Boston | Headquarters

617 492 1400 tel
617 497 7944 fax
800 966 1254 toll free

1000 Winter St
Waltham, MA 02451

Duke Energy Carolinas

Residential Energy Assessments Program Evaluation Report – Final

October 12, 2018

Contributors

Aaiysha Khursheed
Principal Consultant, Opinion Dynamics

Antje Flanders
Vice President, Opinion Dynamics

Stef Wayland
Senior Director, Data Science, Opinion Dynamics

Matt Drury
Director, Engineering, Opinion Dynamics

Marion Cundari
Consultant, Engineering, Opinion Dynamics

Stephen Mariani
Consultant, Opinion Dynamics

Table of Contents

Table of Tables

Table of Figures

Table of Equations

1. Evaluation Summary

1.1 Program Summary

The Duke Energy Carolinas' (DEC) Residential Energy Assessments (REA) program is a home assessment program that provides customers with a customized energy report that includes low- and no-cost recommendations to help lower energy bills. Customers also receive an energy efficiency starter kit that contains two LEDs, a low-flow shower head, two faucet aerators (one kitchen faucet aerator and one bathroom faucet aerator), weather stripping, and outlet seals, which the energy specialist (or auditor) who performs the assessment can install free of charge. Auditors also encourage behavioral changes related to energy use and recommend higher-cost energy-saving investments to customers, such as a new HVAC system or energy-efficient appliances.

The REA program targets owner-occupied, single-family residences and relies primarily on direct mail marketing. Our evaluation includes information from 9,232 households[1] that participated in the program between May 2016 and April 2017.

1.2 Evaluation Objectives

This evaluation includes a gross impact evaluation, a net-to-gross (NTG) analysis, and a process evaluation. The overall objectives of the REA program evaluation were to:

- Estimate energy savings using monthly billing data
- Verify the accuracy of deemed per-unit savings estimates and develop in-service rates (ISRs)
- Estimate energy, summer demand, and winter demand savings at the measure level using engineering analysis
- Assess the likelihood that participants would have installed program measures had the energy efficiency kit not been provided (i.e., free-ridership [FR])
- Document spillover (SO) associated with program participation
- Identify the most successful components of the program's implementation
- Identify the barriers to participation and provide recommendations to address these barriers

To achieve these research objectives, Opinion Dynamics completed several data collection and analytic activities, including an interview with the program manager, a review of program materials, a participant telephone survey, an analysis of the survey results, an analysis of program-tracking data, a billing analysis, a deemed savings review, and an engineering analysis. Through the primary data collection efforts, the evaluation team developed estimates of measure-level ISRs and measure- and program-level net-to-gross ratios (NTGRs).

[1] Participant count is based on the *vendor_update_ts* date variable in the program-tracking data. This represents the date at which the customer was input into the database and is not the date of the assessment.

1.3 High-Level Findings

Table 1-1 presents the participant- and program-level net savings for the evaluation period, which ran from May 1, 2016 through April 30, 2017. These results include the savings from the measures included in the distributed energy efficiency kits, as well as from additional LEDs provided to program participants. The results also include savings from behavioral changes that participants made based on the recommendations received during the assessment, as well as participant SO attributable to the program.

Table 1-1. Net Program Impact Results from Billing Analysis

Net Participant Savings			Net Program Savings		
Energy (kWh)	Summer Coincident Demand (kW)	Winter Coincident Demand (kW)	Energy (MWh)	Summer Coincident Demand (MW)	Winter Coincident Demand (MW)
693.5	0.0831	0.0619	6,402	0.7668	0.5711

Using information collected during the participant survey, we estimated ISRs ranging from 30% for weather stripping to 89% for LEDs. Table 1-2 presents the ISR estimates and relative precision values for the measures included in the energy efficiency kits. We designed our sample to achieve a relative precision of 10% with 90% confidence; however, for some measures, we were unable to achieve this target due to low installation rates (IRs) among the surveyed participants.

Table 1-2. ISR Results and Relative Precision

		By Measure				
	Kit Average	LEDs	Faucet Aerators	Low-Flow Shower Heads	Outlet Seals	Weather Stripping
Sample Size (n)	150	127	149	145	88	99
Estimated ISR	51%	89%	46%	43%	33%	30%
Relative Precision (at 90% confidence)	7.7%	4.5%	12.1%	15.9%	24.9%	24.5%

Table 1-3 presents per-participant gross impact results, based on an engineering review of the measures included in the energy efficiency kit. Note that the results incorporate ISRs. The table presents estimated gross savings for the kit only and for the kit plus additional LEDs, based on the average number provided per participant for the evaluation period.[2]

Table 1-3. Gross Impact Results from Engineering Review

Measure Type		Energy (kWh)	Summer Coincident Demand (kW)	Winter Coincident Demand (kW)	Percent of Total kWh
Energy Efficiency Starter Kit	(2) LEDs (9W bulbs)	61.1	0.0090	0.0044	17%
	(1) Bathroom faucet aerator	10.5	0.0010	0.0019	3%
	(1) Kitchen faucet aerator	66.8	0.0031	0.0063	18%
	(1) Low-Flow Shower Head	85.9	0.0032	0.0065	24%
	(6) Outlet Seals	2.5	0.0003	0.0011	1%

[2] Participants were eligible to receive up to six additional LEDs per home. Note that we did find instances in the program-tracking data where more than six additional LEDs were provided.

Measure Type		Energy (kWh)	Summer Coincident Demand (kW)	Winter Coincident Demand (kW)	Percent of Total kWh
	(1) Weather stripping (roll)	22.6	0.0100	0.0042	6%
Total Kit Only		**249.3**	**0.0266**	**0.0243**	**66%**
Additional LEDs (average of 3.7 bulbs)		127.6	0.0189	0.0091	34%
Total Per-Home Estimate		**376.9**	**0.0455**	**0.0334**	**100%**

The per household gross impact results from the engineering analysis are significantly lower than results from the billing analysis. For programs like REA, it is common to see a lower estimate from an engineering analysis, as it does not incorporate behavioral changes that customers make as a result of their interaction with the program.

Based on responses to FR and SO questions in the participant survey, the evaluation team estimated measure-level NTGRs (defined as 1 – FR + SO) (see Table 1-4). FR survey questions asked about each measure included in the Energy Efficiency Starter Kit while SO questions asked about measures installed outside of the program for which no incentives were received but which were influenced by participation in the REA program. The evaluation team estimated FR at the measure level and SO at the program level.

Table 1-4. Net-to-Gross Results

Component	FR	SO	NTGR
Energy Efficiency Starter Kit*	23.0%	5.0%	82.0%
LEDs**	50.2%		54.8%
Faucet Aerators***	15.0%		90.0%
Low-Flow Shower Head	14.6%		90.4%
Outlet Seals	14.2%		90.8%
Weather stripping	26.7%		78.3%

*FR for the Energy Efficiency Kit is the weighted average of the measure-level FR values.
**FR and NTGR for LEDs applies to LEDs in the kit as well as additional ones supplied.
***FR questions for faucet aerators did not differentiate between kitchen and bathroom aerators.

For planning purposes, Duke Energy requires separate per-participant savings values for the energy efficiency kit and the additional bulbs distributed to participants. To provide these estimates, the evaluation team subtracted the engineering-derived net savings of the average number of additional bulbs distributed (3.7 LED bulbs) from the per-participant billing analysis savings. Taking this step ensures that savings from the additional bulbs are not double-counted for planning purposes, as these savings are already included in the billing analysis estimate (see Table 1-5).

Table 1-5. DSMore Inputs

Development of DSMore Inputs	kWh*	Summer Peak Savings (kW)	Winter Peak Savings (kW)
Net energy efficiency kit savings per participant (excluding additional LEDs)	624.4	0.07284	0.05692
Net savings per additional LED bulb: Engineering analysis	18.7	0.0028	0.0013

*Energy savings values have been rounded.

1.4 Evaluation Recommendations

We have developed a series of recommendations based on the results of our evaluation:

- **Program energy savings would likely improve if auditors installed all possible measures from the kit. If auditors are unable to install all measures, they should document the barriers they face so that these can be assessed for ways to overcome them.** If the program could improve measure installation, it is likely that measure ISRs and program savings would improve, particularly because we found high persistence rates (PRs) for all measures. We understand that there may be safety concerns related to the installation of outlet seals, which may lead auditors to leave these measures uninstalled, but our understanding is that Duke Energy has an expectation that all measures will be installed during home assessments. It should be noted that in subsequent conversations, the evaluation team learned from Duke Energy that in the spring of 2017, after the close of this evaluation period, additional training of implementation staff occurred to address this issue and to instruct installers to document why measures were not installed.

  Specifically, to address faucet aerators that do not fit, we recommend providing adaptors to participants to increase the installation rate of this measure.

- **Provide education on the benefits of early light bulb replacement.** Participants report "not needing them" as the most common reason for not installing the LEDs provided in the kit, suggesting that participants are waiting for their current bulbs to burn out. While more emphasis on installing all measures during the audit (see recommendation above) will help with ISRs, providing additional education on the savings potential of LEDs might lead to additional spillover savings by encouraging participants to more quickly replace inefficient bulbs in the future as well.

- **Channeling efforts by auditors that direct participants of the REA program to other Duke Energy programs could be improved.** While our data preparation for the billing analysis showed that a majority of REA participants have participated in other Duke Energy programs prior to participation, our survey findings showed that only a small portion of customers recalled hearing about other Duke Energy programs through the REA program. If Duke Energy is interested in using the REA program to channel customers to their other offerings, program staff may want to direct auditors to leave behind applicable materials to market its other programs. Additionally, we recommend that auditors familiarize themselves with Duke Energy's other programs and make recommendations to program participants based on the programs that are most suitable.

  According to Duke Energy, the program refreshed the technology and audit report in March 2017 to provide a more user-friendly report to the customer, outlining audit recommendations as well as cross-program recommendations. Additionally, the implementer now has the ability to report back to Duke Energy all recommendations, including cross-promotional referrals. Finally, in addition to including FindItDuke referrals in the audit report, advisors can now generate (where relevant) and email referrals to the customer during the assessment.

- **Ensure that auditors provide all applicable recommendations to customers during assessment visits.** Based on a review of program-tracking data and responses to the participant survey, the evaluation team found that most recommendations were provided to fewer than 20% of customers, with the exceptions being sealing air leaks and installing insulation. It is unclear whether auditors provided recommendations but did not account for them in their program tracking or whether they did not provide the recommendations to customers because they were not applicable or for some other reason.

The energy savings from the program could be improved if auditors provided customers with more recommendations on which they could act, since they may not be knowledgeable about the amount of energy that they could save by making changes, such as replacing furnace filters and adjusting thermostat settings. As noted above, Duke Energy has provided additional training to implementation staff to address providing recommendations to program participants that can help them save energy in their homes.

2. Program Description

The DEC REA program is a home assessment program that provides customers with a customized energy report with high-, low, and no-cost recommendations to help lower energy bills. The program targets residents of owner-occupied, single-family households who have been in their homes for at least 4 months. It relies on direct mailing as its main source of marketing and outreach.

2.1 Program Design

The REA program has two main components. The first is the home energy assessment, branded to customers as the "Home Energy House Call." During the assessment, energy specialists (auditors) enter participants' homes to inspect and assess energy using equipment in the home, including their heating and cooling equipment, and the state of duct and home insulation. Auditors also look for places where customers could either make an improvement to equipment (e.g., replacing an outdated heat pump, removing older secondary appliances) or adjust the way that they use current equipment (e.g., adjusting the settings for their furnace fan, using window shades in the summer). These recommendations are meant to steer customers toward home improvements that will help them save more energy.

The second component is a free kit of low-cost, energy-efficient measures. The Energy Efficiency Starter Kit consists of two 9W LEDs, two faucet aerators, a low-flow shower head, outlet seals (a package of four outlet and two switch seals), and a 17-foot roll of closed cell foam weather stripping. Customers can also receive up to six additional LEDs, regardless of bulbs received from other Duke Energy programs.

In its program-tracking databases, DEC tracks the date that customers sign up for the program, the recommendations made by the auditor during the assessment, and the number of additional light bulbs given to the customer.

2.2 Program Implementation

During the evaluation period, DEC contracted with Franklin Energy to implement the REA program. DEC first implemented this program in 2009 and initially included CFLs in the kits. In the spring of 2016, DEC switched kit bulbs from CFLs to LEDs. The other measures remained the same. The program was implemented using a multichannel marketing approach, including bill inserts and direct mail letters, as well as advertisements on Facebook and Pandora websites.

2.3 Program Performance

The program period under evaluation is May 1, 2016 through April 30, 2017. Over this period, the program served 9,232 unique households. The program saved participants, on average, 694 kWh per household per year. Coincident demand savings per household were 0.083 kW in summer and 0.062 kW in winter.

3. Key Research Objectives

This evaluation included a gross impact evaluation, a NTG analysis, and a process evaluation. The overall objectives of the REA program evaluation were to:

- Estimate energy savings using monthly billing data
- Verify the accuracy of deemed per-unit savings estimates and develop in-service rates (ISRs)
- Estimate energy, summer demand, and winter demand savings at the measure level using engineering analysis
- Assess the likelihood that participants would have installed program measures had the energy efficiency kit not been provided (i.e., FR)
- Document SO associated with program participation
- Identify the most successful components of the program's implementation
- Identify the barriers to participation and provide recommendations to address these barriers

4. Overview of Evaluation Activities

4.1 Program Staff Interview

Opinion Dynamics conducted an in-depth interview with the current REA program manager in October 2016. The purpose of the interview was to gauge the current environment of, and expectations for, the REA program, including the program's goals, successes, and challenges over the evaluation period. During the interview, we discussed the multichannel approach to marketing the program, the change from CFLs to LEDs in the energy efficiency kits, changes in program processes when Duke Energy switched from WECC to Franklin Energy as its REA program implementer,[3] as well as the receptiveness of DEC customers to participating in this offering.

4.2 Program Materials Review

Opinion Dynamics reviewed program materials, including implementation plans, marketing and outreach materials, training materials, and the program-tracking database. We found program materials relating to the assessment, recommendations, and marketing to be complete and of high quality.

4.3 Participant Survey

Opinion Dynamics implemented a computer-assisted telephone interviewing (CATI) survey in May and June 2017. The survey gathered data to develop measure-level estimates of installation and persistence rates, estimate measure- and program-level NTGRs, and support our process evaluation.

The survey sample design and sample size were based on customers who participated in the REA program during the evaluation period. Of the 9,232 participants in the database, we drew a random sample of 1,200 valid telephone numbers from which to complete 150 participant telephone interviews.

The average length of the interviews was approximately 21 minutes; the response rate was 20.1%.

4.4 Billing Analysis

Opinion Dynamics conducted a billing analysis to determine the net savings attributable to the REA program for the evaluation period. We used a linear fixed effects regression (LFER) model to estimate the overall net ex post program savings. The fixed effect in our model is the customer, which allows us to control for all household factors that do not vary over time. The billing analysis used customers who participated from May 2016 through April 2017 as the treatment group and those who participated from May 2017 through December 2017 as the comparison group. A summary of the billing analysis approach is provided in Section 5.1.1; a detailed description of the billing analysis methodology is presented in Appendix F of the accompanying appendices.

[3] The change of implementer from WECC to Franklin Energy occurred in March 2015.

4.5 Deemed Savings Review and Engineering Analysis

Opinion Dynamics conducted a review of Duke Energy's deemed savings values and assumptions for each of the measures included in the Energy Efficiency Starter Kit. The deemed savings review had two main objectives:

1. Develop updated measure-level savings algorithms and input assumptions that are consistent with standard industry practice and comparable with applicable technical reference manuals (TRMs); and

2. Develop a ratio between energy and demand savings that can be applied to the billing analysis energy savings to determine net demand savings.

To conduct our deemed savings review, we reviewed the Indiana TRM V2.2 (IN TRM V2.2)[4] and other secondary resources and developed per-unit savings estimates for each kit measure. For each of the reviewed measures, we identified recommendations and suggested approaches for quantifying savings for this evaluation.

Our evaluation also relied on telephone survey data to confirm measure installation and persistence rates, which were combined with engineering estimates for each measure to develop per-unit gross energy and demand savings by measure type. Appendix E in the accompanying appendices provides more detail on the methods used in the deemed savings review and engineering analysis.

[4] Indiana Technical Reference Manual Version 2.2. July 28, 2015. We reviewed several TRMs, including regional TRMs (e.g., Mid-Atlantic) as part of our engineering review. Many of these TRMs reference consistent methodologies for savings calculations and we ultimately followed the Indiana TRM methods to remain consistent with other Duke evaluations but made DEC-specific updates as applicable based on weather and survey data.

5. Impact Evaluation

5.1 Methodology

5.1.1 Billing Analysis

Opinion Dynamics conducted a billing analysis to determine the net savings of the REA program. Our billing analysis used May 2016–April 2017 participants as the treatment group and May 2017–December 2017 participants as the comparison group. This type of comparison group is referred to as a "future participant comparison group," since comparison group participants have not yet participated in the program during the evaluated program year. A comparison group allows us to establish a counterfactual, i.e., the energy that participants in the treatment group would likely have used in the absence of the program. In addition, because the comparison group represents energy use in absence of the program, results from the billing analysis approximate net results, and application of a NTGR to billing analysis results is unnecessary.

Our method requires pre- and post-installation electricity usage data for the treatment group. To be included in the treatment group, we need both pre- and post-installation usage data for at least 9 months before and after participation. For the control group, the model includes electricity usage data only from before their program participation.

Table 5-1 summarizes information about the treatment and comparison groups included in the analyses.

Table 5-1. Accounts Included in Final Billing Analysis Model

	Treatment Group	Comparison Group
Period of participation	May 2016–April 2017	May 2017–December 2017
Number of customers included in the analysis	1,925	1,647
Usage data included	9+ Months of Pre- and Post-Participation Data	9 Months of Pre-Participation Data

The number of customers included in the analysis is approximately 24% of those who participated during the evaluation period, and 20% of those who participated between May and December 2017. The main reason customers were dropped from the analysis was due to participation in other Duke Energy programs (just over 60% in the treatment group and 69% in the comparison group). The evaluation team recognizes that this is a large number of customers to exclude from the analysis but took this necessary step to limit the risk of the effects of other programs being confounded with the treatment effect of the REA program. It should be noted that while these customers were not included in the billing analysis model, average modeled savings are still applied to them, i.e., the program receives credit for their savings.

The billing analysis employed a LFER model, which accounts for time-invariant factors, such as square footage, appliance stock, habitual behaviors, household size, and other factors that do not vary over time. The model accounts for differences in weather and pre-program energy use between participants. We also added dummy variables for each calendar month, i.e., binomial terms with "1" signifying that the bill occurred in that month of year and "0" otherwise. The monthly variables help control for seasonal trends in energy use and allow for a more accurate estimate of baseline usage absent the program. The model includes interaction terms between weather and the post-participation period for the treatment group, to account for differences in weather patterns across years. A more detailed discussion of the billing analysis methodology - including data-cleaning steps, the comparison group assessment, and the final model - is provided in Appendix F of the accompanying appendices.

5.1.2 Engineering Analysis

As part of our impact evaluation, Opinion Dynamics conducted an engineering analysis for each measure contained in the REA Energy Efficiency Starter Kit. The purposes of the engineering estimates were to:

1. Provide a ratio of kW coincident demand to kWh energy savings, which is then applied to the billing analysis energy savings to estimate demand savings

2. Provide insight into the individual measure contributions to the overall kit savings

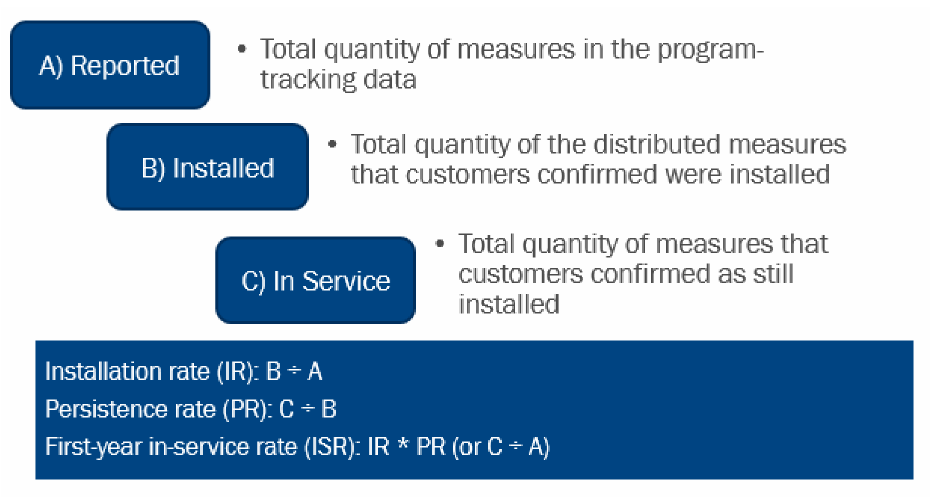
We used the IN TRM V2.2 and other references and assumptions to conduct our engineering analysis. The engineering analysis takes into consideration the measure ISRs to ensure only savings for installed measures are counted. Additional details and information on the engineering analysis are provided in Appendix E of the accompanying appendices.

It should be noted that the billing analysis determines actual energy (kWh) impacts for the program; the engineering analysis only supplements the billing analysis for the two reasons mentioned above.

