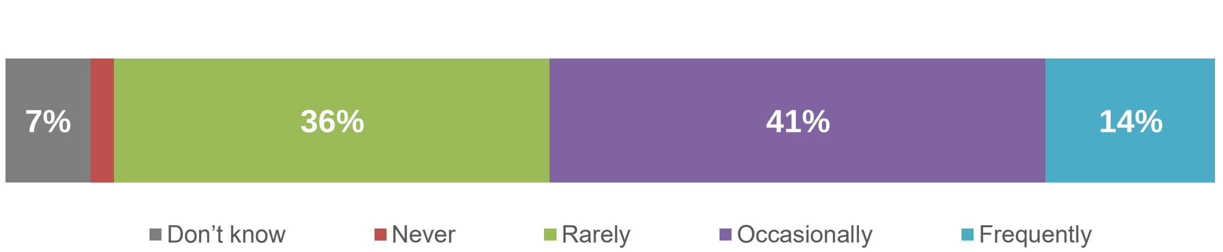


* Excluded respondents who don't sell SEER 15.

5.2.1.3 Recruiting Customers into Smart $aver

Trade ally survey data – which is further corroborated by participant survey data (see section 5.2.2.1) – reveals that trade allies are largely responsible for recruiting customers into the program. While over half of surveyed trade allies (55%) said that their customers "occasionally" or "frequently" ask about Smart $aver rebates, over one-third (38%) said their customers never or rarely ask about the program (Figure 5-3).

Figure 5-3: How Often Customers Ask About Smart $aver Rebates (n=58)

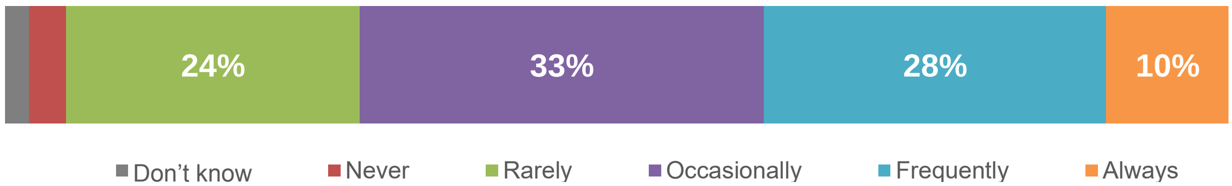


Few trade allies (31%) were highly satisfied with DEC's marketing of the program (see Figure 5-10), with dissatisfied trade allies noting that DEC does not conduct enough Smart $aver marketing. Participant survey results may help corroborate these trade ally reports, as few (6%) surveyed participants explicitly mentioned Duke Energy marketing materials as their source of program awareness. Thus, trade allies often need to educate their customers on the benefits of energy efficiency and the availability of Smart $aver rebates to bring new households into the program.

5.2.1.4 Rebate Application Process

Smart $aver transitioned to an online application system (called the "trade ally portal") in April 2016. We asked trade allies how frequently they have experienced problems or frustrations using the new portal (Figure 5-4). Although most (95%) reported experiencing problems or frustrations with the rebate application process, less than two-fifths (38%) said this was "frequently" or "always."

Figure 5-4: Frequency of Experiencing Problems or Frustrations with Online Rebate Application Process (n=58)



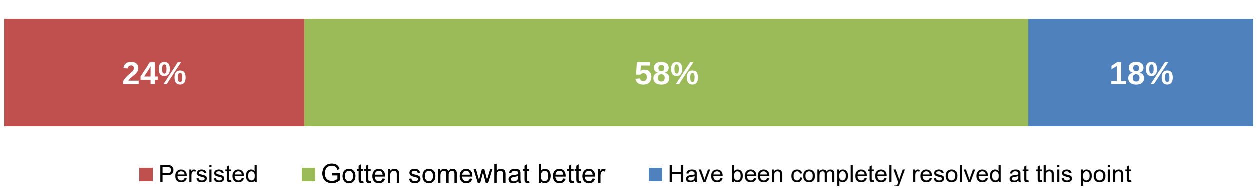
Trade allies that reported experiencing problems or frustrations with the rebate application process (n=55) typically mentioned struggles with uploading to the portal (be it applications or documentation) which can result in needing to resubmit, or indicated that the application process is overly burdensome (Table 5-6).

Table 5-6: Problems and Frustrations with the Rebate Application Process (Multiple Responses Allowed)

Responses	n=55
Data entry and form upload problems / having to resubmit forms	55%
Submission process is difficult, burdensome, or too lengthy	25%
Stringent application requirements	24%
Rebate applications being rejected for unknown or vague reasons	16%
Lack of feedback from Duke regarding rebate status and problems	16%
Resolving application errors is burdensome	13%
Thermostat application issues	11%
Quality Install checklist issues	7%
Rebate tracking issues	5%
Misc. other	40%
Don't know	2%

Echoing the prevalence of these problems and frustrations, the rebate application submission process had the highest level of dissatisfaction in the trade ally satisfaction battery (see Figure 5-10). However, over three-fourths (76%) of trade allies indicated that these problems have gotten at least somewhat better since the rollout of the new portal system (Figure 5-5).

Figure 5-5: Trade Ally Perception of Portal Problems: Persisting vs. Improving (n=55)



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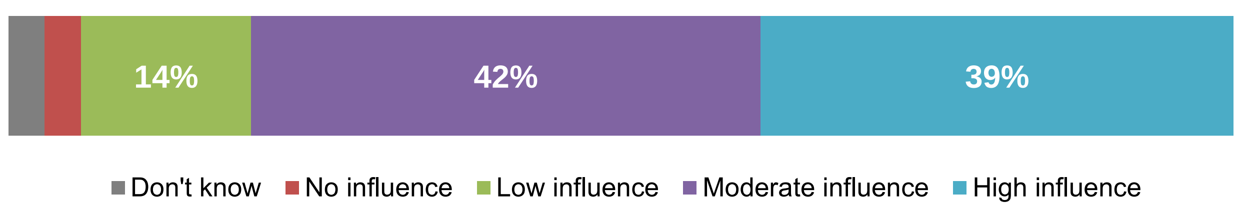
5.2.1.5 Program Influence on Trade Allies

Trade ally survey results reveal that the program is influencing energy efficiency contracting services offered by contractors in the trade ally network. Most (62%, or 36 of 58) surveyed trade allies reported their knowledge of energy efficient products and services had increased since they became involved with Smart $aver, 39% of which said the program was highly influential on their increased knowledge (Figure 5-6).

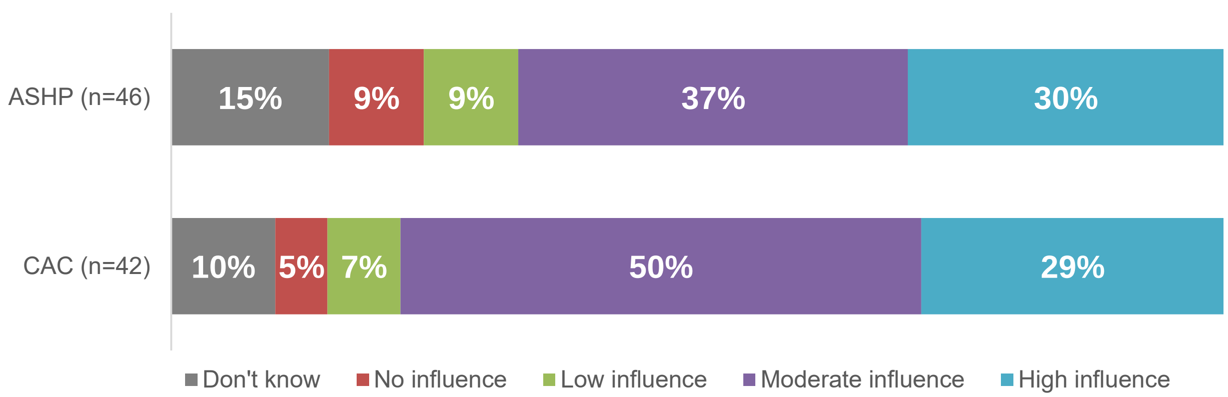
Figure 5-6: Smart $aver Influence on Increased Trade Ally Knowledge of Energy Efficient Products and Services (n=36)*



* Asked on a 0-10 scale, where 0 is "not at all influential" and 10 is "extremely influential." "No influence" represents trade allies that reported "0," low influence represents responses ranging from 1 to 3, moderate influence represents responses ranging from 4 to 7, and high influence represents responses ranging from 8 to 10.

Most HVAC trade allies reported that Smart $aver has at least partially influenced their practice of recommending qualifying HVAC measures, with about two-thirds or more – depending on the measure – indicating Smart $aver was moderately or highly influential (Figure 5-7).

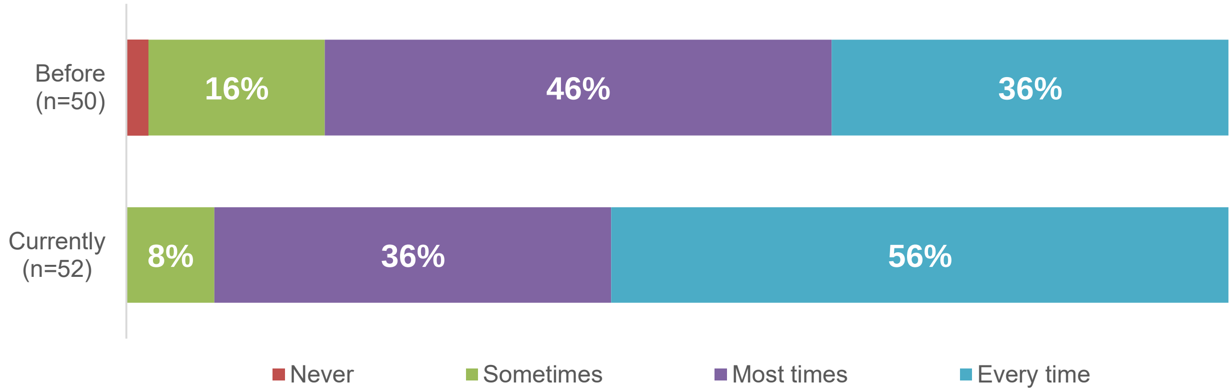
Figure 5-7 Program Influence on Trade Ally Practice of Recommending Program Qualified Measure*



* Asked on a 0-10 scale, where 0 is "not at all influential" and 10 is "extremely influential." "No influence" represents trade allies that reported "0," low influence represents responses ranging from 1 to 3, moderate influence represents responses ranging from 4 to 7, and high influence represents responses ranging from 8 to 10. Each row only includes trade allies who had experience with the measure.

Further, survey data reveals that contractors recommend high efficiency equipment more frequently now compared to before they were a participating trade ally in Smart $aver (Figure 5-8). Ultimately, surveyed trade allies revealed that over half of their central air conditioners (57%) or air source heat pumps (60%) installed in 2016 qualified for Smart $aver rebates.

Figure 5-8: Trade Ally Frequency of Recommending High Efficiency Equipment*



* Figure excludes "don't know" and "not applicable" responses. Only trade allies that install equipment measures (HVAC, water heat, and pool pumps) were asked these questions.

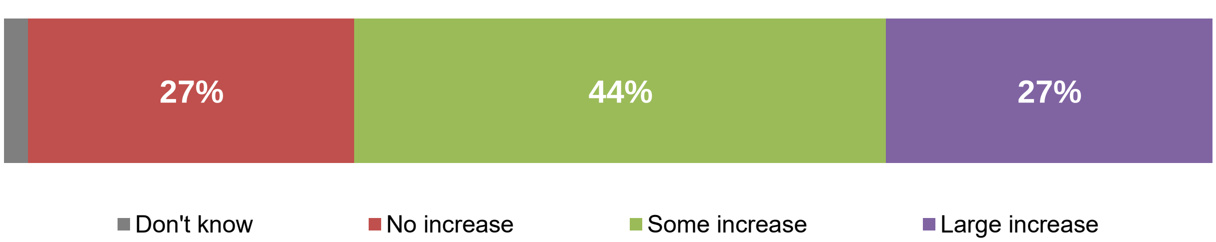
5.2.1.6 New Program Incentives

In April 2016, DEC added several new HVAC incentive offerings to the Smart $aver program:

- Tiered HVAC incentives
- Smart thermostat
- Quality install (QI)

The tiered HVAC rebates increased sales of high SEER units, as almost three-fourths of trade allies that installed CACs (71%) or ASHPs (70%) reported that the higher incentives helped them sell more 15+ SEER units. The smart thermostat incentives also appear to be influential, as almost three-fourths (71%) of HVAC trade allies said they have experienced at least some increase in smart thermostat installations since the introduction of the new incentive offering (Figure 5-9).

Figure 5-9: Smart $aver Effect on Trade Ally Smart Thermostat Installation Volume (n=41)



Almost 80% (22 of 28) of trade allies that performed quality installations reported they were already doing all the techniques on the quality install checklist prior to Duke Energy requiring them. Of these trade allies, most (19 of 22) said they had a system in place to document that their installers were following the same QI techniques. However, when trade allies were asked which specific QI techniques they previously used, only one mentioned all the primary components required in the Duke Energy QI checklist. Trade allies most commonly reported 'airflow and static pressure' as a previously used QI technique (mentioned by 8 of the 22 trade allies that reported previously using quality install techniques) (Table 5-7).

Table 5-7: Previous Quality Install Techniques Used by Trade Allies (Multiple Responses Allowed)

Quality Install Technique	Count (n=22)
Airflow/static pressure*	8
System capacity*	4
Condenser measurements*	4
Blower door tests	4
Enthalpy conversion*	3
System CFM*	1
Other	8
Don't know	8

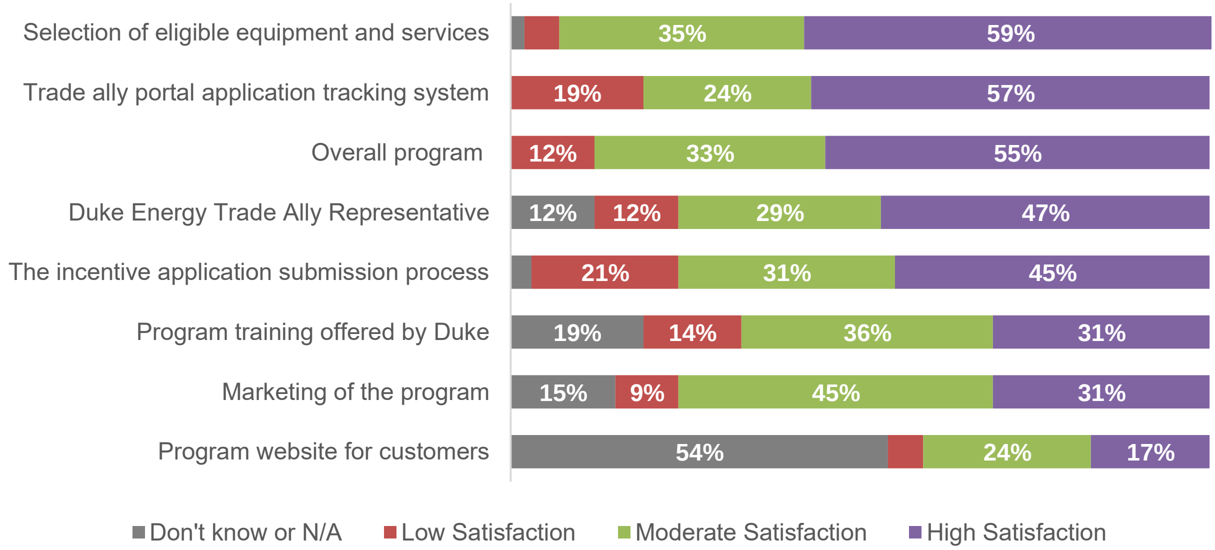
*Primary components of the Duke Energy Quality Install checklist

When completing the quality installation checklist on Tier 2 and Tier 3 HVAC jobs, almost all (91%) trade allies reported they do not charge their customers extra on the invoice for the quality install process. Open-ended comments reveal trade allies are considerably frustrated with the quality install measure: almost three-quarters (71%) of trade allies said improvements were needed or offered criticisms about the 'lengthy and burdensome' process. Of those offering suggestions for improvement, common responses included eliminating the Tier 1 HVAC incentives or checklist altogether, reducing paperwork required for the quality install checklist to simplify the process, and compensating the contractors for their time completing the quality installation. Additional analysis revealed that the more experience the trade ally had with the measure, the less likely they were to criticize it. See Appendix C for full verbatim responses.

5.2.1.7 Satisfaction

Surveyed trade allies reported moderate satisfaction with several program elements (Figure 5-10). The incentive submission process and the application tracking system received the most dissatisfied ratings; dissatisfied trade allies elaborated they were dissatisfied with these items because the submission process is burdensome and rebate statuses are often inaccurate. Program training and DEC's marketing of the program also received low satisfaction ratings, with trade allies explaining they were not aware of their presence (that is, they felt program marketing and training opportunities were lacking). However, over half of trade allies reported high satisfaction with the selection of eligible equipment and services and the overall program.

Figure 5-10: Trade Ally Satisfaction with Program Elements* (n=58)



* Asked on a 0-10 scale, where 0 is "very dissatisfied," 5 is "neither satisfied nor dissatisfied," and 10 is "very satisfied." Figure exhibits percent with "high influence" ratings that range from 8 to 10.

5.2.1.8 Suggestions for Improvement

Despite their moderate satisfaction ratings, trade allies had few suggestions for program improvement, including:

- Continue improving and simplifying the online portal and incentive application process. Some trade allies offered specific suggestions to help streamline the process and enhance the accessibility of the portal, such as eliminating highly technical jargon, reducing unnecessary paperwork, and other general usability improvements.

- Simplify or eliminate the quality installation process. Most trade allies offered suggestions for improving the checklist, including: eliminating the Tier 1 QI requirement or checklist altogether, compensating the trade ally for their time completing the checklist, and reducing the amount of paperwork needed to shorten the processing time.

- Improve communication and customer service. Although almost half of trade allies reported high satisfaction with their trade ally representative, over 40% of trade allies reported low to moderate satisfaction due to lack of communication and accessibility.

5.2.2 Participant Experience

In July 2017, the evaluation team surveyed 73 Smart $aver participants who received rebates through the program. Nearly all (95%) reported living at the residence where the work was performed, all of which reported owning their home. Nearly all (89%) reported living in a single-family detached home, followed by 6% living in a row or town house, 3% living in a factory manufactured single-family home, 1% living in a duplex, and 1% living in an apartment or condo building with four or more units (Table 5-8).

Table 5-8: Participant Housing Type

Housing Type	n=73
Single-family detached home	89%
Row house or town house	6%
Factory manufactured single-family home	3%
Duplex	1%
Apartment or condo building with four or more units	1%
Total	**100%**

5.2.2.1 Participant Awareness

Trade allies are the primary way consumers learn about the program, as evidenced by more than three-quarters (77%) of participants citing their contractor as their source of program awareness (Table 5-9). A minority of participants may have heard about Smart $aver via Duke Energy's marketing efforts, as several participants said they learned about the program from the internet (11%) or a mailer (8%).

Table 5-9: Source of $mart Saver Program Awareness (Multiple Responses Allowed)

Source of Program Awareness	n=73
Trade ally	77%
Online	11%
Mailer	8%
Duke Energy mentioned	6%
Don't know	6%
Other	6%

Respondents typically reported learning about energy efficient technologies from the internet, with about half (48%) of surveyed participants reporting going online to search for information regarding energy savings (Table 5-10). However, nearly one-quarter (22%) reported they do not typically search for information on how to save energy in their home.

Table 5-10: Source of Energy Savings Information (Multiple Responses Allowed)

Source of Energy Savings Information	n=73
Online sources	48%
Read utility information on how to save money	29%
Go to utility website	25%
In-store salespeople	1%
Other	5%
Not applicable – do not typically search for information on how to save energy	22%
Don't know	1%

5.2.2.2 Motivation to Participate

The evaluation team asked participants a series of questions to determine why they selected qualifying Smart $aver measures. For those participants who installed equipment measures, the evaluation team asked about the condition of the previous equipment they replaced, and then asked why they chose an energy efficient version of that equipment.

Overall, a slight majority (60%) of participants reported replacing their equipment because it was "getting old" (Table 5-11). More than half (55%) replaced their equipment because it was broken or not working properly, and 3% did so even though it was in good working condition.

Table 5-11: Condition of Previous HVAC Equipment

Condition of Previous System	Geothermal HP participant (n=1)	CAC participant (n=33)	ASHP participant (n=29)	Total (n=63)
Broken & old	0	6	8	14 (22%)
Old & working	0	0	0	0 (0%)
Working [only response]	0	0	2	2 (3%)
Old [only response]	1	19	4	24 (38%)
Broken [only response]	0	8	13	21 (33%)
Other	0	0	2	2 (3%)
No response	0	0	0	0 (0%)

*n=63 includes participants that installed the following: air source heat pump, geothermal heat pump, OR central air conditioner.

The most commonly reported motivation for selecting highly efficient HVAC equipment over standard efficiency equipment was some form of monetary savings (52%), followed by wanting to take advantage of the cost savings and return on investment (26%) and a desire to consume less energy (18%) as summarized in Table 5-12.

Table 5-12: Motivation for Installing Energy Efficient HVAC Equipment (Multiple Responses Allowed)

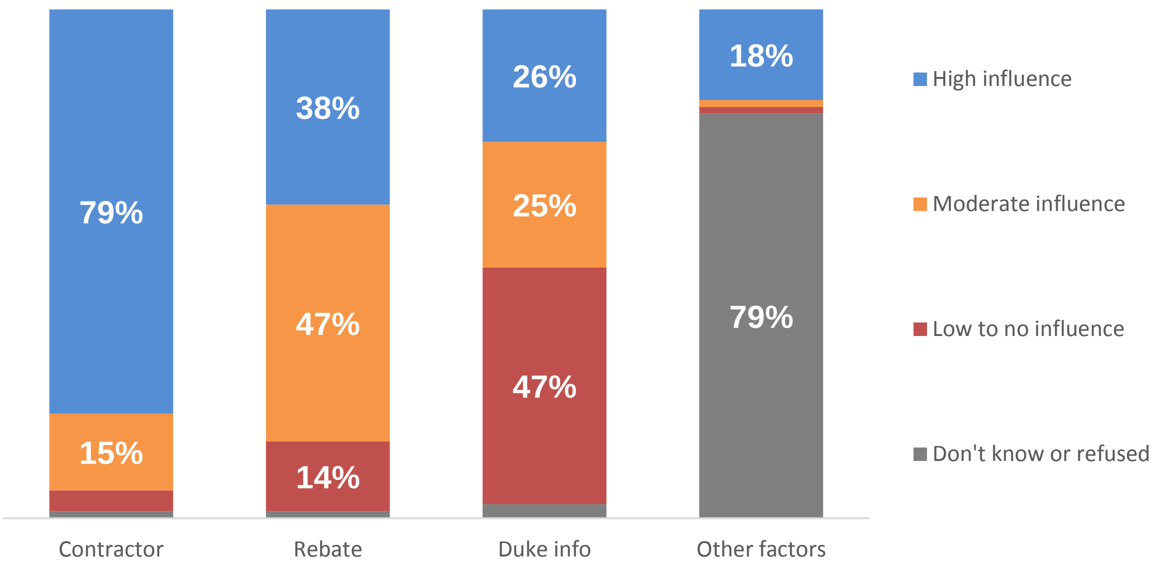
Motivations	n=63
Monetary savings*	52%
ROI & savings on energy bill	26%
To use less energy / make home more energy efficient	18%
To help the environment	8%
Interested in incentive / helped justify increased cost	8%
Wanted a quality system with low maintenance	3%
Contractor recommendation	5%
Other	3%

*Unclear if respondent is citing long term or upfront savings.

5.2.2.3 Program Influence

More than half (55%) of participants who purchased energy efficient equipment reported that recommendations from their contractor were highly influential in their decision to participate in the program (Figure 5-11). Contractors were much more influential than the Smart $aver rebate, information, or advertisements. Other influential factors included recommendations from friends or family, increasing value of home for sale, or federal tax credits.

Figure 5-11: Influential Factors in Decision to Purchase Efficient Measures* (n=73)



* Participants were asked to rate each factor using a 0 to 10 scale where 0 meant "not at all influential," and 10 meant "extremely influential." Low influence represents responses ranging from 0 to 3, moderate influence represents responses ranging from 4 to 7, and high influence represents responses ranging from 8 to 10. This only includes influence of these factors on participants' decision to purchase a primary measure, not add-on measures (smart thermostats or quality installation). For more information on influence on add-on measures, see section 5.2.2.5.