Installation Verification and Persistence

As part of the participant survey, we verified measure installation and persistence to obtain measure-level ISRs. Our engineering estimates use these values in calculations for annual per-customer savings (Figure 5-1). Specifically, we asked sampled participants to confirm the quantity of installed kit measures and, when necessary, to provide the corrected quantity. We then divided the number of measures verified by the respondent by the quantity that they received in the kit. This verified installation rate is the first component of the total ISR. Where applicable, we also asked participants to confirm whether program measures remained installed in their homes to create a persistence rate. We then created a measure-specific total ISR by multiplying the two components.

Figure 5-1. Installation Rate Components



5.2 Results

5.2.1 Billing Analysis Results

This section provides billing analysis results and savings estimates for DEC REA program evaluation period. Appendix F in the accompanying appendices contains the detailed methodology for data cleaning and analysis, as well as complete results of the models. Table 5-2 shows the results of the billing model for REA program participants. The variable "Post" represents the unadjusted treatment effect, i.e., the change in average daily consumption (ADC) attributable to participation in the REA program.

Table 5-2. Results of Billing Analysis Model

Variable	Coefficient
Post (REA program participation)	−5.694856247*
Cooling degree-days (CDD)[a]	0.167953842*
Heating degree-days (HDD)[a]	0.03990706*
Post-participation period CDD	0.012616119**
Post-participation period HDD	0.004052238*
Constant	28.81924207*
Adjusted R-squared	0.691334427
Additional Terms	**Included**
Monthly effects included	YES
Post-participation period interacted with months included	YES

* $p<0.01$, ** $p<0.05$.

Due to post-participation period interaction terms in the model, it is necessary to recalculate the coefficient of the treatment effect (Post) by combining the average value with the coefficient for each interaction term. The coefficient seen in the regression represents the reduction of daily consumption during the post-participation period, separate of any effect of the included interaction terms. Making these adjustments (detailed in Appendix F of the accompanying appendices), Opinion Dynamics found that REA program participants included in the model realized 1.9 kWh of daily energy savings, on average.

Table 5-3 shows the per-home and program-level savings for the program. Overall, customers who participated in the REA program saved 693.5 kWh per year. During the evaluation period, the program realized 6,402 MWh of energy savings.

Table 5-3. Annual Savings from Billing Analysis

Annual Savings	
May 2016–April 2017 Participants	9,232
Per-Home Daily Savings (kWh)	1.9
Per-Home Annual Savings (kWh)	693.5
Program Savings (MWh)	**6,402**

5.2.2 Engineering Analysis Results

This section provides the results of the engineering analysis, including ex post deemed savings values, survey-based ISRs, and application of measure quantities to determine per-participant gross energy and demand savings. Table 5-4 shows the ex post deemed savings values, net of ISR, based on the deemed savings review (see Appendix E in the accompanying appendices).

Table 5-4. Ex Post Deemed Savings* for Energy Efficiency Starter Kit Measures

Measure	Ex Post Deemed Savings Per Unit (kWh)	Ex Post Deemed Savings Per Kit (kWh)*
LED	34.5	69.0
Low-flow shower head	200.9	200.9
Bathroom faucet aerator	22.6	22.6
Kitchen faucet aerator	144.2	144.2
Outlet seals	1.2	7.2
Weather stripping	4.5	76.4
Energy Efficiency Kit	N/A	520.3

*Energy efficiency kit contains two LEDs, six outlet seals and 17 feet of stripping; the per unit value for weather stripping is for 1 foot.

Table 5-5 provides the IRs, PRs, and ISRs by measure. Except for LEDs, the evaluation found relatively low ISRs for measures included in the kit. Findings from the participant survey confirm that auditors often do not install all kit measures during the assessments.

Table 5-5. Measure-Level ISR

Measure	IR	PR	ISR
LEDs	90%	99%	89%
Low-flow shower head	49%	87%	43%
Bathroom faucet aerator	50%	95%	46%
Kitchen faucet aerator			
Outlet seals	33%	100%	33%
Weather stripping	30%	100%	30%
Additional LEDs*	100%	99%	99%

*The IR of additional LEDs is assumed to be 100%. The PR is based on survey responses about LEDs provided in the kit.

To calculate per-participant engineering gross impacts, we multiplied the per-unit deemed savings values by measure-level ISRs and the average distributed quantity of each measure included in the kit. Table 5-6 shows resulting estimated energy and demand savings for each measure included in the kit. In addition to the kit measures, the program reported 34,571 additional LEDs distributed to customers through the assessments (an average of 3.7 per household).[5] The estimated energy savings for these additional LEDs is also included

[5] To determine gross savings for the additional LEDs, the evaluation team applied the same per-unit deemed savings value as used for the LEDs contained within the kit but an ISR specific to the additional LEDs.

in Table 5-6. As expected, the lighting portion of the kit and the additional LEDs accounted for approximately 50% of the energy savings for each household.

Table 5-6. Engineering Analysis Gross Impact Results (inclusive of ISR)

Measure Type		Energy (kWh)	Summer Coincident Demand (kW)	Winter Coincident Demand (kW)	Percent of Total kWh
Energy Efficiency Starter Kit	(2) LEDs (9W bulbs)	61.1	0.0090	0.0044	17%
	(1) Low-flow shower head	85.9	0.0032	0.0065	24%
	(1) Bathroom faucet aerator	10.5	0.0010	0.0019	3%
	(1) Kitchen faucet aerator	66.8	0.0031	0.0063	18%
	(6) Outlet seals	2.5	0.0003	0.0011	1%
	(1) Weather stripping (roll)	22.6	0.0100	0.0042	6%
Total Kit Only		**249.3**	**0.0266**	**0.0243**	**66%**
Additional LEDs (average of 3.7 bulbs)		127.6	0.0189	0.0091	34%
Total Per-Home Estimate		**376.9**	**0.0455**	**0.0334**	**100%**

Using the estimated savings from Table 5-6, we calculated two kW per kWh savings ratios: one for the kit only and one for the kit plus additional LEDs (see Table 5-7).

Table 5-7. Engineering Demand-to-Energy Ratios

	Total Gross Energy Savings	Summer Coincident Peak Savings	Winter Coincident Peak Savings	Summer Ratio Multiplier (summer demand/energy savings)	Winter Ratio Multiplier (winter demand/energy savings)
Kit Only	249.3	0.027	0.024	0.0001068	0.0000973
Kit + Additional LEDs	376.9	0.046	0.033	0.0001207	0.0000886

5.2.3 Comparison between Billing Analysis and Engineering Results

We estimated that the program realized per-participant energy savings of 693.5 kWh during the evaluation period. Savings from our engineering analysis (376.9 kWh per participant) are smaller in comparison to the billing analysis results. Differences in the estimated savings from these analyses are expected, due to differences in methodology and the fact that the engineering analysis addresses only a subset of program savings (i.e., the Energy Efficiency Starter Kit and the additional LEDs that can be included). In contrast, the billing analysis provides a comprehensive estimate of program impacts. In addition to the components addressed by the engineering analysis, the billing analysis includes reduced energy consumption associated with improvements made due to assessment recommendations and behavioral changes. In addition, the billing analysis captures other unobserved factors that might have resulted in additional energy savings among participants.

6. Net-to-Gross Analysis

6.1 Methodology

Our participant survey included a NTG module to determine both program- and measure-level NTGRs. The NTGR represents the portion of gross savings associated with a program-supported measure or behavior change that would not have been realized in the absence of the program. In other words, the NTGR represents the share of tracked savings that are attributable to the program. The NTGR developed for this evaluation incorporates both FR and participant SO.

6.1.1 Free-Ridership

Free-riders are program participants who would have paid for an assessment or installed energy efficiency products on their own, without the program. FR scores represent the percentage of savings that would have been achieved in the absence of the program. We categorized participants who reported that they would not have installed a measure without the program as 0% free-riders and participants who would have installed the measure without the program as 100% free-riders. Partial scores were assigned to customers who had plans to install the measure, but the program had at least some influence over that decision, particularly in terms of timing (i.e., the program accelerated the installation) or quantity (i.e., the program led to the installation of additional measures). We asked questions for each program measure, to enable us to develop measure-level FR estimates. The survey questions measured the following areas of program influence:

- Influence on installation: We asked participants about the likelihood that they would have installed each kit measure if they had not received it with the assessment.
- Influence on timing: We asked participants when they would have installed the measure on their own, whether that would have been around the same time, within 6 months, within a year, or longer.
- Influence on quantity: We asked participants whether they would have purchased the same quantity, more, or fewer on their own.

As part of the FR survey module, we included follow-up questions to check participant responses for consistency. We checked survey data for item nonresponse and calculated the FR rate per the algorithms presented in Appendix C in the accompanying appendices.

6.1.2 Spillover

SO represents energy savings from additional actions (expressed as a percentage of total program savings) that were the result of program participation, but that did not receive program support. While SO can result from a variety of measures, it is not possible to ask about all possible SO measures on a survey due to the need to limit its length. Thus, Opinion Dynamics chose to focus on actions that participants would reasonably take following their program participation and would do so without additional program support.

The participant survey included a series of questions to assess overall SO among program participants. To qualify for program-induced SO, we asked two main questions:

- Did the participant make any additional improvements (or change his or her behavior) to reduce household energy consumption since participation in the program for which he or she received no rebate or incentive?

- *If the respondent indicated making additional improvements (or changing behaviors):* How would the participant rate how much influence (on a scale from 0 to 10, with 0 indicating no influence and 10 indicating complete influence) the experience with the program had on the decision to make these improvements?

We asked participants to rate the degree to which the program influenced their action and to provide a rationale for their rating. We attributed SO for all respondents who gave a program influence score of 7 or higher. These respondents were asked a series of follow-up questions to assess the efficiency of measures.

To estimate the SO rate, we estimated savings for each SO measure using engineering algorithms and assumptions. We determined the program-level SO rate[6] by dividing the sum of measure-level SO savings by the evaluated gross savings achieved by the sample of participants who received SO questions (Equation 6-1).

Equation 6-1. Spillover Rate

$$\textit{Spillover Rate} = \frac{\textit{Spillover Savings}}{\textit{Evaluated Gross Savings in the Respondent Sample}}$$

6.1.3 NTGR

To calculate measure-level NTGRs, we combined the measure-level FR rates and the program-level SO rate, using Equation 6-2:

Equation 6-2. Net-to-Gross Ratio

$$NTGR_{measure} = 1 - FR_{measure} + SO_{program}$$

6.2 Net-to-Gross Results

This section presents our estimates of FR and participant SO, and the resulting NTGRs. Both FR and SO components of the NTGR were derived from self-reported information from telephone interviews with program participants. The final NTGR is the percentage of gross program savings that can be attributed to the program.

Table 6-1 shows FR estimates at the measure level and the SO estimate at the program level. Appendix A of this report contains the participant survey instrument, which includes the questions used in our algorithms. Appendix C provides an overview of the FR algorithm. We estimate the overall FR for the starter kit to be 23% and program-level SO to be 5%. The resulting NTGR for the REA program for the evaluation period is 82%. When applied to engineering gross estimates, the estimated SO rate of 5% represents an average of approximately 18 kWh per household.

[6] Note that SO was estimated at the program level, rather than the measure level, since these SO actions cannot be attributed to individual measures within the kit.

Table 6-1. Measure-Level NTGRs

Component	FR	SO	NTGR
Energy Efficiency Starter Kit*	23.0%	5.0%	82.0%
LEDs**	50.2%		54.8%
Faucet Aerators***	15.0%		90.0%
Low-Flow Shower Head	14.6%		90.4%
Outlet Seals	14.2%		90.8%
Weather stripping	26.7%		78.3%

*FR for the Energy Efficiency Kit is the weighted average of the measure-level FR values.
** FR and NTGR for LEDs applies to LEDs in the kit as well as additional ones supplied.
***FR questions for faucet aerators did not differentiate between kitchen and bathroom aerators.

6.2.1 Measure-Level Free-Ridership

Based on responses to FR questions in our participant survey, which focused on each measure from the Energy Efficiency Starter Kit, FR scores were calculated for customers who installed the measure. Table 6-2 shows the relative precision for the overall kit and measure-level results of the analysis of net of FR ratios.

Table 6-2. Net-to-Gross Results and Relative Precision

		By Measure				
	Kit	LEDs	Faucet Aerators	Low-Flow Shower Head	Outlet Seals	Weather Stripping
Sample Size (n)	142	90	116	114	74	84
FR Estimate	23.0%	50.2%	15.0%	14.6%	14.2%	26.7%
Net of FR Ratio (1-FR)	77.0%	49.8%	85.0%	85.4%	85.8%	73.3%
Relative Precision around 1-FR (at 90% Confidence)	3.6%	14.9%	4.8%	4.7%	5.8%	7.5%

6.2.2 Spillover Savings

Our participant survey collected information on participants who were influenced by the program and installed additional energy-saving measures in their homes and for which they received no incentive or rebate. In all, 16 unique respondents reported SO, out of the survey sample of 150. The total breakdown of SO savings from these participants is shown in Table 6-3. We estimated a SO rate of 5.2% by taking the total measure-level SO estimates from survey respondents in Table 6-3 (i.e., 2,829 kWh) and dividing it by the total engineering savings from all 150 survey respondents (56,535 kWh).

Table 6-3. Engineering Spillover Summary

Measure Type	Quantity of Measure Type	Total Energy Savings (kWh)	Total Coincident Demand Savings (kW)	Source of Savings
Heat Pump Water Heater	1	2,076	0.284	IN TRM V2.2
Showerhead	1	201	0.023	Duke REA Kit deemed savings value
Clothes Washer	1	120	0.016	IL TRM V6.0
LEDs	3	103	0.023	Duke REA Kit deemed savings value
Clothes Dryer	1	93	0.012	IL TRM V6.0
Faucet Aerators	1	83	0.013	Duke REA Kit deemed savings value
Window Replacement	6	54	0.079	IN TRM V2.2
Refrigerator	1	50	0.008	IL TRM V6.0
Room AC	1	48	0.011	IN TRM V2.2
Total	**16**	**2,829**	**0.469**	

7. Process Evaluation

7.1 Research Questions

Based on discussions with Duke Energy program and evaluation, measurement, and verification (EM&V) staff, the evaluation team developed the following process-related research questions:

- What are the most successful components of the program? What improvements can be made to the program's design and implementation?
- Are customers satisfied with the participation process and program measures?
- Do participants find the assessment recommendations useful and actionable?
- Are eligible customers channeled into other Duke Energy programs?
- What kind of behavioral changes do participants make following the assessment?

7.2 Methodology

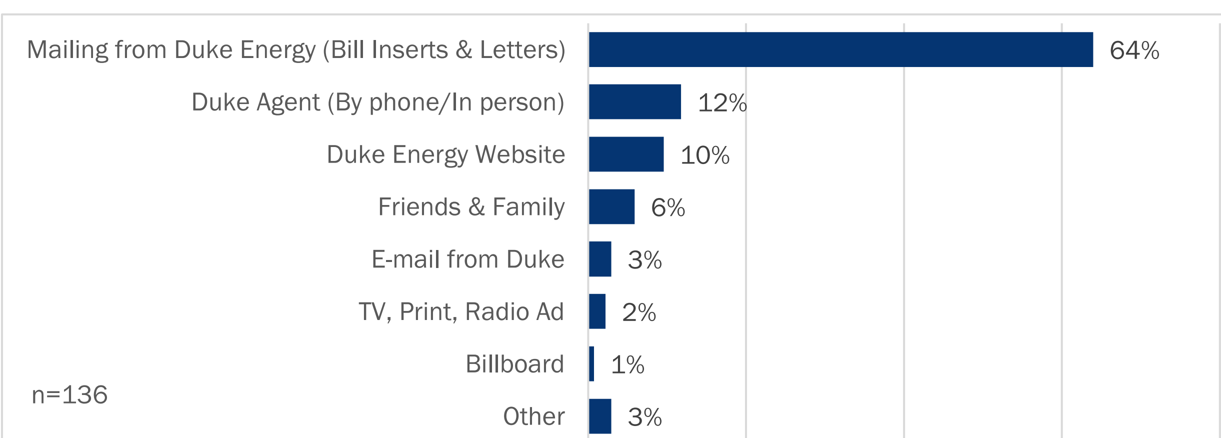
Our process evaluation relied primarily on our interview with program staff, our review of program materials and program-tracking data, and our analysis of the participant survey results. The full survey document can be found in Appendix A of the accompanying appendices.

7.3 Key Findings

7.3.1 Marketing and Channeling

Duke Energy has relied heavily on a direct mail marketing strategy to generate interest in the REA program. As shown in Figure 7-1, the majority of respondents (64%) stated that they first heard about the program via a direct mailing from Duke Energy (e.g., bill inserts or direct mail letters). Given the length of time between the customer learning about the program and taking the survey, we do not distinguish between the types of mailed items. Customers may simply remember receiving "something" in the mail.

Figure 7-1. Sources of Program Awareness



REA program auditors were instructed to inform program participants about other Duke Energy programs for which they might be eligible. However, only about one-quarter of participants (27%) recalled learning about other Duke Energy programs during their assessment. Of these participants, one-third heard about the Power Manager program (33%), followed by the Home Energy Report (20%) and Residential Smart $aver (18%) programs.

Table 7-1. Channeling to Other Duke Energy Programs

Which programs did you recall hearing about? (multiple responses accepted) (n=40)	
Power Manager	33%
Home Energy Report	20%
Residential Smart $aver	18%
Other	18%
Don't know	23%

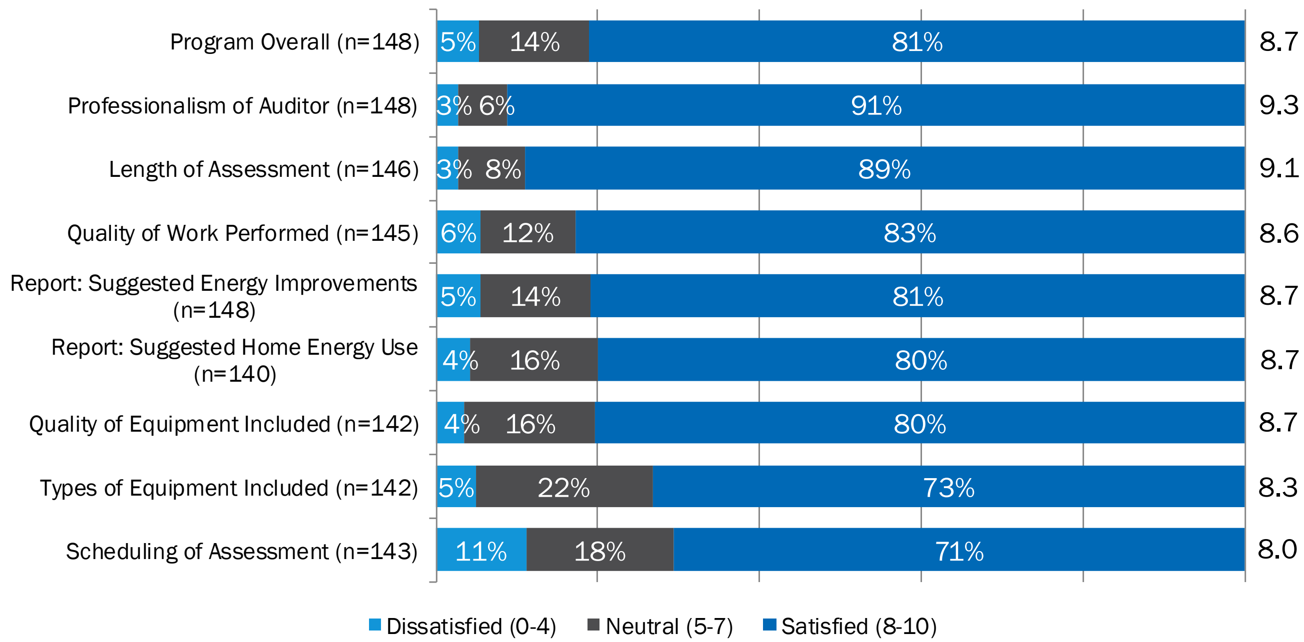
7.3.2 Satisfaction

Satisfaction was high across various aspects of the program and for the program overall. Eighty-one percent of participants considered themselves "satisfied" with the program overall.[7] Slightly more than one-third of participants (38%) noticed savings on their Duke Energy bill since participating in the program, while nearly half did not (49%) and or did not know (13%). Overall satisfaction with the program was significantly higher among respondents who had seen savings or were "not sure" that they had seen savings than among respondents who had not seen any savings. However, among the group who had not seen savings, nearly three-quarters were still satisfied overall (73%) and fewer than 10 percent were "dissatisfied."

The areas of highest satisfaction relate to the quality and speed of the auditor's work. Professionalism of the auditor was rated 9.3 out of 10, the length of the assessment was rated 9.1, and the quality of work performed received an average rating of 8.7 (see Figure 7-2). Factors that were rated slightly lower were related to the types of equipment included in the energy efficiency kits (mean rating of 8.3) and the scheduling process (mean rating of 8.0). The satisfaction factors related to the report are ratings of how well the assessment report improved the participant's understanding of where energy improvements can be made and of their home energy use (mean ratings of 8.7 each). Overall, however, all aspects had a mean satisfaction rating of at least 8 out of 10 and low levels of dissatisfaction (a rating of 4 or less). The mean rating of the program overall was an 8.7 out of 10.

[7] A rating of 8 to 10, on a scale of 0 to 10, where 0 means very dissatisfied and 10 means very satisfied.

Figure 7-2. Program Satisfaction with Mean Ratings



7.3.3 Program Value

Understanding customers' motivations for participating can help in developing effective program marketing strategies. Opinion Dynamics asked participants for their reasons for participating in the program (Table 7-2). A majority (60%) mentioned saving money on energy bills as a reason for their participation; reducing energy consumption was also cited frequently (33% of participants). Few respondents (11%) cited "it was free" as a reason for participation.

Table 7-2. Reasons for Participating in REA Program

Why did you choose to participate? (Multiple responses accepted; n=150)	
Save money on energy/electric/gas bill	60%
Reduce energy consumption	33%
Learn more about home energy use and the program	13%
It was free	11%
Make your home more comfortable	8%
New house or selling house	3%
Other	5%

To assess participants perception of the value of REA offerings, the survey asked how much money they would be willing to pay for the energy assessment and for the kit. Participants reported valuing the program components less than their actual value. Participants who were willing to pay for the assessment (29%) valued this component at $48.05, which is less than a third of its stated value on Duke Energy's website[8]. Participants

[8] Note that two outliers were dropped from the calculation, which inflated the value of the assessment by 50%.

who were willing to pay for the Energy Efficiency Starter Kit (38%) valued it at $29.63 which is approximately the same as its advertised value of $30. Each of the averages were calculated separately without respondents who responded saying $0 or they did not know. One third of respondents said they wouldn't have been willing to pay for either component (33%), while more than a third did not answer the question (36%). With respect to the kit measures, the majority of participants found the LEDs most valuable among the kit items (67%), while they found faucet aerators (23%) and the showerhead (17%) to be the second-most valuable.

7.3.4 Experience with Measures and Program Improvement Suggestions

Respondents who installed some or all of the measures in the energy efficiency kit were asked whether they, the auditor, or both installed each measure. The majority of the installations of LEDs and water measures were performed by the auditor, whereas the outlet seals and weather stripping were predominately installed by the customers. The evaluation team believes that the lower installation rates by the auditors contributes to the lower installation rates of outlet seals and weather stripping overall (see Table 7-3). It should be noted that DEC program staff reported that auditors have been given instruction to perform these installations and the proportion of auditor installations has grown since the end of the evaluation period.

Table 7-3. Measure Installations

Measure	IR	Auditor Installed	Customer Installed	Both Installed
LEDs (n=124)	90%	50%	34%	11%
Faucet aerators (n=95)	49%	72%	22%	3%
Shower head (n=71)	50%	70%	30%	N/A
Outlet seals (n=31)	33%	29%	61%	0%
Weather stripping (n=35)	30%	23%	71%	6%

Additionally, respondents who did not install all of the measures in the energy efficiency kit were asked to provide reasons for not installing them. Common reasons varied across the measure types. For LEDs, the majority reported that they were waiting for their current bulbs to burn out to install their new ones (64%), suggesting that they may benefit from additional education about the energy savings benefits of replacing existing bulbs with LEDs. For faucet aerators, the most common response was the measure not fitting (24%) while for shower heads, the customers already had efficient shower heads (31%) or preferred their own shower head (22%). Most respondents who had not installed all of their outlet seals or weather stripping reported that it was due to not having time to install them (33% and 23%, respectively). Another common reason stated for not installing weather stripping was not seeing a need for it (21%). See Table 7-4 below for full details of the responses by measure.

Table 7-4. Common Reasons for Not Installing Measures

Common reasons for not installing	LEDs (n=22)	Faucet Aerators (n=95)	Shower Head (n=74)	Outlet Seals (n=61)	Weather stripping (n=80)
Already have the measure	9%	14%	31%	18%	14%
Haven't needed the equipment yet	64%	9%	0%	0%	4%
Did not see a need	0%	6%	0%	11%	21%
Did not fit	14%	24%	9%	0%	0%
Haven't had time	0%	5%	14%	33%	23%
Unable to install/needed assistance	0%	4%	0%	13%	10%
Did not receive enough /Only received one*	0%	13%	0%	0%	4%
Did not like the measure	9%	2%	22%	0%	1%
Not enough water pressure	N/A	0%	1%	N/A	N/A
Don't know	5%	12%	11%	20%	15%

Note: The n values represent the number of respondents who said that they had installed only some or none of the measure.
*This response was given by participants who, for example, had more showers, outlet seals, and faucet aerators than could be accommodated by the measures in the kit. In the case of weather stripping, there was not enough to weather strip around all windows and doors in the home.

The evaluation team also inquired about what additional measures participants would have liked to receive. The majority of participants reported that the kit equipment was sufficient (69%), did not know what other equipment they would have liked in the kit or did not provide a measure (10%), or said they would have liked more of the current offerings (9%). Of the eleven percent who offered responses that the REA program could reasonably consider adding, the top suggestion was to include advanced assessment offerings such as thermal imaging and draft checks which respondents interpreted as a kit measure for this question. "Other" responses included smart thermostats and shut-off timers for lighting. The list of additional measures that participants would have liked are listed in Table 7-5.

Participants were also asked to rate their interest in a "Home Energy Score," which uses a 1–10 scale to rate the efficiency of one's home energy usage; 79% said that they were at least somewhat interested in receiving their score.

Table 7-5. Additional Measures

What equipment would you have liked to receive? (n=17)	
Thermal Imaging / Draft Checks	24%
HVAC Filters	18%
Insulation	18%
Water Heater / Heat Pump	18%
Other	24%

Consistent with high satisfaction ratings, the majority of respondents said nothing needed improving in the program overall (41%) or did not know what could be improved (18%). Another 4% of respondents provided invalid or otherwise non-usable responses. Of the 37% who provided suggestions to improve the program, the most common were to increase communication between Duke Energy, the auditors, and the participants before and after the assessment (18%), to include more measures in the energy efficiency starter kit (16%), and to improve issues with scheduling and timing of the assessments (14%). The issues with auditors included complaints about auditors refusing to provide certain measures and not being able to share more information about the work they were performing. The full list is shown in Table 7-6.

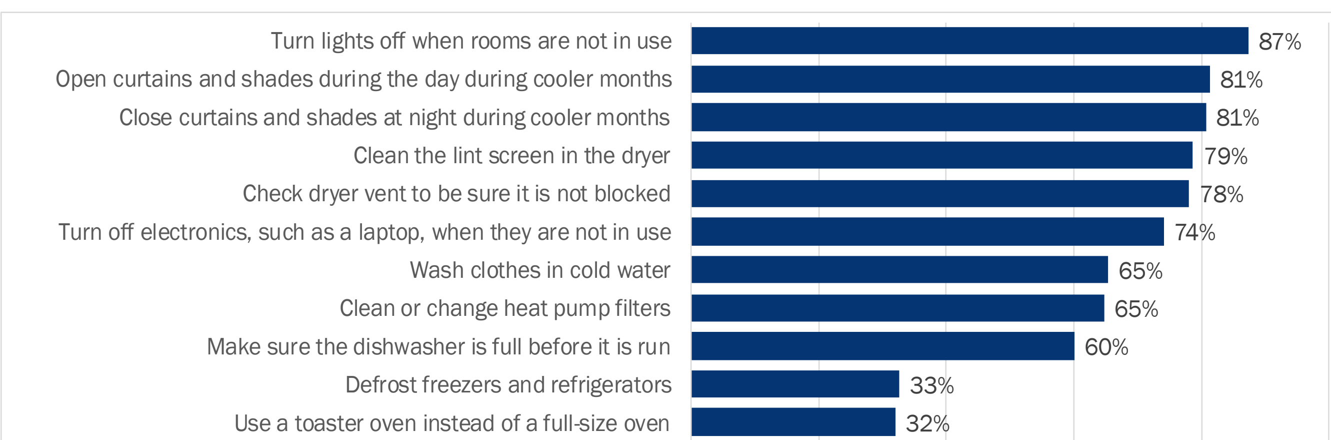
Table 7-6. Suggested Program Improvements

What could be done to improve the program? (multiple response) (n=56)	
Increase follow-up and communication with participants	18%
Include more measures in the kit	16%
Improve Scheduling / Timing Issues	14%
Have auditor install all measures	9%
Address issues with auditors	9%
Improve access to and clarify details of the assessment report	9%
Have auditor perform a more thorough assessment	7%
Include thermal imaging / draft checks in the assessment	7%
Improve the quality of the measures	4%
Provide list of certified contractors	4%
Other	11%

7.3.5 Education

As part of the Energy Efficiency Starter Kit, customers received a "Department of Energy, Energy Savers Booklet." This educational material outlines how energy is used, and wasted, in the home. The booklet provides insight into the effect that insulation, lighting, appliances, and other items in the home can have on energy use. Most respondents remembered receiving the booklet (78%), and 75% of those participants reported taking the time to read it. Included in the booklet was a list of energy-saving tips. All participants were asked about any energy savings behaviors that they had increased since participating in the program and, overall, these actions had high uptake (see Figure 7-3). The only exceptions were two recommendations for kitchen appliances.

Figure 7-3. Behavioral Changes



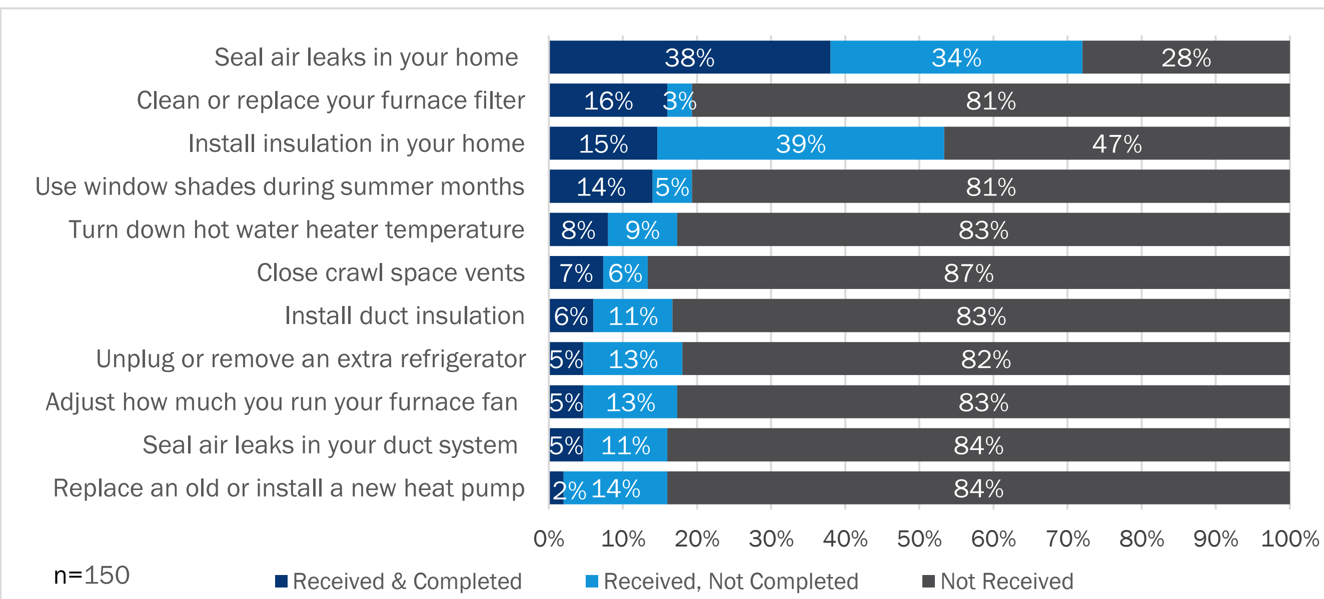
7.3.6 Assessment Recommendations

The program-tracking data includes information about specific recommendations on energy efficiency actions provided to DEC REA program participants during the assessment. The telephone survey then asked participants to confirm that they had received the tracked recommendations, which ones they had completed, and whether they planned to implement any of those recommendations not yet completed. Note that to reduced survey response burden similar recommendations were grouped into categories for the survey. For example, “seal leaky fireplace”, “seal leaky windows”, and “seal leaky doors” were all grouped into the category “seal air leaks” in the survey instrument.

The proportion of participants who received and acted on the given recommendations is shown by the dark blue bars in Figure 7-4. The lighter blue bars represent recommendations that were received but not carried out by participants. The grey bars show recommendations not received. Most of the recommendations were given to participants less than 20% of the time (as shown by the sum of the percentages of the dark blue and lighter blue bars), with the exceptions being sealing air leaks and installing insulation. It is not clear why auditors did not provide recommendations more often, such as those related to sealing home ducts, cleaning or replacing furnace filters, closing crawl space vents, and turning down the water heater temperature, though one possible explanation is that they did not think that they were applicable.

According to Duke Energy, the program implementer has since received additional training to ensure that all appropriate audit recommendations are provided. In addition, the program refreshed its audit reports in March 2017 to make sure to cover applicable audit recommendations. Among respondents who had not completed one or more of their received recommendations, the majority said that they were currently planning to complete some or all of the remaining recommendations (61%), while the rest either had no plans to complete them (34%) or said that they did not know (5%).

Figure 7-4. Received and Completed Recommendations



8. Conclusions and Recommendations

The following discussion presents our findings and accompany recommendations. Note that each finding does not have a recommendation.

Finding: Overall, Opinion Dynamics found that the DEC REA program performed well. Participants were highly satisfied with the program and net savings were in line with results from most prior evaluations. We found that most participants first heard about the program through Duke Energy mailings, which is consistent with Duke's marketing efforts.

Finding: Like the REA program that operates in other Duke Energy jurisdictions, not all measures from the Energy Efficiency Starter Kit were installed by auditors. Almost half of the kit measures were not installed by the auditor during the home assessment (weighted average of 53% were installed). However, measures that save more energy, such as LEDs, faucet aerators, and low-flow showerheads were installed more frequently than outlet seals and weather stripping. Of the 38% who did not have their faucet aerators installed, two-thirds said it was because they did not fit and of the 15% of customers who did not have their free LEDs installed, about one-quarter said they were waiting for their old bulbs to burn out first.

> **Recommendation: Program energy savings would likely improve if auditors installed all possible measures from the kit. If auditors are unable to install all measures, they should document the barriers they face so that these can be assessed for ways to overcome them.** If the program could improve measure installation, it is likely that measure ISRs and program savings would improve, particularly because we found high PRs for all measures. We understand that there may be safety concerns related to the installation of outlet seals, which may lead auditors to leave these measures uninstalled, but our understanding is that Duke Energy has an expectation that all measures will be installed during home assessments. It should be noted that in subsequent conversations, the evaluation team learned from Duke Energy that in the spring of 2017, after the close of this evaluation period, additional training of implementation staff occurred to address this issue and to instruct installers to document why measures were not installed.
>
> Specifically, to address faucet aerators that do not fit, we recommend providing adaptors to participants to increase the installation rate of this measure.
>
> **Recommendation: Provide education on the benefits of early light bulb replacement.** Participants report "not needing them" as the most common reason for not installing the LEDs provided in the kit, suggesting that participants are waiting for their current bulbs to burn out. While more emphasis on installing all measures during the audit (see recommendation above) will help with ISRs, providing additional education on the savings potential of LEDs might lead to additional spillover savings by encouraging participants to more quickly replace inefficient bulbs in the future as well.

Finding: While our data preparation for the billing analysis showed that a majority of REA participants have participated in other Duke Energy programs, our survey findings show showed that only a small portion of customers recalled hearing about other Duke Energy programs through the REA program.

> **Recommendation: Channeling efforts by auditors that direct participants of the REA program to other Duke Energy programs could be improved.** While our data preparation for the billing analysis showed that a majority of REA participants have participated in other Duke Energy programs prior to participation, our survey findings showed that only a small portion of customers recalled hearing about other Duke Energy programs through the REA program. If Duke Energy is interested in using the REA program to channel customers to their other offerings, program staff may want to direct auditors to

leave behind applicable materials to market its other programs. Additionally, we recommend that auditors familiarize themselves with Duke Energy's other programs and make recommendations to program participants based on the programs that are most suitable.

According to Duke Energy, the program refreshed the technology and audit report in March 2017 to provide a more user-friendly report to the customer, outlining audit recommendations as well as cross-program recommendations. Additionally, the implementer now has the ability to report back to Duke Energy all recommendations, including cross-promotional referrals. Finally, in addition to including FindItDuke referrals in the audit report, advisors can now generate (where relevant) and email referrals to the customer during the assessment.

Finding: Based on a review of the program-tracking data, several energy saving recommendations were provided less than 20% of the time to customers. During assessment visits, auditors are expected to provide participants with applicable recommendations to improve energy efficiency in their homes. It is unclear if recommendations were not provided because they were not applicable or for some other reason. According to Duke Energy, the program implementer has since received additional training to ensure that all appropriate audit recommendations are provided. In addition, the program refreshed its audit reports in March 2017 to make sure to cover applicable audit recommendations.

Recommendation: The energy savings from the program could be improved if auditors provided customers with more recommendations on which they could act. They may not be knowledgeable about the amount of energy that they could save by making changes, such as replacing furnace filters and adjusting thermostat settings. As noted above, Duke Energy has provided additional training to implementation staff to address providing recommendations to program participants that can help them save energy in their homes.

9. DSMore Inputs

For planning purposes, Duke Energy requires separate per-participant savings values for the energy efficiency kit and the additional bulbs distributed to participants. To provide these estimates, the evaluation team took the following steps:

1. We estimated **net savings per additional LED** by multiplying gross savings per additional LED by the LED NTG ratio of 55.0%.

2. We estimated **net savings of the kit exclusive of additional LEDs** by subtracting net savings for the average number of additional LEDs (3.7 bulbs) from per household savings based on the billing analysis.

Developing these separate inputs ensures that savings from the additional bulbs are not double-counted for planning purposes, as their savings are already included in the billing analysis estimate.

Table 9-1 presents the development of the DSMore inputs.

Table 9-1. Development of Energy and Demand Savings for DSMore Table

Data for Development of DSMore Inputs	Energy Savings (kWh)*	Summer Coincident Demand (kW)	Winter Coincident Demand (kW)
Gross savings per additional LED bulb: Engineering analysis	34.06	0.00504	0.00244
LED NTG ratio = 54.8%			
Net savings per LED additional bulb: Engineering analysis	**18.67**	**0.00276**	**0.00134**
Program savings per participant: Billing analysis	693.50	0.08306	0.06186
Net Savings for additional LED Bulbs	69.06	0.01022	0.00495
Net kit savings per participant (excluding additional LEDs)	**624.44**	**0.07284**	**0.05692**

*Energy values have been rounded.

The DSMore Inputs are included in a separately provided Microsoft Excel file.

10. Summary Form

Residential Energy Assessments

Completed EM&V Fact Sheet

The REA program provides, free of cost, a home energy assessment, which includes a kit of low-cost energy efficiency measures. A report of recommended upgrades and behavioral changes is given to the customer at the end of the assessment.

Date	October 12, 2018
Region(s)	Duke Energy Carolinas
Evaluation Period	May 2016–April 2017
Annual kWh Savings	6,402,392
Annual kWh Savings (per participant)	693.5
Coincident kW Impact	0.083 (Summer), 0.062 (Winter)
Measure Life	Not Evaluated
Net-to-Gross Ratio	82%
Process Evaluation	Yes
Previous Evaluation(s)	N/A

Evaluation Methodology

The evaluation team verified measure-level deemed savings estimates using an engineering analysis of savings assumptions and calculations. The evaluation team also leveraged a participant survey to verify installation and ISRs for each measure and to estimate a NTGR. The evaluation team conducted a billing analysis to estimate energy savings and used a combination of billing analysis and engineering analysis results to estimate coincident demand savings.

Impact Evaluation Details

- Residential customers in the DEC service territory who have owned their single-family home for at least 4 months are eligible for the program. Homes must have an electric water heater, electric heat, or central air conditioning.
- The evaluation team based assumptions and inputs, for deemed savings and gross impacts, on the IN TRM V2.2. The engineering analysis applied deemed savings values to measures distributed and in service (e.g., via Energy Efficiency Starter Kits and additional LEDs).
- Results from the billing analysis reflect savings associated with measures installed, assessment recommendations, SO, and potential behavioral changes from energy efficiency knowledge gained through participation in the REA program.

For more information, please contact:

Aaiysha Khursheed, Ph.D.
Principal Consultant

858 401 7638 tel
akhursheed@opiniondynamics.com

7590 Fay Avenue, Suite 406
La Jolla, CA 92037

Boston | Headquarters

617 492 1400 tel
617 497 7944 fax
800 966 1254 toll free

1000 Winter St
Waltham, MA 02451

Duke Energy Carolinas

Residential Energy Assessments Program Evaluation Report Appendices - Final

October 12, 2018

Contributors

Aaiysha Khursheed
Principal Consultant, Opinion Dynamics

Antje Flanders
Vice President, Opinion Dynamics

Stef Wayland
Senior Director, Data Science, Opinion Dynamics

Matt Drury
Director, Engineering, Opinion Dynamics

Marion Cundari
Consultant, Engineering, Opinion Dynamics

Stephen Mariani
Consultant, Opinion Dynamics

Table of Contents

Table of Tables

Table of Figures

Table of Equations

Appendix A. Participant Telephone Survey Instrument

Opinion Dynamics

Duke Energy Carolinas Residential Energy Assessment Program Phone Survey

June 9, 2017 – Final

VARIABLES

CONTACT_NAME	Name of contact
ALT_CONTACT	Alternate contact name
PHONE	Contact's phone number
DATE	Date of Home Energy House Call assessment
T_QTY	Tracked quantity of LEDs received during the assessment
QTY	Verified quantity of LEDs received during the assessment
FINAL INSTALLED QUANTITY	The total quantity of installed measure from the assessment
PRICE	The cost of a standard LED distributed by the program
CFL	The cost of a standard CFL equivalent to the LED distributed by the program
REC_*	Flag indicating the customer received the recommendation (* = a – k)

Introduction

Hello, my name is _________ and I am calling from Opinion Dynamics, an independent research firm, on behalf of Duke Energy. We're calling recent participants in Duke Energy's Home Energy House Call program to learn about its experience and satisfaction with the program. Duke Energy will use this information to improve its programs to benefit customers. I want to assure you that this is not a sales call and your answers will be strictly confidential.