Nearly one-third (30%, or 22 of 73) of participants reported being familiar with other DEC energy efficiency programs (Table 5-13). Participants were most aware of the HVAC rebates (6 mentions). Among the 22 respondents that were aware of other DEC rebates, nine reported receiving one or more of them.

Table 5-13: Awareness and Participation in Other Duke Energy Programs (Multiple Responses Allowed)

	Count Aware (n=73)
Familiar with Other Duke Energy Rebates	22
Other Smart $aver Rebates	8
HVAC	*6*
Heat pump water heater	*2*
Pool pump	*2*
Attic insulation and air seal	*1*
Duct sealing and insulation	*1*
Smart Thermostat	*1*
Other Duke Energy Rebates	14
Discounted efficient lighting	*8*
In-home energy audit	*2*
Power manager	*1*
Other	*2*

Around one-third (30%) of participants reported purchasing other products or services to help save energy in their homes. However, very little of this resulted in attributable spillover savings as most (73%) said Smart $aver had no influence on their subsequent energy upgrades.

5.2.2.4 Participant Experience with the Program

About one-sixth (15%, or 11 of 71) of surveyed participants reported they contacted program staff with questions during the course of participating in the program. Of the 11 participants that contacted program staff, most (7 of 11) contacted them just once. Furthermore, of those participants who contacted staff, the majority (10 of 11) reported doing so via phone (Table 5-14).

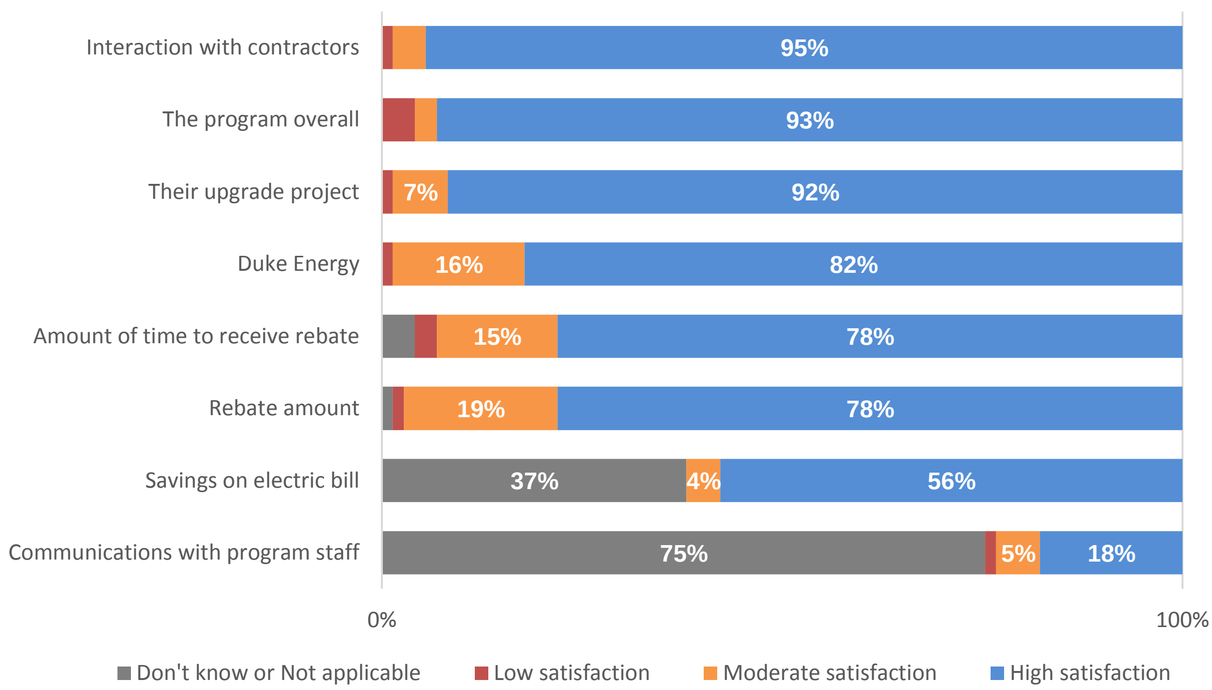
Table 5-14: Contact with Program Staff (n=73)

Contact with Program Staff	Count	Percent
Frequency of Contact		
Never	55	75%
Once	11	15%
Two or three times	6	8%
Four times or more	1	1%
Total	**73**	**100%**
Contact Type (Multiple Responses Allowed; n=18)*		
Phone	18	100%
Email	1	5%

* Includes those that indicated they contacted program staff at least once.

The majority of participants reported high satisfaction levels with most program elements (Figure 5-12). Nearly all (95%) reported being highly satisfied with their interaction with contractor. Furthermore, most participants reported being highly satisfied with their overall experience (93%) and results of their upgrade project (92%). Participants were comparably less satisfied with the rebate amount, and the amount of time to receive their rebate. Few participants noticed savings on their bill or interacted with program staff, but those who did tended to be highly satisfied.

Figure 5-12: Participant Satisfaction with Program Elements* (n=73)



* Participants were asked to rate each factor using a 0 to 10 scale where 0 meant “not at all satisfied,” 5 meant “neither satisfied nor dissatisfied,” and 10 meant “very satisfied.” Low satisfaction represents responses ranging from 0 to 3, moderate satisfaction represents responses ranging from 4 to 7, and high satisfaction represents responses ranging from 8 to 10.

* For this item, participants were asked to rate their overall satisfaction on a five-point scale, from “very dissatisfied” to “very satisfied.” The Evaluation Team recoded responses to be comparable with other items in the series.

To further understand Smart $aver’s effect on participants attitudes towards Duke Energy, the evaluation team asked whether their participation in the program had a positive, neutral, or negative effect on their overall satisfaction with Duke Energy. Overall, participation was beneficial, with the majority (84%) of respondents reporting a positive effect, and just 1% reporting a negative effect (Table 5-15).

Table 5-15: Effect of $mart Saver Program on Participants Satisfaction with Duke Energy

Effect of Program on Satisfaction with Duke Energy	n=73
Positive effect	84%
No effect	15%
Negative effect	1%
Total	**100%**

Although savings were not a driving factor for participants' program satisfaction, the majority (62%) reported noticing savings on their electric bill since their last project was completed (Table 5-16).

Table 5-16: Resulting Energy Savings on Electric Bill

Experienced Savings on Electric Bill	n=73
Yes, they noticed savings	62%
No - they looked but did not notice any savings	10%
No - they looked but it is too soon to tell	4%
They didn't look	14%
Don't know	11%
Total	**100%**

The evaluation team asked all respondents if they had any suggestions to improve the program. Among the 24 participants who provided a response, around one-quarter (6 of 324) reported wanting more customer outreach to increase awareness of the program (Table 5-17). An additional five respondents suggested improving the program description and instructions around how to receive the rebate.

Table 5-17: Suggestions for Improving $mart Saver Program (Multiple Responses Allowed)

Suggestions for Improving the Program	Count (n=24)
Raise awareness, perform more outreach	6
Improve program description/Instructions on how to get rebate	5
Expand rebates / offerings	5
Improve customer service	1
Use a check for rebates rather than gift card	2
Other	6

5.2.2.5 New HVAC Incentives

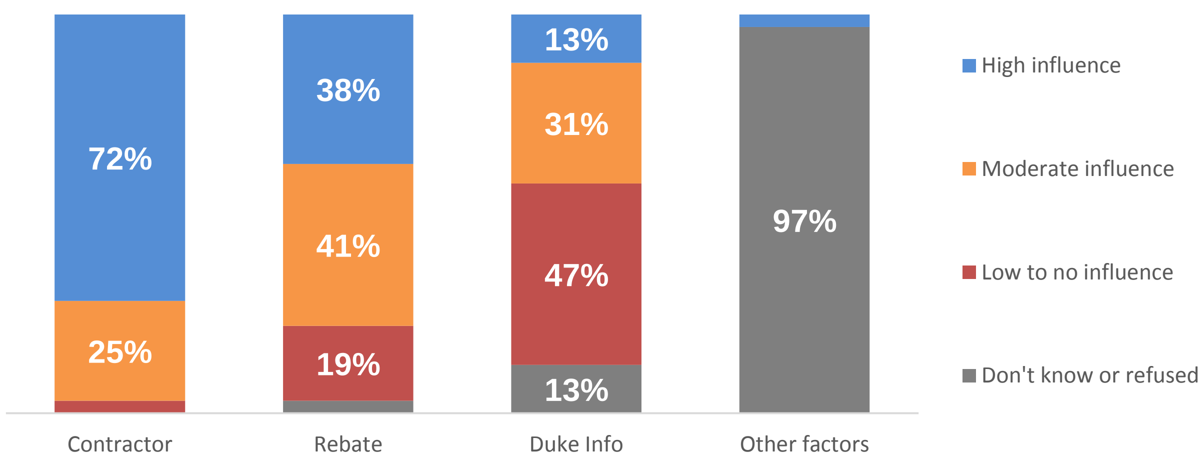
Most (97%) smart thermostat participants replaced non-programmable (50%) or standard programmable (47%) thermostats. Participants were motivated to replace their old thermostats with smart thermostats primarily because it was a ‘package deal’ and they liked the features (Table 5-18).

Table 5-18: Participant Motivations for Installing Smart Thermostats (Multiple Responses Allowed)

Motivations	(n=32)
Came as a package deal	47%
Thermostat features	38%
Convenience	9%
Rebate	9%
Don’t know	6%

Nearly three quarters (72%) of participants that received a smart thermostat reported that recommendations from their contractor were highly influential in their decision to participate in the program (Figure 5-13). Participants rated their contractor as significantly more influential than the Smart $aver rebate or DEC information on their decision to purchase a smart thermostat.

Figure 5-13: Influence on Decision to Purchase a Smart Thermostat (n=32)



Most (75%) quality install rebate recipients were not aware that they had received a rebate for the service. Of those that were aware of the rebate, most (6 of 7) said their contractors gave them a choice between a standard installation and quality installation and most (5 of 7) had heard of quality install before receiving the service. However, the quality install rebate had little influence on participant purchase decisions among those that were aware that they received the rebate for the quality installation service: most (6 of 7) said that if Duke had not offered a rebate for the service, they still would have demanded their contractor provide a quality installation even if they would have had to pay extra for the service.

6 Conclusions and Recommendations

Based on evaluation findings, the evaluation team concluded the following and provides several suggestions on how to improve the program:

Conclusion 1: Trade allies are the driving force of the program, but there may be opportunities to improve their program experience and effectiveness. Trade allies are the primary mechanism for bringing participants into the program, as they often upsell energy efficient systems to customers who have no prior awareness of the program during a time of immediate heating or cooling needs. However, trade ally satisfaction with certain program elements is relatively low, particularly: the application process and portal, program training, and the quality installation process and requirements.

Recommendation: Look for ways to increase trade ally satisfaction and rebate volumes. Trade allies are vital to the program's success. DEC should work with Blackhawk Engagement Solutions, the program implementer, to improve the trade ally experience and look for ways to increase trade ally effectiveness in the field.

- Potential strategies for increasing trade ally effectiveness (and simultaneously increasing trade ally satisfaction):
- <u>Provide marketing materials to trade allies</u>, such as co-op marketing
- <u>Attempt to increase trade ally participation in training events</u>. Potential strategies:
    - Align training offerings with trade ally content requests, particularly: sales, quality install, portal/application process, and program changes
    - Ensure training sessions occur during convenient periods during the year (i.e., non-peak seasons) and convenient times (breakfast meetings can be particularly successful).
- Potential strategies for improving TA (Trade Ally) satisfaction:
    - <u>Continue improving portal system and simplifying the application process</u>
    - <u>Consider splitting incentives with TAs</u> to compensate TAs for their time spent on Duke Energy processes. Shifting a small portion of the incentive to the trade ally is unlikely to negatively impact participation levels, as participants were only marginally influenced by the rebate and were instead mainly influenced by their contractor's recommendation (a finding which underscores the need to retain a strong trade ally network).

Conclusion 2: Approximately 60% of sampled quality install sheets included issues. Trade allies complete quality install sheets detailing system measurements taken while on site. Upon review of a sample of quality install sheets, the evaluation team found several issues including:

- Math errors
- Calculated capacities below program requirement
- Rule of thumb CFM estimates instead of actual measurements
- Testing in sub-optimal conditions

These issues compromise the validity of the impact of quality installation and therefore the associated energy and demand savings cannot be verified.

- **Recommendations:**
  - Establish additional internal QA/QC processes when reviewing submitted quality install sheets.
  - Work with trade allies to better understand issues encountered with the quality install sheets and to improve quality install reporting.

Conclusion 3: The quality installation measure may have experienced some growing pains in its infancy. Many trade allies expressed frustration with the 'complex and time consuming' quality install form, especially since they receive no compensation for completing it. These concerns may have limited the initial growth of the new measure:

- Tier 1 (which requires QI) was the least installed HVAC tier, amounting to about one-tenth of all HVAC units in the program.
- Less than one-third of Tier 2 and Tier 3 HVAC units received a QI rebate.
  - **Recommendation: As DEC matures the quality installation measure, look for ways to retain, expand, and improve trade ally quality install practices.**
  - Potential strategies for retaining and expanding trade ally quality installation practices:
    - <u>Shift the quality install rebate to trade allies</u>: trade ally dissatisfaction with the process may be mitigated by compensation.
    - <u>Hold a round table meeting with trade allies to collaborate on a revised quality install process that better serves the needs of both parties:</u> for DEC to generate cost-effective savings from the measure, the process must be minimally burdensome for trade allies so that they actively and accurately complete it

Conclusion 4: New HVAC rebates and requirements are generating additional energy savings that would not have occurred naturally. The new HVAC program components have resulted in increased trade ally sales of high SEER HVAC units and smart thermostats. Although comparatively less successful, quality installation rebates and requirements have encouraged a minority of trade allies to adopt new quality install techniques.

- **Recommendation 1:** Continue offering the new incentives:
  - tiered HVAC incentives
  - smart thermostats incentives
  - QI incentives (however, shift the rebate to trade allies)
- **Recommendation 2:** Continue looking for new program offerings that could generate additional savings

Appendix A Summary Form

Smart $aver Program

Completed EMV Fact Sheet

Description of program

The Smart $aver program offers Duke Energy existing residential customers incentives for improving their home's energy efficiency through the installation of energy efficient heating, ventilating, and air conditioning (HVAC), quality installation of HVAC units, smart thermostats, pool pump, and water heating equipment replacements, duct sealing, duct insulation, and attic insulation with air sealing.

Date	May1, 2016 – April 30, 2017	Measure	Verified Net Savings (kWh)
Region(s)	Carolinas	Central Air Conditioner	150
Evaluation Period	May 1, 2016 – April 30, 2017	Air Source Heat Pump	318
Annual kWh Net Savings	5,308,068	Geothermal Heat Pump	1,758
Coincident kW Net Impact - Summer	1,385	Quality Installation	9
Coincident kW Net Impact - Winter	1,665	Smart Thermostat	227
Net-to-Gross Ratio	66.7%	Attic Insulation & Air Seal	549
Process Evaluation	Yes	Variable Speed Pool Pump	1,621
Previous Evaluation(s)	N/A	Heat Pump Water Heater	1,078
		Duct Sealing	292
		Duct Insulation	423

Evaluation Methodology

Impact Evaluation Activities

- *44 on-site metered systems*
- *73 telephone surveys with participants*

Impact Evaluation Findings

- *Realization rate: 83.0%*
- *Net-to-gross: 66.7%*

Process Evaluation Activities

- *Program and implementation staff: interviews with one program staff and one implementation staff*
- *Trade Allies; 5 interviews with high volume contractors, surveys with a representative sample of 58 trade allies*
- *Participants; 73 telephone surveys of participating households.*

Process Evaluation Findings

- *Participants are highly satisfied with Smart $aver.*
- *Smart $aver influences energy efficiency contracting services.*
- *Trade allies are Smart $aver's most successful marketing channel.*
- *Trade ally satisfaction is moderately low, particularly with: portal/application process and quality install process*

Appendix B Measure Impact Results

Table B-1 Program Year 2016 Verified Impacts by Measure

Measure	Gross Energy Savings per unit (kWh)	Gross Summer Coincident Demand per unit (kW)	Gross Winter Coincident Demand per unit (kW)	Free Ridership	Spillover	Net to Gross Ratio	Measure Life
Central Air Conditioner	225	0.123	0.167	0.38	0.05	0.67	18
Heat Pump	490	0.149	0.213				18
Quality Install	13	0.005	0.004				10
Smart Thermostat	340	0.000	0.000				11
Attic Insulation & Air Seal	824	0.221	0.399				20
Variable Speed Pool Pump	2,430	0.527	0.000				10
Heat Pump Water Heater	1,616	0.000	0.000				10
Duct Sealing	438	0.162	0.153				18
Duct Insulation	634	0.234	0.222				20

Appendix C Survey Instruments

C.1 Trade Ally In Depth Interview

Introduction

Hi, I'm ____ calling from Research Into Action on behalf of Duke Energy Carolinas. We are evaluating the SMART $AVER program and we are looking to speak with contractors like yourself who have been particularly active in the program. Our program records indicate that your firm completed several projects this year for which a customer received an incentive from Duke Energy Carolinas SMART $AVER program, is that correct? And are you knowledgeable about those incented projects?

[If "no," ask to speak to someone who is knowledgeable about SMART $AVER work]

Your participation in this study is very important to Duke Energy Carolinas – this is your chance to tell us what is working well, what isn't, and how Duke Energy Carolinas can improve the program to better serve you and your customers. Do you have time to speak on the phone with me today about your experiences in the program?

Great. Rest assured, your answers will be kept strictly confidential and will not be tied to you or your firm. Is it okay if I record our conversation for note keeping purposes? [IF NEEDED: It is just so I can go back and clean up my notes after we are done talking, as to ensure I accurately captured everything you said.]

Background

Q1. My records show your company provides [PIPE IN SERVICES OFFERED: HVAC, plumbing, shell] services through SMART $AVER. Is that correct?

Q2. Have you completed any **new construction** projects that received incentives from the Smart Saver program?

Awareness and Engagement

Q3. How do you explain the value of energy efficiency upgrades to your customers? What are some successful strategies?

Q4. [ASK IF INSTALLED HVAC] Thinking about all customers – including those that do and don't go through the program, what are the primary reasons your customers replace their HVAC equipment?

[ASK IF INSTALLED HPWH] Thinking about all customers – including those that do and don't go through the program, what are the primary reasons your customers replace their water heaters?

[ASK IF INSTALLED POOL PUMPS] Thinking about all customers – including those that do and don't go through the program, what are the primary reasons your customers install ENERGY STAR efficient pool pumps that are equipped with variable speed drives? What proportion of efficient pool pump sales are replacing used pool pumps (as compared to pool pumps that go into newly constructed pools)?

[ASK IF INSTALLED ATTIC/DUCT INSULATION] Thinking about all customers – including those that do and don't go through the program, what are the primary reasons your customers insulate and seal their attics and ducts?

Q5. How did your company learn about the SMART $AVER program?

Q6. About what proportion of your SMART $AVER customers knew about the program prior to you mentioning it? [IF NEEDED: about what proportion of your SMART $AVER customers requested SMART $AVER rebates before you had a chance to mention them?]

Q7. Duke Energy conducts various marketing efforts to promote the SMART $AVER program to your customers. Would you say the program has the right amount, too much, or too little marketing?

Q8. How do you think Duke Energy Carolinas could improve their marketing and outreach efforts?

Q9. What does your company do to market the SMART $AVER program?

Q10. How can Duke better support your SMART $AVER marketing efforts?

Q11. Have you attended any orientations or training events from Duke Energy Carolinas? If yes: What events did you attend? Did the training provide you with information you found useful? Is there anything that you wish had been discussed in the training, but was not?

Q12. Would you like additional training opportunities to help your team more effectively sell rebated equipment? [*Probe: What type of training: sales/marketing training?*]

Q13. Tell me about your thoughts and experiences with the new online application system. (How has it improved or worsened the application process?)

Q14. Do you ever use the program's online portal for contractors for reasons other than submitting rebate applications? If so, for what? Is it helpful? Could it use improvement?

Q15. A new company, Blackhawk Engagement Solutions, is implementing the program now (they take care of rebate application processing, fulfillment and the program call center). How has this affected your experience in the program, if at all?

Q16. How satisfied are you with your Duke Energy Trade Ally Representative? (IF NEEDED: Please explain why you said that)

Trade Ally Program Experience

Q17. What are the challenges you've experienced in the program?

Probes:

- QA audit process (common fails? QA process is cumbersome?)
- Variety of measures offered
- Customer participation rates
- Rebate application process
- Delays
- Communications with Duke Energy and implementer
- Other

Q18. Do you have any suggestions on how to improve the program process?

Program Satisfaction

Q19. What do you like best about the program?

Q20. What do you like least about the program?

Market Changes

Q21. What new energy efficient technologies do you see taking off in the near future? What are your customers asking for? Are there any energy efficient technologies you think would sell better if Duke offered incentives for them? If so, what?

HVAC Offerings [ASK IF HVAC CONTRACTOR]

As you may know, Duke Energy offers additional rebates for HVAC rebate customers who also install smart thermostats that connect to the internet.

Q22. Has this rebate affected the number of smart thermostats you install each year? If so, by how much?

Q23. How, if at all, has the smart thermostat rebate influenced you to recommend smart thermostats to your customers?

Q24. Do you think the smart thermostat rebate has any influence on a consumer's decision to replace their HVAC system?

Duke Energy now offers higher rebates for central air-conditioners and heat pumps that are above SEER 16.

Q25. Thinking of these higher incentives, how, if at all, have they helped you sell more central air-conditioners that are above SEER 16?

Q26. How, if at all, have the higher incentives helped you sell more air-source heat pumps that are above SEER 16?

Q27. Duke Energy also now offers higher rebates for "quality installs" of central air-conditioners and heat pumps. [IF NEEDED: On qualified HVAC replacement, a quality install checklist must be performed to ensure 90 percent net capacity has been achieved at time of installation as rated by AHRI.].

a) Have you done any quality install rebate projects yet?

b) How, if it all, has the "quality install" rebate changed the way you install heat pumps and air conditioners?

c) What kind of metrics were you using previously to verify the system was correctly installed? (static pressure, rated capacity for system, etc.?)

d) How did you all internally document quality installation metrics before the program provided the checklist?

Q28. How, if at all, has the "quality install" rebate changed the way you install air conditioners?

Closing

Q49. Thanks so much for your time today. Are there any other comments you would like to provide?

C.2 Trade Ally Survey

Introduction

Hi, I'm ____ calling from Nexant on behalf of Duke Energy. May I speak with whomever is most knowledgeable about the rebated [MEASURE LIST] that your firm has installed through the Duke Energy Smart Saver rebate program?

[*If needed*:] I need to speak with someone who is knowledgeable about the sales and installation process – which is typically an installer or sales person]

[*Once appropriate contact is one phone*]

We want to get some feedback on how the Smart $aver Duke Energy program is working for your firm - this is your chance to tell us what is working well, what isn't, and how Duke Energy can improve the program to better serve you and your customers. Is this a good time to talk?

[*If needed*:]

- The survey takes about 15 minutes, depending on how much we have to discuss.
- If now isn't a good time, when could I call you back?

Please note that this call may be monitored or recorded for quality assurance purposes. Rest assured, your answers will be confidential and not tied to you or your firm.

Screening [Ask All]

[Base: All respondents]

S1. How many locations does your company have?

1. One
2. Two
3. Three
4. Four
5. Five
6. More than five [*Interviewer, make sure to record the exact number of locations if this option is checked*:] _______________

98. Don't Know
99. Refusal

[ASK IF S1>1]

S2. We would like to talk today about the projects that were sold and installed by the [**PIPE IN ADDRESS**] location. Are you able to speak to the work associated with that location?

1. YES [CONTINUE]
2. NO [*Ask to speak with alternative appropriate person*]

98. Don't know [*Ask to speak with alternative appropriate person*]
99. Refused [*Thank and terminate*]

[*Read preface to all*:] Please note when I mention Duke I am referring only to Duke Energy Carolinas.

S3. Does your firm primarily focus on new construction or existing home projects?