(**READ IN ONLY IF NEEDED**: Depending on your responses, this survey will just take about 20 minutes of your time.)

May I speak with **<CONTACT NAME>** or someone in your household who is familiar with the Home Energy House Call that was conducted on **<DATE>**?

C1. Are you currently talking to me on a regular landline phone or a cell phone?
1. Regular landline phone
2. Cell Phone
8. (Don't know)
9. (Refused)

[SKIP IF C1 = 1]
C2. Are you currently in a place where you can talk safely and answer my questions?
1. Yes
2. No **[Schedule call back]**
8. (Don't know) **[Schedule call back]**

9. (Refused) **[Schedule call back]**

Screeners

S1. Our records show that you participated in Duke Energy's Home Energy House Call program. As part of the program you registered for a home energy assessment where someone came to your home and provided you with energy-saving recommendations and a free energy efficiency kit that included light bulbs, a shower head, and faucet aerators. Do you remember participating in this program?

1. Yes
2. No **[ASK IF SOMEONE ELSE MIGHT BE KNOWLEDGEABLE; ELSE THANK AND TERMINATE]**
8. (Don't know) **[ASK IF SOMEONE ELSE MIGHT BE KNOWLEDGEABLE; ELSE THANK AND TERMINATE]**
9. (Refused) **[ASK IF SOMEONE ELSE MIGHT BE KNOWLEDGEABLE; ELSE THANK AND TERMINATE]**

Program Awareness

PA1. How did you first hear about Home Energy House Call?

01. (Duke Energy website)
02. (Email from Duke Energy)
03 (Mailing from Duke Energy – includes bill inserts and letters)
04. (a Billboard)
05. (through social media)
06. (Pandora radio)
00. (Other, please specify)
98. (Don't know)
99. (Refused)

PA2. Why did you decide to participate in this program? **[RECORD ALL THAT APPLY]**

01. (Save money on energy/electric/gas bill)
02. (Reduce energy consumption)
03. (Make your home more comfortable)
07. (It was free)
00. (Other **[Specify]**)
98. (Don't know)
99. (Refused)

Energy Assessment Willingness-To-Pay

WTP1. Before you heard about the Home Energy House Call program from Duke Energy, had you already been considering getting a home energy assessment?

1. Yes
2. No
8. (Don't know)
9. (Refused)

WTP2. If the energy assessment and energy efficiency kit that you received from Duke Energy had not been free, how much would you have been willing to pay for the...?

a. Energy assessment **[00=NUMERIC OPEN END, 98=DK, 99=REF]**
b. Energy efficiency kit **[00=NUMERIC OPEN END, 98=DK, 99=REF]**

Channeling

CH1. Do you recall learning about other Duke Energy programs through your participation in the Home Energy House Call program?
1. Yes
2. No
8. (Don't know)
9. (Refused)

[ASK IF CH1=1]

CH2. Which other Duke Energy programs did you learn about? **[MULTIPLE RESPONSE; UP TO 4]**
01. (Old/inefficient refrigerator or freezer recycling; "Appliance Recycling Program")
02. (Air conditioner cycling; "Power Manager")
03. (Home improvement rebate programs; "Smart $aver")
04. (My Home Energy Report)
00. (Other: Specify)
98. (Don't know)
99. (Refused)

Measure Verification and Free-Ridership [ROTATE MEASURE SECTIONS]

Now we have some questions about the equipment that was installed during your home energy assessment.

LED Measure Verification and Free-Ridership

LED0. The free light bulbs you received from Duke Energy are LEDs. Thinking about ALL of the light sockets in your home in which you could use an LED, how many of them contained LEDs BEFORE you received the free LEDs from Duke Energy in the mail? Would you say... (IF NEEDED: An LED bulb often has a plastic base, sometimes with ridges. LEDs are the newest type of light bulb on the market. They typically cost more than the other types of light bulbs.)
1. All of them
2. Most of them
3. Some of them
4. A few of them
5. None of them
8. (Don't know)
9. (Refused)

LED0a. Our records indicate that you received <T_QTY> bulb(s) in your energy efficiency starter kit. Is that correct?
1. Yes, the number is correct
2. No, I received a different number of bulbs
8. (Don't know)
9. (Refused)

[ASK IF LED0a = 2,8,9]
LED0b. How many free LEDs did you receive from Duke? **[NUMERIC OPEN END 0-8; 98 = DON'T KNOW, 99 = REFUSED]**

[SKIP TO NEXT MEASURE SECTION IF LED0b = 0, 98,99]

[CALCULATE <QTY> = <T_QTY> IF LED0a = 1; ELSE <QTY> = LED0b]

LED1a. Were all <QTY> free LEDs you received from Duke installed?
1. (Yes)
2. (Some of them)
3. (None of them)
8. (Don't know) **[SKIP TO FR1]**
9. (Refused) **[SKIP TO FR1]**

[ASK IF LED1a = 1,2]
LED1b. Did you or did the auditor install them?
1. (I installed the LEDs)
2. (The auditor installed LEDs)
3. (I installed some LEDs and the auditor installed some LEDs)
8. (Don't know)
9. (Refused)

[ASK IF LED1a = 2 AND LED1b = 2,3]
LED1c. How many of the <QTY> LEDs that you received from Duke were installed by the auditor? **[NUMERIC OPEN END 0-8; CAP AT <QTY>, 98 = DON'T KNOW, 99 = REFUSED]**

[ASK IF LED1a = 2 AND LED1b = 1,3]
LED1d. How many of the <QTY> LEDs that you received from Duke did you install? **[NUMERIC OPEN END 0-8; CAP AT <QTY>, 98 = DON'T KNOW, 99 = REFUSED]**

[SKIP TO FR1 IF LED1d = 98,99 OR LED1d = 98,99]

[ASK IF LED1a = 2, 3; ELSE SKIP TO LED4]

LED2. Why haven't all of the free LEDs you received been installed?
1. (Haven't needed to/waiting for light bulbs to burn out)
2. (Don't have a light socket where I use that wattage)
3. (Don't like LEDs)
00. (Other, specify)
98. (Don't know)
99. (Refused)

LED3. What did you do with the LEDs that weren't installed? **[MULTIPLE RESPONSE UP TO 4]**
1. (In storage for later use)
2. (Threw them away)
3. (Gave them away)
00. (Other, specify)
98. (Don't know)
99. (Refused)

[CALCULATE < INSTALLED QUANTITY> = 0 if LED1a=3]

[CALCULATE < INSTALLED QUANTITY> = <QTY> if LED1a = 1]

[CALCULATE < INSTALLED QUANTITY> = LED1c if LED1a = 2 AND LED1b = 2 AND LED1c < 98]

[CALCULATE < INSTALLED QUANTITY> = LED1d if LED1a = 2 AND LED1b = 1 AND LED1d < 98]

[CALCULATE < INSTALLED QUANTITY> = LED1c + LED1d if LED1a=2 AND LED1b = 3 AND LED1c < 98 AND LED1d < 98]

[SKIP TO FR1 IF INSTALLED QUANTITY = 0]

[ASK IF LED1a = 1, 2 & INSTALLED QUANTITY >0]

LED4. Have you removed any of the <FINAL INSTALLED QUANTITY> free LEDs that were installed?
1. Yes
2. No
8. (Don't know)
9. (Refused)

[ASK IF LED4=1]

LED5a. How many of the LEDs did you remove?
00. **[OPEN END]**
98. (Don't know)
99. (Refused)

[ASK IF LED4=1]

LED5b. Why did you remove the LED(s)? **[MULTIPLE RESPONSE UP TO 5]**
1. (Do not like light quality/not bright enough/too bright)
2. (Do not like appearance of bulb)
3. (Stopped working/burned out)
4. (Never worked)
00. (Other, specify)
98. (Don't know)
99. (Refused)

[ASK IF LED4=1 AND LED5b <> 3,4]

LED6. What did you do with the working LED(s) you removed? **[MULTIPLE RESPONSE UP TO 5]**
1. (In storage for later use)
2. (Threw them away)
3. (Gave them away)
4. (Installed them somewhere else – not in my home)
00. (Other, specify)
98. (Don't know)
99. (Refused)

LED7. What types of bulbs were in the sockets where **[READ IF LED1b = 1,3:** you] **[READ IF LED1b = 3:** or] **[READ IF LED1b = 2,3:** the auditor] installed the free LEDs from Duke?
[MULTIPLE RESPONSE UP TO 5]
1. Incandescent or halogen bulbs
2. CFLs
3. LEDs
4. Installed in empty sockets
00. (Other, specify)
08. (Don't know)
99. (Refused)

[ASK IF MULTIPLE ANSWERS TO LED7]
LED8. How many of the <INSTALLED QUANTITY> LEDs…
[SUM OF RESPONSES SHOULD EQUAL INSTALLED QUANTITY]

LED8A. **[READ IF LED7 = 1]** Replaced incandescent or halogen bulbs? **[NUMERIC RESPONSE]**

LED8B. **[READ IF LED7 = 2]** Replaced CFLs? **[NUMERIC RESPONSE]**

LED8C. **[READ IF LED7 = 3]** Replaced LEDs? **[NUMERIC RESPONSE]**

LED8D. **[READ IF LED7 = 4]** Were installed in empty sockets? **[NUMERIC RESPONSE]**

LED8E. **[READ IF LED7 = 0]** Replaced other types of bulbs? **[NUMERIC RESPONSE]**

[CREATE <FINAL INSTALLED QUANTITY>; FILL IN LED8A-LED8E WITH ZEROS IF NOT SELECTED IN LED7, WITH < INSTALLED QUANTITY> IF ONLY ONE SELECTED IN LED7; IF DK/REF IN LED7, <FINAL INSTALLED QUANTITY> = <INSTALLED QUANTITY>]

[SKIP IF LED8D = FINAL INSTALLED QUANTITY]
LED9. Were any of the bulbs that were replaced with free LEDs still working or had all of them burned out?
1. Some were still working
2. All of them had burned out
3. All of them were still working
8. (Don't know)
9. (Refused)

[ASK IF LED9=1]
LED10. Of the <FINAL INSTALLED QUANTITY> bulbs that were replaced with free LEDs, how many were still working? **[NUMERIC OPEN END 0-15, CAP AT <FINAL INSTALLED QUANTITY>, 98 = DON'T KNOW 99 = REFUSED]**

LED Free-Ridership

For this next set of questions, please think about **all** of the LEDs that you received for free from Duke Energy through the Home Energy House Call program.

FR1. When you purchase light bulbs, do you generally purchase the lowest-priced bulb, or do you consider other factors, such as energy efficiency, quality of light, or longevity of the bulb? (IF PARTICIPANT SAYS THAT THEY CONSIDER BOTH PRICE AND OTHER FACTORS, RECORD RESPONSE AS 2)
1. I purchase the lowest-priced bulb
2. I consider other factors
8. (Don't know)
9. (Refused)

[ASK IF LED1b = 2 AND LED1c <98 AND LED1c >0]
FR1a. Earlier you told me that the auditor installed <LED1c> LED bulbs in your home. If it had not been for the program, would you have replaced **ANY** of the **WORKING** light bulbs in your home at that time, or would you have waited for the light bulbs to burn out?
1. Would have replaced working bulbs
2. Would have waited for bulbs to burn out
8. (Don't know)
9. (Refused)

[ASK IF FR1a = 1]
FR1b. How many of the **WORKING** bulbs would you have replaced? **[NUMERIC OPEN END, 998=DON'T KNOW, 999=REFUSED]**

FR2. The <QTY> LED bulbs you received from Duke Energy cost about $<PRICE> per bulb at a retail store, for a total cost of $<PRICE * QTY>.

If you had not received the <QTY> LEDs from Duke Energy, what would you have purchased the next time you needed to buy light bulbs? Would you have purchased... **[RANDOMIZE]**
1. Incandescent or halogen bulbs
2. CFLs
3 LEDs
4. A mix of bulbs **[HIDE IF QTY=1]**
5. The lowest cost bulbs
8. (Don't know)
9. (Refused)

[ASK IF FR2=2]
FR3. Similar CFL bulbs cost about $<CFL> per bulb at a retail store. Knowing this, would you have still purchased CFLs, or would you have purchased a different type of light bulb?
1. Still would have purchased CFLs **[SKIP TO FR10]**
2. Would have purchased a different type of light bulb **[RETURN TO FR2, DO NOT GIVE CFLs AS AN OPTION IN FR2]**
8. (Don't know) **[SKIP TO FR10]**
9. (Refused) **[SKIP TO FR10]**

[ASK IF FR2=3 AND QTY>1]
FR4. Would you have purchased all <QTY> LEDs or just some at full retail price of $<PRICE> per bulb?
1. All of them
2. Some of them
3. (None of them)
8. (Don't know)
9. (Refused)

[ASK IF FR4=2]
FR5. How many of the <QTY> LEDs would you have purchased at the full retail price of $<PRICE> per bulb? **[NUMERIC OPEN END, 1 TO** <QTY>**, 98=DON'T KNOW; 99=REFUSED]**

[CALCULATE FR_QTY=FR5 IF FR4=2 OR FR_QTY=QTY IF FR4=1]

[CALCULATE PROG_QTY=QTY - FR_QTY>]

[ASK IF FR4=2 AND FR5<98 AND PROG_QTY>0]
FR6. Just to make sure I recorded everything accurately, you are telling me that of the <QTY> LEDs that you received from Duke Energy, you would have purchased <FR5 ANSWER> LEDs, which means that you would not have purchased <PROG_QTY> Is that correct?
1. Yes
2. No **[RETURN TO FR5]**
8. (Don't know)
9. (Refused)

[ASK IF FR4=2 AND FR5<9 AND PROG_QTY>0]
FR7. For these <PROG_QTY> bulbs, would you have still purchased LEDs but have done it later, or would you have purchased a different type of light bulb instead of LEDs?
1. Purchased LEDs later
2. Purchased a different type of light bulb
8. (Don't know)
9. (Refused)

[ASK IF FR7=2]
FR7A. What type(s) of light bulbs would you have purchased instead of LEDs? **[MULTIPLE RESPONSE]**
1. Incandescent or halogen bulbs
2. CFLs
4. (Other)
8. (Don't know)
9. (Refused)

[ASK IF FR7A=2]

FR7B. Similar CFL bulbs cost about $<CFL> per bulb at a retail store. Knowing this, would CFLs still have been a part of the mix?

1. Yes
2. No
8. (Don't know)
9. (Refused)

[IF FR7B=2, GO BACK TO FR7A AND RECORD UPDATED RESPONSES]

[ASK IF FR2=4]

FR8. What types of bulbs would likely have been in the mix? **[MULTIPLE RESPONSE]**

1. Incandescent or halogen bulbs
2. CFLs
3 LEDs
00. (Other: Specify)
8. (Don't know)
9. (Refused)

[ASK IF FR8=2]

FR9. Similar CFL bulbs cost about $<CFL> per bulb at a retail store. Knowing this, would CFLs still have been a part of the mix?

1. Yes
2. No
8. (Don't know)
9. (Refused)

[IF FR9=2, GO BACK TO FR8 AND RECORD UPDATED RESPONSES]

[ASK IF (LED8A > 0 AND LED8A <98 AND LED1b = 1,3) OR (LED7 HAS A SINGLE RESPONSE AND LED7 = 1 AND LED1b = 1,3); ELSE SKIP TO NEXT MEASURE]

FR10. Earlier, you told us you replaced working incandescent or halogen light bulbs with the LEDs you received for free from Duke. If you had not received the free LEDs from Duke, would you have still replaced these working incandescent or halogen light bulbs with LEDs, or would you have waited until they burned out?

1. (Would have replaced working incandescents or halogens with LEDs)
2. (Would have waited until incandescents or halogens burned out)
8. (Don't know)
9. (Refused)

Faucet Aerator Measure Verification

FA1. How many of the two faucet aerators you received from Duke Energy were installed?

1. One
2. Two
6. None
8. (Don't know) [SKIP TO NEXT MEASURE SECTION]
9. (Refused) [SKIP TO NEXT MEASURE SECTION]

[ASK IF FA1 = 1, 2]

FA1a. Did you or did the auditor install them?
1. (I installed the faucet aerator(s).)
2. (The auditor installed the faucet aerator(s).)
3. (I installed one faucet aerator and the audit installed one faucet aerator.)
8. (Don't know)
9. (Refused)

[ASK IF FA1 =1,2]

FA1b. Where **[READ IF FA1** = 1:is the faucet aerator; **READ IF FA1 = 2**: are the faucet aerators**]** installed? **[MULTIPLE RESPONSE]**
1. (Kitchen)
2. (Bathroom)
3. (Other: Specify)
8. (Don't know)
9. (Refused)

[ASK IF FA1 = 1, 6]

FA2. Why haven't [READ IF FA1=1: all of] the free faucet aerators you received been installed?
01. (I did not need both: Installed one)
02. (I already had aerators installed)
03. (Did not fit my faucet(s)/I have a specialty faucet)
04. (I don't like faucet aerators)
00. (Other: Specify)
96. (Did not receive any) [SKIP TO NEXT MEASURE SECTION]
98. (Don't know)
99. (Refused)

[ASK IF FA1=1,2]

FA3. Have you removed any of the faucet aerators that were installed?
1. Yes
2. No
8. (Don't know)
9. (Refused)

[ASK IF FA3=1 & FA1=2]

FA3a. How many did you remove?
1. One
2. Two
8. (Don't know)
9. (Refused)

[ASK IF FA3=1]

FA3b. Why did you remove the faucet aerator(s)?
- 00. [OPEN END]
- 98. (Don't know)
- 99. (Refused)

Faucet Aerator Free-Ridership

FA4. If you had not received free faucet aerators from Duke, how likely is it that you would have purchased any faucet aerators for your home? Please use a likelihood scale from 0 to 10, where 0 is "Not at all likely" and 10 is "Extremely likely" **[RECORD 0-10 98=Don't know; 99=Refused].**

[ASK IF FA4>0 &<98]

FA5. If you had not received faucet aerators from Duke, would you have installed the same number or fewer faucet aerators than were installed?
1. I would have installed FEWER faucet aerators
2. I would have installed the SAME number of faucet aerators
3. I would have installed more
4. I would NOT have installed any
8. (Don't know)
9. (Refused)

[ASK IF FA5<> 4]

FA7. If you had not received faucet aerators from Duke, when would you have installed them?
1. At roughly the same time
2. Within 6 months
3. Within a year
4. More than a year
8. (Don't know)
9. (Refused)

Shower Head Measure Verification

SH1. Was the low-flow shower head you received from Duke Energy installed?
1. Yes
2. No
8. (Don't know) [SKIP TO NEXT MEASURE SECTION]
9. (Refused) [SKIP TO NEXT MEASURE SECTION]

[ASK IF SH1 = 1]

SH1a. Did you or did the auditor install it?
1. I installed the shower head
2. The auditor installed the shower head
8. (Don't know)
9. (Refused)

[ASK IF SH1=2]

SH2. Why hasn't the low-flow shower head you received been installed?
- 01. (Appearance/Didn't like how it looked)
- 02. (Didn't fit)
- 03. (Haven't gotten around to it)
- 00. (Other, specify)
- 96. (Did not receive) [SKIP TO NEXT MEASURE SECTION]
- 98. (Don't know)
- 99. (Refused)

[SKIP IF SH1=2]

SH3. Is the low-flow shower head you received from Duke still installed in your home?
- 1. Yes
- 2. No
- 8. (Don't know)
- 9. (Refused)

[ASK IF SH3=2]

SH4. Why did you remove the low-flow shower head?
- 01. (The shower head was broken or leaked)
- 02. (The shower head had low water pressure)
- 03. (I disliked the look of the shower head)
- 05. (I purchased a better shower head)
- 00. (Other: specify)
- 98. (Don't know)
- 99. (Refused)

[ASK IF SH3=1]

SH6. Typically, how many showers per week are taken using this shower head?
- 1. 0 to 4
- 2. 5 to 10
- 3. 11 to 15
- 4. 16 to 20
- 5. More than 20
- 8. (Don't know)
- 9. (Refused)

Shower Head Free-Ridership

SH7. If you had not received the low-flow shower head from Duke, how likely is it that you would have purchased a low-flow shower head for your home? Please use a likelihood scale from 0 to 10, where 0 is "Not at all likely" and 10 is "Extremely likely" **[RECORD 0-10 98=Don't know; 99=Refused].**

[ASK IF SH7>0 & <98; ELSE SKIP TO NEXT MEASURE SECTION]

SH8. If you had not received the low-flow shower head from Duke, would you have installed the same number of low-flow shower heads than were installed?
1. I would have installed the SAME number of low-flow shower heads
2. I would have installed more
3. I would NOT have installed any
8. (Don't know)
9. (Refused)

[ASK IF SH8<>3, ELSE SKIP TO NEXT MEASURE SECTION]

SH9. If you had not received the low-flow shower head from Duke when would you have installed one?
1. At roughly the same time
2. Within 6 months
3. Within a year
4. More than a year
8. (Don't know)
9. (Refused)

Outlet Seal Measure Verification

G0. How many outlet seals did you receive from Duke Energy?

[NUMERIC OPEN END; 98=DK 99=REF]

[IF G0=0, SKIP TO NEXT MEASURE SECTION]

G1. Were the outlet seals you received from Duke installed?
1. (Yes)
2. (Some of them)
6. (None of them) **[SKIP TO G1b]**
8. (Don't know) **[SKIP TO NEXT MEASURE SECTION]**
9. (Refused) **[SKIP TO NEXT MEASURE SECTION]**

G1a. Did you or did the auditor install them?
1. I installed the outlet seals
2. The auditor installed the outlet seals
3. I installed some of the outlet seals and the auditor installed some of the outlet seals
8. (Don't know)
9. (Refused)

[ASK IF G1=2]

G1aa. How many of the outlet seals were installed? **[NUMERIC OPEN END; 98=DK 99=REF]**

[ASK IF G1 = 1, 2]

G1ab. How many of the outlet seals were installed in interior walls? **[NUMERIC OPEN END; 98=DK 99=REF]**

[ASK IF G1 = 1,2 and G1ab <> G1aa]

G1ac. How many of the outlet seals were installed in exterior walls? **[NUMERIC OPEN END; 98=DK 99=REF]**

[ASK IF G1 = 2, 6]

G1b. Why haven't all the outlet seals you received been installed?
- 00. [OPEN END]
- 98. (Don't know)
- 99. (Refused)

[ASK IF G1=1, 2; ELSE SKIP TO G5]

G2. Are all the outlet seals that were installed still in place?
1. Yes
2. No
8. (Don't know)
9. (Refused)

[ASK IF G2=2, ELSE SKIP TO G5]
G3. How many outlet seals were removed from your home?
- 00. [NUMERIC OPEN END]
- 96. (Removed all of them)
- 98. (Don't know)
- 99. (Refused)

Outlet Seal Free-Ridership

G5. If you had not received the outlet seals from Duke, how likely is it that you would have purchased any outlet seals for your home? Please use a likelihood scale from 0 to 10, where 0 is "Not at all likely" and 10 is "Extremely likely" **[RECORD 0-10 98=Don't know; 99=Refused].**

[ASK IF G5>0 & <98; ELSE SKIP TO NEXT SECTION]

G6. If you had not received the outlet seals from Duke, would you have installed the same number of outlet seals than were installed?
1. I would have installed FEWER outlet seals
2. I would have installed the SAME number of outlet seals
3. I would have installed more
4. I would NOT have installed any
8. (Don't know)
9. (Refused)

[ASK IF G6<>4, ELSE SKIP TO NEXT SECTION]

G7. If you had not received the outlet seals from Duke when would you have installed them?
1. At roughly the same time

2. Within 6 months
3. Within a year
4. More than a year
8. (Don't know)
9. (Refused)

Weather stripping Measure Verification

W0. How many feet of weather stripping did you receive from Duke Energy?
1. 1 to 5
2. 6 to 10
3. 11 to 17
4. 18 or more
6. (None) [SKIP TO NEXT MEASURE SECTION]
8. (Don't know)
9. (Refused)

W1. Was the weather stripping from Duke installed?
1. (Yes, all)
2. (Yes, some of it)
6. (No / None of it) [**SKIP TO W1b]**
8. (Don't know) **[SKIP TO NEXT MEASURE SECTION]**
9. (Refused) **[SKIP TO NEXT MEASURE SECTION]**

W1a. Did you or did the auditor install it?
1. I installed all the weather stripping
2. The auditor installed all the weather stripping
3. I installed some of the weather stripping and the auditor installed some of the weather stripping
8. (Don't know)
9. (Refused)

[ASK IF W1 = 2,6]

W1b. Why hasn't [READ IF W1=2: all of] the weather stripping you received been installed?
00. [OPEN END]
98. (Don't know)
99. (Refused)

[ASK IF W1 = 1,2; ELSE SKIP TO W3]

W2. How many feet were installed?
1. 1 to 5
2. 6 to 10
3. 11 to 17
4. 18 or more
8. (Don't know)
9. (Refused)

W2a. Did you remove any of the weather stripping?
1. Yes
2. No
8. (Don't know)
9. (Refused)

[ASK IF W2a = 1]

W2b. How many feet did you remove?
1. 1 to 5
2. 6 to 10
3. 11 to 17
4. 18 or more
8. (Don't know)
9. (Refused)

Weather stripping Free-Ridership

W3. If you had not received the weather stripping from Duke, how likely is it that you would have purchased the weather stripping for your home? Please use a likelihood scale from 0 to 10, where 0 is "Not at all likely" and 10 is "Extremely likely" **[RECORD 0-10 98=Don't know; 99=Refused].**

[ASK IF W3>0 & <98; ELSE SKIP TO NEXT SECTION]

W4. If you had not received the weather stripping from Duke, would you have installed the same amount of weather stripping than what was installed?
1. I would have installed LESS weather stripping
2. I would have installed the SAME amount of weather stripping
3. I would have installed more
4. I would NOT have installed any
8. (Don't know)
9. (Refused)

[ASK IF W4<>4; ELSE SKIP TO NEXT SECTION]

W5. If you had not received the weather stripping from Duke when would you have installed it?
1. At roughly the same time
2. Within 6 months
3. Within a year
4. More than a year
8. (Don't know)
9. (Refused)

Assessment Recommendations

We have a few questions about the recommendations that you received from your energy assessment report.

B1. Do you recall receiving recommendations in the assessment report for how to save energy in your home from the auditor?
1. Yes
2. No
8. (Don't know)
9. (Refused)

[ASK IF B1=1, ELSE SKIP TO SO1]

B2. Can you please tell us which of the following assessment report recommendations you completed? [READ IF HAS_REC=0 "If you did not receive a recommendation, please let me know."] **<READ IN RECOMMENDATIONS IF REC_* = 1, READ ALL FOR HAS_REC=0>. [01=YES; 02=NO, 06=WAS NOT RECOMMENDED, 8=DK, 9=REF]**

Did you...
a. Close crawl space vents
b. Seal air leaks in your duct system
c. Install duct insulation
d. Unplug or remove an extra appliance
e. Adjust how much you run your furnace fan
f. Clean or replace your furnace filter
g. Replace an old or install a new heat pump
h. Seal air leaks in your home
i. Install insulation in your home
j. Turn down your hot water heater temperature
k. Use window shades during summer months

[ASK IF ANY B2a-k=1]

B2aa. Did you receive a utility incentive, rebate, or other discount for any of these recommendations that you completed?
1. Yes
2. No
8. (Don't know)
9. (Refused)

[ASK FOR EACH B2b,c,d,f,g,h,i=1 AND LIST OPTIONS; IF B2aa=1]

B2bb. Did you receive a utility incentive, rebate, or discount for <RECOMMENDATION>? **98=DK, 99=REF]**
02. Seal air leaks in your duct system
03. Install duct insulation
04. Unplug or remove an extra refrigerator
06. Clean or replace your furnace filter
07. Replace an old or install a new your heat pump
08. Seal air leaks in your home
09. Install insulation in your home

[ASK IF ANY B2a-k = 2, 98]

B3. Do you have any current plans to complete the remaining energy saving recommendations?
1. Yes, All
2. Yes, Some
3. No
8. (Don't know)
9. (Refused)

[ASK IF B3 = 2]

B3a. Which recommendations are you planning to complete within the next 12 months? **[Multiple Response Up to 5; LIST ONLY RECOMMENDATIONS NOT COMPLETED: B2a-k = 2, 8]**
01. (Close crawl space vents)
02. (Seal air leaks in your duct system)
03. (Install duct insulation)
04. (Unplug or removed an extra refrigerator)
05. (Adjust how much you run your furnace fan)
06. (Clean or replaced your furnace filter)
07. (Replace an old or install a new heat pump)
08. (Seal air leaks in your home)
09. (Install insulation in your home)
10. (Use less hot water)
11. (Use window shades during summer months)
95. (I will eventually make all these improvements)
96. (I am still deciding which recommendations to complete)
98. (Don't know)
99. (Refused)

Spillover

SO1. Since participating in the Home Energy House Call program, have you made any energy-saving home improvements, for which you <u>DID NOT RECEIVE A UTILITY INCENTIVE, REBATE, OR OTHER DISCOUNT</u>? These could be big things like home remodeling or the purchasing of new appliances or smaller things like light bulbs and shower heads.
1. Yes
2. No
8. (Don't know)
9. (Refused)

[ASK IF SO1=1]

SO1b. Did the Home Energy House Call program influence you in any way to make these additional improvements?
1. Yes
2. No
8. (Don't know)
9. (Refused)

[ASK IF SO1b=1; ELSE SKIP TO BC1]

SO2. How influential was your participation in the Home Energy House Call program on your decision to make additional energy efficiency improvements on your own? Please use a scale that ranges from 0 to 10 where 0 is "Not at all influential" and 10 is "Extremely influential" **[RECORD 0-10; 98=Don't know; 99=Refused].**

[ASK IF SO2>6 AND <98; ELSE SKIP TO BC1]

SO3. More specifically, how did the Home Energy House Call program influence your decision to make additional home improvements to increase your energy savings? **[OPEN END; 98=Don't know; 99=Refused]**

SO4. I just have a few additional questions about these energy-saving improvements you made that <u>DID NOT INVOLVE ASSISTANCE FROM A UTILITY INCENTIVE, REBATE, OR OTHER DISCOUNT</u>. We are specifically interested in energy-saving improvements you made that were influenced by your participation in Duke Energy's Home Energy House Call program. Can you please tell me whether you purchased or installed the following:

Did you ... **[1=Yes; 2=No; 8=Don't know; 9=Refused]**

a. Purchase an ENERGY STAR appliance?
b. Purchase a new high-efficiency water heater?
c. Purchase a new ENERGY STAR room air conditioner?
d. Purchase a new energy-efficient furnace?
e. Purchase a new central air conditioning system or heat pump?
f. Purchase additional energy-efficient lighting, such as CFLs or LEDs?
g. Install additional weather stripping?
h. Install additional faucet aerators?
i. Install additional outlet seals?
j. Install additional low-flow shower heads?
k. Did you make any other improvements?

[ASK IF SO4a=1]

SO5a. What type of ENERGY STAR appliance did you purchase? Was it a refrigerator, a dishwasher, a clothes washer, a freezer, or something else? **[MULTIPLE RESPONSE]**

01. (Refrigerator)
02. (Dishwasher)
03. (Clothes washer)
04. (Freezer)
00. (Other, specify)
96. (Didn't purchase ENERGY STAR appliance
98. (Don't know)
99. (Refused)

[ASK IF SO4b=1]

SO5b. Was the water heater you purchased an electric or gas water heater?

1. Electric water heater

2. Electric heat pump water heater
3. ENERGY STAR gas water heater
8. (Don't know)
9. (Refused)

[ASK IF SO5b=1, 3]

SO5bb. Was it a storage or tankless water heater?
1. Tankless water heater
2. Storage water heater
8. (Don't know)
9. (Refused)

[ASK IF SO4c=1]

SO5c. How many ENERGY STAR room air conditioners did you purchase?

[NUMERIC OPEN END. 98=DON'T KNOW, 99= REFUSE]

[ASK SO5da – SO5dc IF SO4d=1]
SO5da. What fuel does the furnace use?
1. Electricity
2. Natural Gas
3. Oil
4. (Other, specify)
5. (Don't know)
6. (Refused)

SO5db. Is the new furnace a high-efficiency model?

1. Yes
2. No
8. (Don't know)
9. (Refused)

SO5dc. How old was the furnace you replaced?
000. [Numeric Open End, 0-99]
998. (Don't know)
999. (Refused)

[ASK SO6a – SO6b IF SO4f=1]
SO6a. How many CFLs have you purchased since you participated in the program?
000. [Numeric Open End, 0-99]
998. (Don't know)
999. (Refused)

SO6b. How many LEDs have you purchased since you participated in the program?
000. [Numeric Open End, 0-99]
998. (Don't know)
999. (Refused)

[ASK IF SO4g=1]

SO7A. How many feet of additional weather stripping have you installed since you participated in the program? **[Numeric Open End; 98=DK, 99=REF]**

[ASK IF SO4h =1]

SO7B. How many additional faucet aerators have you installed since you participated in the program? **[Numeric Open End; 98=DK, 99=REF]**

[ASK IF SO4i =1]

SO7C. How many additional outlet seals have you installed since you participated in the program? **[Numeric Open End; 98=DK, 99=REF]**

[ASK IF SO4j=1]

SO7D. How many additional low-flow shower heads have you installed since you participated in the program? **[Numeric Open End; 98=DK, 99=REF]**

[ASK IF SO4lk=1]

SO8. What *other* improvements did you make?
00. [OPEN END]
98. (Don't know)
99. (Refused)

Behavioral Changes

BC1. As part of the energy efficiency kit, your received a "Department of Energy, Energy Savers Booklet," which provided information about energy efficiency in the home, and tips on how to save energy. Do you recall receiving the booklet provided to you during your energy assessment?
1. Yes
2. No
6. (Don't recall receiving booklet)
8. (Don't know)
9. (Refused)

[ASK IF BC=1]
BC2. Did you read the booklet provided to you during your energy assessment?
1. Yes
2. No
8. (Don't know)
9. (Refused)

BC3_NEW. Since participating in the program, has the frequency of the following behaviors increased? Do you more frequently… **[1=Yes, 2=No; 6=Not applicable, 8=Don't know; 9=Refused; RANDOMIZE a through k]**

a. Close curtains and shades at night to protect against drafts during cooler months
b. Open curtains and shades during the day to let in warming sunlight during cooler months
c. Turn lights off when rooms are not in use

d. Make sure the dishwasher is full before it is run
e. Defrost freezers and refrigerators
f. Use a toaster oven instead of a full-size oven
g. Wash clothes in cold water
h. Clean the lint screen in the dryer
i. Check dryer vent to be sure it is not blocked
j. Turn off electronics, such as a laptop, when they are not in use
k. Clean or change heat pump filters

Value of Current and Proposed Equipment and Services

V1a. Which piece of equipment that you were given during the Home Energy House Call assessment did you find most valuable? (Read list if necessary)

1. (LED Light bulbs)
2. (Faucet aerators)
3. (Low-flow shower head)
4. (Outlet seals)
5. (Weather stripping)
8. (Don't know)
9. (Refused)

[ASK IF V1a <> 8 OR 9]

V1b. Which piece of equipment was the second-most valuable? (Read list if necessary)

1. (LED Light bulbs)
2. (Faucet aerators)
3. (Low-flow shower head)
4. (Outlet seals)
5. (Weather stripping)
8. (Don't know)
9. (Refused)

V2. Is there any energy efficiency equipment that was not part of your kit but that you would like to have received during your Home Energy House Call? **[OPEN END RESPONSE]**

V3. The Home Energy House Call program is also considering adding a Home Energy Score. The Home Energy Score provides easy-to-understand information about a home's energy performance. It uses a simple 1–10 scale, where a 10 represents the most energy-efficient homes. If you choose, you may list your Home Energy Score when selling your home.

How interested would you have been to receive a Home Energy Score as part of your assessment? Would you say…

1. Very interested
2. Somewhat interested
3. Not very interested
4. Not at all interested
8. (Don't know)
9. (Refused)

Program Satisfaction

I'd like to ask you just a few more questions about your satisfaction with the Duke Energy's Home Energy House Call Program ...

First, we would like to ask you a few questions about the scheduling of your assessment and the auditor that came to your home….

SAT0. Using a scale where 0 is "Extremely dissatisfied" and 10 is "Extremely satisfied"… how satisfied were you with**… [INDICATE NUMBER 0 THROUGH 10, 98=DON'T KNOW, 99=REFUSED; RANDOMIZE ORDER]**

a. The amount of time between when you called to schedule the assessment and when it was done
b. The professionalism of the auditor who visited your home
c. The quality of work performed by the auditor **[INDICATE NUMBER 0 THROUGH 10, 96=Auditor did not perform any work, 98=DON'T KNOW, 99=REFUSED]**
d. The time it took to complete the assessment

For the next set of questions, we would like to ask you about the assessment report and the free energy efficiency kit that you received…

SAT1. Using a scale where 0 is "Extremely dissatisfied" and 10 is "Extremely satisfied"… how satisfied were you with… **[INDICATE NUMBER 0 THROUGH 10, 98=DON'T KNOW, 99=REFUSED; RANDOMIZE ORDER]**

a. The types of equipment included in the energy efficiency kit
b. The quality of the equipment included in the energy efficiency kit
c. The assessment report in helping you understand your home's energy usage
d. The assessment report in helping you understand where energy improvements could be made in your home.

[ASK IF SAT1a<4 OR SAT1b<4]
SAT1o. Can you briefly explain which equipment from the kit you were dissatisfied with?

00. **[OPEN END]**
98. (Don't know)
99. (Refused)

SAT2. Using a scale where 0 is "Extremely dissatisfied" and 10 is "Extremely satisfied," how satisfied are you overall with the Duke Home Energy House Call Program?

00 **[NUMERIC OPEN END]**
98. (Don't know)
99. (Refused)

[ASK IF SAT2 <5]
SAT3. Why do you give it that rating?

00. **[OPEN END]**
98. (Don't know)

SAT8. Have you noticed any savings on your electric bill since completing your energy assessment?
1. Yes
2. No
3. Not sure
8. (Don't know)
9. (Refused)

[ASK IF SAT8=1]
SAT9. Would you say your bill savings are…
1. About what you expected
2. More than you expected
3. Less than you expected
8. (Don't know)
9. (Refused)

SAT10. From your perspective, what, if anything, could be done to improve the program?
00. **[OPEN END]**
96. (No/nothing)
98. (Don't know)
99. (Refused)

Demographics

Now I'd like to ask you just a few final questions about your home.

D1. Which of the following best describes your home/residence? (READ LIST)
01. Single-family home, detached construction (IF NEEDED: NOT A DUPLEX, TOWNHOME, OR APARTMENT. ATTACHED GARAGE IS OK)
02. Single-family home, factory manufactured (IF NEEDED: OFTEN REFERRED TO AS A MOBILE HOME, THESE HOMES DO NOT HAVE A CONVENTIONAL FOUNDATION)
03. Single-family home, modular (IF NEEDED: MODULAR HOMES ARE ASSEMBLED AT A BUILDING SITE ON TOP OF A CONVENTIONAL CONCRETE FOUNDATION)
04. Single-family, mobile home
05. Rowhouse
06. Two- or three-family attached residence—traditional structure
07. Apartment (4+ families)---traditional structure
08. Condominium---traditional structure
00. (Other: [Specify])
98. (Don't know)
99. (Refused)

D1a. Do you own or rent this residence?
1. Own
2. Rent
8. (Don't know)
9. (Refused)

D1b. Including yourself, how many people currently live in your residence year-round?

00. [NUMERIC OPEN END]
98. (Don't know)
99. (Refused)

D2. Approximately when was your home constructed? (DO NOT READ)
1. Before 1960
2. 1960-1969
3. 1970-1979
4. 1980-1989
5. 1990-1999
6. 2000-2005
7. 2006 OR LATER
8. (Don't know)
9. (Refused)

D3. What is the approximate total square feet of heated or cooled indoor space in your home?
00. **[NUMERIC OPEN END, 0 - 99,997]**
98. (Don't know)
99. (Refused)

[ASK IF D3 = 98, 99]

D3a. Would you estimate the heated or cooled indoor space in your home to be:
1. less than 1,000 sq.ft.
2. 1,001-2,000 sq.ft.
3. 2,001-3,000 sq.ft.
4. 3,001-4,000 sq.ft.
5. 4,001-5,000 sq.ft.
6. Greater than 5,000 sq.ft.
8. (Don't know)
9. (Refused)

D4. Does your home have central air conditioning?
1. Yes
2. No
8. (Don't know)
9. (Refused)

D5. Does your home have electric heat?
1. Yes
2. No
8. (Don't know)
9. (Refused)

D6. Does your home have electric hot water heating?
1. Yes
2. No
8. (Don't know)
9. (Refused)

D7. In what year were you born? **[NUMERIC OPEN END 1900-2015, 99998 = DON'T KNOW, 99999 = REFUSED; RESPONSE NOT REQUIRED]**

D8. What is your highest level of education? **[RESPONSE NOT REQUIRED]**
1. Less than a high school degree
2. High school degree
3. Technical/trade school program
4. Associates degree or some college
5. Bachelor's degree
6. Graduate/professional degree, e.g., J.D., MBA, MD
8. (Don't know)
9. (Refused)

D9. Which of the following best describes your current employment status? **[RESPONSE NOT REQUIRED]**
1. Employed full-time
2. Employed part-time
3. Retired
4. Not employed, but actively looking
5. Not employed, and not looking
8. (Don't know)
9. (Refused)

D10. Which category best describes your annual household income in 2016? **[RESPONSE NOT REQUIRED]**
1. Less than $25,000
2. $25,000 to just under $50,000
3. $50,000 to just under $75,000
4. $75,000 to just under $100,000
5. $100,000 to just under $150,000
6. $150,000 or more
8. (Don't know)
9. (Refused)

D11. What is your gender? **[RESPONSE NOT REQUIRED]**
1. Male
2. Female
8. (Don't know)
9. (Refused)

FIN. This completes the survey. Thank you very much for your time and participation in this important study. Have a great day!