1. New construction projects [*Thank and terminate*]
2. Existing homes
3. Both

98. Don't know [*Ask to speak with alternative appropriate person*]
99. Refused [*Thank and terminate, Record*]

Sources of Program Awareness

[Base: All respondents]

Q1. How did you first hear about Duke Energy Smart $aver rebate offers for HVAC equipment, variable speed pool pumps, insulation, and duct sealing?

1. Word-of-mouth (co-worker, another contractor)
2. Duke Energy website
3. Duke Energy program representative
4. TV/Radio/Newspaper/Billboard Ad
5. Event (home show, workshop, etc.)
6. Other, please specify: ______________
98. Don't know
99. Refused

Nonparticipant Spillover

[*READ PREFACE TO ALL*:]

Next, I will ask you some questions about the work your company did last year in Duke Energy territory, which is separate from Duke Energy Progress territory. When answering these questions, please only consider your work in Duke Energy territory, which includes communities in western North Carolina and the Northwestern parts of South Carolina.

[IF 0>1, DISPLAY:] [*Interviewer read*:] Remember, please only consider projects associated with the [**PIPE IN ADDRESS**] location when answering questions.

[START LOOP – LOOP THROUGH TOP THREE MOST INSTALLED MEASURE TYPES THAT TRADE ALLIES INSTALLED SINCE APRIL OF 2016]

[Base: All respondents]

Q2. Since August of 2016, about what proportion of the [**MEASURE**] jobs that your company did in Duke territory would have qualified for a Duke rebate? [If needed: Your best estimate is fine.] [*Interviewers: Record a number. if they give a range, record a mid-point of that range. For example, if they say 80 to 90%, input 85%.*]

1. [Record response]

[*Do not read*:]

98. Don't Know
99. Refused

[Base: All respondents]

Q3. And since August 2016, what percent of all your Duke rebate qualified [MEASURE] projects did you actually apply for a rebate? [If needed: Your best estimate is fine.] *[Interviewers: Record a number. if they give a range, record a mid-point of that range. For example, if they say 80 to 90%, input 85%.*]

1. [Record response]

[*Do not read*:]

98. Don't Know
99. Refused

Q4. About what proportion of your rebate qualifying [**MEASURE**] customers specifically requested the [**MEASURE**] on their own and were not influenced by your recommendation? [If needed: Your best estimate is fine.]

1. [*Record percent*]

[*Do not read*:]

98. Don't Know
99. Refused

Q5. Using a 0 to 10 scale, where 0 is "not at all influential" and 10 is "extremely influential," how much influence has the Duke program had on your business practice of recommending rebate qualifying [**MEASURE**] to your customers?

[SINGLE RESPONSE]

0.	0. Not all influential
1.	1.
2.	2
3.	3
4.	4
5.	5.
6.	6.
7.	7.
8.	8.
9.	9.
10.	10. Extremely influential
98.	Don't Know
99.	Refused

[END LOOP]

Program Influence and Effects on TAs

[BASE: TRADE ALLIES THAT INSTALLED AIR SOURCE HEAT PUMPS, CENTRAL AIR CONDITIONERS, GEOTHERMAL HEAT PUMPS, POOL PUMPS, OR WATER HEATERS]

Q6. Thinking back to before you were involved in the Duke Energy program, how often did you recommend higher efficiency equipment that uses less energy than standard models to your customers? Would you say none of the time, some of the time, most of the time, or every time?

[SINGLE RESPONSE]

1. None of the time
2. Some of the time
3. Most of the time
4. Every time
97. Not applicable – I've been involved with the Duke program since starting in the industry/this company
98. Don't know
99. Refused

[BASE: TRADE ALLIES THAT INSTALLED AIR SOURCE HEAT PUMPS, CENTRAL AIR CONDITIONERS, GEOTHERMAL HEAT PUMPS, POOL PUMPS, OR WATER HEATERS]

Q7. And what about now? [*If needed:* Currently, how often do you recommend higher efficiency equipment that uses less energy than standard models to your customers? Would you say none of the time, some of the time, most of the time, or every time?]

[SINGLE RESPONSE. DO NOT READ]

1. None of the time
2. Some of the time
3. Most of the time
4. Every time
98. Don't know
99. Refused

[BASE: ALL RESPONDENTS]

Q8. Would you say your knowledge of energy efficient products and services has increased, decreased, or stayed about the same since you became involved with the program?

[SINGLE RESPONSE]

1. Increased
2. Decreased

3. Stayed about the same
98. Don't know
99. Refused

[ASK IF Q8 =1]

Q9. Using a 0 to 10 scale, where 0 is “not at all influential” and 10 is “extremely influential,” how much influence has Duke Energy program had on your increased knowledge of energy efficient products and services?

[SINGLE RESPONSE]

0.	0. Not all influential
1.	1.
2.	2
3.	3
4.	4
5.	5.
6.	6.
7.	7.
8.	8.
9.	9.
10.	10. Extremely influential
98.	Don’t Know
99.	Refused

Code Changes

[READ PREFACE IF CONTRACTOR INSTALLED CENTRAL AIR CONDITIONERS OR AIR SOURCE HEAT PUMPS]

As you may know, a new code for air conditioners and air source heat pumps was enforced in 2015 – the minimum SEER went from 13 to 14.

[Base: IF CONTRACTOR INSTALLED CENTRAL AIR CONDITIONERS]

Q10. How much more difficult or easier is it to sell 15 SEER central air conditioners now that the code is 14 SEER? Would you say it is: [READ FIRST FIVE RESPONSE OPTIONS:]

1. Much more difficult
2. Somewhat more difficult
3. No different
4. Somewhat easier
5. Much easier

[*Do not read*:]

97. Do not sell SEER 15
98. Don't know
99. Refused

[Base: IF CONTRACTOR INSTALLED AIR SOURCE HEAT PUMPS]

Q11. How much more difficult or easier is it to sell 15 SEER HVAC heat pumps now that the code is 14 SEER? Would you say it is:

[*Read*:]

1. Much more difficult
2. Somewhat more difficult
3. No different
4. Somewhat easier
5. Much easier

[*Do not read*:]

97. Do not sell SEER 15
98. Don't know
99. Refused

New Incentives

[Base: IF CONTRACTOR INSTALLED SMART THERMOSTATS]

Q12. As you may know, Duke Energy offers a rebate for smart thermostats. By how much did your installations of smart thermostats increase since Duke began offering smart thermostat rebates? Would you say…

[*Read*:]

1. No increase
2. Some increase
3. A large increase

[*Do not read*:]

98. Don't know
99. Refused

[Base: IF CONTRACTOR INSTALLED CENTRAL AIR CONDITIONERS OR AIR SOURCE HEAT PUMPS]

[*Before asking Q13 and Q14, read*:] As you also may know, Duke Energy started to offer higher rebates for central air-conditioners and heat pumps that are above 14 SEER.

[Base: IF INSTALLED CACS]

Q13. Thinking of these higher incentives, did those help you sell more central air-conditioners that are 15 SEER or higher?

1. Yes
2. No
98. Don't know
99. Refused

[Base: IF INSTALLED AIR SOURCE HEAT PUMPS]

Q14. Thinking of these higher incentives, did those help you sell more air-source heat pumps that are 15 SEER or higher?

1. Yes
2. No
98. Don't know
99. Refused

[Base: IF PERFORMED QUALITY INSTALLS]

Q15. As you may know, Duke Energy recently added "quality install" requirements for installations of heat pumps and air conditioners? Were you already doing all the techniques on the quality install check list prior to Duke requiring them?

1. Yes
2. No
98. Don't know
99. Refused

[Base: IF Q15=1]

Q16. Prior to using Duke's quality install checklist, did you have a system in place to document that your installers were following these same quality install techniques?

1. Yes
2. No
98. Don't know
99. Refused

[Base: IF Q15=1]

Q17. Prior to using Duke's quality install checklist, what specific quality install techniques were you using? Please be as specific as possible.

[*Multiple response, do not read*:]

1. System capacity
2. Airflow / static pressure
3. System CFM (cubic feet per minute)
4. Condenser measurements
5. Enthalpy conversion
6. Blower door tests
7. Duct blaster tests
96. Other, please specify: [OPEN-ENDED RESPONSE]
98. Don't know
99. Refused

[Base: IF PERFORMED QUALITY INSTALLS ON TIER 2 OR TIER 3 HVAC MEASURES]

Q18. I have a question about your Duke Energy tier 2 and tier 3 HVAC jobs – these are the ones where the quality installation check list is not required, so quality installations get the customer an additional $60 rebate. Do you charge your customers extra on the invoice for completing the quality installation rebate checklist on tier 2 and tier 3 HVAC jobs?

1. Yes
2. No
98. Don't know
99. Refused

[Base: IF PERFORMED QUALITY INSTALLS]

Q19. Do you have any suggestions on how Duke Energy could improve the quality install requirements?

1. [*Record response*]
98. Don't know
99. Refused

Challenges and Suggestions for Improvement

[Base: All respondents]

Q20. What energy efficient products, technologies, or services should be added to the Duke Energy Progress rebate program? [*Do not read: Choose all that apply*.] [MULTIPLE RESPONSE]

1. Modulating furnaces
2. Heat recovery ventilation (HRV) systems
3. Boilers
4. Furnaces equipped with electronically commutated motor (ECM) furnaces

5. Tankless water heaters
6. Humidifiers
7. Air handlers
8. Windows
9. Doors
10. No others should be added
96. Other, please specify: [OPEN-ENDED RESPONSE]
98. Don't know
99. Refused

[Base: All respondents]

Q21. Have you attended any orientations or training events from Duke Energy Carolinas?

1. Yes
2. No
98. Don't know
99. Refused

[BASE: IF Q21=1]

Q22. What topics were covered in the last Duke Energy event you attended?

1. [OPEN-ENDED RESPONSE]
98. Don't know
99. Refused

[BASE: IF Q21=1]

Q23. On a scale from 0 to 10, where 0 is “not at all helpful” and 10 is “extremely helpful,” how helpful was the last Duke Energy event you attended?

1. Yes
2. No
98. Don't know
99. Refused

[Base: All respondents]

Q24. What types of training, if any, would you be interested in receiving from Duke Energy?

1. [OPEN-ENDED RESPONSE]
98. Don't know
99. Refused

[Base: All respondents]

Q25. On a scale from 0 to 10, where 0 is “not at all interested” and 10 is “extremely interested,” how interested would you be in a training course on how to more effectively sell high efficiency equipment to your customers if it was offered by the program?

[SINGLE RESPONSE]

0.	0. Not all interested
1.	1.
2.	2
3.	3
4.	4
5.	5.
6.	6.
7.	7.
8.	8.
9.	9.
10.	10. Extremely interested
98.	Don’t Know
99.	Refused

[Base: All respondents]

Q26. How often do your customers ask about the Duke Energy rebates before you’ve had the chance to bring them up? Would you say…

[*Read*:]

1. Never
2. Rarely
3. Occasionally
4. Frequently, or
5. Always

[*Do not read*:]

98. Don’t Know
99. Refused

[Base: All respondents]

Q27. Since Duke transitioned to the online application system in April 2016, how frequently have you experienced problems or frustrations with the rebate application process? Would you say…

[*Read*:]

1. Never
2. Rarely
3. Occasionally
4. Frequently, or
5. Always

[*Do not read*:]

98. Don't Know
99. Refusal

[ASK IF Q27=2-5]

Q28. What types of problems or frustrations did you experience?

1. [*Record response*]

[*Do not read*:]

98. Don't Know
99. Refusal

[ASK IF Q27=2-5]

Q29. Overall, have these problems persisted or gotten better over time? Would you say these problems have:

[*Read*:]

1. Persisted
2. Gotten somewhat better, or
3. Have been completely resolved at this point

[*Do not read*:]

98. Don't Know
99. Refusal

[Base: All respondents]

Q30. Do you have any suggestions on how Duke Energy could improve the rebate application process?

1. [*Record response*]
98. Don't Know
99. Refusal

[Base: All respondents]

Q31. Do you have any suggestions on how Duke Energy could improve the project inspection process?

1. [*Record response*]

[*Do not read*:]

98. Don't Know
99. Refusal

Satisfaction

[Preamble:]

Thanks for your feedback so far, next I have some questions about your satisfaction with the program.

[Base: All respondents]

Q32. Please rate the extent to which you are satisfied with the following aspects of the program using a 0 to 10 scale where 0 means "very dissatisfied," 5 means "neither satisfied nor dissatisfied," and 10 means "very satisfied." How satisfied are you with:

A	Program training offered by Duke Energy
B	Your Duke Energy Trade Ally Representative
C	The program website for customers
D	The trade ally portal application tracking system
E	The marketing of the program
F	The incentive application submission process
G	The selection of eligible equipment and services
H	The overall program

[Single Response on Each A-H Item]

0.	0. Very dissatisfied
1.	1.
2.	2
3.	3
4.	4
5.	5. Neither satisfied nor dissatisfied
6.	6.
7.	7.
8.	8.
9.	9.
10.	10. Very satisfied
97.	N/A
98.	Don't Know
99.	Refused

[BASE: ASK IF Q32 < 5]

[**PROGRAMMER'S NOTE:** REPEAT Q33 FOR EACH STATEMENT FROM Q32 WHERE Q32<5]

Q33. Please explain why you were dissatisfied with [**INSERT STATEMENT FROM Q32 A-H**]:

1. [*Record response*]
98. Don't Know
99. Refusal

Closing

[Base: All respondents]

Q34. Thanks so much for your time today. Are there any other comments you would like to provide?

1. [*Record response*]

C.3 Participant Survey

Introduction

[*READ IF CONTACT NAME IS KNOWN:*] Hello, may I speak with _____. [*READ IF NAME IS UNKNOWN*] Hi, my name is ___________from Nexant. I'm calling on behalf of Duke Energy. Our records show that you received a rebate for [**LIST ALL MEASURES**] from the Duke Energy Smart $aver Program.

[*INTERVIEWER – IF PERSON ON PHONE IS UNAWARE OF THE REBATED WORK, ASK TO SPEAK WITH SOMEONE IN THE HOME WHO MIGHT RECALL RECEIVING A REBATE FROM DUKE ENERGY.*

IF PERSON ON PHONE SAYS THEY ARE RENTER (AND/OR THEIR LANDLORD OR PROPERTY MANAGER WAS RESPONSIBLE FOR THE PROJECT), ASK FOR LANDLORD/PROPERTY MANAGER'S NAME AND PHONE NUMBER AND USE THAT AS THE NEW POINT OF CONTACT]

Duke Energy would like your feedback about the work that was done to the home/property through the program as well as feedback on your experience with the program. Is now a good time to talk?

[*IF NEEDED*]*:* The survey will take about 10 to 15 minutes, depending on the details you have for us.

[*IF NEEDED*: *SCHEDULE A TIME TO CALL THEM TO COMPLETE THE SURVEY*]

Please note that this call may be monitored or recorded for quality assurance purposes.

Building Type Confirmation

[ASK ALL]

Q1. I'm going to read a list of building types. Please stop me when I mention the building type that best describes the residence where this work was done. [*READ LIST*]

[SINGLE RESPONSE]

1. Single-family detached home [*IF NEEDED: NOT A DUPLEX, TOWNHOME, OR APARTMENT; ATTACHED GARAGE IS OK*]
2. Factory manufactured single family home
3. Row house or town house
4. Duplex
5. Triplex [*IF NEEDED: building with three units*]
6. Apartment or condo building with four or more units
96. Other, please specify: [OPEN-ENDED RESPONSE]
98. Don't know
99. Refused

[PROGRAMMER: IF 0=1-2, BUILDING TYPE=SF. IF 0=3-6, BUILDING TYPE=OTHER. IF 0=96-99, USE PRE-CODED BUILDING TYPE FROM LIST]

Sources of Program Information

[ASK ALL]

Q2. How did you hear about the Duke Energy Smart $aver **rebate(s)** that you received? *[RECORD VERBATIM]*

[ASK ALL]

Q3. Are you familiar with other energy-efficiency rebates that Duke Energy offers, aside from the **[LIST ALL MEASURES THEY RECEIVED FROM SMART $SAVER PROGRAM]** rebate(s)?

[SINGLE RESPONSE]

1. Yes
2. No
98. Don't know
99. Refused

[ASK IF 0= 1 (Yes)]

Q4. Which other rebates are you familiar with? *[Do not read list]* [PROGRAMMER: EXCLUDE THE REBATES THAT THEY RECEIVED FROM THE LIST BELOW]

[MULTIPLE RESPONSE]

1. Heat pump water heater rebate
2. Heating and cooling system rebate
3. Geothermal heat pump rebate
4. Smart Wi-Fi enabled thermostat rebate
5. Attic Insulation and Air Seal rebate
6. Duct sealing and insulation rebate
7. In-home energy audit
8. Pool pump rebate
9. Power Manager bill discounts (for allowing Duke Energy to ramp down air-conditioning during peak usage events)
10. Discounted efficient lighting (CFLs, LEDs, and specialty bulbs)
11. Other – please specify: [OPEN-ENDED RESPONSE]
98. Don’t know
99. Refused

[ASK IF 0= 1 (Yes)]

Q5. Have you received any of these other rebates?

[SINGLE RESPONSE]

1. Yes
2. No

98. Don't know
99. Refused

[ASK IF 0= 1 (Yes) AND Q4 <>98 OR 99 AND MORE THAN ONE ITEM SELECTED IN 0; IF ONLY ONE ITEM SELECTED IN 0 (AND Q4 <>98 OR 99) AND 0=1, AUTOCODE 0 RESPONSE FOR 0]

Q6. Which rebate(s) did you receive? *[Do not read list]*

[MULTIPLE RESPONSE]

1. Heat pump water heater rebate
2. Heating and cooling system rebate
3. Geothermal heat pump rebate
4. Smart Wi-Fi enabled thermostat rebate
5. Attic Insulation and Air Seal rebate
6. Duct sealing/insulation rebate
7. In-home energy audit
8. Pool pump rebate
9. Power Manager bill discounts (for allowing Duke Energy to ramp down air-conditioning during peak usage events)
10. Discounted efficient lighting (CFLs, LEDs, and specialty bulbs)
11. Other – please specify: [OPEN-ENDED RESPONSE]
98. Don't know
99. Refused

Program Influence

[ASK IF 0= 1 (Yes)]

Q7. Did you receive the [**Insert rebated measures from 0**] before or after [**PROJECT #1 LIST**] work was done? [REPEAT THIS QUESTION FOR EACH REBATE OPTION SELECTED IN 0]

[SINGLE RESPONSE]

1. Before
2. After
3. Both before and after
4. At the same time
98. Don't know
99. Refused

[ASK IF 0= 2 or 3 (“After” or “Both before and after”)]

Q8. Using a scale from 0 to 10, where 0 means “Not at all influential” and 10 means “Extremely influential,” how influential was the rebate for [**PROJECT #1 LIST**] in your decision to take advantage of Duke Energy’s [**Insert response from 0**]? [REPEAT THIS QUESTION FOR EACH REBATE OPTION SELECTED IN 0 WHERE RESPONSE TO 0=2 (“After”) OR 0=3 (“Both before and after”)]

[SINGLE RESPONSE]

0.	0. Not all influential
1.	1.
2.	2
3.	3
4.	4
5.	5.
6.	6.
7.	7.
8.	8.
9.	9.
10.	10. Extremely influential
98.	Don't Know
99.	Refused

[ASK IF RESPONDENT HAS A **PROJECT #2 LIST**]

Q9. Using a scale from 0 to 10, where 0 means "Not at all influential" and 10 means "Extremely influential," how influential was the rebate for [**PROJECT #1 LIST**] in your decision to take advantage of additional Duke Energy rebates for [**PROJECT #2 LIST**]?

[SINGLE RESPONSE]

0.	0. Not all influential
1.	1.
2.	2
3.	3
4.	4
5.	5.
6.	6.
7.	7.
8.	8.
9.	9.
10.	10. Extremely influential
98.	Don't Know
99.	Refused

Motivations

We'd like to know what motivated you to complete the work we've been talking about that was rebated through the Duke Energy Smart $aver Program.

[ASK IF AIR SOURCE HEAT PUMP, GEOTHERMAL HEAT PUMP, OR CENTRAL AIR CONDITIONER WAS INSTALLED]

Q10. [IF AIR SOURCE HEAT PUMP OR GEOTHERMAL HEAT PUMP WAS INSTALLED, READ:] Which of the following best describes the condition of the previous HVAC system that you replaced with a [**PIPE IN WHICHEVER WAS INSTALLED: AIR SOURCE HEAT PUMP OR GEOTHERMAL HEAT PUMP**]?

[IF CENTRAL AIR CONDITIONER WAS INSTALLED, READ:] Which of the following best describes the condition of the previous air conditioner that you replaced?

[*READ* – MULTIPLE RESPONSE]

1. It was broken or malfunctioning
2. It was getting old, or
3. It was in good working condition

[*Do not read*:]

96. Other, please specify: [OPEN-ENDED RESPONSE]
98. Don't know
99. Refused

Q11. [ASK IF AIR SOURCE HEAT PUMP, GEOTHERMAL HEAT PUMP, OR CENTRAL AIR CONDITIONER WAS INSTALLED] Approximately, how many years old was the previous HVAC unit that you replaced with your new [**PIPE IN WHICHEVER WAS INSTALLED: AIR SOURCE HEAT PUMP, CENTRAL AIR CONDITIONER, OR GEOTHERMAL HEAT PUMP**] [*RECORD VERBATIM*]

[ASK IF CENTRAL AIR CONDITIONER, AIR SOURCE HEAT PUMP OR GEOTHERMAL HEAT PUMP, HEAT PUMP WATER HEATER WAS INSTALLED]

Q12. What motivated you to install an **energy efficient** system rather than a less efficient one that would use more energy? [*RECORD VERBATIM*]

Q13. [ASK IF CENTRAL AIR CONDITIONER, AIR SOURCE HEAT PUMP, OR GEOTHERMAL HEAT PUMP WAS INSTALLED] I'd like to know how you selected the specific make and model of the [PIPE IN WHICHEVER WAS INSTALLED: AIR SOURCE HEAT PUMP, CENTRAL AIR CONDITIONER, OR GEOTHERMAL HEAT PUMP] you purchased. Would you say that you chose it…

[READ LIST; SINGLE RESPONSE]

1. Yourself, based entirely on your own research?
2. From a list of options provided by the contractor?
3. Because it was the only option recommended by your contractor?

[*Do not read*:]

96. In some other way, please specify: [RECORD OPEN-ENDED RESPONSE]

98. Don't know
99. Refused

Q14. [ASK IF CENTRAL AIR CONDITIONER, AIR SOURCE HEAT PUMP, OR GEOTHERMAL HEAT PUMP WAS INSTALLED] Suppose the contractor that installed your [**PIPE IN WHICHEVER WAS INSTALLED: AIR SOURCE HEAT PUMP, CENTRAL AIR CONDITIONER, OR GEOTHERMAL HEAT PUMP**] did not offer high efficiency [**PIPE IN WHICHEVER WAS INSTALLED: AIR SOURCE HEAT PUMP, CENTRAL AIR CONDITIONER, OR GEOTHERMAL HEAT PUMP**]s that qualify for Duke rebates. Which of the following is most likely what you would have done? [*READ RESPONSE OPTIONS, SINGLE RESPONSE*]

1. You would have installed the cheaper less efficient unit that would not have qualified for rebates if that's all your contractor offered, or
2. You would have looked for a contractor that could install a rebate-qualified high efficiency unit

[*Do not read*:]

96. Other, please specify: [OPEN-ENDED RESPONSE]
98. Don't know
99. Refused

[ASK IF SMART THERMOSTAT WAS INSTALLED]

Q15. Which of the following best describes the old thermostat that you replaced?

[*READ* – SINGLE RESPONSE]

1. Manual non-programmable thermostat,
2. Programmable thermostat that *does not* communicate with your wi-fi network, or
3. Programmable thermostat that communicates with your wi-fi network

[*Do not read*:]

96. Other, please specify: [OPEN-ENDED RESPONSE]
98. Don't know
99. Refused

[ASK IF SMART THERMOSTAT WAS INSTALLED]

Q16. Thinking of your old thermostat, at what temperature was that thermostat typically set in the winter?

1. *Record temperature setting/response here*: ____________
98. Don't know
99. Refused

[ASK IF SMART THERMOSTAT WAS INSTALLED]

Q17. And what about your new wifi thermostat? At what temperature is the new thermostat typically set in the winter?

1. *Record temperature setting/response here*: ____________
98. Don't know
99. Refused

[ASK IF SMART THERMOSTAT WAS INSTALLED]

Q18. If you used your old thermostat to control air conditioning, at what temperature was your old thermostat typically set in the summer for air conditioning?