(**NOTE TO INTERVIEWER:** If respondent mentioned that the auditor did not perform the assessment, or did not offer to install any of the equipment in the energy efficiency starter kit, please make note of that).

Appendix B. Detailed Survey Results

This section contains detailed survey results from the participant survey effort. We provide results in the form of Wincross tables with breakdowns across core customer characteristics.

Table rec_pa1 Page 1

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

How did you first hear about Home Energy House Call?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	150 100.0%	54 100.0%	40 100.0%	19 100.0%	52 100.0%	41 100.0%	25 100.0%	26 100.0%	46 100.0%	56 100.0%	37 100.0%
Total Answering	136 100.0%	47 100.0%	36 100.0%	19 100.0%	47 100.0%	37 100.0%	23 100.0%	23 100.0%	39 100.0%	52 100.0%	34 100.0%
Mailing from Duke Energy - includes bill inserts and letters	87 64.0%	30 63.8%	25 69.4%	11 57.9%	32 68.1%	22 59.5%	19 82.6% FH	11 47.8%	29 74.4% k	31 59.6%	19 55.9%
Duke Agent (In Person/By Phone)	16 11.8%	9 19.1% C	1 2.8%	3 15.8%	8 17.0% g	4 10.8%	1 4.3%	3 13.0%	5 12.8%	5 9.6%	6 17.6%
Duke Energy Website	13 9.6%	2 4.3%	5 13.9%	3 15.8%	1 2.1%	7 18.9% E	2 8.7%	2 8.7%	2 5.1%	7 13.5%	4 11.8%
Friends / Family	8 5.9%	3 6.4%	4 11.1%	-	2 4.3%	3 8.1%	-	2 8.7%	2 5.1%	2 3.8%	3 8.8%
Email from Duke Energy	4 2.9%	-	1 2.8%	-	-	1 2.7%	-	2 8.7%	-	1 1.9%	2 5.9%
TV/Newspaper/Radio	3 2.2%	-	-	1 5.3%	1 2.1%	-	1 4.3%	1 4.3%	-	3 5.8%	-
a Billboard	1 0.7%	1 2.1%	-	-	1 2.1%	-	-	-	-	1 1.9%	-
through Social Media	-	-	-	-	-	-	-	-	-	-	-
Pandora Radio	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table rec_pa1 Page 2
(Continued)
DEC Res Assessments Survey Results (Opinion Dynamics #7880)

How did you first hear about Home Energy House Call?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Other	4	2	-	1	2	-	-	2	1	2	-
	2.9%	4.3%		5.3%	4.3%			8.7%	2.6%	3.8%	
DK	14	7	4	-	5	4	2	3	7	4	3
	9.3%	13.0%	10.0%		9.6%	9.8%	8.0%	11.5%	15.2%	7.1%	8.1%
Refused	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table rec_pa2m1_1 Page 3

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

Why did you decide to participate?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	150 100.0%	54 100.0%	40 100.0%	19 100.0%	52 100.0%	41 100.0%	25 100.0%	26 100.0%	46 100.0%	56 100.0%	37 100.0%
Save money on energy/ electric/gas bill	90 60.0%	30 55.6%	29 72.5% b	10 52.6%	31 59.6%	24 58.5%	18 72.0%	14 53.8%	31 67.4% k	36 64.3%	18 48.6%
Reduce Energy consumption	49 32.7%	19 35.2%	14 35.0%	8 42.1%	14 26.9%	15 36.6%	8 32.0%	12 46.2% e	14 30.4%	23 41.1%	11 29.7%
Learn about energy usage/ program	20 13.3%	6 11.1%	5 12.5%	3 15.8%	11 21.2% Fgh	3 7.3%	2 8.0%	2 7.7%	7 15.2%	6 10.7%	4 10.8%
It was free	16 10.7%	6 11.1%	5 12.5%	2 10.5%	3 5.8%	5 12.2%	2 8.0%	6 23.1% e	4 8.7%	5 8.9%	7 18.9%
Make your home more comfortable	12 8.0%	3 5.6%	4 10.0%	1 5.3%	5 9.6%	2 4.9%	2 8.0%	3 11.5%	3 6.5%	6 10.7%	3 8.1%
New House/Selling House	5 3.3%	1 1.9%	2 5.0%	1 5.3%	1 1.9%	1 2.4%	1 4.0%	2 7.7%	2 4.3%	2 3.6%	1 2.7%
Other	8 5.3%	4 7.4%	-	2 10.5%	3 5.8%	2 4.9%	2 8.0%	-	3 6.5%	2 3.6%	1 2.7%
DK	2 1.3%	1 1.9%	-	-	1 1.9%	1 2.4%	-	-	1 2.2%	-	1 2.7%
Refused	-	-	-	-	-	-	-	-	-	-	-
(Other: Specify)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table wtp1 Page 4

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

WTP1. Before you heard about the Home Energy House Call Program from Duke Energy had you already been considering getting a home energy assessment?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	150 100.0%	54 100.0%	40 100.0%	19 100.0%	52 100.0%	41 100.0%	25 100.0%	26 100.0%	46 100.0%	56 100.0%	37 100.0%
Yes	41 27.3%	18 33.3%	13 32.5%	6 31.6%	13 25.0%	15 36.6%	5 20.0%	7 26.9%	15 32.6%	16 28.6%	7 18.9%
No	107 71.3%	36 66.7%	27 67.5%	12 63.2%	38 73.1%	26 63.4%	19 76.0%	19 73.1%	31 67.4%	38 67.9%	30 81.1%
(Don't know)	2 1.3%	-	-	1 5.3%	1 1.9%	-	1 4.0%	-	-	2 3.6%	-
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table wtp2a Page 5

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

WTP2A. If the energy assessment and energy efficiency kit that you received from Duke Energy had not been free, how much would you have been willing to pay for the energy assessment?

	Total	Income			Education				Year House was Built		
	------	< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	150 100.0%	54 100.0%	40 100.0%	19 100.0%	52 100.0%	41 100.0%	25 100.0%	26 100.0%	46 100.0%	56 100.0%	37 100.0%
Total Valid	44 100.0%	7 100.0%	18 100.0%	8 100.0%	10 100.0%	12 100.0%	12 100.0%	7 100.0%	11 100.0%	20 100.0%	13 100.0%
(Don't know)	50 33.3%	25 46.3% D	12 30.0%	3 15.8%	20 38.5% g	14 34.1%	5 20.0%	9 34.6%	18 39.1%	14 25.0%	11 29.7%
(Refused)	4 2.7%	2 3.7%	2 5.0%	-	1 1.9%	1 2.4%	1 4.0%	1 3.8%	1 2.2%	2 3.6%	1 2.7%
0	50 33.3%	20 37.0% C	7 17.5%	8 42.1% c	21 40.4%	13 31.7%	7 28.0%	9 34.6%	16 34.8%	19 33.9%	12 32.4%
10	2 4.5%	-	-	-	1 10.0%	-	-	-	1 9.1%	1 5.0%	-
15	1 2.3%	1 14.3%	-	-	-	1 8.3%	-	-	-	-	1 7.7%
20	7 15.9%	1 14.3%	5 27.8%	-	1 10.0%	3 25.0%	2 16.7%	-	2 18.2%	5 25.0%	-
25	11 25.0%	5 71.4% CD	2 11.1%	1 12.5%	3 30.0%	3 25.0%	2 16.7%	3 42.9%	4 36.4%	4 20.0%	3 23.1%
29	1 2.3%	-	-	1 12.5%	-	-	-	1 14.3%	1 9.1%	-	-
30	1 2.3%	-	1 5.6%	-	-	-	1 8.3%	-	1 9.1%	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table wtp2a Page 6
(Continued)
DEC Res Assessments Survey Results (Opinion Dynamics #7880)

WTP2A. If the energy assessment and energy efficiency kit that you received from Duke Energy had not been free, how much would you have been willing to pay for the energy assessment?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
50	9 20.5%	-	5 27.8%	1 12.5%	3 30.0%	1 8.3%	2 16.7%	2 28.6%	1 9.1%	4 20.0%	4 30.8%
75	1 2.3%	-	-	-	-	1 8.3%	-	-	-	1 5.0%	-
80	1 2.3%	-	-	1 12.5%	-	-	1 8.3%	-	-	1 5.0%	-
100	10 22.7%	-	5 27.8%	4 50.0%	2 20.0%	3 25.0%	4 33.3%	1 14.3%	1 9.1%	4 20.0%	5 38.5% i
500	1 0.7%	-	1 2.5%	-	-	1 2.4%	-	-	-	1 1.8%	-
750	1 0.7%	-	-	-	-	-	-	-	-	-	-
Mean	48.05	22.86	51.67	73.00	45.50	47.92	58.33	43.43	32.64	48.25	60.77

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table wtp2b Page 7

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

WTP2B. If the energy assessment and energy efficiency kit that you received from Duke Energy had not been free, how much would you have been willing to pay for the kit?

	Total	Income			Education				Year House was Built		
	------	< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	150 100.0%	54 100.0%	40 100.0%	19 100.0%	52 100.0%	41 100.0%	25 100.0%	26 100.0%	46 100.0%	56 100.0%	37 100.0%
Total Valid	57 100.0%	11 100.0%	23 100.0%	8 100.0%	13 100.0%	17 100.0%	12 100.0%	12 100.0%	13 100.0%	21 100.0%	21 100.0%
(Don't know)	41 27.3%	22 40.7% CD	8 20.0%	3 15.8%	17 32.7% G	13 31.7% G	3 12.0%	5 19.2%	15 32.6% K	16 28.6% k	5 13.5%
(Refused)	5 3.3%	2 3.7%	3 7.5%	-	1 1.9%	1 2.4%	2 8.0%	1 3.8%	1 2.2%	3 5.4%	1 2.7%
0	47 31.3%	19 35.2% C	6 15.0%	8 42.1% C	21 40.4% f	10 24.4%	8 32.0%	8 30.8%	17 37.0%	16 28.6%	10 27.0%
5	1 1.8%	-	1 4.3%	-	-	-	-	1 8.3%	-	1 4.8%	-
10	10 17.5%	2 18.2%	4 17.4%	-	1 7.7%	2 11.8%	2 16.7%	4 33.3% e	1 7.7%	5 23.8%	4 19.0%
15	2 3.5%	-	-	-	-	-	1 8.3%	-	-	1 4.8%	1 4.8%
20	10 17.5%	1 9.1%	5 21.7%	2 25.0%	3 23.1%	3 17.6%	4 33.3%	-	2 15.4%	4 19.0%	4 19.0%
25	12 21.1%	3 27.3%	3 13.0%	2 25.0%	3 23.1%	4 23.5%	2 16.7%	2 16.7%	3 23.1%	5 23.8%	3 14.3%
29	1 1.8%	-	-	1 12.5%	-	-	-	1 8.3%	1 7.7%	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table wtp2b Page 8
(Continued)
DEC Res Assessments Survey Results (Opinion Dynamics #7880)

WTP2B. If the energy assessment and energy efficiency kit that you received from Duke Energy had not been free, how much would you have been willing to pay for the kit?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
30	7	3	3	-	3	1	2	1	4	-	3
	12.3%	27.3%	13.0%		23.1%	5.9%	16.7%	8.3%	30.8%		14.3%
35	2	1	-	1	1	1	-	-	-	1	1
	3.5%	9.1%		12.5%	7.7%	5.9%				4.8%	4.8%
40	3	1	1	-	1	1	-	1	2	1	-
	5.3%	9.1%	4.3%		7.7%	5.9%		8.3%	15.4%	4.8%	
50	5	-	5	-	1	2	-	2	-	1	4
	8.8%		21.7%		7.7%	11.8%		16.7%		4.8%	19.0%
75	1	-	-	1	-	-	1	-	-	1	-
	1.8%			12.5%			8.3%			4.8%	
100	3	-	1	1	-	3	-	-	-	1	1
	5.3%		4.3%	12.5%		17.6%				4.8%	4.8%
Mean	29.63	25.45	30.43	41.12	27.69	40.29	25.00	24.50	27.23	27.38	30.24

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table ch1 Page 9

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

CH1. Do you recall learning about other Duke Energy programs through your participation in the Home Energy House Call Program?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	150	54	40	19	52	41	25	26	46	56	37
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Yes	40	16	12	5	12	12	6	9	13	13	11
	26.7%	29.6%	30.0%	26.3%	23.1%	29.3%	24.0%	34.6%	28.3%	23.2%	29.7%
No	98	36	22	13	35	29	16	15	31	36	24
	65.3%	66.7%	55.0%	68.4%	67.3%	70.7%	64.0%	57.7%	67.4%	64.3%	64.9%
(Don't know)	11	1	6	1	4	-	3	2	2	6	2
	7.3%	1.9%	15.0%	5.3%	7.7%		12.0%	7.7%	4.3%	10.7%	5.4%
			B								
(Refused)	1	1	-	-	1	-	-	-	-	1	-
	0.7%	1.9%			1.9%					1.8%	

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table rec_ch2m1_1 Page 10

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

CH2. Which other Duke Energy programs did you learn about?

	Total	Income			Education				Year House was Built		
	------	< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	40 100.0%	16 100.0%	12 100.0%	5 100.0%	12 100.0%	12 100.0%	6 100.0%	9 100.0%	13 100.0%	13 100.0%	11 100.0%
Power Manager	13 32.5%	6 37.5%	3 25.0%	2 40.0%	2 16.7%	5 41.7%	3 50.0%	3 33.3%	4 30.8%	4 30.8%	4 36.4%
My Home Energy Report	8 20.0%	3 18.8%	4 33.3%	1 20.0%	2 16.7%	2 16.7%	1 16.7%	3 33.3%	1 7.7%	2 15.4%	4 36.4% i
Smart	7 17.5%	1 6.2%	2 16.7%	-	2 16.7%	1 8.3%	-	3 33.3%	1 7.7%	2 15.4%	3 27.3%
Appliance Recycling Program	6 15.0%	2 12.5%	2 16.7%	1 20.0%	1 8.3%	2 16.7%	1 16.7%	1 11.1%	1 7.7%	2 15.4%	2 18.2%
Other	7 17.5%	3 18.8%	2 16.7%	1 20.0%	2 16.7%	1 8.3%	2 33.3%	1 11.1%	2 15.4%	3 23.1%	1 9.1%
DK	9 22.5%	4 25.0%	3 25.0%	1 20.0%	4 33.3%	4 33.3%	-	1 11.1%	5 38.5%	2 15.4%	2 18.2%
Refused	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table led0 Page 11

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

LED0. The free light bulbs you received from Duke Energy are LEDs. Thinking about all of the light sockets in your home in which you could use an LED, how many of them contained LEDs before you received the free LEDs from Duke Energy?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	150 100.0%	54 100.0%	40 100.0%	19 100.0%	52 100.0%	41 100.0%	25 100.0%	26 100.0%	46 100.0%	56 100.0%	37 100.0%
All of them	14 9.3%	9 16.7%	4 10.0%	1 5.3%	7 13.5%	5 12.2%	-	2 7.7%	4 8.7%	1 1.8%	6 16.2% J
Most of them	24 16.0%	6 11.1%	5 12.5%	4 21.1%	7 13.5%	7 17.1%	4 16.0%	4 15.4%	5 10.9%	10 17.9%	8 21.6%
Some of them	38 25.3%	13 24.1%	10 25.0%	5 26.3%	9 17.3%	12 29.3%	7 28.0%	9 34.6%	12 26.1%	16 28.6%	7 18.9%
A few of them	33 22.0%	10 18.5%	13 32.5%	4 21.1%	11 21.2%	8 19.5%	6 24.0%	8 30.8%	11 23.9%	12 21.4%	9 24.3%
None of them	37 24.7%	12 22.2%	8 20.0%	5 26.3%	15 28.8% h	8 19.5%	8 32.0% h	3 11.5%	11 23.9%	16 28.6%	7 18.9%
(Don't know)	4 2.7%	4 7.4%	-	-	3 5.8%	1 2.4%	-	-	3 6.5%	1 1.8%	-
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table led0a Page 12

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

LED0a. Our records indicate that you received <qty. bulb(s) in your energy efficiency kit. Is this correct?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	150 100.0%	54 100.0%	40 100.0%	19 100.0%	52 100.0%	41 100.0%	25 100.0%	26 100.0%	46 100.0%	56 100.0%	37 100.0%
Yes, the number is correct	123 82.0%	41 75.9%	36 90.0% b	16 84.2%	41 78.8%	34 82.9%	19 76.0%	24 92.3% e	39 84.8%	43 76.8%	34 91.9% J
No, I received a different number of bulbs	8 5.3%	5 9.3%	1 2.5%	-	4 7.7%	3 7.3%	1 4.0%	-	4 8.7%	3 5.4%	-
(Don't know)	19 12.7%	8 14.8%	3 7.5%	3 15.8%	7 13.5%	4 9.8%	5 20.0%	2 7.7%	3 6.5%	10 17.9% i	3 8.1%
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table led0b Page 13

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

LED0b. How many free LEDs did you receive from Duke?

	Total	Income			Education				Year House was Built		
	------	< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	27 100.0%	13 100.0%	4 100.0%	3 100.0%	11 100.0%	7 100.0%	6 100.0%	2 100.0%	7 100.0%	13 100.0%	3 100.0%
(Don't know)	16 59.3%	7 53.8%	3 75.0%	2 66.7%	7 63.6%	3 42.9%	4 66.7%	2 100.0% EFg	4 57.1%	8 61.5%	2 66.7%
(Refused)	-	-	-	-	-	-	-	-	-	-	-
0	2 7.4%	2 15.4%	-	-	1 9.1%	1 14.3%	-	-	1 14.3%	1 7.7%	-
1	2 7.4%	1 7.7%	-	-	1 9.1%	1 14.3%	-	-	-	-	-
2	2 7.4%	1 7.7%	1 25.0%	-	1 9.1%	1 14.3%	-	-	2 28.6%	-	-
4	3 11.1%	2 15.4%	-	1 33.3%	1 9.1%	1 14.3%	1 16.7%	-	-	2 15.4%	1 33.3%
6	1 3.7%	-	-	-	-	-	1 16.7%	-	-	1 7.7%	-
8	1 3.7%	-	-	-	-	-	-	-	-	1 7.7%	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table led1a Page 14

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

LED1a. Were all <qty> free LEDs you received from Duke installed?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	132 100.0%	45 100.0%	37 100.0%	17 100.0%	44 100.0%	37 100.0%	21 100.0%	24 100.0%	41 100.0%	47 100.0%	35 100.0%
(Yes)	111 84.1%	37 82.2%	33 89.2%	14 82.4%	36 81.8%	29 78.4%	19 90.5%	22 91.7%	37 90.2%	37 78.7%	30 85.7%
(Some of them)	13 9.8%	3 6.7%	3 8.1%	1 5.9%	4 9.1%	4 10.8%	2 9.5%	2 8.3%	2 4.9%	6 12.8%	3 8.6%
(None of them)	8 6.1%	5 11.1%	1 2.7%	2 11.8%	4 9.1%	4 10.8%	-	-	2 4.9%	4 8.5%	2 5.7%
(Don't know)	-	-	-	-	-	-	-	-	-	-	-
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table led1b Page 15

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

LED1b. Did you or the auditor install them?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	124 100.0%	40 100.0%	36 100.0%	15 100.0%	40 100.0%	33 100.0%	21 100.0%	24 100.0%	39 100.0%	43 100.0%	33 100.0%
(I installed the LEDs)	42 33.9%	7 17.5%	14 38.9% B	3 20.0%	11 27.5%	16 48.5% eH	7 33.3%	5 20.8%	11 28.2%	16 37.2%	12 36.4%
(The auditor installed the LEDs)	62 50.0%	27 67.5% C	15 41.7%	8 53.3%	23 57.5%	15 45.5%	8 38.1%	13 54.2%	23 59.0%	18 41.9%	16 48.5%
(I installed some of the LEDs and the auditor installed some LEDs)	14 11.3%	5 12.5%	3 8.3%	3 20.0%	5 12.5%	2 6.1%	3 14.3%	4 16.7%	3 7.7%	6 14.0%	4 12.1%
(Don't know)	6 4.8%	1 2.5%	4 11.1%	1 6.7%	1 2.5%	-	3 14.3%	2 8.3%	2 5.1%	3 7.0%	1 3.0%
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table led1b_1 Page 16

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

LED1b. Did you or the auditor install them?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	124 100.0%	40 100.0%	36 100.0%	15 100.0%	40 100.0%	33 100.0%	21 100.0%	24 100.0%	39 100.0%	43 100.0%	33 100.0%
(I installed the LEDs)	42 33.9%	7 17.5%	14 38.9% B	3 20.0%	11 27.5%	16 48.5% eH	7 33.3%	5 20.8%	11 28.2%	16 37.2%	12 36.4%
(The auditor installed the LEDs)	62 50.0%	27 67.5% C	15 41.7%	8 53.3%	23 57.5%	15 45.5%	8 38.1%	13 54.2%	23 59.0%	18 41.9%	16 48.5%
(I installed some of the LEDs and the auditor installed some LEDs)	14 11.3%	5 12.5%	3 8.3%	3 20.0%	5 12.5%	2 6.1%	3 14.3%	4 16.7%	3 7.7%	6 14.0%	4 12.1%
(Don't know)	6 4.8%	1 2.5%	4 11.1%	1 6.7%	1 2.5%	-	3 14.3%	2 8.3%	2 5.1%	3 7.0%	1 3.0%
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table led1c Page 17

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

LED1c. How many of the <qty> LEDs that you received from Duke were installed by the auditor?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	7 100.0%	3 100.0%	-	-	4 100.0%	1 100.0%	-	1 100.0%	3 100.0%	2 100.0%	-
(Don't know)	1 14.3%	-	-	-	-	-	-	-	-	-	-
(Refused)	-	-	-	-	-	-	-	-	-	-	-
3	2 28.6%	1 33.3%	-	-	2 50.0%	-	-	-	-	1 50.0%	-
4	3 42.9%	1 33.3%	-	-	1 25.0%	1 100.0%	-	1 100.0%	2 66.7%	1 50.0%	-
5	1 14.3%	1 33.3%	-	-	1 25.0%	-	-	-	1 33.3%	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table led1d Page 18

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

LED1d. How many of the <qty> LEDs that you received from Duke did you install?