1. *Record temperature setting/response here*: ____________
2. Did not use my old thermostat to control air conditioning
98. Don’t know
99. Refused

[ASK IF SMART THERMOSTAT WAS INSTALLED AND Q18<>2]

Q19. And what about your new wifi thermostat? At what temperature is the new thermostat typically set in the summer?

1. *Record temperature setting/response here*: ____________
98. Don't know
99. Refused

[ASK IF SMART THERMOSTAT WAS INSTALLED]

Q20. What motivated you to install a wi-fi enabled thermostat? [*RECORD VERBATIM*]

[ASK IF HVAC TIER = 2 OR 3, AND QUALITY INSTALL REBATE WAS RECEIVED]

Q21. Program records show that you received an additional $60 rebate for a quality installation from your contractor. This additional rebate was included on the VISA gift card you received in the mail from Duke Energy. This rebate was for additional work your contractor did to ensure that your new [**PIPE IN WHICHEVER WAS INSTALLED: AIR SOURCE HEAT PUMP, CENTRAL AIR CONDITIONER, OR GEOTHERMAL HEAT PUMP**] was installed to run as efficiently as possible. Prior to today, were you aware that you received a quality installation rebate?

1. Yes
2. No

[*Do not read*:]

98. Don’t know
99. Refused

[ASK IF Q21=1]

Q22. Prior to talking with the contractor that installed the [**PIPE IN WHICHEVER WAS INSTALLED: AIR SOURCE HEAT PUMP, CENTRAL AIR CONDITIONER, OR GEOTHERMAL HEAT PUMP**], were you aware of quality installation practices that ensure the [**PIPE IN WHICHEVER WAS INSTALLED: AIR SOURCE HEAT PUMP, CENTRAL AIR CONDITIONER, OR GEOTHERMAL HEAT PUMP**] is installed to run as efficiently as possible?

1. Yes – I was already familiar with quality installation practices
2. No – I was not previously familiar with quality installation practices

[*Do not read*:]

96. Other, please specify: [[OPEN-ENDED RESPONSE]
98. Don't know

[ASK IF Q21=1]

Q23. Did your contractor let you choose between a standard installation service that was not eligible for the additional rebate and a quality installation that would get you an additional rebate from Duke Energy?

1. Yes – they let me choose between standard and quality
2. No – they did not give me a choice

[*Do not read*:]

96. Other, please specify: [[OPEN-ENDED RESPONSE]
98. Don't know
99. Refused

[ASK IF HEAT PUMP WATER HEATER WAS INSTALLED]

Q24. Which of the following best describes the condition of the previous water heater that you replaced?

[*READ* – MULTIPLE RESPONSE]

1. It was broken or malfunctioning
2. It was getting old, or
3. It was in good working condition

[*Do not read*:]

96. Other, please specify: [OPEN-ENDED RESPONSE]
98. Don't know
99. Refused

Q25. [ASK IF HEAT PUMP WATER HEATER WAS INSTALLED] Approximately, how many years old was the previous water heater that you replaced with your new heat pump water heater? [*RECORD VERBATIM*]

[ASK IF HEAT PUMP WATER HEATER WAS INSTALLED]

Q26. Where did you install your new heat pump water heater?

1. Garage
2. Basement
3. Closet
4. Laundry room

[*Do not read*:]

96. Other, please specify: [OPEN-ENDED RESPONSE]
98. Don't know
99. Refused

[ASK IF HEAT PUMP WATER HEATER WAS INSTALLED and IF Q26<>98 or 99]

Q27. Do you use your HVAC system to heat and cool the [PIPE IN ANSWER FROM Q26] where the heat pump water heater is located?

1. Yes
2. No

[*Do not read*:]

96. Other, please specify: [[OPEN-ENDED RESPONSE]
98. Don't know
99. Refused

Q28. [ASK IF AIR SOURCE HEAT PUMP OR GEOTHERMAL HEAT PUMP WAS **NOT** INSTALLED] What type of system do you use to heat your home? [Multiple response allowed]

1. Heat pump
2. Electric baseboard heaters
3. Natural gas furnace
4. Plug in space heaters
5. Cadet wall heaters

[*Do not read*:]

96. Other, please specify: [[OPEN-ENDED RESPONSE]
98. Don't know
99. Refused

[ASK IF CENTRAL AIR CONDITIONER, AIR SOURCE HEAT PUMP, OR GEOTHERMAL HEAT PUMP WAS **NOT** INSTALLED]

Q29. What type of system do you use to cool your home? [Multiple response allowed]

1. Central air conditioner
2. Heat pump
3. Room/window air conditioner
4. Evaporative/swamp cooler
5. I do not have any air conditioning in my home

[*Do not read*:]

96. Other, please specify: [[OPEN-ENDED RESPONSE]
98. Don't know
99. Refused

[ASK IF HEAT PUMP WATER HEATER WAS INSTALLED]

Q30. What motivated you to install an **energy efficient** water heater rather than a less efficient one that would use more energy? [*RECORD VERBATIM*]

[ASK IF DUCT SEALING OR INSULATION WAS PERFORMED/INSTALLED]

Q31. What motivated you to [IF DUCT SEALING WAS PERFORMED, READ: repair your ductwork; IF ATTIC INSULATION WAS INSTALLED, READ: add insulation to your attic]? [*RECORD VERBATIM*]

[ASK IF POOL PUMP WAS INSTALLED]

Q32. What motivated you to install an ENERGY STAR pool pump? [*RECORD VERBATIM*]

[ASK IF POOL PUMP WAS INSTALLED]

Q33. Approximately what month do you first open your pool for the season?

1. January
2. February
3. March
4. April
5. May
6. June
7. July
8. August
9. September
10. October
11. November
12. December

[*Do not read*:]

96. Other, please specify: [OPEN-ENDED RESPONSE]

98. Don't know
99. Refused

[ASK IF POOL PUMP WAS INSTALLED]

Q34. Approximately what month do you close your pool for the season?

1. January
2. February
3. March
4. April
5. May
6. June
7. July
8. August
9. September
10. October
11. November
12. December

[*Do not read*:]

96. Other, please specify: [[OPEN-ENDED RESPONSE]
98. Don't know
99. Refused

Free-ridership

I'd like to ask a few questions about what you most likely would have done had you not received assistance from Duke Energy for the **[LIST ALL MEASURES]**.

[ASK IF THEY INSTALLED: CENTRAL AIR CONDITIONER, AIR SOURCE HEAT PUMP, OR GEOTHERMAL HEAT PUMP]

Q35. Which of the following statements best describes the actions you would have taken if Duke Energy rebates and information were not available: [*READ LIST*]

[SINGLE RESPONSE]

1. Would not have installed the **[PIPE IN WHICHEVER WAS INSTALLED: CENTRAL AIR CONDITIONER, AIR SOURCE HEAT PUMP OR GEOTHERMAL HEAT PUMP]** and would have just continued using your old system
2. Would have postponed the purchase for at least one year
3. Would have bought a less expensive or less energy efficient system
4. Would have bought the exact same [**PIPE IN WHICHEVER WAS INSTALLED: CENTRAL AIR CONDITIONER, AIR SOURCE HEAT PUMP, OR GEOTHERMAL HEAT PUMP**], and paid the full cost yourself

[*Do not read*:]

96. Other, please specify: [OPEN-ENDED RESPONSE]
98. Don't know
99. Refused

[ASK IF Q35= 3]

Q36. You said you would have bought a/an [**PIPE IN WHICHEVER WAS INSTALLED: CENTRAL AIR CONDITIONER, AIR SOURCE HEAT PUMP, OR GEOTHERMAL HEAT PUMP**] that was less expensive or less energy efficient if you had not received the rebate or information from Duke Energy. Do you think it is more likely that you would have bought equipment that was…?

1. Almost as efficient as the one you bought, or
2. Significantly less efficient than the one you bought

[*Do not read*:]

98. Don't know
99. Refused

[ASK IF Q21=1]

Q37. If Duke Energy did not offer the additional rebate for quality installation services, would you have allowed your contractor to perform a quality installation service that ensured the [**PIPE IN WHICHEVER WAS INSTALLED: CENTRAL AIR CONDITIONER, AIR SOURCE HEAT PUMP, OR GEOTHERMAL HEAT PUMP**] was performing as efficiently as possible, even if it meant you had to pay more money?

[SINGLE RESPONSE]

1. Yes – I would have allowed quality installation if no rebates were available
2. No – I would not have allowed quality installation if no rebates were available

[*Do not read*:]

96. Other, please specify: [OPEN-ENDED RESPONSE]
98. Don't know
99. Refused

[ASK IF Q21=1]

Q38. If Duke Energy did not offer the additional rebate for quality installation services and your contractor did not offer you the service in their initial bid, would you have demanded that your contractor perform a quality installation service that ensured the [**PIPE IN WHICHEVER WAS INSTALLED: CENTRAL AIR CONDITIONER, AIR SOURCE HEAT PUMP, OR GEOTHERMAL HEAT PUMP**] was performing as efficiently as possible, even if it meant you had to pay more money?

[SINGLE RESPONSE]

1. Yes – I would have demanded quality installation if no rebates were available and my contractor did not initially offer it
2. No – I would not have demanded quality installation if no rebates were available and my contractor did not initially offer it

[*Do not read*:]

96. Other, please specify: [OPEN-ENDED RESPONSE]
98. Don't know
99. Refused

[ASK IF THEY INSTALLED: SMART THERMOSTAT]

Q39. Now we want to ask you about the smart thermostat you got with your [**PIPE IN WHICHEVER WAS INSTALLED: CENTRAL AIR CONDITIONER, AIR SOURCE HEAT PUMP, OR GEOTHERMAL HEAT PUMP**]. Which of the following statements best describes the actions you would have taken if Duke Energy rebates and information were not available: [*READ LIST*]

[SINGLE RESPONSE]

1. Would not have purchased the wi-fi enabled thermostat
2. Would have postponed the purchase of the wi-fi thermostat for at least one year
3. Would have installed some other type of thermostat, or
4. Would have bought the exact same wi-fi thermostat, and paid the full cost yourself

[*Do not read*:]

96. Other, please specify: [OPEN-ENDED RESPONSE]
98. Don't know
99. Refused

[ASK IF Q39=3]

Q40. What type of thermostat would you have bought then? Would you have bought… [*READ*]

1. A manual non-programmable thermostat, or
2. A programmable thermostat that is *not* wi-fi enabled

[*Do not read*:]

96. Other, please specify: [OPEN-ENDED RESPONSE]
98. Don't know
99. Refused

[ASK IF THEY INSTALLED: HEAT PUMP WATER HEATER]

Q41. Which of the following statements best describes the actions you would have taken if Duke Energy rebates and information were not available: [*READ LIST*]

[SINGLE RESPONSE]

1. Would not have replaced my water heater
2. Would have postponed the water heater replacement for at least one year
3. Would have bought a less expensive or less energy efficient water heater, or
4. Would have bought the exact same high efficiency Heat Pump Water Heater, and paid the full cost yourself

[*Do not read*:]

96. Other, please specify: [OPEN-ENDED RESPONSE]
98. Don't know
99. Refused

[ASK IF Q41=3]

Q42. You said you would have bought a water heater that was less expensive or less energy efficient if you had not received the rebate or information from Duke Energy. Do you think it is more likely that you would have bought equipment that was…?

1. Almost as efficient as the one you bought, or
2. Significantly less efficient than the one you bought

[*Do not read*:]

98. Don't know
99. Refused

[ASK IF THEY UPGRADED: ATTIC INSULATION]

Q43. Which of the following statements best describes the actions you would have taken if Duke Energy rebates and information were not available: [READ LIST]

[SINGLE RESPONSE]

1. Would not have done the attic insulation
2. Put off doing attic insulation for at least one year
3. Would have added less insulation
4. Would have done the exact same upgrade, and paid the full cost yourself

[*Do not read*:]

96. Other, please specify: [OPEN-ENDED RESPONSE]
98. Don't know
99. Refused

[ASK IF Q43=3]

Q44. You said you would have added less insulation if you had not received the rebate or information from Duke Energy. How much less insulation would you have purchased? Please answer in a percentage, such as "50% less."

1. [*RECORD VERBATIM*:] _______________
98. Don't know
99. Refused

[ASK IF THEY DID DUCT SEALING]

Q45. Which of the following statements best describes the actions you would have taken if Duke Energy rebates and information were not available: [*READ LIST*]

[SINGLE RESPONSE]

1. Would not have had ducts sealed, insulated, or repaired
2. Would have postponed the work for at least one year
3. Would have had the exact same work done, and paid the full cost yourself

[*Do not read*:]

96. Other, please specify: [OPEN-ENDED RESPONSE]
98. Don't know
99. Refused

[ASK IF THEY INSTALLED A VARIABLE SPEED POOL PUMP]

Q46. Which of the following statements best describes the actions you would have taken if Duke Energy rebates and information were not available: [*READ LIST*]

[SINGLE RESPONSE]

1. Would not have installed or replaced the pool pump
2. Would have postponed the installation of the pool pump for at least one year
3. Would have bought a less expensive or less energy efficient pool pump, or
4. Would have had the exact same high efficiency pool pump installed, and paid the full cost yourself

[*Do not read*:]

96. Other, please specify: [OPEN-ENDED RESPONSE]
98. Don't know
99. Refused

[ASK ALL]

Q47. 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 purchase the [**MEASURE**]? *How influential was…*

[*INTERVIEWER NOTE: 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	0 – Not at all influential	1	2	3	4	5	6	7	8	9	10 – Extremely influential	98 DK	99 RF
The rebate you received													
Information or advertisements from Duke Energy, including their website													
Recommendation from your contractor													
Did anything else influence you? If so, please specify: _____________ [*INTERVIEWER: PROBE IF UNCLEAR. RECORD VERBATIM RESPONSE*]													

[PROGRAMMER: REPEAT Q47 FOR EACH MEASURE IN MEASURE LIST. WHEN REPEATING, CALLERS CAN USE ABBREVIATED LANGUAGE (E.G.: “AND FOR THE INSULATION, HOW INFLUENTIAL WAS…”]

Spillover

Q48. Since receiving your rebate from Duke Energy for the [LIST ALL SMART $AVER MEASURES], have you purchased any other products or services to help save energy in your home?

1. Yes
2. No
98. Don't know

[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 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 [*EXCLUSIVE ANSWER*]
96. Other, please specify: ____________________
98. Don't know [*EXCLUSIVE ANSWER*]

[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? [MULTIPLE RESPONSE]

[LOGIC] Item
[IF Q49.1 IS SELECTED] 1. Bought energy efficient appliances
[IF Q49.2 IS SELECTED] 2. Moved into an ENERGY STAR home
[IF Q49.3 IS SELECTED] 3. Bought efficient heating or cooling equipment
[IF Q49.4 IS SELECTED] 4. Bought efficient windows
[IF Q49.5 IS SELECTED] 5. Bought additional insulation
[IF Q49.6 IS SELECTED] 6. Sealed air leaks in windows, walls, or doors
[IF Q49.7 IS SELECTED] 7. Sealed or insulated ducts
[IF Q49.8 IS SELECTED] 8. Bought LEDs
[IF Q49.9 IS SELECTED] 9. Bought CFLs
IF Q49.10 IS SELECTED] 10. Installed an energy efficient water heater
[IF Q49.96 IS SELECTED] **[Q49 open ended response]**
I did not get any Duke rebates [*EXCLUSIVE ANSWER*]
Don’t know [*EXCLUSIVE ANSWER*]

[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 [**LIST ALL SMART $AVER MEASURES**] rebate 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
[IF Q49.2 IS SELECTED] 2. Move into an ENERGY STAR home	0-10 scale with DK
[IF Q49.3 IS SELECTED] 3. Buy efficient heating or cooling equipment	0-10 scale with DK
[IF Q49.4 IS SELECTED] 4. Buy efficient windows	0-10 scale with DK
[IF Q49.5 IS SELECTED] 5. Buy additional insulation	0-10 scale with DK
[IF Q49.6 IS SELECTED] 6. Seal air leaks in windows, walls, or doors	0-10 scale with DK
[IF Q49.7 IS SELECTED] 7. Seal or insulate ducts	0-10 scale with DK
[IF Q49.8 IS SELECTED] 8. Buy LEDs	0-10 scale with DK
[IF Q49.9 IS SELECTED] 9. Buy CFLs	0-10 scale with DK
IF Q49.10 IS SELECTED] 10. Install an energy efficient water heater	0-10 scale with DK
[IF Q49.96 IS SELECTED] **[Q49 open ended response]**	0-10 scale with DK

[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? [*read list*]

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

How They Search for EE Information

[ASK ALL]

Q66. Where do you typically search for information on how to save energy in your property?

[*Do not read list*] [MULTIPLE RESPONSE]

1. Online – read reviews about products
2. Go to utility website

3. Read my utility information – it has tips on how to save energy
4. Go to the store and talk to salespeople
5. Look for ENERGY STAR logo on products
96. Other, please specify: [OPEN-ENDED RESPONSE]
97. Not applicable – I don't typically search for information on how to save energy in my home/property
98. Don't know
99. Refused

Program Satisfaction and Challenges

The next few questions are about your satisfaction with the program.

[ASK ALL]

Q67. Using a 0 to 10 scale where 0 means "very dissatisfied," 5 means "neither satisfied nor dissatisfied," and 10 means "very satisfied," how satisfied were you with the rebate amount for [**LAST PROJECT**]? [SINGLE RESPONSE]

0.	0. Very dissatisfied.
1.	1.
2.	2
3.	3
4.	4
5.	5. Neither satisfied nor dissatisfied
6.	6.
7.	7.
8.	8.
9.	9.
10.	10. Very satisfied
97.	N/A
98.	Don't Know
99.	Refused

[ASK ALL]

Q68. How satisfied were you with how long it took to receive that rebate? Please use a 0 to 10 scale where 0 means "very dissatisfied," 5 means "neither satisfied nor dissatisfied," and 10 means "very satisfied." [SINGLE RESPONSE]

0.	0. Very dissatisfied.
1.	1.
2.	2
3.	3
4.	4
5.	5. Neither satisfied nor dissatisfied
6.	6.
7.	7.
8.	8.
9.	9.
10.	10. Very satisfied
97.	N/A
98.	Don't Know
99.	Refused

[ASK IF Q68<5 (Somewhat to Very Dissatisfied)]

Q69. Why did you give that rating? ________ [RECORD VERBATIM]

[ASK ALL]

Q70. In the course of participating in the Duke Smart $aver program, how often did you contact Duke Energy or program staff with questions?

[*Do not read list*] [SINGLE RESPONSE]

1. Never
2. Once
3. 2 or 3 times
4. 4 times or more
98. Don't know
99. Refused

[ASK IF Q70 = 2-4]

Q71. How did you contact them?

[*Do not read list*] [MULTIPLE RESPONSE]

1. Phone
2. Email
3. Fax
4. Letter
5. In person

98. Don't know
99. Refused

[ASK IF Q70 =2-4]

Q72. Using that same scale, how satisfied were you with these communications? [*INTERVIEWER NOTE: REPEAT SCALE IF NECESSARY: Please use a 0 to 10 scale where 0 means "very dissatisfied," 5 means "neither satisfied nor dissatisfied," and 10 means "very satisfied."*]

[SINGLE RESPONSE]

0.	0. Very dissatisfied.
1.	1.
2.	2
3.	3
4.	4
5.	5. Neither satisfied nor dissatisfied
6.	6.
7.	7.
8.	8.
9.	9.
10.	10. Very satisfied
97.	N/A
98.	Don't Know
99.	Refused

[ASK IF Q72<5 (Somewhat to Very Dissatisfied)]

Q73. Why did you give that rating? ________ [RECORD VERBATIM]

[ASK ALL]

Q74. Have you noticed any savings on your electric bill since the [**LAST PROJECT**] project?

[SINGLE RESPONSE]

1. Yes, they noticed savings
2. No - They looked but **did not** notice any savings
3. No - They looked but it is too soon to tell
4. They didn't look
98. Don't know
99. Refused

[ASK IF Q74= Yes (if noticed savings)]

Q74_B. How satisfied are you with any savings you noticed on your electric bill since the [**LAST PROJECT**] project? [*INTERVIEWER NOTE: REPEAT SCALE IF NECESSARY: Please use a 0 to 10 scale where 0 means "very dissatisfied," 5 means "neither satisfied nor dissatisfied," and 10 means "very satisfied."*]

[SINGLE RESPONSE]

0.	0. Very dissatisfied.
1.	1.
2.	2
3.	3
4.	4
5.	5. Neither satisfied nor dissatisfied
6.	6.
7.	7.
8.	8.
9.	9.
10.	10. Very satisfied
97.	N/A
98.	Don't Know
99.	Refused

[ASK ALL]

Q75. How satisfied are you with your [**LAST PROJECT**] project? [*INTERVIEWER NOTE: REPEAT SCALE IF NECESSARY: Please use a 0 to 10 scale where 0 means "very dissatisfied," 5 means "neither satisfied nor dissatisfied," and 10 means "very satisfied."*] [*INTERVIEWER NOTE: IF RESPONDENT SAYS 'TOO SOON TO TELL,' THEN FOLLOW UP WITH: "So would you say you are "Neither satisfied nor dissatisfied?" or you just don't know yet AND PROBE TO CODE*]

[SINGLE RESPONSE]

0.	0. Very dissatisfied.
1.	1.
2.	2
3.	3
4.	4
5.	5. Neither satisfied nor dissatisfied
6.	6.
7.	7.
8.	8.
9.	9.
10.	10. Very satisfied
97.	N/A
98.	Don’t Know
99.	Refused

[ASK IF Q75<5 (Somewhat to Very Dissatisfied)]

Q76. Why did you give that rating?

1. [*RECORD VERBATIM*] ________
98. Don't know
99. Refused

[ASK ALL]

Q77. How satisfied are you with the interaction with the contractors who worked on the [**LAST PROJECT**] project? [*INTERVIEWER NOTE: REPEAT SCALE IF NECESSARY: Please use a 0 to 10 scale where 0 means “very dissatisfied,” 5 means “neither satisfied nor dissatisfied,” and 10 means “very satisfied.”*]

[SINGLE RESPONSE]

0.	0. Very dissatisfied.
1.	1.
2.	2
3.	3
4.	4
5.	5. Neither satisfied nor dissatisfied
6.	6.
7.	7.
8.	8.
9.	9.
10.	10. Very satisfied
97.	N/A
98.	Don't Know
99.	Refused

[ASK IF Q77< 5 (Somewhat to Very Dissatisfied)]

Q78. Why did you give that rating?

1. [*RECORD VERBATIM*] ________
98. Don't know
99. Refused

Q79. How satisfied you are with Duke Energy's overall performance as your electricity supplier? [*INTERVIEWER NOTE: REPEAT SCALE IF NECESSARY: Please use a 0 to 10 scale where 0 means "very dissatisfied," 5 means "neither satisfied nor dissatisfied," and 10 means "very satisfied."*]

[SINGLE RESPONSE]

0.	0. Very dissatisfied.
1.	1.
2.	2
3.	3
4.	4
5.	5. Neither satisfied nor dissatisfied
6.	6.
7.	7.
8.	8.
9.	9.
10.	10. Very satisfied
97.	N/A
98.	Don't Know
99.	Refused

Q80. Would you say that your participation in Duke Energy Smart $aver Rebate Program has had a positive effect, a negative effect, or no effect on your overall satisfaction with Duke Energy?

1. Negative effect
2. No effect
3. Positive effect
98. Don't know
99. Refused

[ASK ALL]

Q81. Finally, if you were rating your overall satisfaction with the Duke Energy Smart $aver Rebate Program, would you say you were Very Satisfied, Somewhat Satisfied, Neither Satisfied nor Dissatisfied, Somewhat Dissatisfied, or Very Dissatisfied? [SINGLE RESPONSE]

1. Very satisfied
2. Somewhat satisfied
3. Neither satisfied nor dissatisfied
4. Somewhat dissatisfied
5. Very dissatisfied
98. Don't Know
99. Refused

[ASK IF Q81 = 4 or 5]

Q82. Why do you give that rating? __________

[ASK ALL]

Q83. Do you have any suggestions to improve Duke Energy's Smart $aver Program?

1. [YES, *RECORD VERBATIM*] ________
2. No
98. Don't know
99. Refused

Demographics/Property Characteristics

Finally, I just need to ask you some questions about the residence where the rebated work was done.

[ASK ALL]

Q84. Do you live at this residence where the work was performed?

1. Yes
2. No
99. Refused

[ASK IF Q84=2]

Q85. Are you a property manager or an owner of the residence where the work was performed?

1. Owner
2. Property manager
96. Other, please specify: [OPEN-ENDED RESPONSE]
99. Refused

[ASK IF Q84=1]

Q86. Do you own or rent this residence?

[SINGLE RESPONSE]

1. Own
2. Rent
98. Don't know
99. Refused

[ASK IF Q86=Rent]

Q87. Do you pay your own electric bill or is it included in your rent? [*DO NOT READ*]

[SINGLE RESPONSE]

1. Pay own bill
2. Included in rent
98. Don't know
99. Refused

[ASK ALL]

Q88. Approximately when was this residence first built? [*DO NOT READ*]

[SINGLE RESPONSE]

1. Before 1960
2. 1960-1969
3. 1970-1979
4. 1980-1989
5. 1990-1999
6. 2000-2005
7. 2006-2010
8. 2011-2015
9. 2016
98. Don't know
99. Refused

[ASK ALL]

Q89. Excluding unfinished basements, how many square feet is the residence?

1. NUMERICAL OPEN END [RANGE 0-99,999] _______
98. Don't know
99. Refused

[ASK IF Q89=Don’t Know or Refused]

Q90. Would you estimate the residence is about: [*READ LIST*]

[SINGLE RESPONSE]

1. less than 1,000 sqft
2. 1,001-2,000 sqft
3. 2,001-3,000 sqft
4. 3,001-4,000 sqft
5. 4,001-5,000 sqft
6. Greater than 5,000 sqft
98. Don’t know

99. Refused

[ASK ALL]

Q91. Does the primary heating system at the residence run on… [*READ*]

[SINGLE RESPONSE]

1. Electricity
2. Natural Gas (not propane)
3. Liquid propane gas
4. Fuel Oil
5. Wood
6. Or something else, please specify: [OPEN-ENDED RESPONSE]

[*Do not read list*:]

98. Don't know
99. Refused

[ASK ALL]

Q92. I'm going to read a list of income ranges. Please stop me when I reach the range that includes your annual household income. [*READ LIST*]

[SINGLE RESPONSE]

1. Less than $25,000
2. $25,000 to less than $50,000
3. $50,000 to less than $75,000
4. $75,000 to less than $100,000
5. $100,000 to less than $150,000
6. $150,000 or more
98. Don't know
99. Refused

That is all of the questions I have for you today. Thank you very much for your time

Appendix D Participant Survey Results

This section reports the results from each question in the 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. I'm going to read a list of building types. Please stop me when I mention the building type that best describes the residence where this work was done.

Response Option	Percent (n=73)
Single-family detached home	89%
Factory manufactured single family home	3%
Row house or town house	5%
Duplex	1%
Triplex	0%
Apartment or condo building with four or more units	1%
Other	0%
Don't know	0%
Refused	0%

Q2. How did you hear about the Duke Energy Smart $aver rebate(s) that you received?

Response Option	Count (n=73)
Airworks told us about it when they came out.	1
Company that did hvac system did everything through Duke Energy for us.	1
Company that installed the unit.	1
conbtractor	1
contractor	1
contratcor	4
Doesn't remember anything about the rebate.	1
Don't remember.	1
From let see aimes receiving and plumping put it in.	1
From my neighbor.	1
From my vendor, the people the air conditioning folks.	1
From the air conditioner installers.	1
from the contractor	1
from the installer	1
From the installer.	1
From the people that installed the air conditioning.	1
from the pool installer	1
from thje contractor	1
Guy that puts the heat and air in the units, told us about it.	1
hvac installer	1
I believe I read it on the internet when I was researching pool pumps.	1
I Don’t know, unless it was applied for by the person who put it in.	1
I don't remember that.	1
I got an energy efficient heat pump and they called me about it.	1
I got one for my AC and one for my pump.	1
I picked it up from a mailer. The contractor I used was recommended by Duke.	1
I think it was the sales person who told us when he was writing up the contract for the new AC.	1
I think the Guy that installed our HVAC	1
I was in need in repair and they were going to stop making the freon. The guy that came for the repair told me about the rebate.	1
In the duke energy bill and the contractor that did the work.	1
insert in the statement	1
It was actually through the person that installed the equipment.	1
It was through my AC guy. He's the one who mentioned it and did it.	1
mailer	1
on the internet	1

Response Option	Count (n=73)
on the my energy alert	1
One: Online from Duke Energy Website because I moved from FL and got a rebate from that utility company	
Two: The contractor that I got the AC unit through mentioned it.	1
Read about it online. Also, the people that installed it said we would get a rebate.	1
Repairman from All Seasons told us about it.	1
the company	1
the contractor	1
The Contractor	1
The contractor told me.	1
The guy that put the heat in, the brotham brothers.	1
The people that put the AC in	1
the person who installed the HVAC	1
The website, the Duke Energy Website.	2
Through a vendor at our job.	1
Through our installer, hvac company.	1
Through the company that installed the air conditioner	1
Through the company that installed the unit.	1
through the contractor	1
Through the contractor	1
Through the contractor that did the work	1
Through the heating and air company.	1
through the HVAC company	1
Through the installers. The sales people.	1
Through the patterson, company that installed the air conditioning for the heat pump.	1
through the representative that did the install	1
through the vendor	1
throught the contractor	1
unknown	1
We found out about it from the Heating and AC contractor	1
website	1
went online	1

Q3. Are you familiar with other energy-efficiency rebates that Duke Energy offers, aside from the [LIST ALL MEASURES THEY RECEIVED FROM SMART $AVER PROGRAM] rebate(s)?

Response Option	Percent (n=73)
Yes	30%
No	70%
Don't know	0%
Refused	0%

Q4. [If Q3=YES] Which other rebates are you familiar with?

Response Option	Percent (n=22)*
Heat pump water heater rebate	9%
Heating and cooling system rebate	14%
Geothermal heat pump rebate	14%
Smart Wi-Fi enabled thermostat rebate	5%
Attic insulation and air seal rebate	5%
Duct sealing/insulation rebate	5%
In-home energy audit	9%
Pool pump rebate	9%
Power Manager bill discounts (for allowing Duke Energy to ramp down air conditioning during peak usage events)	5%
Discounted efficient lighting (CFLs, LEDs, and specialty bulbs)	36%
Other	9%
Don't know	5%
Refused	0%

* Multiple responses allowed.

Verbatim Other Response	Count (n=3)
Solar Power	1
Washers, things like that	1

Q5. [If Q3=YES] Have you received any of these other rebates?

Response Option	Percent (n=22)
Yes	36%
No	59%
Don't know	5%
Refused	0%

Q6. [If Q5=YES and Q4<>DON'T KNOW OR REFUSED] Which rebate(s) did you receive?

Response Option	Percent (n=9)

Not asked*	100%

* Due to a programming error, this question was not asked.

Q7. [If Q5=YES] Did you receive the [INSERT REBATED MEASURES FROM Q6] before or after [PROJECT #1 LIST] work was done? [REPEAT THIS QUESTION FOR EACH REBATE OPTION SELECTED IN Q6]

Response Option	Percent (n=?)
Not asked*	100%

* Due to a programming error, this question was not asked.

Q8. [IF Q7=AFTER OR Q7=BOTH BEFORE AND AFTER] Using a scale from 0 to 10, where 0 means “Not at all influential” and 10 means “Extremely influential,” how influential was the rebate for [PROJECT #1 LIST] in your decision to take advantage of Duke Energy’s [INSERT RESPONSE FROM Q6]? [REPEAT THIS QUESTION FOR EACH REBATE OPTION SELECTED IN Q6 WHERE RESPONSE TO Q7=AFTER OR Q7=BOTH BEFORE AND AFTER]

Response Option	Percent (n=?)
Not asked*	100%

* Due to a programming error, this question was not asked.

Q9. [ASK IF RESPONDENT HAS A PROJECT #2 LIST] Using a scale from 0 to 10, where 0 means “Not at all influential” and 10 means “Extremely influential,” how influential was the rebate for [PROJECT#1 LIST] in your decision to take advantage of additional Duke Energy rebates for [PROJECT#2 LIST]?

Response Option	Percent (n=73)
Not asked*	100%

* No respondents met display logic condition.

Q10. [ASK IF AIR SOURCE HEAT PUMP, GEOTHERMAL HEAT PUMP, OR CENTRAL AIR CONDITIONER WAS INSTALLED]

Which of the following best describes the condition of the previous HVAC system that you replaced with a [PIPE IN WHICHEVER WAS INSTALLED: AIR SOURCE HEAT PUMP OR GEOTHERMAL HEAT PUMP]?

Response Option	Percent (n=30)*
It was broken or malfunctioning	70%
It was getting old, or	43%
It was in good working condition	7%
Other	7%
Don't know	0%
Refused	0%

* Multiple responses allowed.

Verbatim Other Response	Count (n=2)
It was a space heater that it was replacing.	1
It was undersized for the house.	1

[IF CENTRAL AIR CONDITIONER WAS INSTALLED] Which of the following best describes the condition of the previous air conditioner that you replaced?

Response Option	Percent (n=33)*
It was broken or malfunctioning	42%
It was getting old, or	76%
It was in good working condition	0%
Other	0%
Don't know	0%
Refused	0%

* Multiple responses allowed.

Q11. [ASK IF AIR SOURCE HEAT PUMP, GEOTHERMAL HEAT PUMP, OR CENTRAL AIR CONDITIONER WAS INSTALLED] Approximately, how many years old was the previous HVAC unit that you replaced with your new [PIPE IN WHICHEVER WAS INSTALLED: AIR SOURCE HEAT PUMP, CENTRAL AIR CONDITIONER, OR GEOTHERMAL HEAT PUMP]?

Verbatim Response	Count (n=63)
10	5
10 year old	1
10 years	1
10 years roughly	1
11	1
12	1
12 years old	1
13	4
14	1
15	5
16	1
16 years old	1
17	2
17 or 18 years old	1
17+ years old.	1
18	5
18 years old	1
20	7
20 years old	1
20 years old.	1
21 or 22	1
23	2
24	1
25	1
26	1
29	1
30	1
30 years old and still working fine.	1
4	1
5	1
8	2
9.5	1
approx 15 years	1
approximately 20	1
Doesn't know	1
it was 2002 or 2003	1
probably 18 or 19	1

Verbatim Response	Count (n=63)
probably 7	1
unknown	1

Q12. [ASK IF CENTRAL AIR CONDITIONER, AIR SOURCE HEAT PUMP, OR GEOTHERMAL HEAT PUMP WAS INSTALLED] What motivated you to install an energy efficient system rather than a less efficient one that would use more energy?

Verbatim Response	Count (n=63)
Always looking for the best energy-efficiency regardless of what it is.	1
Because it was old.	1
Because of all the dang money we were spending on electricity. We were tired of paying so much on our energy bill.	1
Because the one I had was propane and propane is expensive.	1
Because what they offered. It was able to do what we need it to do.	1
cost	1
Cost	3
cost and better for the environment	1
cost and efficiency made sense	1
Cost savings	1
Cost savings.	1
cut cost	1
Fact that we were upgrading, might as well choose one that uses less energy.	1
Get a cheaper deal each month and one that would last longer.	1
Guess the main reason was the actual rebate.	1
I plan to stay in this house and I know I can recoup the cost through energy efficiency for both the AC and the Furnace.	1
I try to go with something that's more efficient.	1
It's what was recommended by the AC company.	1
Just having a better system, and having a cheaper cost system. I Don't know they put it one that was not what it should have been.	1
Just the energy efficiency.	1
Just to be more energy efficient.	1
Just to save money.	1
Long-Term Savings	1
Lower Bill, Better for Environment.	1
Lower bills and more consistent cooling.	1
makes sense for rverybody	1
Money!	1
Our bills were really really high.	1
Over the long-haul, end up being cheaper	1
price	1
Read through a lot of things about energy savings, Long term savings	1
save money	4
Save Money	1
save money and energy	1
save money and to help with the environment	1

Verbatim Response	Count (n=63)
Save Money, Save Energy, No brainer!	1
Save money.	1
Save on my energy bill.	1
Saving	1
saving on the cost	1
savings	1
savings and the rebate	1
smaller bills	1
Smarter Long Term Investment.	1
That's a no-brainer.	1
The cost and be cheaper, and better for environment and would've got the rebate.	1
The one that made the most sense to me.	1
the return on the investment is good	1
The sales person who came out told us the options we had.	1
the savings	1
to make the home more efficient	1
to save money	1
To save money and cut down our cost.	1
Try to be conservative, recycle things.	1
Try to do that on anything that has good energy star ratings, try to do that on all electrical appliances.	1
wanted it to be dependable.	1
We got a good deal on it.	1
We wanted to save energy.	1

Q13. [ASK IF CENTRAL AIR CONDITIONER, AIR SOURCE HEAT PUMP, OR GEOTHERMAL HEAT PUMP WAS INSTALLED] I'd like to know how you selected the specific make and model of the [PIPE IN WHICHEVER WAS INSTALLED: AIR SOURCE HEAT PUMP, CENTRAL AIR CONDITIONER, OR GEOTHERMAL HEAT PUMP] you purchased. Would you say that you chose it…

Response Option	Percent (n=63)
Yourself, based entirely on your own research?	24%
From a list of options provided by the contractor?	57%
Because it was the only option recommended by your contractor?	13%
Other	6%
Don’t know	0%
Refused	0%

Verbatim Other Response	Count (n=4)
Combination of my own research and the several options provided by contractor.	1
I just asked he contractor what the best unit to buy, he said it was the best one.	1
talked with a neighbor	1
Refused	1

Q14. [ASK IF CENTRAL AIR CONDITIONER, AIR SOURCE HEAT PUMP, OR GEOTHERMAL HEAT PUMP WAS INSTALLED] Suppose the contractor that installed your [PIPE IN WHICHEVER WAS INSTALLED: AIR SOURCE HEAT PUMP, CENTRAL AIR CONDITIONER, OR GEOTHERMAL HEAT PUMP] did not offer high efficiency [PIPE IN WHICHEVER WAS INSTALLED: AIR SOURCE HEAT PUMP, CENTRAL AIR CONDITIONER, OR GEOTHERMAL HEAT PUMP]s that qualify for Duke rebates. Which of the following is most likely what you would have done?

Response Option	Percent (n=63)
You would have installed the cheaper, less efficient, unit that would not have qualified for rebates if that's all your contractor offered, or	14%
You would have looked for a contractor that could install a rebate-qualified high efficiency unit	84%
Other	2%
Don’t know	0%
Refused	0%

Verbatim Other Response	Count (n=1)
Just kept old unit	1

Q15. [ASK IF SMART THERMOSTAT INSTALLED] Which of the following best describes the old thermostat that you replaced?

Response option	Percent (n=32)
Manual non-programmable thermostat,	50%
Programmable thermostat that does not communicate with your Wi-Fi network, or	47%
Programmable thermostat that communicates with your Wi-Fi network	3%
Other	0%
Don't know	0%
Refused	0%

Q16. [ASK IF SMART THERMOSTAT INSTALLED] Thinking of your old thermostat, at what temperature was that thermostat typically set in the winter?

Verbatim Response	Count (n=32)
55	1
60	1
64	1
65	3
66	1
67	1
68	2
69	1
69-70	1
69-71	1
70	8
72	6
74	1
75	1
76-77	1
Don't know	2

Q17. [ASK IF SMART THERMOSTAT INSTALLED] And what about your new wi-fi thermostat? At what temperature is the new thermostat typically set in the winter?

Verbatim Response	Count (n=32)
55	1
60	1
64	1
65	2
65-66	1
66	2
67	1
68	4
69	1
69-70	1
70	5
72	5
76-77	1
Don't know	6

Q18. [ASK IF SMART THERMOSTAT INSTALLED] If you used your old thermostat to control air conditioning, at what temperature was your old thermostat typically set in the summer for air conditioning?

Verbatim Response	Count (n=32)
68	2
70	5
71	1
71-72	1
72	5
73	1
74	7
75	2
76	1
76-77	1
77	1
78	2
Did not use my old thermostat to control air conditioning	1
Don't know	2

Q19. [ASK IF SMART THERMOSTAT INSTALLED AND Q18<>DID NOT USE MY OLD THERMOSTAT TO CONTROL AIR CONDITIONING] And what about your new wi-fi thermostat? At what temperature is the new thermostat typically set in the summer?

Verbatim Response	Count (n=31)
65	1
68-72	1
69-71	1
70	4
71-72	1
72	3
73	1
74	9
75	2
76	2
77	2
77-78	1
78	2
79	1

Q20. [ASK IF SMART THERMOSTAT INSTALLED] What motivated you to install a wi-fi enabled thermostat?

Verbatim Response	Count (n=32)
amazing convenience and different options	1
background as IT. to make it more comfortable	1
Better rebate with that.	1
came with the heat pump	1
came with the system	1
came with the unit	1
came with the unit	2
Came with the unit	1
Convenience and More Energy Efficient.	1
Convenient.	1
Future technology I guess.	1
I didn't know it was Wi-fi.	1
I don't have Wi-fi, I guess it just came with it.	1
I Don't know, I don't understand all these terms.	1
I honestly Don't know. It was an option and I took it. I like the idea of being able to control the temp with my phone.	1
I thought it would work better, as far as the programs and all that.	1
I wasn't interested in the Wi-fi part of it. Just that it was high efficiency. Just that it was programmable.	1
it came with the system	1
It came with the unit.	1
It was recommended by the contractor.	1
Just a suggestion through the installer.	1
keeping up with the times	1
Loved the fact that control it from anywhere in the house.	1
nothing	1
Really only one that was offered to us.	1
So that we could get it on the phone and turn it up when we're away.	1
That was just what came with it.	1
That way we could do it on vacation if we had to adjust anything. More accessible.	1
Things I've been reading about them. It's the only way to go	1
unsure	1
We didn't choose that, it was just the one that was recommended.	1

Q21. [ASK IF HVAC TIER=2 OR 3, AND QUALITY INSTALL REBATE WAS RECEIVED] Program records show that you received an additional $60 rebate for a quality installation from your contractor. This additional rebate was included on the VISA gift card you received in the mail from Duke Energy. This rebate was for additional work your contractor did to ensure that your new [PIPE IN WHICHEVER WAS INSTALLED: AIR SOURCE HEAT PUMP, CENTRAL AIR CONDITIONER, OR GEOTHERMAL HEAT PUMP] was installed to run as efficiently as possible. Prior to today, were you aware that you received a quality installation rebate?

Response Option	Percent (n=28)
Yes	25%
No	68%
Don't know	7%
Refused	0%

Q22. [ASK IF Q21=YES] Prior to talking with the contractor that installed the [PIPE IN WHICHEVER WAS INSTALLED: AIR SOURCE HEAT PUMP, CENTRAL AIR CONDITIONER, OR GEOTHERMAL HEAT PUMP], were you aware of quality installation practices that ensure the [PIPE IN WHICHEVER WAS INSTALLED: AIR SOURCE HEAT PUMP, CENTRAL AIR CONDITIONER, OR GEOTHERMAL HEAT PUMP] is installed to run as efficiently as possible?

Response Option	Percent (n=7)
Yes – I was already familiar with quality installation practices	71%
No – I was not previously familiar with quality installation practices	29%
Don't know	0%
Refused	0%

Q23. [ASK IF Q21=YES] Did your contractor let you choose between a standard installation service that was not eligible for the additional rebate and a quality installation that would get you an additional rebate from Duke Energy?

Response Option	Percent (n=7)
Yes – they let me choose between standard and quality	86%
No – they did not give me a choice	14%
Don't know	0%
Refused	0%

Q24. [ASK IF HEAT PUMP WATER HEATER WAS INSTALLED] Which of the following best describes the condition of the previous water heater that you replaced?

Response Option	Percent (n=1)
It was broken or malfunctioning	0%
It was getting old, or	100%
It was in good working condition	0%
Other	0%
Don't know	0%
Refused	0%

Q25. [ASK IF HEAT PUMP WATER HEATER WAS INSTALLED] Approximately, how many years old was the previous water heater that you replaced with your new heat pump water heater?

Verbatim Response	Count (n=1)
16	1

Q26. [ASK IF HEAT PUMP WATER HEATER WAS INSTALLED] Where did you install your new heat pump water heater?

Response Option	Percent (n=1)
Garage	0%
Basement	0%
Closet	0%
Laundry Room	0%
Other	100%
Don't know	0%
Refused	0%

Verbatim Other Response	Count (n=1)
Crawl space	1

Q27. [ASK IF HEAT PUMP WATER HEATER WAS INSTALLED AND IF Q26 <> DON'T KNOW OR REFUSED] Do you use your HVAC system to heat and cool the [PIPE IN ANSWER FROM Q26] where the heat pump water heater is located?

Response Option	Percent (n=1)
Yes	0%
No	100%
Other	0%
Don't know	0%
Refused	0%

Q28. [ASK IF AIR SOURCE HEAT PUMP OR GEOTHERMAL HEAT PUMP WAS NOT INSTALLED] What type of system do you use to heat your home?

Response Option	Percent (n=43)*
Heat pump	30%
Electric baseboard heaters	2%
Natural gas furnace	74%
Plug in space heaters	0%
Cadet wall heaters	0%
Other	7%
Don't know	0%
Refused	0%

* Multiple responses allowed.

Verbatim Other Response	Count (n=3)
forced air	1
Geothermal	1
Propane heater.	1

Q29. [ASK IF CENTRAL AIR CONDITIONER, AIR SOURCE HEAT PUMP, OR GEOTHERMAL HEAT PUMP WAS NOT INSTALLED] What type of system do you use to cool your home?

Response Option	Percent (n=10)*
Central air conditioner	60%
Heat pump	30%
Room/window air conditioner	0%
Evaporative/swamp cooler	0%
Other	10%
Don't know	0%
Refused	0%
I do not have any air conditioning in my home	0%

* Multiple responses allowed.

Verbatim Other Response	Count (n=1)
Geothermal	1

Q30. [ASK IF HEAT PUMP WATER HEATER WAS INSTALLED] What motivated you to install an energy efficient water heater rather than a less efficient one that would use more energy?

Verbatim Response	Count (n=1)
switched to solar and it would save more money	1

Q31. [ASK IF DUCT SEALING OR ATTIC INSULATION WAS PERFORMED/INSTALLED] What motivated you to [IF DUCT SEALING WAS PERFORMED, READ: repair your ductwork; IF ATTIC INSULATION WAS INSTALLED, READ: add insulation to your attic]?

Duct Sealing

Verbatim Response	Count (n=1)
needed to be done	1

Attic Insulation

Verbatim Response	Count (n=5)
need it	1
needed to be done	1
power bills were way high and wanted to lower the bills. A/C was really old	1
the bills were too high	1
Well, I knew it was thin. I just took the opportunity to handle it	1

Q32. [ASK IF POOL PUMP WAS INSTALLED] What motivated you to install an ENERGY STAR pool pump?

Verbatim Response	Count (n=4)
efficiency savings and the rebate from Duke help with the decision	1
Just doing the math on it and having a single speed pump as opposed to an energy efficient pump.	1
lower the bills. recommended by the pool company	1
the rebate	1

Q33. [ASK IF POOL PUMP WAS INSTALLED] Approximately what month do you first open your pool for the season?

Response Option	Percent (n=4)
January	0%
February	0%
March	0%
April	0%
May	50%
June	0%
July	0%
August	0%
September	0%
October	0%
November	0%
December	0%
Other	50%
Don’t know	0%
Refused	0%

Verbatim Response	Count (n=2)
Year round	2

Q34. [ASK IF POOL PUMP WAS INSTALLED] Approximately what month do you close your pool for the season?

Response Option	Percent (n=4)
January	0%
February	0%
March	0%
April	0%
May	0%
June	0%
July	0%
August	0%
September	0%
October	25%
November	25%
December	0%
Other	25%
Don't know	0%
Refused	25%

Verbatim Response	Count (n=1)
Year round	1

I'd like to ask a few questions about what you most likely would have done had you not received assistance from Duke Energy Carolinas for the [LIST ALL MEASURES].