	Total	Income			Education				Year House was Built		
	------	< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	8 100.0%	-	2 100.0%	1 100.0%	1 100.0%	5 100.0%	1 100.0%	1 100.0%	1 100.0%	4 100.0%	3 100.0%
(Don't know)	-	-	-	-	-	-	-	-	-	-	-
(Refused)	-	-	-	-	-	-	-	-	-	-	-
1	1 12.5%	-	-	-	-	-	-	1 100.0%	-	1 25.0%	-
2	1 12.5%	-	-	1 100.0%	-	1 20.0%	-	-	-	1 25.0%	-
3	4 50.0%	-	2 100.0%	-	1 100.0%	3 60.0%	-	-	1 100.0%	1 25.0%	2 66.7%
4	2 25.0%	-	-	-	-	1 20.0%	1 100.0%	-	-	1 25.0%	1 33.3%

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table led2 Page 19

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

LED2. Why haven't all the free LEDs you received been installed?

	Total	Income			Education				Year House was Built		
	------	< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	22 100.0%	8 100.0%	4 100.0%	3 100.0%	8 100.0%	9 100.0%	2 100.0%	2 100.0%	5 100.0%	10 100.0%	5 100.0%
(Other, Specify:)	-	-	-	-	-	-	-	-	-	-	-
(Haven't needed to/ waiting for light bulbs to burn out)	16 72.7%	6 75.0%	4 100.0%	3 100.0%	5 62.5%	8 88.9%	1 50.0%	2 100.0% E	4 80.0%	7 70.0%	4 80.0%
(Don't have a light socket where I use that wattage)	3 13.6%	1 12.5%	-	-	2 25.0%	-	-	-	-	2 20.0%	-
(Don't like LEDs)	2 9.1%	-	-	-	-	1 11.1%	1 50.0%	-	1 20.0%	-	1 20.0%
(Don't know)	-	-	-	-	-	-	-	-	-	-	-
(Refused)	1 4.5%	1 12.5%	-	-	1 12.5%	-	-	-	-	1 10.0%	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table led2o Page 20

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

LED2. Why haven't all the free LEDs you received been installed?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	6 100.0%	2 100.0%	-	1 100.0%	1 100.0%	3 100.0%	1 100.0%	1 100.0%	2 100.0%	3 100.0%	1 100.0%
ALREADY HAD LEDS INSTALLED	1 16.7%	1 50.0%	-	-	-	1 33.3%	-	-	1 50.0%	-	-
BECAUSE THEY HAVE ONE	1 16.7%	-	-	1 100.0%	-	1 33.3%	-	-	-	1 33.3%	-
DIDN'T NEED TO	1 16.7%	-	-	-	-	-	-	1 100.0%	-	1 33.3%	-
EVERYTIME PUTS IN THE BULBS THEY BLOW	1 16.7%	1 50.0%	-	-	1 100.0%	-	-	-	-	1 33.3%	-
RESECESSED LIGHTING	1 16.7%	-	-	-	-	-	1 100.0%	-	-	-	1 100.0%
THE TECH DIDN'T WANT TO PUT ALL IN SO CUSTOMER PUT LIGHT BULBS IN HERSELF	1 16.7%	-	-	-	-	1 33.3%	-	-	1 50.0%	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table led3m1 Page 21

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

LED3. What did you do with the LEDs that weren't installed?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	22 100.0%	8 100.0%	4 100.0%	3 100.0%	8 100.0%	9 100.0%	2 100.0%	2 100.0%	5 100.0%	10 100.0%	5 100.0%
(Other, specify:)	-	-	-	-	-	-	-	-	-	-	-
(In storage for later use)	19 86.4%	7 87.5%	4 100.0%	3 100.0%	7 87.5%	8 88.9%	2 100.0%	2 100.0%	3 60.0%	10 100.0% i	5 100.0% i
(Threw them away)	-	-	-	-	-	-	-	-	-	-	-
(Gave them away)	2 9.1%	1 12.5%	-	-	1 12.5%	-	-	-	1 20.0%	-	-
(Don't know)	1 4.5%	-	-	-	-	1 11.1%	-	-	1 20.0%	-	-
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table led3m1o Page 22

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

LED3. What did you do with the LEDs that weren't installed?

	Total	Income			Education				Year House was Built		
	------	< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	1 100.0%	-	-	-	-	-	-	-	-	-	-
TOOK WITH THEM	1 100.0%	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table led4 Page 23

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

LED4. Have you removed any of the <FINAL INSTALLED QUANTITY> free LEDs that were installed?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	122 100.0%	40 100.0%	35 100.0%	15 100.0%	40 100.0%	33 100.0%	20 100.0%	24 100.0%	39 100.0%	42 100.0%	33 100.0%
Yes	7 5.7%	5 12.5%	1 2.9%	-	5 12.5%	2 6.1%	-	-	4 10.3%	1 2.4%	-
No	112 91.8%	34 85.0%	33 94.3%	15 100.0% B	33 82.5%	31 93.9%	20 100.0% E	23 95.8% e	34 87.2%	41 97.6% i	32 97.0%
(Don't know)	3 2.5%	1 2.5%	1 2.9%	-	2 5.0%	-	-	1 4.2%	1 2.6%	-	1 3.0%
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table led5a Page 24

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

LED5a. How many of the LEDs did you remove?

	Total	Income			Education				Year House was Built		
	------	< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	7 100.0%	5 100.0%	1 100.0%	-	5 100.0%	2 100.0%	-	-	4 100.0%	1 100.0%	-
(Don't know)	-	-	-	-	-	-	-	-	-	-	-
(Refused)	-	-	-	-	-	-	-	-	-	-	-
0	2 28.6%	1 20.0%	-	-	-	2 100.0%	-	-	1 25.0%	-	-
1	1 14.3%	1 20.0%	-	-	1 20.0%	-	-	-	-	-	-
2	4 57.1%	3 60.0%	1 100.0%	-	4 80.0%	-	-	-	3 75.0%	1 100.0%	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table led5bm1 Page 25

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

LED5b. Why did you remove the LED(s)?

(MULTIPLE RESPONSE UP TO 5)

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	7 100.0%	5 100.0%	1 100.0%	-	5 100.0%	2 100.0%	-	-	4 100.0%	1 100.0%	-
(Other: Specify)	1 14.3%	-	-	-	-	1 50.0%	-	-	1 25.0%	-	-
(Do not like light quality/not bright enough/too bright)	1 14.3%	1 20.0%	-	-	1 20.0%	-	-	-	-	-	-
(Do not like appearance of bulb)	-	-	-	-	-	-	-	-	-	-	-
(Stopped working/burned out)	4 57.1%	3 60.0%	1 100.0%	-	4 80.0%	-	-	-	3 75.0%	1 100.0%	-
(Never worked)	-	-	-	-	-	-	-	-	-	-	-
(Don't know)	1 14.3%	1 20.0%	-	-	-	1 50.0%	-	-	-	-	-
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table led5bm1o Page 26

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

LED5b. Why did you remove the LED(s)?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	2 100.0%	-	1 100.0%	-	1 100.0%	1 100.0%	-	-	1 100.0%	1 100.0%	-
ALL STILL WORKING AND INSTALLED	1 50.0%	-	-	-	-	1 100.0%	-	-	1 100.0%	-	-
STOP WORKING	1 50.0%	-	1 100.0%	-	1 100.0%	-	-	-	-	1 100.0%	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table led6m1 Page 27

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

LED6. What did you do with the working LED(s) that you removed? (Read list)

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	4 100.0%	2 100.0%	1 100.0%	-	2 100.0%	2 100.0%	-	-	1 100.0%	1 100.0%	-
(Other: Specify)	3 75.0%	1 50.0%	1 100.0%	-	1 50.0%	2 100.0%	-	-	1 100.0%	1 100.0%	-
(In storage for later use)	1 25.0%	1 50.0%	-	-	1 50.0%	-	-	-	-	-	-
(Threw them away)	-	-	-	-	-	-	-	-	-	-	-
(Gave them away)	-	-	-	-	-	-	-	-	-	-	-
(Installed them somewhere else - NOT in my home)	-	-	-	-	-	-	-	-	-	-	-
(Don't know)	-	-	-	-	-	-	-	-	-	-	-
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table led6m1o Page 28

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	3 100.0%	1 100.0%	1 100.0%	-	1 100.0%	2 100.0%	-	-	1 100.0%	1 100.0%	-
DID NOT REMOVE ANY	1 33.3%	1 100.0%	-	-	-	1 50.0%	-	-	-	-	-
IN THE TRASH	1 33.3%	-	1 100.0%	-	1 100.0%	-	-	-	-	1 100.0%	-
NONE HAVE BEEN REMOVED	1 33.3%	-	-	-	-	1 50.0%	-	-	1 100.0%	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table led7m1_1 Page 29

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

LED7. What types of bulbs were in the sockets where “you” or “the auditor” installed the free LEDs?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	122 100.0%	40 100.0%	35 100.0%	15 100.0%	40 100.0%	33 100.0%	20 100.0%	24 100.0%	39 100.0%	42 100.0%	33 100.0%
(Other, specify)	-	-	-	-	-	-	-	-	-	-	-
Incandescent or halogen bulbs	68 55.7%	19 47.5%	20 57.1%	11 73.3% b	21 52.5%	16 48.5%	13 65.0%	15 62.5%	21 53.8%	26 61.9%	19 57.6%
CFLs	38 31.1%	12 30.0%	11 31.4%	5 33.3%	12 30.0%	13 39.4%	6 30.0%	6 25.0%	14 35.9%	14 33.3%	9 27.3%
LEDs	10 8.2%	4 10.0%	2 5.7%	1 6.7%	3 7.5%	3 9.1%	1 5.0%	2 8.3%	3 7.7%	2 4.8%	3 9.1%
Installed in empty sockets	1 0.8%	1 2.5%	-	-	1 2.5%	-	-	-	-	-	-
(Don't know)	11 9.0%	5 12.5%	2 5.7%	-	5 12.5%	3 9.1%	-	2 8.3%	3 7.7%	1 2.4%	4 12.1%
(Refused)	1 0.8%	-	1 2.9%	-	1 2.5%	-	-	-	-	1 2.4%	-
8	1 0.8%	1 2.5%	-	-	-	-	-	1 4.2%	-	1 2.4%	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table led8a Page 30

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

LED8A. How many of the <INSTALLED QUANTITY> LEDs: replaced incandescent or halogen bulbs?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	7 100.0%	1 100.0%	1 100.0%	2 100.0%	2 100.0%	2 100.0%	-	2 100.0%	2 100.0%	3 100.0%	2 100.0%
(Don't know)	4 57.1%	-	-	2 100.0%	1 50.0%	-	-	2 100.0%	1 50.0%	2 66.7%	1 50.0%
(Refused)	-	-	-	-	-	-	-	-	-	-	-
2	1 14.3%	-	-	-	-	1 50.0%	-	-	-	1 33.3%	-
5	1 14.3%	1 100.0%	-	-	1 50.0%	-	-	-	1 50.0%	-	-
6	1 14.3%	-	1 100.0%	-	-	1 50.0%	-	-	-	-	1 50.0%

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table led8b Page 31

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

LED8B. How many replaced CFLs?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	6 100.0%	1 100.0%	1 100.0%	1 100.0%	2 100.0%	2 100.0%	-	1 100.0%	2 100.0%	3 100.0%	1 100.0%
(Don't know)	3 50.0%	-	-	1 100.0%	1 50.0%	-	-	1 100.0%	1 50.0%	2 66.7%	-
(Refused)	-	-	-	-	-	-	-	-	-	-	-
1	1 16.7%	-	1 100.0%	-	-	1 50.0%	-	-	-	-	1 100.0%
2	2 33.3%	1 100.0%	-	-	1 50.0%	1 50.0%	-	-	1 50.0%	1 33.3%	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table led8c Page 32

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

LED8C. How many replaced LEDs?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	2 100.0%	1 100.0%	-	1 100.0%	1 100.0%	-	-	1 100.0%	-	-	1 100.0%
(Don't know)	2 100.0%	1 100.0%	-	1 100.0%	1 100.0%	-	-	1 100.0%	-	-	1 100.0%
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table led8d Page 33

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

LED8D. How many were installed in empty sockets?

	Total	Income			Education				Year House was Built		
	------	< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	1 100.0%	1 100.0%	-	-	1 100.0%	-	-	-	-	-	-
(Don't know)	1 100.0%	1 100.0%	-	-	1 100.0%	-	-	-	-	-	-
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table led9 Page 34

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

LED9. Were any of the bulbs that were replaced with free LEDs still working or had all of them burnt out?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	122 100.0%	40 100.0%	35 100.0%	15 100.0%	40 100.0%	33 100.0%	20 100.0%	24 100.0%	39 100.0%	42 100.0%	33 100.0%
Some were still working	22 18.0%	9 22.5% d	4 11.4%	1 6.7%	9 22.5%	4 12.1%	3 15.0%	4 16.7%	6 15.4%	9 21.4%	4 12.1%
All of them had burned out	10 8.2%	3 7.5%	3 8.6%	1 6.7%	4 10.0%	4 12.1%	1 5.0%	1 4.2%	3 7.7%	3 7.1%	3 9.1%
All of them were still working	89 73.0%	27 67.5%	28 80.0%	13 86.7% b	27 67.5%	25 75.8%	16 80.0%	18 75.0%	29 74.4%	30 71.4%	26 78.8%
(Don't know)	1 0.8%	1 2.5%	-	-	-	-	-	1 4.2%	1 2.6%	-	-
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table led10 Page 35

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

LED10. Of the bulb(s) that were replaced with free LEDs, how many were still working?

	Total	Income			Education				Year House was Built		
	------	< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	22 100.0%	9 100.0%	4 100.0%	1 100.0%	9 100.0%	4 100.0%	3 100.0%	4 100.0%	6 100.0%	9 100.0%	4 100.0%
(Don't know)	4 18.2%	2 22.2%	1 25.0%	-	1 11.1%	1 25.0%	2 66.7% e	-	1 16.7%	2 22.2%	-
(Refused)	-	-	-	-	-	-	-	-	-	-	-
1	7 31.8%	2 22.2%	2 50.0%	-	2 22.2%	1 25.0%	-	3 75.0% E	-	5 55.6%	1 25.0%
2	1 4.5%	-	-	-	-	1 25.0%	-	-	1 16.7%	-	-
4	2 9.1%	1 11.1%	-	-	1 11.1%	-	-	-	1 16.7%	-	1 25.0%
5	1 4.5%	1 11.1%	-	-	1 11.1%	-	-	-	1 16.7%	-	-
6	1 4.5%	-	1 25.0%	-	-	-	1 33.3%	-	-	1 11.1%	-
7	6 27.3%	3 33.3%	-	1 100.0%	4 44.4%	1 25.0%	-	1 25.0%	2 33.3%	1 11.1%	2 50.0%

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table fr1 Page 36

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

FR1. When you purchase light bulbs, do you generally purchase the lowest priced bulb or do you consider other factors, such as energy efficiency, quality of light, or longevity of the bulb?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	132 100.0%	45 100.0%	37 100.0%	17 100.0%	44 100.0%	37 100.0%	21 100.0%	24 100.0%	41 100.0%	47 100.0%	35 100.0%
I purchase the lowest-priced bulb	27 20.5%	15 33.3%	7 18.9%	-	16 36.4% FGH	6 16.2%	2 9.5%	2 8.3%	12 29.3% J	5 10.6%	7 20.0%
I consider other factors	99 75.0%	27 60.0%	29 78.4% b	17 100.0% BC	26 59.1%	29 78.4% e	19 90.5% E	20 83.3% E	28 68.3%	39 83.0%	26 74.3%
(Don't know)	5 3.8%	2 4.4%	1 2.7%	-	1 2.3%	2 5.4%	-	2 8.3%	1 2.4%	2 4.3%	2 5.7%
(Refused)	1 0.8%	1 2.2%	-	-	1 2.3%	-	-	-	-	1 2.1%	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table fr1a Page 37

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

FR1a. Earlier you told me that the auditor installed <QTY> LED bulbs in your home. If it had not been for the program, would you have replaced any of the working light bulbs in your home at that time, or would you have waited for the light bulbs to burn out?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	4 100.0%	3 100.0%	-	-	3 100.0%	-	-	1 100.0%	2 100.0%	1 100.0%	-
Would have replaced working bulbs	1 25.0%	-	-	-	-	-	-	1 100.0%	-	1 100.0%	-
Would have waited for bulbs to burn out	3 75.0%	3 100.0%	-	-	3 100.0%	-	-	-	2 100.0%	-	-
(Don't know)	-	-	-	-	-	-	-	-	-	-	-
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table fr1b Page 38

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

FR1b. How many of the WORKING bulbs would you have replaced?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	1 100.0%	-	-	-	-	-	-	1 100.0%	-	1 100.0%	-
(Don't know)	-	-	-	-	-	-	-	-	-	-	-
(Refused)	-	-	-	-	-	-	-	-	-	-	-
0	1 100.0%	-	-	-	-	-	-	1 100.0%	-	1 100.0%	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table fr2 Page 39

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

FR2. The LED bulbs you received from Duke Energy cost about $PRICE per bulb at a retail store. If you had not received the <QTY> LEDs from Duke Energy, what would you have purchased the next time you needed light bulbs?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	132	45	37	17	44	37	21	24	41	47	35
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Incandescent or halogen bulbs	14	3	5	-	4	3	5	2	4	6	3
	10.6%	6.7%	13.5%		9.1%	8.1%	23.8%	8.3%	9.8%	12.8%	8.6%
CFLs	13	5	4	3	4	5	4	-	6	5	1
	9.8%	11.1%	10.8%	17.6%	9.1%	13.5%	19.0%		14.6%	10.6%	2.9%
									k		
LEDs	67	16	23	12	20	18	8	19	15	27	24
	50.8%	35.6%	62.2%	70.6%	45.5%	48.6%	38.1%	79.2%	36.6%	57.4%	68.6%
			B	B				EFG		I	I
A mix of bulbs	8	2	2	1	-	5	1	-	4	2	2
	6.1%	4.4%	5.4%	5.9%		13.5%	4.8%		9.8%	4.3%	5.7%
The lowest cost alternative	21	13	2	1	12	3	3	2	10	3	4
	15.9%	28.9%	5.4%	5.9%	27.3%	8.1%	14.3%	8.3%	24.4%	6.4%	11.4%
		CD			FH				J		
(Don't know)	9	6	1	-	4	3	-	1	2	4	1
	6.8%	13.3%	2.7%		9.1%	8.1%		4.2%	4.9%	8.5%	2.9%
		c									
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table fr3 Page 40

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

FR3. Similar CFL bulbs cost about $PRICE per bulb at a retail store. Knowing this, would you have still purchased CFLs or would you have purchased a different type of light bulb?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	13 100.0%	5 100.0%	4 100.0%	3 100.0%	4 100.0%	5 100.0%	4 100.0%	-	6 100.0%	5 100.0%	1 100.0%
Still would have purchased CFL(s)	12 92.3%	4 80.0%	4 100.0%	3 100.0%	4 100.0%	4 80.0%	4 100.0%	-	5 83.3%	5 100.0%	1 100.0%
Would have purchased a different type of light bulb	-	-	-	-	-	-	-	-	-	-	-
(Don't know)	1 7.7%	1 20.0%	-	-	-	1 20.0%	-	-	1 16.7%	-	-
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table fr4 Page 41

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

FR4. Would you have purchased all <QTY> LEDs or just some at full retail price of $PRICE per bulb?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	47 100.0%	9 100.0%	18 100.0%	10 100.0%	14 100.0%	12 100.0%	6 100.0%	14 100.0%	11 100.0%	18 100.0%	17 100.0%
All	25 53.2%	6 66.7%	9 50.0%	5 50.0%	6 42.9%	9 75.0% eG	1 16.7%	8 57.1% G	7 63.6%	11 61.1%	6 35.3%
Some	14 29.8%	1 11.1%	6 33.3%	3 30.0%	4 28.6%	3 25.0%	4 66.7% efH	3 21.4%	1 9.1%	5 27.8%	8 47.1% I
(None of them)	6 12.8%	2 22.2%	2 11.1%	1 10.0%	2 14.3%	-	1 16.7%	3 21.4%	3 27.3%	1 5.6%	2 11.8%
(Don't know)	1 2.1%	-	-	1 10.0%	1 7.1%	-	-	-	-	-	1 5.9%
(Refused)	1 2.1%	-	1 5.6%	-	1 7.1%	-	-	-	-	1 5.6%	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table fr5 Page 42

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

FR5. How many of the <QTY> LEDs would you have purchased at the full retail price of $PRICE per bulb?