Q35. [ASK IF THEY INSTALLED: CENTRAL AIR CONDITIONER, AIR SOURCE HEAT PUMP OR GEOTHERMAL HEAT PUMP] Which of the following statements best describes the actions you would have taken if Duke Energy Carolinas rebates and information were not available:

Response Option	Percent (n=63)
Would not have installed the [Measure]	0%
Would have postponed the purchase for at least one year	10%
Would have bought a less expensive or less energy efficient system	13%
Would have bought the exact same high efficiency [Measure], and paid the full cost yourself	71%
Other	2%
Don't know	3%
Refused	0%

Verbatim Other Response	Count (n=1)
Would have just kept shopping around.	1

Q36. [ASK IF Q35=WOULD HAVE BOUGHT A LESS EXPENSIVE OR LESS ENERGY EFFICIENT HEATING ND COOLING SYSTEM] You said you would have bought a/an [PIPE IN WHICHEVER WAS INSTALLED: CENTRAL AIR CONDITIONER, AIR SOURCE HEAT PUMP OR GEOTHERMAL HEAT PUMP] that was less expensive or less energy efficient if you had not received the rebate or information from Duke Energy Carolinas. Do you think it is more likely that you would have bought equipment that was…?

Response Option	Percent (n=8)
Almost as efficient as the one you bought, or	75%
Significantly less efficient than the one you bought	25%
Don't know	0%
Refused	0%

Q37. [ASK IF Q21=YES] If Duke Energy did not offer the additional rebate for quality installation services, would you have allowed your contractor to perform a quality installation service that ensured the [PIPE IN WHICHEVER WAS INSTALLED: CENTRAL AIR CONDITIONER, AIR SOURCE HEAT PUMP OR GEOTHERMAL HEAT PUMP] was performing as efficiently as possible, even if it meant you had to pay more money?

Response Option	Percent (n=7)
Yes – I would have allowed quality installation if no rebates were available	71%
No – I would not have allowed quality installation if no rebates were available	14%
Other	0%
Don't know	0%
Refused	14%

Q38. [ASK IF Q21=YES] If Duke Energy did not offer the additional rebate for quality installation services and your contractor did not offer you the service in their initial bid, would you have demanded that your contractor perform a quality installation service that ensured the [PIPE IN WHICHEVER WAS INSTALLED: CENTRAL AIR CONDITIONER, AIR SOURCE HEAT PUMP OR GEOTHERMAL HEAT PUMP] was performing as efficiently as possible, even if it meant you had to pay more money?

Response Option	Percent (n=7)
Yes – I would have demanded quality installation if no rebates were available and my contractor did not initially offer it	86%
No – I would not have demanded quality installation if no rebates were available and my contractor did not initially offer it	0%
Other	0%
Don't know	0%
Refused	14%

Q39. [ASK IF THEY INSTALLED: SMART THERMOSTAT] Now we want to ask you about the smart thermostat you got with your [PIPE IN WHICHEVER WAS INSTALLED: CENTRAL AIR CONDITIONER, AIR SOURCE HEAT PUMP OR GEOTHERMAL HEAT PUMP]. Which of the following statements best describes the actions you would have taken if Duke Energy Carolinas rebates and information were not available:

Response Option	Percent (n=32)
Would not have purchased the Wi-Fi enabled thermostat	9%
Would have postponed the purchase of the Wi-Fi thermostat for at least one year	0%
Would have installed some other type of thermostat, or	38%
Would have bought the exact same Wi-Fi thermostat, and paid the full cost yourself	44%
Other	6%
Don't know	3%
Refused	0%

Verbatim Other Response	Count (n=2)
I would have got whatever thermostat that went with the system	1
This was the only option. Only model available for the HVAC we purchased.	1

Q40. [ASK IF Q39=WOULD HAVE INSTALLED SOME OTHER TYPE OF THERMOSTAT] What type of thermostat would you have bought then? Would you have bought…

Response Option	Percent (n=12)
A manual non-programmable thermostat, or	17%
A programmable thermostat that is not Wi-Fi enabled	83%
Other	0%
Don't know	0%
Refused	0%

Q41. [ASK IF THEY INSTALLED: HEAT PUMP WATER HEATER] Which of the following statements best describes the actions you would have taken if Duke Energy Carolinas rebates and information were not available:

Response Option	Count (n=1)
Would not have replaced my water heater	0%
Would have postponed the water heater replacement for at least one year	0%
Would have bought a less expensive or less energy efficient water heater, or	0%
Would have bought the exact same high efficiency Heat Pump Water Heater, and paid the full cost yourself	100%
Other	0%
Don't know	0%
Refused	0%

[ASK IF Q41=WOULD HAVE BOUGHT A LESS EXPENSIVE OR LESS ENERGY EFFICIENT WATER HEATER]

Q42. You said you would have bought a water heater that was less expensive or less energy efficient if you had not received the rebate or information from Duke Energy Carolinas Do you think it is more likely that you would have bought equipment that was…?

Response Option	Percent (n=1)
Not asked*	100%

* No respondents met display logic condition.

[ASK IF THEY UPGRADED: ATTIC INSULATION]

Q43. Which of the following statements best describes the actions you would have taken if Duke Energy Carolinas rebates and information were not available:

Response Option	Count (n=5)
Would not have done the attic insulation	0%
Put off doing attic insulation for at least one year	60%
Would have added less insulation	0%
Would have done the exact same upgrade, and paid the full cost yourself	40%
Other	0%
Don't know	0%
Refused	0%

[ASK IF Q43=WOULD HAVE ADDED LESS INSULATION]

Q44. You said you would have added less insulation if you had not received the rebate or information from Duke Energy Carolinas. How much less insulation would you have purchased? Please answer in a percentage, such as "50% less."

Response Option	Percent (n=5)
Not asked*	100%

* No respondents met display logic condition.

[ASK IF THEY DID DUCT SEALING]

Q45. Which of the following statements best describes the actions you would have taken if Duke Energy Carolinas rebates and information were not available:

Response Option	Count (n=2)
Would not have had ducts sealed or repaired	0%
Would have postponed the work for at least one year	50%
Would have had the exact same work done, and paid the full cost yourself	50%
Other	0%
Don't know	0%
Refused	0%

[ASK IF THEY INSTALLED A VARIABLE SPEED POOL PUMP]

Q46. Which of the following statements best describes the actions you would have taken if Duke Energy Carolinas rebates and information were not available:

Response Option	Count (n=4)
Would not have installed or replaced the pool pump	0%
Would have postponed the installation of the pool pump for at least one year	0%
Would have bought a less expensive or less energy efficient pool pump, or	50%
Would have had the exact same high efficiency pool pump installed, and paid the full cost yourself	50%
Other	0%
Don't know	0%
Refused	0%

[ASK ALL]

Q47. 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 purchase the [MEASURE]? How influential was…

Air-Source Heat Pump

Response Option	Percent (n=29)			
	Rebate	Information or advertisements from Duke Energy Carolinas, including their website	Recommendation from your contractor	Other
0	7%	34%	0%	0%
1	0%	3%	0%	0%
2	0%	3%	0%	0%
3	3%	7%	0%	0%
4	3%	0%	0%	0%
5	24%	7%	3%	0%
6	7%	7%	7%	0%
7	7%	7%	7%	3%
8	10%	14%	17%	0%
9	14%	3%	21%	3%
10	24%	10%	45%	10%
Don’t know	0%	3%	0%	41%
Refused	0%	0%	0%	41%

Verbatim Other Descriptor	Count (n=5)
A neighbor that used the contractor.	1
dependability and expected maintenance on the unit	1
I needed to fix the old one and they weren't sure if that would help. They said I needed a new one.	1
It was a good perk or a bonus to know I was getting a rebate.	1
Online and different sources giving information.	1

Attic Insulation and Air Sealing

Response Option	Percent (n=5)			
	Rebate	Information or advertisements from Duke Energy Carolinas, including their website	Recommendation from your contractor	Other
0	0%	20%	40%	0%
1	0%	0%	0%	0%
2	0%	0%	0%	0%
3	0%	0%	0%	0%
4	0%	0%	0%	0%
5	0%	20%	0%	0%
6	40%	0%	0%	0%
7	20%	20%	0%	0%
8	20%	20%	0%	0%
9	0%	0%	0%	0%
10	20%	20%	40%	0%
Don't know	0%	0%	20%	100%
Refused	0%	0%	0%	0%

Central Air Conditioner

Response Option	Percent (n=33)			
	Rebate	Information or advertisements from Duke Energy Carolinas, including their website	Recommendation from your contractor	Other
0	9%	24%	0%	3%
1	0%	6%	0%	0%
2	3%	6%	0%	0%
3	6%	9%	0%	0%
4	3%	3%	0%	0%
5	21%	6%	6%	0%
6	9%	12%	0%	0%
7	15%	6%	9%	0%
8	15%	12%	21%	3%
9	6%	3%	18%	6%
10	9%	9%	45%	15%
Don't know	3%	3%	0%	55%
Refused	0%	0%	0%	18%

Verbatim Other Descriptor	Count (n=9)
Fact that the system broke and were looking to replace it.	1
How energy efficient it was.	1
Needing it to replace before the summer.	1
Neighbor got same information	1
no	1
Past experience with the product.	1
Rebate from contractor as well as Duke Energy.	1
Very high monthly bills and the age of our old unit.	1
We needed a new AC.	1

Duct Sealing

Response Option	Percent (n=1)			
	Rebate	Information or advertisements from Duke Energy Carolinas, including their website	Recommendation from your contractor	Other
0	0%	0%	0%	0%
1	0%	0%	0%	0%
2	0%	0%	0%	0%
3	0%	0%	0%	0%
4	0%	0%	0%	0%
5	100%	0%	0%	0%
6	0%	0%	0%	0%
7	0%	0%	0%	0%
8	0%	0%	0%	0%
9	0%	0%	0%	0%
10	0%	100%	100%	0%
Don’t know	0%	0%	0%	100%
Refused	0%	0%	0%	0%

Geothermal Heat Pump

Response Option	Percent (n=1)			
	Rebate	Information or advertisements from Duke Energy Carolinas, including their website	Recommendation from your contractor	Other
0	0%	100%	0%	0%
1	0%	0%	0%	0%
2	0%	0%	0%	0%
3	0%	0%	0%	0%
4	0%	0%	0%	0%
5	100%	0%	0%	0%
6	0%	0%	0%	0%
7	0%	0%	0%	0%
8	0%	0%	0%	0%
9	0%	0%	0%	0%
10	0%	0%	100%	0%
Don't know	0%	0%	0%	100%
Refused	0%	0%	0%	0%

Smart Thermostat

Response Option	Percent (n=32)			
	Rebate	Information or advertisements from Duke Energy Carolinas including their website	Recommendation from your contractor	Other
0	9%	34%	3%	0%
1	0%	0%	0%	0%
2	3%	6%	0%	0%
3	6%	6%	0%	0%
4	0%	0%	0%	0%
5	25%	6%	13%	0%
6	9%	6%	6%	0%
7	6%	19%	6%	0%
8	9%	6%	25%	3%
9	6%	3%	13%	0%
10	22%	3%	34%	0%
Don't know	3%	9%	0%	69%
Refused	0%	0%	0%	28%

Verbatim Other Descriptor	Count (n=1)
Research and information	1

Pool Pump

Response Option	Percent (n=4)			
	Rebate	Information or advertisements from Duke Energy Carolinas, including their website	Recommendation from your contractor	Other
0	0%	50%	25%	0%
1	25%	0%	0%	0%
2	0%	0%	0%	0%
3	0%	0%	0%	0%
4	0%	0%	0%	0%
5	0%	25%	0%	0%
6	0%	0%	0%	0%
7	25%	25%	0%	0%
8	50%	0%	25%	0%
9	0%	0%	0%	0%
10	0%	0%	50%	25%
Don't know	0%	0%	0%	75%
Refused	0%	0%	0%	0%

Verbatim Other Descriptor	Count (n=1)
Research on different pool pumps.	1

Heat Pump Water Heater

Response Option	Percent (n=1)			
	Rebate	Information or advertisements from Duke Energy Carolinas, including their website	Recommendation from your contractor	Other
0	0%	100%	0%	0%
1	0%	0%	0%	0%
2	0%	0%	0%	0%
3	100%	0%	0%	0%
4	0%	0%	0%	0%
5	0%	0%	0%	0%
6	0%	0%	100%	0%
7	0%	0%	0%	0%
8	0%	0%	0%	0%
9	0%	0%	0%	0%
10	0%	0%	0%	0%
Don't know	0%	0%	0%	100%
Refused	0%	0%	0%	0%

Quality Installation

Response Option	Percent (n=28)			
	Rebate	Information or advertisements from Duke Energy Carolinas, including their website	Recommendation from your contractor	Other
0	21%	39%	7%	4%
1	0%	4%	0%	0%
2	4%	0%	0%	0%
3	4%	4%	0%	0%
4	0%	4%	0%	0%
5	7%	4%	0%	0%
6	7%	4%	4%	0%
7	0%	0%	7%	0%
8	18%	11%	21%	4%
9	11%	11%	14%	0%
10	21%	11%	36%	11%
Don't know	7%	11%	11%	50%
Refused	0%	0%	0%	32%

Verbatim Other Descriptor	Count (n=4)
Brand	1
High efficiency.	1
Inefficiency of the unit and the high cost for Duke Energy with the unit.	1
Word of Mouth.	1

Q48. Since receiving your rebate from Duke Energy Carolinas for the [LIST ALL SMART $AVER MEASURES], have you purchased any other products or services to help save energy in your home?

Response Option	Percent (n=73)
Yes	30%
No	70%
Don't know	0%
Refused	0%

[If Q48=YES]

Q49. What products have you purchased and installed to help save energy in your home?

Response Option	Percent (n=22)
Bought energy efficient appliances	14%
Moved into an ENERGY STAR home [VERIFY: Duke Energy still your gas or electricity utility?]	0%
Bought efficient heating or cooling equipment	14%
Bought efficient windows	0%
Added insulation	5%
Sealed air leaks in windows, walls, or doors	5%
Bought LEDs	45%
Bought CFLs	5%
Installed an energy efficient water heater	14%
Sealed or insulated ducts	0%
None - no other actions taken	0%
Other	14%
Don't know	0%
Refused	0%

Verbatim Other Responses	Count (n=3)
Dish washer	1
High efficiency pool pump	1
solar panels	1

Q50. [ASK IF Q49<>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?

Response Option	Percent (n=22)*
Bought energy efficient appliances	0%
Moved into an ENERGY STAR home	0%
Bought efficient heating or cooling equipment	9%
Bought efficient windows	0%
Bought additional insulation	0%
Sealed air leaks in windows, walls, or doors	0%
Sealed or insulated ducts	0%
Bought LEDs	14%
Bought CFLs	5%
Installed an energy efficient water heater	0%
Other	9%
I did not get any Duke rebates	59%
Don't know	9%
Refused	0%

* Multiple responses allowed.

Q51. [ASK IF ANY ITEM IN Q49 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 [LIST ALL SMART $AVER MEASURES] rebate have on your decision to…

Buy Efficient Heating or Cooling Equipment

Response Option	Percent (n=3)
0	67%
1	0%
2	0%
3	0%
4	0%
5	33%
6	0%
7	0%
8	0%
9	0%
10	0%
Don't know	0%
Refused	0%

Buy Additional Insulation

Response Option	Percent (n=1)
0	100%
1	0%
2	0%
3	0%
4	0%
5	0%
6	0%
7	0%
8	0%
9	0%
10	0%
Don't know	0%
Refused	0%

Sealed air leaks in windows, walls, or doors

Response Option	Percent (n=1)
0	100%
1	0%
2	0%
3	0%
4	0%
5	0%
6	0%
7	0%
8	0%
9	0%
10	0%
Don't know	0%
Refused	0%

Buy LEDs

Response Option	Percent (n=10)
0	70%
1	0%
2	0%
3	0%
4	0%
5	10%
6	0%
7	0%
8	10%
9	0%
10	0%
Don't know	10%
Refused	0%

Buy CFLs

Response Option	Percent (n=1)
0	100%
1	0%
2	0%
3	0%
4	0%
5	0%
6	0%
7	0%
8	0%
9	0%
10	0%
Don't know	0%
Refused	0%

Installed an energy efficient water heater

Response Option	Percent (n=3)
0	67%
1	0%
2	0%
3	0%
4	0%
5	0%
6	0%
7	33%
8	0%
9	0%
10	0%
Don't know	0%
Refused	0%

Other

Response Option	Percent (n=3)
0	33%
1	0%
2	0%
3	0%
4	0%
5	33%
6	0%
7	0%
8	0%
9	0%
10	33%
Don't know	0%
Refused	0%

Q52. [ASK IF Q49.1 IS SELECTED AND Q51.1<>0 – NOT AT ALL INFLUENTIAL] What kinds of appliance(s) did you buy?

Response Option	Percent (n=1)
Refrigerator	0%
Stand-alone Freezer	0%
Dishwasher	0%
Clothes washer	0%
Clothes dryer	0%
Oven	0%
Microwave	0%
Other	100%
Don’t know	0%
Refused	0%

Verbatim Other Response	Count (n=1)
TV	1

Q53. [ASK IF Q52<>DON’T KNOW OR REFUSED] Was the [INSERT Q52 RESPONSE] an ENERGY STAR or high-efficiency model?

Television

Response Option	Percent (n=1)
Yes	100%
No	0%
Don’t know	0%
Refused	0%

Q54. [ASK IF Q52=CLOTHES DRYER] Does the new clothes dryer use natural gas?

Response Option	Percent (n=1)
Not asked*	100%

* No respondents met display logic condition.

Q55. [ASK IF Q49 BOUGHT EFFICIENT HEATING OR COOLING EQUIPMENT IS SELECTED AND Q51 FOR EFFICIENT HEATING OR COOLING EQUIPMENT > 0] What type of heating or cooling equipment did you buy?

Response Option	Percent (n=1)
Central air conditioner	100%
Window/room air conditioner unit	0%
Air source heat pump	0%
Geothermal heat pump	0%
Boiler	0%
Furnace	0%
Wi-Fi enabled thermostat	0%
Wall air conditioner unit	0%
Other	0%
Don't know	0%
Refused	0%

[ASK IF Q55=BOILER OR FURNACE]

Q56. Does the new [INSERT Q55 RESPONSE] use natural gas?

Response Option	Percent (n=1)
Not asked*	100%

* No respondents met display logic condition.

[ASK IF Q55<>DON'T KNOW OR REFUSED]

Q57. Was the [INSERT Q55 RESPONSE] an ENERGY STAR or high-efficiency model?

Central Air Conditioner

Response Option	Percent (n=1)
Yes	100%
No	0%
Don't know	0%
Refused	0%

Q58. [ASK IF Q49 BOUGHT EFFICIENT WINDOWS IS SELECTED AND Q51 WINDOWS > 0] How many windows did you install?

Response Option	Percent (n=22)
Not asked*	100%

* No respondents met display logic condition.

Q59. [ASK IF Q49 ATTIC INSULATION IS SELECTED AND Q51 FOR ATTIC INSULATION > 0] Did you add insulation to your attic, walls, or below the floor?

Response Option	Percent (n=1)
Not asked*	100%

* No respondents met display logic condition.

Q60. [ASK IF Q59<>DON'T KNOW OR REFUSED] Approximately what proportion of the [ITEM MENTIONED IN Q59] space did you add insulation?

Response Option	Percent (n=1)
Not asked*	100%

* No respondents met display logic condition.

Q61. [ASK IF Q49 LEDS IS SELECTED AND Q51 FOR LEDS > 0] How many of LEDs did you install in your property?

Verbatim Other Response	Count (n=3)
12	1
27	1
Don't know	1

Q62. [ASK IF Q49 CFLS IS SELECTED AND Q51 FOR CFLS > 0] How many of CFLs did you install in your property?

Response Option	Percent (n=1)
Not asked*	100%

* No respondents met display logic condition.

Q63. [ASK IF Q49 WATER HEATER IS SELECTED AND Q51 FOR WATER HEATER > 0] Does the new water heater use natural gas?

Response Option	Percent (n=1)
Yes	100%
No	0%
Don't know	0%
Refused	0%

Q64. [ASK IF Q49 WATER HEATER IS SELECTED AND Q51 FOR WATER HEATER > 0] Which of the following water heaters did you purchase? [read list]

Response Option	Percent (n=1)
A traditional water heater with a large tank that holds the hot water	100%
A tankless water heater that provides hot water on demand	0%
A solar water heater	0%
Other, please specify:	0%
Don’t know	0%
Refused	0%

Q65. [ASK IF Q49 WATER HEATER IS SELECTED AND Q51 FOR WATER HEATER > 0] Is the new water heater an ENERGY STAR model?

Response Option	Percent (n=1)
Yes	100%
No	0%
Don’t know	0%
Refused	0%

Q66. Where do you typically search for information on how to save energy in your property?

Response Option	Percent (n=73)*
Online - read reviews about products	48%
Go to utility website	25%
Read my utility information - it has tips on how to save energy	29%
Go to the store and talk to salespeople	1%
Look for ENERGY STAR logo on products	3%
Other, please specify:	5%
N/A - I don't typically search for information on how to save energy in my home/property	22%
Don’t know	1%
Refused	0%

* Multiple responses allowed.

Verbatim Other Response	Count (n=4)
Google	1
Information from Electrician, builders and contractors	1
Someone from Duke Energy gave information once.	1
talk to neighbors	1

Q67. Using a 0 to 10 scale where 0 means "very dissatisfied," 5 means "neither satisfied nor dissatisfied," and 10 means "very satisfied," how satisfied were you with the rebate amount for [LAST PROJECT]?

Response Option	Percent (n=73)
0	1%
1	0%
2	0%
3	0%
4	3%
5	10%
6	5%
7	1%
8	11%
9	8%
10	59%
N/A	0%
Don't know	1%
Refused	0%

Q68. How satisfied were you with how long it took to receive that rebate? Please use a 0 to 10 scale where 0 means "very dissatisfied," 5 means "neither satisfied nor dissatisfied," and 10 means "very satisfied."

Response Option	Percent (n=73)
0	0%
1	0%
2	0%
3	3%
4	1%
5	8%
6	3%
7	3%
8	15%
9	12%
10	51%
N/A	1%
Don't know	3%
Refused	0%

Q69. [ASK IF Q68 IS SOMEWHAT TO VERY DISSATISFIED] Why did you give that rating?

Verbatim Response	Count (n=3)
It's strange the contractor said it would take 4-5 weeks to get the rebate. It took much longer to get it. Contractor said it would be a rebate check, we got a visa gift card. Would be nice to just get a credit on our power bill because that's what we're using the visa gift card for. We would prefer a check or that amount of credit applied to our duke energy bill.	1
Took over a month and a half or two months I think.	1
Waiting for my rebate, three weeks go buy and I called. They dont know what I'm talking about. I was on the phone for 3 hours talking with 4 employees of duke. When I got the rebate it came from Raleigh and I told a supervisor, Williams, that she needed to inform her customer service about the rebates and about the Smart Saver Program.	1

Q70. In the course of participating in the Duke Smart $aver program, how often did you contact Duke Energy or program staff with questions?

Response Option	Percent (n=73)
Never	75%
Once	15%
2 or 3 times	8%
4 or more times	1%
Don’t know	0%
Refused	0%

Q71. [ASK IF Q70=MORE THAN NEVER] How did you contact them?

Response Option	Percent (n=18)*
Phone	100%
Email	6%
Fax	0%
Letter	0%
In person	0%
Don’t know	0%
Refused	0%

* Multiple responses allowed.

Q72. [ASK IF Q70 > NEVER] Using that same scale, how satisfied were you with these communications? [*INTERVIEWER NOTE: REPEAT SCALE IF NECESSARY: Please use a 0 to 10 scale where 0 means “very dissatisfied,” 5 means “neither satisfied nor dissatisfied,” and 10 means “very satisfied.”*]

Response Option	Percent (n=18)
0	6%
1	0%
2	0%
3	0%
4	0%
5	11%
6	0%
7	11%
8	11%
9	11%
10	50%
N/A	0%
Don't know	0%
Refused	0%

Q73. [ASK IF Q72 IS SOMEWHAT TO VERY DISSATISFIED] Why did you give that rating?

Verbatim Response	Count (n=1)
Because nobody knew about the Smart Saver Program. It's called communication with your employees. It's like NOBODY knew what I was talking about.	1

Q74. Have you noticed any savings on your electric bill since the [LAST PROJECT] project?

Response Option	Percent (n=73)
Yes, they noticed savings	62%
No - They looked, but did not notice any savings	10%
No - They looked, but it is too soon to tell	4%
They didn't look	14%
Don't know	11%
Refused	0%

Q74_B. [ASK IF Q74=YES, NOTICED SAVINGS] How satisfied are you with any savings you noticed on your electric bill since the [LAST PROJECT] project?

Response Option	Percent (n=45)
0	0%
1	0%
2	0%
3	0%
4	0%
5	0%
6	0%
7	7%
8	29%
9	4%
10	58%
Don't know	0%
Refused	2%

Q75. How satisfied are you with your [LAST PROJECT] project?

Response Option	Percent (n=73)
0	0%
1	0%
2	0%
3	1%
4	0%
5	1%
6	1%
7	4%
8	11%
9	12%
10	68%
Don't know	0%
Refused	0%

Q76. [ASK IF Q75 IS SOMEWHAT TO VERY DISSATISFIED] Why did you give that rating?

Verbatim Response	Count (n=1)
the company was not good	100%

Q77. How satisfied are you with the interaction with the contractors who worked on the [LAST PROJECT] project?

Response Option	Percent (n=73)
0	0%
1	0%
2	1%
3	0%
4	1%
5	0%
6	0%
7	3%
8	7%
9	16%
10	71%
Don’t know	0%
Refused	0%

Q78. [ASK IF Q77 IS SOMEWHAT TO VERY DISSATISFIED] Why did you give that rating?

Verbatim Response	Count (n=2)
The company couldn't keep the same workers on the job. They made mistakes. They didn't do it right and had to be called back out. They caused damage to the house and made cracks in the and knocked some of the siding off.	1
They did make me aware of the replacement for the duct work rebate and after I called them about it they told me the inspection would be more than the rebate amount and refused to do it.	1

Q79. How satisfied you are with Duke Energy’s overall performance as your electricity supplier?

Response Option	Percent (n=73)
0	0%
1	0%
2	0%
3	1%
4	0%
5	0%
6	4%
7	12%
8	12%
9	14%
10	56%
N/A	0%
Don't know	0%
Refused	0%

Q80. Would you say that your participation in Duke Energy Carolinas Smart $aver Rebate Program has had a positive effect, a negative effect, or no effect on your overall satisfaction with Duke Energy?

Response Option	Percent (n=73)
Negative effect	1%
No effect	15%
Positive effect	84%
Don't know	0%
Refused	0%

Q81. Finally, if you were rating your overall satisfaction with the Duke Energy Smart $aver Rebate Program, would you say you were Very Satisfied, Somewhat Satisfied, Neither Satisfied nor Dissatisfied, Somewhat Dissatisfied, or Very Dissatisfied?

Response Option	Percent (n=73)
Very satisfied	77%
Somewhat satisfied	16%
Neither satisfied nor dissatisfied	3%
Somewhat dissatisfied	4%
Very dissatisfied	0%
Don't know	0%
Refused	0%

Q82. [ASK IF Q81=SOMEWHAT OR VERY DISSATISFIED] Why do you give that rating?

Verbatim Response	Count (n=3)
Because I am very disappointed in the Thermostat. It's memory is having a negative impact on the environment of my house. I would prefer just a straight programmable thermostat like I had before, but I'd like to be able to control it through Wi-fi. I would like someone to call me about my thermostat.	1
Because there should be a higher value than $300 when you buy an entire system. I put in a heat pump with propane backup and an AC to the tune of $14,000 and I think a $300 rebate is kinda cheap. In Delaware, the rebate I got was around $2,500 for a complete Heater/AC system.	1
I don't want the prepaid debit card.	1

Q83. Do you have any suggestions to improve Duke Energy's Smart $aver Program?

Verbatim Response	Count (n=25)
As long as the contractors notify the customer about the rebates. I guess DUKE sends news letters so that customers know about the rebates. TV and Commercials don’t help me at all. I do get letters from DUKE that I read once in a while, like the light bulb rebates.	1
Communication with their employees. So when someone calls with questions about the rebate, they know who to send them to.	1
Depending on the price and size of unit, that you are going to have a furnace or ac or both, or even a water heater, even of those major appliances, it would be nice to have a price range and base that cost on the rebate you received.	1
get more rebates and give a better LED	1
get with the Acosta Vendors about the additional savings and don't give them the option to participate or not	1
getting more information out to the public	1
give out rebate checks instead of Cards	1
Guess if anything, the only thing I would recommend is to have a pamphlet of some type about LED Bulbs, and other things.	1
Just keep doing what they're doing. If products come along, the rebate was a great idea. It was an expensive project and the rebate helped out a lot.	
That will encourage people to get a newer system.	1
Keep the good work up	1
larger rebate	1
Make it easier for their contractors to submit the info needed to get the rebate and if an error is made let the contractors resubmit it	1
make it more available to people	1
make more noticeable	1
make the surveys shorter	1
More availability of auditors or assessors in the western part of North Carolina. I'm in the mountains next to TN.	1
Only thing would suggest on Monthly Bill, what the temperature was during the time. Like to see something that would allow him to evaluate how efficient my unit is.	1
show where the big rebates are	1
that they check out who they recommend	1
The contractor was not aware Duke was not sending checks. Better information between contractors and Duke Energy.	1
The only thing that was a surprise that the rebate card more like a credit card, and not a cash rebate. The card itself could not be exchanged for cash.	1
They could promote a little bit more. If you don't go online, I Don’t know, just think they could a little bit more promotion on it.	1
Think when I bought my washer and dryer, never heard if she qualified for anything with it.	1
Wasn't aware of a lot of it because they were just moving into the area. Just was	1

Verbatim Response	Count (n=25)
following the advice of our contractors. Smart Thermostat was replaced with a different type of thermostat after.	
Don't know	1

Q84. Do you live at this residence where the work was performed?

Response Option	Percent (n=73)
Yes	95%
No	4%
Refused	1%

Q85. [ASK IF Q84=NO] Are you a property manager or an owner of the residence where the work was performed?

Response Option	Percent (n=3)
Owner	67%
Property manager	33%
Other	0%
Refused	0%

Q86. [ASK IF Q84=YES] Do you own or rent this residence?

Response Option	Percent (n=69)
Own	100%
Rent	0%
Don't know	0%
Refused	0%

Q87. [ASK IF Q86=RENT] Do you pay your own electric bill or is it included in your rent

Response Option	Percent (n=69)
Not asked*	100%

* No respondents met display logic condition.

Q88. Approximately when was this residence first built?

Response Option	Percent (n=73)
Before 1960	12%
1960-1969	7%
1970-1979	16%
1980-1989	11%
1990-1999	29%
2000-2005	14%
2006-2010	8%
2011-2015	0%
2016-2017	0%
Don't know	3%
Refused	0%

Q89. Excluding unfinished basements, how many square feet is the residence?

Verbatim Response	Count (n=73)
1000	2
1100	1
1200	2
1260	1
1380	1
1400	2
1425	1
1490	1
1500	2
1553	1
1576	1
1590	1
1600	3
1700	2
1800	4
1898	1
1900	1
1950	1
1990	1
2000	4
2150	1
2200	1

Verbatim Response	Count (n=73)
2300	2
2384	1
2400	1
2500	2
2600	1
2700	6
2800	1
2900	1
3000	4
3100	2
3200	2
3500	1
3600	1
3700	1
4000	2
4800	1
5000	1
5800	1
6000	1
Don't know	6

Q90. [ASK IF Q89=DON'T KNOW OR REFUSED] Would you estimate the residence is about:

Response Option	Percent (n=6)
less than 1,000 sq. ft.	0%
1,001-2,000 sq. ft.	17%
2,001-3,000 sq. ft.	33%
3,001-4,000 sq. ft.	17%
4,001-5,000 sq. ft.	0%
Greater than 5,000 sq. ft.	0%
Don't know	33%
Refused	0%

Q91. Does the primary heating system at the residence run on…

Response Option	Percent (n=73)
Electricity	53%
Natural Gas (not propane)	41%
Liquid propane gas	4%
Fuel Oil	0%
Wood	0%
Or something else	1%
Don't know	0%
Refused	0%

Verbatim Response	Count (n=1)
Geothermal	1

Q92. I'm going to read a list of income ranges. Please stop me when I reach the range that includes your annual household income.

Response Option	Percent (n=73)
Less than $25,000	4%
$25,000 to less than $50,000	8%
$50,000 to less than $75,000	14%
$75,000 to less than $100,000	11%
$100,000 to less than $150,000	14%
$150,000 or more	16%
Don't know	3%
Refused	30%

Appendix E Trade Ally Survey Results

This section reports the results from each question in the trade ally 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.

S1. How many locations does your company have?

Response Option	Percent (n=58)
One	85%
Two	15%
Three	0%
Four	0%
Five	0%
More than five	0%
Don’t know	0%

S2. [Ask if S1 > ONE] We would like to talk today about the projects that were sold and installed by the [PIPE IN ADDRESS] location. Are you able to speak to the work associated with that location?

Response Option	Percent (n=9)
Yes	100%
No	0%
Don’t know	0%
Refused	0%

S3. Does your firm primarily focus on new construction or existing home projects?

Response Option	Percent (n=58)
Existing Homes	78%
New construction projects	22%
Don’t know	0%
Refused	0%

Q1. How did you first hear about Duke Energy Smart $aver rebate offers for HVAC equipment, variable speed pool pumps, insulation, and duct sealing?

Response Option	Percent (n=58)
Word-of-mouth (co-worker, another contractor)	14%
Duke Energy website	2%
Duke Energy program representative	26%
TV/Radio/Newspaper/Billboard Ad	0%
Event	2%
Other	17%
Don't know	40%
Refused	0%

Verbatim Other Response	Count (n=10)
were already filing them when I started	1
Through Pump Manufactures	1
They were doing it when I started 3 years ago.	1
The boss got us enrolled	1
Sense we've been in business	1
Followed in from an old program.	1
Email or letter. It's been so long ago.	1
Been doing it sense employee first started.	1
Already in place when I started working here	1
Already in place over a year when I started	1

Q2. Since August 2016, about what proportion of the [MEASURE] projects that your company did in Duke territory would have qualified for a Duke rebate?

Central Air Conditioners

Verbatim Responses	Count (n=42)
0%	1
10%	1
20%	2
25%	3
30%	2
33%	1
40%	5
50%	7
60%	1
70%	2
80%	6
85%	4
90%	2
99.9%	1
100%	2
Don't know	2

Air Source Heat Pumps

Verbatim Responses	Count (n=46)
0%	1
10%	3
20%	1
25%	4
30%	1
33%	1
40%	3
50%	7
60%	1
70%	1
75%	2
80%	6
85%	3
90%	4
100%	6
Don't know	2

Attic Insulation & Air Sealing

Verbatim Responses	Count (n=5)
5%	1
10%	1
15%	1
25%	1
40%	1

Pool Pumps

Verbatim Responses	Count (n=5)
50%	1
80%	1
85%	1
95%	1
Don't know	1

Heat Pump Water Heater

Verbatim Responses	Count (n=3)
15%	1
40%	1
100%	1

Geothermal Heat Pump

Verbatim Responses	Count (n=4)
0%	1
90%	1
100%	1
Don't know	1

Duct Sealing

Verbatim Responses	Count (n=4)
25%	1
40%	1
100%	1
Don't know	1

Q3. And since August 2016, what percent of all your Duke rebate qualified [MEASURE] projects did you actually apply for a rebate? [If needed: Your best estimate is fine.]

Central Air Conditioners

Verbatim Responses	Count (n=42)
0%	1
5%	1
30%	2
50%	1
55%	1
70%	1
80%	2
90%	3
100%	28
Don't know	2

Air Source Heat Pumps

Verbatim Responses	Count (n=46)
0%	1
5%	2
20%	1
25%	1
50%	1
70%	1
85%	1
90%	4
95%	2
100%	29
Don't know	3

Attic Insulation and Air Sealing

Verbatim Responses	Count (n=5)
15%	1
80%	1
95%	1
100%	2

Pool Pumps

Verbatim Responses	Count (n=5)
100%	4
Don't know	1

Heat Pump Water Heaters

Verbatim Responses	Count (n=3)
10%	1
100%	2

Geothermal Heat Pumps

Verbatim Responses	Count (n=4)
0%	1
100%	2
Don't know	1

Duct Sealing

Verbatim Responses	Count (n=4)
10%	1
15%	1
95%	1
100%	1

Q4. About what proportion of your rebate qualifying [MEASURE] customers specifically requested the [MEASURE] on their own and were not influenced by your recommendation?

Central Air Conditioners

Verbatim Responses	Count (n=42)
0%	10
2%	1
5%	5
10%	1
15%	1
20%	2
25%	1
40%	1
50%	3
60%	1
75%	1
80%	1
85%	1
90%	2
100%	2
Don't know	9

Air Source Heat Pumps

Verbatim Responses	Count (n=46)
0%	9
1%	1
2%	2
3%	1
5%	2
10%	3
15%	1
20%	2
25%	2
30%	1
50%	5
75%	2
80%	1
90%	1
100%	2
Don't know	10

Attic Insulation and Air Sealing

Verbatim Responses	Count (n=5)
25%	1
50%	2
75%	1
80%	1

Pool Pumps

Verbatim Responses	Count (n=5)
0%	1
2%	1
50%	1
80%	1
Don't know	1

Heat Pump Water Heaters

Verbatim Responses	Count (n=3)
0%	2
10%	1

Geothermal Heat Pumps

Verbatim Responses	Count (n=4)
0%	1
50%	1
60%	1
Don't know	1

Duct Sealing

Verbatim Responses	Count (n=4)
25%	1
30%	1
60%	1
75%	1

Q5. Using a 0 to 10 scale, where 0 is “not at all influential” and 10 is “extremely influential,” how much influence has the Duke program had on your business practice of recommending rebate qualifying [MEASURE] to your customers?

Central Air Conditioners

Response Option	Percent (n=42)
0	5%
1	5%
2	0%
3	2%
4	5%
5	19%
6	17%
7	10%
8	7%
9	10%
10	12%
Don't know	10%
Refused	0%

Air Source Heat Pumps

Response Option	Percent (n=46)
0	9%
1	4%
2	2%
3	2%
4	0%
5	17%
6	11%
7	9%
8	13%
9	4%
10	13%
Don't know	15%
Refused	0%

Attic Insulation and Air Sealing

Response Option	Percent (n=5)
0	0%
1	0%
2	0%
3	0%
4	40%
5	60%
6	0%
7	0%
8	0%
9	0%
10	0%
Don’t know	0%
Refused	0%

Pool Pumps

Response Option	Percent (n=5)
0	0%
1	0%
2	20%
3	0%
4	0%
5	0%
6	20%
7	0%
8	20%
9	20%
10	20%
Don’t know	0%
Refused	0%

Heat Pump Water Heaters

Response Option	Percent (n=3)
0	33%
1	0%
2	0%
3	33%
4	0%
5	33%
6	0%
7	0%
8	0%
9	0%
10	0%
Don't know	0%
Refused	0%

Geothermal Heat Pumps

Response Option	Percent (n=4)
0	0%
1	0%
2	25%
3	0%
4	0%
5	25%
6	0%
7	0%
8	0%
9	0%
10	0%
Don't know	50%
Refused	0%

Duct Sealing

Response Option	Percent (n=4)
0	25%
1	0%
2	0%
3	0%
4	25%
5	25%
6	0%
7	25%
8	0%
9	0%
10	0%
Don’t know	0%
Refused	0%

Q6. [ASK IF CONTRACTOR INSTALLED AIR SOURCE HEAT PUMPS, CENTRAL AIR CONDITIONERS, GEOTHERMAL HEAT PUMPS, POOL PUMPS, OR WATER HEATERS] Thinking back to before you were involved in the Duke Energy program, how often did you recommend higher efficiency equipment that uses less energy than standard models to your customers? Would you say none of the time, some of the time, most of the time, or every time?

Response Option	Percent (n=53)
None of the time	2%
Some of the time	15%
Most of the time	43%
Every time	34%
Not applicable – I’ve been involved with the Duke program since starting in the industry/this company	4%
Don't know	2%
Refused	0%

Q7. [ASK IF CONTRACTOR INSTALLED AIR SOURCE HEAT PUMPS, CENTRAL AIR CONDITIONERS, GEOTHERMAL HEAT PUMPS, POOL PUMPS, OR WATER HEATERS] And what about now?

Response Option	Percent (n=53)
None of the time	0%
Some of the time	7%
Most of the time	36%
Every time	55%
Not applicable – I've been involved with the Duke program since starting in the industry/this company	0%
Don't know	2%
Refused	0%

Q8. Would you say your knowledge of energy efficient products and services has increased, decreased, or stayed about the same since you became involved with the program?

Response Option	Percent (n=58)
Increased	62%
Stayed about the same	36%
Decreased	0%
Don't know	2%
Refused	0%

Q9. [Ask if Q8=INCREASED] Using a 0 to 10 scale, where 0 is "not at all influential" and 10 is "extremely influential," how much influence has the Duke Energy program had on your increased knowledge of energy efficient products and services?

Response Option	Percent (n=36)
0	3%
1	0%
2	8%
3	6%
4	0%
5	14%
6	3%
7	25%
8	17%
9	8%
10	14%
Don't know	3%
Refused	0%

Q10. [ASK IF CONTRACTOR INSTALLED CENTRAL AIR CONDITIONERS] How much more difficult or easier is it to sell 15 SEER central air conditioners now that the code is 14 SEER?

Response Option	Percent (n=41)
Much more difficult	0%
Somewhat more difficult	15%
No different	51%
Somewhat easier	15%
Much easier	12%
Don't sell SEER 15	2%
Don't know	5%
Refused	0%

Q11. [ASK IF CONTRACTOR INSTALLED AIR SOURCE HEAT PUMPS] How much more difficult or easier is it to sell 15 SEER HVAC heat pumps now that the code is 14 SEER?

Response Option	Percent (n=47)
Much more difficult	2%
Somewhat more difficult	11%
No different	36%
Somewhat easier	28%
Much easier	13%
Don't sell SEER 15	2%
Don't know	8%
Refused	0%

Q12. [ASK IF CONTRACTOR INSTALLED SMART THERMOSTATS] As you may know, Duke Energy offers a rebate for smart thermostats. By how much did your installations of smart thermostats increase since Duke began offering smart thermostat rebates? Would you say…

Response Option	Percent (n=41)
No increase	27%
Some increase	44%
A large increase	27%
Don't know	2%
Refused	0%

Q13. [ASK IF CONTRACTOR INSTALLED CENTRAL AIR CONDITIONERS] Thinking of these higher incentives, did those help you sell more central air-conditioners that are 15 SEER or higher?

Response Option	Percent (n=41)
Yes	71%
No	24%
Don't know	5%
Refused	0%

Q14. [ASK IF CONTRACTOR INSTALLED AIR SOURCE HEAT PUMPS] Thinking of these higher incentives, did those help you sell more air-source heat pumps that are 15 SEER or higher?

Response Option	Percent (n=47)
Yes	70%
No	21%
Don't know	9%
Refused	0%

Q15. [ASK IF CONTRACTOR PERFORMED QUALITY INSTALLS] As you may know, Duke Energy recently added "quality install" requirements for installations of heat pumps and air conditioners? Were you already doing all the techniques on the quality install check list prior to Duke requiring them?

Response Option	Percent (n=28)
Yes	79%
No	18%
Don't know	3%
Refused	0%

Q16. [Ask if Q15=YES] Prior to using Duke's quality install checklist, did you have a system in place to document that your installers were following these same quality install techniques?

Response Option	Percent (n=22)
Yes	86%
No	14%
Don't know	0%
Refused	0%

Q17. [Ask if Q15=YES] Prior to using Duke's quality install checklist, what specific quality install techniques were you using? Please be as specific as possible.

Response Option	Percent (n=22)
Airflow/static pressure	36%
Blower door tests	18%
System capacity	18%
Condenser measurements	18%
Enthalpy conversion	14%
Duct blaster tests	9%
System CFM	5%
Other	36%
Don't Know	36%

Q18. [ASK IF CONTRACTOR PERFORMED QUALITY INSTALLS ON TIER 2 OR 3 HVAC MEASURES] Do you charge your customers extra on the invoice for completing the quality installation rebate checklist on tier 2 and tier 3 HVAC jobs?

Response Option	Percent (n=23)
Yes	4%
No	91%
Don’t know	4%
Refused	0%

Q19. [ASK IF CONTRACTOR PERFORMED QUALITY INSTALLS] Do you have any suggestions on how Duke Energy could improve the quality install requirements?

Response Option	Percent (n=28)
Yes	71%
Don’t know	25%
Refused	4%

Verbatim Responses	Count (n=20)
When it first came out. There was only one check sheet for all seasons. I like that there are two sheets for different seasons. It's easier to get the rebate processed.	1
They should be more lenient. Sometimes we get apps back from customers and everything has to match with dates. It's difficult to get anything through that's 14 SEER.	1
the only thing I have is when I submit the info for the customer and them it takes 8-10 weeks to process. If there is a problem with the application you contact the Customer and us. If you contacted us before customer so we could fix the issue	1
Stop doing the quality install checklist. That's at the engineering level, not the installation level. I am a licensed contractor, most guys don't have their own license. The processing center is slow, inaccurate, and not very efficient. Go back to the one page fax or email that completed the process, Also, when the contractor got paid.	1
No. the software is kinda difficult when uploading and putting information in. So much that we don't enter the quality pledge. We've ran into too many cases where it was not completed correctly.	1
No	1
Make it easier. Do away with the enthalpy requirements.	1
make it easier. Add more options to the checklist and prorating if added	1
Make it easier to enter into the computer. If you don't want to offer a rebate for a 14 SEER, don't offer a rebate for a quality installation for that 14 SEER.	1
it would be nice to have guidelines where we would need to be so we know if the customer qualifies	1
It is tedious to scan all the documents and put them in. It's a lot of time to input the data to Duke. It would be nicer if the guys in the field could upload the information and get it done there. Like an app on their phone. We do the quality install on each rebate qualified installation, regardless if it's required or not. It would be good if Duke paid the contractor for the extra work and time we are putting into the rebates.	1
If there was an app where it could all be submitted	1
I believe the amount of time it takes to complete the rebates... We don't get anything as a company. It's difficult when you have 200 installs. It's time consuming and the company doesn't want to hire a specific person for just rebates. The existing employees have to be used to process the rebates. Very time consuming.	1
Get rid of it. It takes too long. It's a 2 1/2 hour process.	1
Do away with it. Minimize paperwork sense we're, in essence, working for free for the customer. The less paperwork we're doing for free, the more we would be willing to push the higher efficiency stuff. It would be good to compensate the contractors because we are doing a lot of excessive work and paperwork.	1
Do away with it. It would stop the install department from extra work. It has slowed down the install department. It has really made a hardship on the installation department. If you would give the contractor something for all the extra work.	1
Biggest problem we're having is when we start a house without AC for several days. The AC load is so big inside the house, when you let it run an hour, we will run 160% to 190% capacity above, the requirement is between 80%-180%. To not charge them extra, it's not feasible for us to come back to check it again because duke doesn't give the contractor any incentive. It's a losing proposition. A lot of times we don't do the QI test on the 15 and 16 SEER because we've had the numbers being so wild with the crazy temperatures. We lose the money on a service call if we go	1

Verbatim Responses	Count (n=20)
back out there to get the customer an extra $75.	
Have people who understand the industry creating the process. change the time frame when the inspection needs to be done.	1
Give the dealers something back like you used to	1
Give the company that's doing the rebate some of the rebate. Do away with the quality checklist because it's time consuming. Scanning, putting it in the document, submitting it, attaching is very time consuming.	1

Q20. What energy efficient products, technologies, or services should be added to the Duke Energy rebate program?

Response Option	Percent (n=58)*
Modulating furnaces	2%
Heat recovery ventilation systems	2%
Boilers	0%
Electronically commutated motor furnaces	3%
Tankless water heaters	5%
humidifiers	2%
air handlers	3%
Windows	2%
Doors	0%
No others should be added	38%
Other	34%
Don't Know	21%
Refused	0%

Verbatim Other Responses	Count (n=20)
Wifi Thermostat ONLY (without HVAC)	1
Tier rating for SEER. Keep it easy	1
Solar and the geothermal split system	1
Solar	1
Solar	1
Pool water heaters	1
Package products, because most don't achieve the HSPF minimum requirements even though they're 14 or 15 SEER	1
More Programmable Thermostats, Air filtration systems	1
More models of Smart Thermostats	1
mini split heat pumps	1
Lighting for the pools	1
LED swimming pool lights	1
Energy Audits, figure out what they (Duke) need on Smart Installations	1
Drop the 14 SEER and make efficiency requirements higher	1
Douglas Mini-Splits	1
dealer incentive	1
Crawl Space Insulation	1
being able to upload copies of the bill so the info matches	1
Attic Fan/Ventilation	1
14 SEER without Quality Installation requirement.	1

Q21. Have you attended any orientations or training events from DEC?

Response Option	Percent (n=58)
Yes	33%
No	67%
Don't know	0%
Refused	0%

Q22. [Ask if Q21=YES] What topics were covered in the last Duke Energy event you attended?

Verbatim Responses	Count (n=19)
When the new changes at the first of the year, when they implemented the new rebate system	1
What was being input on the QI	1
What qualified for the rebates	1
Trade ally portal	1
The rebates. How to file them and how much trouble we were having to get through	1
The new rebate system	1
the administrative part of the website	1
Submitting the rebate. Went over the new program.	1
New programs coming out, what is required, educational programs, courses.	1
Just about rebates	1
It was about the Duke rebates and how they worked and how things were processed. And how the system was supposed to operate.	1
Hydraulics and energy consumption on pool pumps.	1
heat pump water heater. went over other programs	1
General Knowledge and Best sales Practices.	1
Duct testing and heat pump training.	1
Duct sealing	1
Duct sealing	1
Different qualifying equipment and the general proceeds on how it works	1
Don’t know	1

Q23. [Ask if Q21=YES] On a scale from 0 to 10, how helpful was the last Duke Energy event you attended?

Response Option	Percent (n=19)
0	0%
1	5%
2	0%
3	0%
4	5%
5	16%
6	0%
7	10%
8	16%
9	0%
10	47%
Don't know	0%
Refused	0%

Q24. What types of training, if any, would you be interested in receiving from Duke Energy?

Response Option	Percent (n=58)
Offered verbatim response	47%
Don’t know	50%
Refused	3%

Verbatim Responses	Count (n=27)
Would like training on all the programs. I would feel like a good training on BPI. It would be good to have air flow training	1
When you update things it would be nice to have a class that would go over that. Also if it is rejected I would like a class going over what we can do.	1
We would like training on going over the different systems	1
Training about the rebates. To make sure we're updated.	1
Thermal class and refresher courses where a contractor could come in and talk	1
Selling points about rebates. Other rebates related to HVAC industry. Up-and-Coming rebate information.	1
Sales for efficiency purposes. Benefits for customer. Technology that is out on Variable speed pump equipment	1
Requirements	1
Open to anything	1
Nothing	1
None	1
None	1
None	1
Net Zero Information.	1
More training on energy efficiency.	1
More paperwork information and more information about the energy efficient products.	1
More of the rebate information. Some of the rebates are very vague.	1
More information for the contractors about when there will be changes and how to adapt to those changes.	1
Love to know when the programs change. Have notification there.	1
Installation or service.	1
How to market the program better	1
Equipment selection. Class for installers to perform the quality install checklist.	1
Energy efficiency and how they would like the process done. What duke energy is looking for in an installation	1
Energy consumption training	1
Duct sealing certification	1
Any and all. The past training has been good.	1
Any communication. When you started this up, we had 2 meetings to understand the rebate processing. There's a LOT that cannot be done on the contractors end.	1

Q25. On a scale from 0 to 10, how interested would you be in a training course on how to effectively sell high efficiency equipment to your customers if it was offered by the program?

Response Option	Percent (n=58)
0	19%
1	9%
2	5%
3	5%
4	2%
5	14%
6	2%
7	15%
8	5%
9	3%
10	17%
Don't know	3%
Refused	0%

Q26. How often do your customers ask about the Duke Energy rebates before you've had the chance to bring them up? Would you say…

Response Option	Percent (n=58)
Never	2%
Rarely	36%
Occasionally	41%
Frequently	14%
Always	0%
Don't know	7%
Refused	0%

Q27. Since Duke transitioned to the online application system in April 2016, how frequently have you experienced problems or frustrations with the rebate application process? Would you say…

Response Option	Percent (n=58)
Never	3%
Rarely	24%
Occasionally	33%
Frequently	28%
Always	10%
Don't know	2%
Refused	0%

Q28. [Ask if Q27=RARELY, OCCASIONALLY, FREQUENTLY, OR ALWAYS] What types of problems or frustrations did you experience?

Verbatim Responses	Count (n=55)
A couple quality installation checklist issues with the 14 SEER. This may have been an issue on our end.	1
Don't know	1
When we first started, getting everyone on the same page was difficult.	1
The online process is frustrating. It's easier now. To get the documentation in the thermostat is where we've struggled. Not being able to go in and attach information later. Info was entered, but it was frustrating you could not edit it.	1
Rebates declining for no reason	1
Right now, I have 4 that say "attention required" and I have to call a Duke representative, Aaron, to find out exactly what's wrong. It just tells me "Invalid reason, the smart thermostat number cannot be validated". Before, when I would send in a thermostat, we were just using the complete model number. Now we need to enter it "exactly as they appear on the product list". It's a simple fix, but I need to look twice. "The quality installation did not meet program requirements". If they would tell exactly why something would not qualify so I did not have to contact Aaron, it would save a lot of time. I think we should not have to call someone for every reason it says "Attention Required". Give us a reason on your website WHY the rebate needs attention. Contractor contacts Aaron at Duke, then Aaron has to contact Blackhawk. Then Blackhawn needs to respond to Aaron and he can get back to me. This takes a lot longer than it should. We should be working directly with the vendor that gives the rebates. I have a rebate we did 5/10/17 that says "Attention required-Rejected-The account holder name does not match the application name" Glen vs Glenn was the only issue with this. I sent the account number in with this application but it was still rejected because of an extra N in the customer name Glen.	1
Always kicking out application saying not enough info.	1
Submitting the rebates	1
Rejections are bring sent out before resolved. sounds like there may be a glitch	1
There were issues with model numbers and rebates not going through. Customers call back to ask where there rebates were. Some issue with Insurance not updating.	1
It is very frustrating to start with. then you need to resubmit. So you resubmit and it wouldn't do anything. If you click resubmit, it would not work, so you had to start over. It's gotten better, but the old system was easier in some ways. I like the online, without paper.	1
If it declined the application, or said it had an issue, it never told you exactly what the issue was. Simple things like the name on the paperwork being husband and wife, and the bill was just the husband would not work. I misspelled an address once, and I had to call Duke instead of just seeing what the problem was and fixing it online.	1
Feedback information from Duke as far as status and delay of rebates.	1
All the attachments are time consuming.	1
Mostly with Quality Checks and 14 SEER.	1
It needs attention and we call Duke and find out we're not able to complete the rebate on our side. Calling duke takes a lot of time. Tracking. Status Updates on OLD rebates that still say "in review". The system went down for a week or two for a manual update, we should get a warning if you're going to update the system.	1
It's the inability to change something that's been input within 48 hours. As soon as I enter a rebate, I might get a call from an installer to change the name or address. I cannot change the info for 48 hours. Once I update something, regarding MY Account, it takes days or up to a week before I can	1

Verbatim Responses	Count (n=55)
submit rebates or receive referrals. It's like someone needs to approve it at Duke. This mostly affects referrals.	
When you switch from winter to spring it would take a while to get the different checklist up	1
Applications were not showing up	1
The last one I had needed a qualified thermostat. When I called customer service, they said it was qualified, but the price was messed up in the system. Customer service fixed it for me. It usually has to do with the thermostat.	1
The process was a little slow at times.	1
Sending in/Scanning info that is sent and has never been received. Lost information.	1
Wouldn't accept the application and said it wasn't right.	1
No guide to the quality installation process. It requires certain things that you need to test at certain times of the year according to outdoor temp. No guide to CFM, I just have to guess the numbers because Duke doesn't tell where to test the CFMs	1
Confusion with the system would enter info and it would say it was unfinished	1
Just when I'd go back to track the process, it'd say it would need more paperwork. When I was uploading, I had to split up the files instead of processing it all in one file.	1
Homeowners were getting things sent saying there was an issue with the rebate.	1
Mostly just the beginning, when we were trying to switch the program over. When it was initially setup, you could get an extra rebate for a certain thermostat. The system kept asking me to submit specific paperwork for a thermostat that the customer did not order.	1
Started before 2016. Thought we'd never get the first few rebates to process.	1
Never got an email about an issue	1
Just once I could not get the site to load. Just an issue with Cookies and Cache, I think. Once it didn't accept a serial number and kicked back an application.	1
Incorrect info provided and having trouble getting it corrected.	1
It kept adding more requirements that you had to have on the paperwork that needed to qualify. Kept adding things that need to be on there. The paper that we'd fax was much easier than using the scanner. When you're limited on time, having to scan and then upload to a computer is frustrating. The address and names are VERY PICKY and would kick back, then we need to call to address the issue. It should be more human friendly, simpler to find discrepancies. Husbands/Wives is the same thing. If the husband on the power bill and both are on the rebate, it will kick it back and we have to call to get an answer on the issue. We don't get paid for the rebate. There's no incentive for the contractor, but we need to do them because the customer wants the savings.	1
When you try to track a rebate, part of its missing. Information is wrong. Double rebates, duplicated applications, then the application would be gone. Would not take specific wording. Have a hard time uploading documents, as well.	1
You have to upload everything, scan it, put the QI think and invoice together and then upload it.	1
Losing paperwork on Dukes side. Denying claims that were properly done. Paying out less than what the claim was. Long time delays between completing a claim and finding out if it was accepted. Many frustrated customers who didn't receive their claim that they were supposed to, in a timely fashion. It's really hard to have customers angry with us when it was Duke who was being slow on the process.	1

Verbatim Responses	Count (n=55)
After you fill out the application, it takes about 30 days to get it back. Sometimes I would end up duplicating the application because it would take so long. It's very unforgiving because it will cancel the rebate after 60 days. 1 or 2 things that are not entered will reject the rebate.	1
When things get denied that should not be denied. They get kicked out and when I call Duke, they say "that shouldn't have been denied" and then approve. Whenever I call, except one, it has been erroneously denied. The one I messed up on was because the homeowners name was different from the account holder.	1
Estimation work. Insurance certificates. Quality Checklist, filling out and submitting it. If the customer didn't want the WiFi thermostat, Duke would reject the refund. The communication back and forth is horrible. The ease of uploading files is not user friendly.	1
When we first started using it was rejecting a lot of applications saying need more details. When we called, I was told it was a glitch	1
It took Duke 2 months to create our profile so we could submit rebates. It took 6-7 phone calls and 1 to management to realize the IT issue was on Dukes end. I had to get special approval to get expired rebates approved because of the IT issue. I had several customers upset because of the delay on their rebates.	1
The initial onset is having a hard time adding a new user. The referral program is harder to navigate	1
Giving me errors when accessing the application	1
What we see says the application was accepted and paid but the customer gets a letter saying it's rejected.	1
I didn't know the server was going to be down for updates. I didn't get any notification. When I was trying to do my billing, I could not.	1
Having to submit new paperwork for things that were already submitted in the online portal.	1
First, it was in a foreign language. Asking for additional paperwork that I had already submitted. On follow-up, it takes forever for DUKE to respond to the submission, it gets too close to the deadline. They say it takes 24 hours, but in reality, it takes 2-3 weeks to get back.	1
Getting the whole program setup. It kept getting pushed back. But now it works just fine.	1
There was quite a while where I had to go to different browsers to get it to work because I couldn't stay logged in.	1
Would not let me submit all the way. Would say it was submitted but would not be in my portfolio	1
The portal and when you scan a document they want you to send in.	1
Names not matching on the accounts	1
Worst part is that it would not go anywhere. I called and was told to use Google Chrome instead of Internet Explorer. As long as I get my numbers in right, it works smooth.	1
Can't enter the information. System is down.	1
Thermostat model number cannot be validated.	1

Q29. [Ask if Q27=RARELY, OCCASIONALLY, FREQUENTLY, OR ALWAYS] Overall, have these problems persisted or gotten better over time?

Response Option	Percent (n=55)
Persisted	24%
Gotten somewhat better	58%
Have been completely resolved at this point	18%
Don't know	0%
Refused	0%

Q30. Do you have any suggestions on how Duke Energy could improve the rebate application process?

Response Option	Percent (n=58)
Verbatim response offered	62%
Don’t know	33%
Refused	5%

Verbatim Responses	Count (n=36)
Allow things to be attached or addendum to be done.	1
Have better training for your employees	1
Let the home owner do the application like they did before. Keep the contractors out of it because we are not compensated for any of these rebates. Let the homeowner fill out the information. Contractor can give the homeowner the Model, Serial number, and invoice and the home owner can send in the information.	1
If it is duke energy or duke progress it should be the same application.	1
Makes the system faster	1
Make the customers file instead of the contractor.	1
Not have to do a checklist for 14 SEER. Add more programmable thermostats that are applicable. The duct work should be a little more lenient.	1
Keep the questions on the rebate application worded similarly, or more simple. E.X. There's a question on the pool pump application regarding the horsepower on Old and New that is hard to determine which line I am supposed to put the information for the old pump or the information on the new pump.	1
Pay the company that's submitting it. Go back to the rebate for the contractor.	1
More leniency on quality checklist being submitted with applications.	1
Give it back to the customer. Let the customer submit it. Contractor puts the equipment on the form and hands the form to the customer. Take it out of the hands of the contractor.	1
Make it more human friendly. Make the requirements be more user friendly and not kick back because simple things like the names don't match exactly.	1
Maybe try to get the software to work better.	1
If you'd stop the QI, it would speed it up a whole lot. I've scanned over 50 rebates this morning, double checked everything, and it takes a LOT OF TIME.	1
Go back to the old way that worked. Go back to the one page that was faxed in with the customer name, number, what was installed and an AHRI number. The claims department is the problem. All the things that are requested are way over the top and at the engineering level, not the installer level.	1
It asks what the total cost is, this is not necessary information, then you ask for the price of the thermostat, but we price our jobs as a whole. There are redundant and ridiculous questions on the online forms. They don't have anything to do with efficiency or SEER rating.	1
Streamline the process. There's 4 documents I have to scan and that takes a lot of time.	1
Less paperwork. Be more user friendly. Less work for the contractor. Compensate the contractor for the extra time. Go back to faxing the paperwork.	1
wait until the application process has been looked at before rejecting the application	1
If the customer doesn't qualify, would be nice to be able to delete the application.	1
Scanning and uploading was hard at first. I've gotten used to it and it works just fine when the scanner works.	1
Pay the contractors some of the rebate as well. Especially because we have to do the rebate paperwork. We interact if the customer has any questions.	1
It would be great if there were some kind of check system where it would validate the info immediately	1

Verbatim Responses	Count (n=36)
Give the contractor back the incentive	1
Easier use of the portal.	1
Giving the option to upload sheets electronically	1
Shorter Forms.	1
When there's a problem (like checking a box or if something doesn't match) with an application, make it easier to fix it online instead of calling Duke to get it corrected.	1
I feel that it's redundant to answer electronic questions in the applications. They're the same as the paperwork. That's not good time management to be required to submit them on paper AND be required to submit them electronically within the application online.	1
Making an app where you can scan the equipment tags. automatically input AHRI	1
If it is just A/c only make it so it bypasses the indoor info	1
Be more detailed in what the rebate is for. Not so many choices.	1
The whole Visa Gift Card Card Thing. I've had 1/2 of my customers contact us again wondering when they filed, when they'll get the rebate, when it was completed, when it was sent. I have to have the customer give Duke a call to get the information because it's been over 6 weeks.	1
Downsizing what needs to be submitted	1
Make it faster. Faster turn around for processing and rejecting (if applicable). Respond back to the contractor when a customer gets paid a rebate. Make it more clear to the contractor when, and how much, a rebate has been paid to the customer.	1
They could go back to giving the contractor money as well as the customer.	1

Q31. Do you have any suggestions on how Duke Energy could improve the project inspection process?

Response Option	Percent (n=58)
Verbatim response offered	19%
Don't know	76%
Refused	5%

Verbatim Responses	Count (n=11)
It requires a lot of data and man hours and it isn't worth it to do it	1
No	1
None	1
No	1
None	1
I don't think I've ever had them inspect one of my project.	1
Stop it! We usually do a load calculation to make sure we're welling the right equipment. If the SEER rating is there, the ECM motor is there, there's no need for an inspection.	1
None	1
I think most of it works really well. It would be nice if there was an auto-fill option on the website.	1
I don't know too much about it.	1
Nope	1

Q32. Please rate the extent to which you are satisfied with the following aspects of the program using a 0 to 10 scale. How satisfied are you with:

Program training offered by Duke

Response Option	Percent (n=58)
0	3%
1	2%
2	2%
3	2%
4	5%
5	24%
6	7%
7	5%
8	10%
9	3%
10	17%
N/A	12%
Don't know	3%
Refused	0%

Your Duke energy trade ally representative

Response Option	Percent (n=58)
0	10%
1	12%
2	0%
3	0%
4	0%
5	29%
6	3%
7	9%
8	7%
9	5%
10	34%
N/A	5%
Don’t know	7%
Refused	0%

The program website for customers

Response Option	Percent (n=58)
0	2%
1	0%
2	2%
3	%
4	2%
5	10%
6	2%
7	12%
8	3%
9	3%
10	10%
N/A	19%
Don’t know	34%
Refused	0%

The trade ally portal applications tracking system

Response Option	Percent (n=58)
0	3%
1	3%
2	3%
3	0%
4	9%
5	5%
6	5%
7	14%
8	19%
9	12%
10	26%
N/A	0%
Don't know	0%
Refused	0%

The marketing of the program

Response Option	Percent (n=58)
0	2%
1	0%
2	0%
3	3%
4	3%
5	29%
6	5%
7	10%
8	12%
9	2%
10	17%
N/A	7%
Don't know	9%
Refused	0%

The incentive applications submission process

Response Option	Percent (n=58)
0	3%
1	2%
2	3%
3	3%
4	9%
5	10%
6	5%
7	16%
8	16%
9	7%
10	22%
N/A	2%
Don't know	2%
Refused	0%

The selection of eligible equipment and services

Response Option	Percent (n=58)
0	0%
1	2%
2	0%
3	0%
4	3%
5	14%
6	9%
7	12%
8	24%
9	5%
10	29%
N/A	0%
Don't know	2%
Refused	0%

The overall program

Response Option	Percent (n=58)
0	2%
1	3%
2	5%
3	2%
4	0%
5	9%
6	5%
7	19%
8	21%
9	14%
10	21%
N/A	0%
Don't know	0%
Refused	0%

Q33. [ASK IF ANY ANSWER IN Q32 < 5] Please explain why you were dissatisfied with:

Program training offered by Duke Energy

Verbatim Response	Count (n=8)
I don't know that I've been offered training for it. I don't know what you're talking about.	1
Didn't even know it was there.	1
Never had any offered to me. I didn't know it existed.	1
I have never received any training or any notification about it.	1
See previous answer.	1
There isn't really any training. I haven't received any training.	1
They haven't provided any within the last year.	1
Don't know	1

Your Duke energy trade ally representative

Verbatim Response	Count (n=7)
I don't know who he is. Lack of communication with me or our company.	1
Didn't even know that I had one.	1
They don't return calls or emails. I'm not sure who it is because it changes regularly.	1
That's the company that handles the rebates. It's awful now. The feedback, website, insurance is difficult.	1
Never had any contact with him. Emailed 3 times and got no response.	1
I haven't from anybody	1
Not aware they exist.	1

The program website for customers

Verbatim Response	Count (n=3)
Don't know	1
Don't know	1
Ease of use.	1

The trade ally portal applications tracking system

Verbatim Response	Count (n=11)
Slow Process	
It's not up to date. It doesn't report. It's just not accurate.	
Mostly because of the length of time to get a response if it was been approved. If it does not get approved, it's been 30 days and gets entirely rejected after 60 days.	
It's just not correct. I have to call in a lot and then they put the application on hold for days. I end up calling a lot.	
Ease of use. Not user friendly. Upload hard.	
If it's in review, it won't tell you why. I don't know why applications pass or fail.	
Don't know	
Some have gotten to be taken care of, but mostly never gets updated on my end.	
needs more information. It needs when the customer has been paid	
It takes a little while to upload, if there is information put in wrong, can't go back and fix it. Doesn't tell me what is wrong all the time, most the time I have to call. The way it wants us to fix things is silly.	
It doesn't show that the customer has been paid their rebate. The rebates just seem to disappear and I am unable to find that they've been processed.	

The marketing of the program

Verbatim Response	Count (n=5)
Don't know	1
Don't know	1
Never seen any marketing.	1
hasn't really looked at the website	1
I've never seen marketing as a customer or a contractor.	1

The incentive applications submission process

Verbatim Response	Count (n=12)
Don't know	1
It just doesn't take what I put in there.	1
I can change that to a 5 of 10. The submission is fine, the requirements are inadequate.	1
Slow Process. Inaccurate. False Results. People I know FOR A FACT that qualify that don't get the rebate, then the contractor looks like a liar.	1
Some of the questions don't seem relevant.	1
Ease of use. Difficult sense last switch to new rebate company	1
The other way was so simple. For us to not get any compensation, except a referral (which I have not received), this takes the installers 1 hour extra and takes 45 minutes in paperwork to submit the rebate.	1
It's a pain in the butt. It's extra work I need to do to get a rebate for the customer and I don't get anything out of it. It's extra work to do.	1
not sure if you will be accepted	1
they require a lot of information.	1
It's redundant. I upload hand written paperwork that's identical to the electronic application. Considering the number of applications our company submits.	1
It takes too dang long. It's very tedious.	1

The selection of eligible equipment and services

Verbatim Response	Count (n=3)
Don't know	1
Because of the quality installation program for extra money. It's too time consuming. It costs the contractor more money than Duke is offering the customer. It costs us too much labor. You should just do away with the quality installation program.	1
I don't feel that 14 SEER equipment should get a rebate. Also there are other thermostats out there that are not the list. The heat pump package unit should be included.	1

The overall program

Verbatim Response	Count (n=7)
It was easy to deal with when you were using good-sense to submit applications. The PDF applications were much easier. If anything is wrong, now, it really makes this frustrating.	1
I don't think there's enough marketing. It's too difficult for any product under 15 SEER	1
Too much of a hassle. Unhappy customers. Slow. Bad results. Too complicated. NO incentive for contractors.	1
I've been here for 2 years, a guy applied for a rebate in Feb 2015 and he didn't get his rebate until late spring 2016. He would call me every three weeks. I would call duke and get different answers from different representatives. Despite the many re-submissions and reasons, he finally got his rebate. From a company standpoint, you put all the work on the contractor and the contractor needs to pay to do your rebate application. You don't give an incentive to the contractor.	1
Ease of use. Difficult sense last switch to new rebate company	1
it is a big hassle. Every time something is wrong they send a card to the customer	1
Quality Inspection Process is really the killer. It takes too much time to complete.	1

Q34. Thanks so much for your time today. Are there any other comments you would like to provide?

Verbatim Response	Count (n=13)
What is a Duke energy contracted truck?? I see smaller vans that says "Duke Energy Contracted" and they're not just meter readers, they were doing something else. I don't know what they were doing.	1
We already try to sell higher end stuff. This is just extra work we are doing to get the customer money. You can't go from paying someone to do something to making it WAY harder and not paying them anymore.	1
they ought to offer the dealer some incentive like they before for doing all the paperwork.	1
Sometimes our customers get a pre-paid visa card, sometimes a check. It would be nice to know what determined which one they will receive so that we can tell our customers. For people who are not as technologically enhanced, a check would be MUCH NICER than a VISA card.	1
Please start paying the contractors for the rebate paperwork and making sure the installations are done correctly. This all takes time. Do away with the 14 SEER rebates and start at a higher SEER level.	1
on the portal when it says it is in review it could give more of an explanation on if it was completed and when the card was mailed	1
My experience is that most HVAC companies will offer their own rebates because of the Quality Install process. The percentages and calculations that Duke is asking for is very redundant and pointless. Because the contractors are supposed to have the inspection done by the county, the quality install process is not necessary.	1
It would be nice if Duke would offer incentive the people that install the rebated equipment.	1
I'm very upset that my employer has to pay me a salary to process the rebates and he gets no compensation for it.	1
I wish you would provide an incentive to the contractor. I wish you hadn't taken our incentive because it is extra work. We should be paid for the time it takes us to submit the rebate	1

Verbatim Response	Count (n=13)
paperwork.	
give money back to the dealers	1
A lot of the time when someone else gets the job they will send us a thing that requires us to look at their reference number. On the paper it says "Loss". When I check it, it shows that the people never call us to give them a quote. That is just wording. Marketing can improve. We get a lot of referrals but we don't have a lot of people that call us. Put a check box that asks the customer if they would like us to call them or not. That will improve rebates and business for contractors.	1
Get rid of the quality checklist/quality inspection.	1

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