	Total	Income			Education				Year House was Built		
	------	< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	14 100.0%	1 100.0%	6 100.0%	3 100.0%	4 100.0%	3 100.0%	4 100.0%	3 100.0%	1 100.0%	5 100.0%	8 100.0%
(Don't know)	4 28.6%	-	1 16.7%	1 33.3%	-	1 33.3%	1 25.0%	2 66.7%	-	2 40.0%	2 25.0%
(Refused)	-	-	-	-	-	-	-	-	-	-	-
2	6 42.9%	-	3 50.0%	1 33.3%	3 75.0%	1 33.3%	2 50.0%	-	1 100.0%	2 40.0%	3 37.5%
3	1 7.1%	-	1 16.7%	-	-	1 33.3%	-	-	-	-	1 12.5%
4	2 14.3%	1 100.0%	1 16.7%	-	1 25.0%	-	-	1 33.3%	-	-	2 25.0%
7	1 7.1%	-	-	1 33.3%	-	-	1 25.0%	-	-	1 20.0%	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table fr6 Page 43

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

FR6. Just to make sure I recorded everything accurately, you are telling me that of the <QTY> LEDs that you received from Duke Energy, you would have purchased <FR5> LEDs, which means you would not have purchased PROG_QTY. Is that correct?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	7 100.0%	1 100.0%	3 100.0%	1 100.0%	3 100.0%	1 100.0%	2 100.0%	1 100.0%	1 100.0%	2 100.0%	4 100.0%
Yes	6 85.7%	1 100.0%	3 100.0%	1 100.0%	3 100.0%	-	2 100.0%	1 100.0%	1 100.0%	1 50.0%	4 100.0%
No	-	-	-	-	-	-	-	-	-	-	-
(Don't know)	1 14.3%	-	-	-	-	1 100.0%	-	-	-	1 50.0%	-
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table fr7 Page 44

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

FR7. For these bulbs, would you have still purchased LEDs but have done it later, or would you have purchased a different type of light bulb instead of LEDs?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	7 100.0%	1 100.0%	3 100.0%	1 100.0%	3 100.0%	1 100.0%	2 100.0%	1 100.0%	1 100.0%	2 100.0%	4 100.0%
Purchased LEDs later	6 85.7%	1 100.0%	3 100.0%	1 100.0%	3 100.0%	-	2 100.0%	1 100.0%	1 100.0%	1 50.0%	4 100.0%
Purchased a different type of light bulb	-	-	-	-	-	-	-	-	-	-	-
(Don't know)	1 14.3%	-	-	-	-	1 100.0%	-	-	-	1 50.0%	-
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table fr8m1_1 Page 45

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

FR8. What types of bulbs would likely have been in the mix?

	Total	Income			Education				Year House was Built		
	------	< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	8 100.0%	2 100.0%	2 100.0%	1 100.0%	-	5 100.0%	1 100.0%	-	4 100.0%	2 100.0%	2 100.0%
Incandescent or halogen bulbs	6 75.0%	1 50.0%	2 100.0%	1 100.0%	-	4 80.0%	1 100.0%	-	3 75.0%	1 50.0%	2 100.0%
CFLs	2 25.0%	1 50.0%	1 50.0%	-	-	2 40.0%	-	-	1 25.0%	-	1 50.0%
LEDs	4 50.0%	-	1 50.0%	1 100.0%	-	1 20.0%	1 100.0%	-	3 75.0%	-	1 50.0%
(Other)	1 12.5%	1 50.0%	-	-	-	1 20.0%	-	-	-	1 50.0%	-
(Don't know)	-	-	-	-	-	-	-	-	-	-	-
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table fr9 Page 46

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

FR9. Similar CFL bulbs cost about $PRICE per bulb at a retail store. Knowing this, would CFLs still have been part of the mix?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	2 100.0%	1 100.0%	1 100.0%	-	-	2 100.0%	-	-	1 100.0%	-	1 100.0%
Yes	2 100.0%	1 100.0%	1 100.0%	-	-	2 100.0%	-	-	1 100.0%	-	1 100.0%
No	-	-	-	-	-	-	-	-	-	-	-
(Don't know)	-	-	-	-	-	-	-	-	-	-	-
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table fr10 Page 47

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

FR10. Earlier, you told us you replaced working incandescent or halogen light bulbs with the LEDs you received for free from Duke. If you had not received the free LEDs, would you have still replaced the working incandescent or halogen light bulbs with LEDs, or would you have waited until they burned out?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	33 100.0%	9 100.0%	10 100.0%	3 100.0%	11 100.0%	11 100.0%	6 100.0%	4 100.0%	10 100.0%	14 100.0%	8 100.0%
(Would have replaced working incandescents with CFLs)	8 24.2%	1 11.1%	3 30.0%	1 33.3%	2 18.2%	3 27.3%	-	3 75.0% Ef	2 20.0%	3 21.4%	3 37.5%
(Would have waited until incandescents burned out)	20 60.6%	5 55.6%	6 60.0%	2 66.7%	7 63.6%	6 54.5%	5 83.3% H	1 25.0%	6 60.0%	9 64.3%	4 50.0%
(Don't know)	5 15.2%	3 33.3%	1 10.0%	-	2 18.2%	2 18.2%	1 16.7%	-	2 20.0%	2 14.3%	1 12.5%
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table fa1 Page 48

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

FA1. How many of the two faucet aerators you received from the energy efficiency kit were installed?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	150 100.0%	54 100.0%	40 100.0%	19 100.0%	52 100.0%	41 100.0%	25 100.0%	26 100.0%	46 100.0%	56 100.0%	37 100.0%
One	41 27.3%	10 18.5%	13 32.5%	7 36.8%	13 25.0%	10 24.4%	10 40.0%	6 23.1%	13 28.3%	12 21.4%	13 35.1%
Two	54 36.0%	23 42.6%	14 35.0%	6 31.6%	21 40.4%	13 31.7%	7 28.0%	11 42.3%	18 39.1%	19 33.9%	11 29.7%
None	54 36.0%	20 37.0%	13 32.5%	6 31.6%	17 32.7%	18 43.9%	8 32.0%	9 34.6%	14 30.4%	25 44.6%	13 35.1%
(Don't know)	1 0.7%	1 1.9%	-	-	1 1.9%	-	-	-	1 2.2%	-	-
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table fa1a Page 49

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

FA1a. Did you or did the auditor install them?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	95 100.0%	33 100.0%	27 100.0%	13 100.0%	34 100.0%	23 100.0%	17 100.0%	17 100.0%	31 100.0%	31 100.0%	24 100.0%
I installed the faucet aerators	21 22.1%	5 15.2%	6 22.2%	5 38.5%	6 17.6%	6 26.1% h	7 41.2% eH	1 5.9%	8 25.8%	5 16.1%	7 29.2%
The auditor installed the faucet aerators	68 71.6%	26 78.8%	19 70.4%	8 61.5%	26 76.5% G	17 73.9% g	8 47.1%	14 82.4% G	22 71.0%	22 71.0%	17 70.8%
I installed one faucet aerator and the auditor installed one faucet aerator	3 3.2%	1 3.0%	1 3.7%	-	1 2.9%	-	1 5.9%	1 5.9%	-	2 6.5%	-
(Don't know)	3 3.2%	1 3.0%	1 3.7%	-	1 2.9%	-	1 5.9%	1 5.9%	1 3.2%	2 6.5%	-
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table fa1bm1_1 Page 50

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

FA1b. Where is/are the faucet aerator(s) installed?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	95	33	27	13	34	23	17	17	31	31	24
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
(Other: Specify)	6	1	2	2	1	2	3	-	-	3	3
	6.3%	3.0%	7.4%	15.4%	2.9%	8.7%	17.6%			9.7%	12.5%
(Kitchen)	63	28	12	6	31	16	7	6	25	17	12
	66.3%	84.8%	44.4%	46.2%	91.2%	69.6%	41.2%	35.3%	80.6%	54.8%	50.0%
		CD			FGH	gH			JK		
(Bathroom)	64	26	19	8	23	14	10	15	21	22	15
	67.4%	78.8%	70.4%	61.5%	67.6%	60.9%	58.8%	88.2%	67.7%	71.0%	62.5%
								eFG			
(Don't know)	3	-	1	-	-	1	1	-	2	1	-
	3.2%		3.7%			4.3%	5.9%		6.5%	3.2%	
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table fa1bm1o Page 51

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

FA1b. Where is/are the faucet aerator(s) installed?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	4 100.0%	1 100.0%	1 100.0%	1 100.0%	-	2 100.0%	2 100.0%	-	-	2 100.0%	2 100.0%
LAUNDRY ROOM	3 75.0%	1 100.0%	1 100.0%	1 100.0%	-	2 100.0%	1 50.0%	-	-	1 50.0%	2 100.0%
UTILITY ROOM	1 25.0%	-	-	-	-	-	1 50.0%	-	-	1 50.0%	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table fa1bm2o Page 52

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

FA1b. Where is/are the faucet aerator(s) installed?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	2 100.0%	-	1 100.0%	1 100.0%	1 100.0%	-	1 100.0%	-	-	1 100.0%	1 100.0%
BAR ARIEA	1 50.0%	-	-	1 100.0%	1 100.0%	-	-	-	-	-	1 100.0%
BOTH IN THE UPSTAIRS BATHROOM	1 50.0%	-	1 100.0%	-	-	-	1 100.0%	-	-	1 100.0%	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table rec_fa2m1_1 Page 53

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

FA2. Why haven't the free faucet aerators you received been installed?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	95 100.0%	30 100.0%	26 100.0%	13 100.0%	30 100.0%	28 100.0%	18 100.0%	15 100.0%	27 100.0%	37 100.0%	26 100.0%
I did not need both: Installed one	9 9.5%	2 6.7%	3 11.5%	-	2 6.7%	3 10.7%	2 11.1%	2 13.3%	2 7.4%	5 13.5%	2 7.7%
I already had aerators installed	13 13.7%	4 13.3%	5 19.2%	1 7.7%	4 13.3%	4 14.3%	2 11.1%	3 20.0%	3 11.1%	8 21.6%	2 7.7%
Did not fit my faucets/ have specialty faucet	23 24.2%	9 30.0%	4 15.4%	6 46.2% C	5 16.7%	4 14.3%	6 33.3%	7 46.7% EF	9 33.3% j	5 13.5%	8 30.8%
I don't like faucet aerators	2 2.1%	1 3.3%	-	1 7.7%	1 3.3%	1 3.6%	-	-	-	1 2.7%	1 3.8%
Haven't needed it yet	5 5.3%	2 6.7%	2 7.7%	-	-	4 14.3%	-	1 6.7%	2 7.4%	1 2.7%	2 7.7%
Did not need	6 6.3%	1 3.3%	1 3.8%	1 7.7%	3 10.0%	2 7.1%	-	-	2 7.4%	3 8.1%	1 3.8%
Auditor did not install/ cannot install myself	4 4.2%	2 6.7%	1 3.8%	1 7.7%	2 6.7%	1 3.6%	-	1 6.7%	1 3.7%	1 2.7%	2 7.7%
Only received one	12 12.6%	3 10.0%	4 15.4%	1 7.7%	3 10.0%	5 17.9%	3 16.7%	1 6.7%	4 14.8%	4 10.8%	3 11.5%
Other	1 1.1%	1 3.3%	-	-	1 3.3%	-	-	-	1 3.7%	-	-
Did not receive any	13 13.7%	3 10.0%	3 11.5%	2 15.4%	7 23.3% f	2 7.1%	3 16.7%	-	1 3.7%	7 18.9% I	4 15.4%
DK	9 9.5%	3 10.0%	3 11.5%	-	2 6.7%	4 14.3%	2 11.1%	-	3 11.1%	3 8.1%	1 3.8%

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table rec_fa2m1_1 Page 54
(Continued)
DEC Res Assessments Survey Results (Opinion Dynamics #7880)

FA2. Why haven't the free faucet aerators you received been installed?

	Total	Income			Education				Year House was Built		
	------	< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Refused	1 1.1%	-	1 3.8%	-	-	-	1 5.6%	-	-	1 2.7%	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table fa3 Page 55

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

FA3. Have you removed any of the faucet aerators that were installed?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	95 100.0%	33 100.0%	27 100.0%	13 100.0%	34 100.0%	23 100.0%	17 100.0%	17 100.0%	31 100.0%	31 100.0%	24 100.0%
Yes	11 11.6%	3 9.1%	4 14.8%	3 23.1%	3 8.8%	1 4.3%	4 23.5% f	3 17.6%	2 6.5%	6 19.4%	2 8.3%
No	84 88.4%	30 90.9%	23 85.2%	10 76.9%	31 91.2%	22 95.7% g	13 76.5%	14 82.4%	29 93.5%	25 80.6%	22 91.7%
(Don't know)	-	-	-	-	-	-	-	-	-	-	-
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table fa3a Page 56

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

FA3a. How many did you remove?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	8 100.0%	2 100.0%	2 100.0%	3 100.0%	2 100.0%	1 100.0%	3 100.0%	2 100.0%	1 100.0%	5 100.0%	1 100.0%
One	8 100.0%	2 100.0%	2 100.0%	3 100.0%	2 100.0%	1 100.0%	3 100.0%	2 100.0%	1 100.0%	5 100.0%	1 100.0%
Two	-	-	-	-	-	-	-	-	-	-	-
(Don't know)	-	-	-	-	-	-	-	-	-	-	-
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table rec_fa3bm1 Page 57

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

FA3b. Why haven't the free faucet aerators you received been installed?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	11 100.0%	5 100.0%	3 100.0%	-	5 100.0%	3 100.0%	-	3 100.0%	3 100.0%	2 100.0%	4 100.0%
Disliked aerator/ pressure	7 63.6%	4 80.0%	2 66.7%	-	3 60.0%	3 100.0% eH	-	1 33.3%	2 66.7%	1 50.0%	3 75.0%
Broken	3 27.3%	1 20.0%	1 33.3%	-	2 40.0%	-	-	1 33.3%	1 33.3%	-	1 25.0%
Not compatible	1 9.1%	-	-	-	-	-	-	1 33.3%	-	1 50.0%	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table fa4 Page 58

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

FA4. If you had not received free faucet aerators from Duke, how likely is it that you would have purchased any faucet aerators for your home?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	136 100.0%	50 100.0%	37 100.0%	17 100.0%	44 100.0%	39 100.0%	22 100.0%	26 100.0%	44 100.0%	49 100.0%	33 100.0%
0 - Not at all likely	65 47.8%	23 46.0%	18 48.6%	9 52.9%	21 47.7%	12 30.8%	14 63.6% F	13 50.0%	21 47.7%	24 49.0%	15 45.5%
1	2 1.5%	1 2.0%	-	1 5.9%	-	1 2.6%	1 4.5%	-	-	1 2.0%	1 3.0%
2	10 7.4%	2 4.0%	5 13.5%	3 17.6%	3 6.8%	5 12.8%	1 4.5%	1 3.8%	2 4.5%	5 10.2%	3 9.1%
3	6 4.4%	-	2 5.4%	2 11.8%	2 4.5%	-	3 13.6%	1 3.8%	-	3 6.1%	2 6.1%
4	2 1.5%	1 2.0%	1 2.7%	-	1 2.3%	-	-	1 3.8%	1 2.3%	-	1 3.0%
5	9 6.6%	2 4.0%	3 8.1%	-	2 4.5%	5 12.8%	2 9.1%	-	3 6.8%	2 4.1%	3 9.1%
6	2 1.5%	1 2.0%	-	-	-	2 5.1%	-	-	2 4.5%	-	-
7	2 1.5%	2 4.0%	-	-	1 2.3%	-	-	1 3.8%	1 2.3%	-	-
8	15 11.0%	5 10.0%	4 10.8%	1 5.9%	7 15.9%	5 12.8%	-	3 11.5%	8 18.2% k	5 10.2%	2 6.1%
9	3 2.2%	2 4.0%	1 2.7%	-	1 2.3%	1 2.6%	1 4.5%	-	-	2 4.1%	1 3.0%
10 - Extremely likely	11 8.1%	4 8.0%	3 8.1%	1 5.9%	2 4.5%	5 12.8%	-	4 15.4%	2 4.5%	5 10.2%	3 9.1%

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table fa4 Page 59
(Continued)
DEC Res Assessments Survey Results (Opinion Dynamics #7880)

FA4. If you had not received free faucet aerators from Duke, how likely is it that you would have purchased any faucet aerators for your home?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
(Don't know)	9	7	-	-	4	3	-	2	4	2	2
	6.6%	14.0%			9.1%	7.7%		7.7%	9.1%	4.1%	6.1%
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table fa5 Page 60

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

FA5. If you had not received faucet aerators from Duke, would you have installed the same number or fewer faucet aerators than were installed?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	62	20	19	8	19	24	8	11	19	23	16
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
I would have installed FEWER faucet aerators	14	4	5	4	1	6	5	2	2	6	5
	22.6%	20.0%	26.3%	50.0%	5.3%	25.0%	62.5%	18.2%	10.5%	26.1%	31.2%
						e	EfH				
I would have installed the SAME number of faucet aerators	29	10	7	4	11	9	1	8	11	9	8
	46.8%	50.0%	36.8%	50.0%	57.9%	37.5%	12.5%	72.7%	57.9%	39.1%	50.0%
					G			FG			
I would have installed more	9	3	4	-	4	3	1	1	3	4	2
	14.5%	15.0%	21.1%		21.1%	12.5%	12.5%	9.1%	15.8%	17.4%	12.5%
I would NOT have installed any	8	2	3	-	3	5	-	-	3	2	1
	12.9%	10.0%	15.8%		15.8%	20.8%			15.8%	8.7%	6.2%
(Don't know)	2	1	-	-	-	1	1	-	-	2	-
	3.2%	5.0%				4.2%	12.5%			8.7%	
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table fa7 Page 61

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

FA7. If you had not received faucet aerators from Duke when would you have installed them?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	54 100.0%	18 100.0%	16 100.0%	8 100.0%	16 100.0%	19 100.0%	8 100.0%	11 100.0%	16 100.0%	21 100.0%	15 100.0%
At roughly the same time	12 22.2%	5 27.8%	4 25.0%	-	5 31.2%	5 26.3%	-	2 18.2%	5 31.2%	3 14.3%	4 26.7%
Within 6 months	21 38.9%	8 44.4%	5 31.2%	4 50.0%	6 37.5%	6 31.6%	3 37.5%	6 54.5%	5 31.2%	10 47.6%	5 33.3%
Within a year	3 5.6%	-	2 12.5%	-	1 6.2%	1 5.3%	-	1 9.1%	1 6.2%	1 4.8%	1 6.7%
More than a year	8 14.8%	1 5.6%	3 18.8%	3 37.5% b	2 12.5%	3 15.8%	2 25.0%	1 9.1%	1 6.2%	3 14.3%	4 26.7%
(Don't know)	9 16.7%	4 22.2%	2 12.5%	1 12.5%	2 12.5%	4 21.1%	2 25.0%	1 9.1%	4 25.0%	4 19.0%	1 6.7%
(Refused)	1 1.9%	-	-	-	-	-	1 12.5%	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table sh1 Page 62

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

SH1. Was the low-flow shower head you received from Duke Energy installed?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	150 100.0%	54 100.0%	40 100.0%	19 100.0%	52 100.0%	41 100.0%	25 100.0%	26 100.0%	46 100.0%	56 100.0%	37 100.0%
Yes	71 47.3%	31 57.4%	19 47.5%	7 36.8%	29 55.8% G	16 39.0%	7 28.0%	15 57.7% G	30 65.2% JK	22 39.3%	14 37.8%
No	74 49.3%	22 40.7%	20 50.0%	12 63.2% b	22 42.3%	23 56.1%	16 64.0% e	11 42.3%	15 32.6%	31 55.4% I	22 59.5% I
(Don't know)	4 2.7%	1 1.9%	1 2.5%	-	1 1.9%	2 4.9%	1 4.0%	-	1 2.2%	3 5.4%	-
(Refused)	1 0.7%	-	-	-	-	-	1 4.0%	-	-	-	1 2.7%

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table sh1a Page 63

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

SH1A. Did you or did the auditor install it?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	71 100.0%	31 100.0%	19 100.0%	7 100.0%	29 100.0%	16 100.0%	7 100.0%	15 100.0%	30 100.0%	22 100.0%	14 100.0%
I installed the Shower head	21 29.6%	7 22.6%	6 31.6%	3 42.9%	8 27.6%	6 37.5%	2 28.6%	3 20.0%	9 30.0%	8 36.4%	4 28.6%
The auditor installed the shower head	50 70.4%	24 77.4%	13 68.4%	4 57.1%	21 72.4%	10 62.5%	5 71.4%	12 80.0%	21 70.0%	14 63.6%	10 71.4%
(Don't know)	-	-	-	-	-	-	-	-	-	-	-
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table rec_sh2m1 Page 64

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

SH2. Why hasn't the shower head you received been installed?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	62 100.0%	18 100.0%	18 100.0%	10 100.0%	19 100.0%	21 100.0%	13 100.0%	7 100.0%	12 100.0%	24 100.0%	20 100.0%
Appearance/Didn't like how it looked	5 8.1%	3 16.7%	1 5.6%	1 10.0%	2 10.5%	2 9.5%	1 7.7%	-	-	2 8.3%	2 10.0%
Didn't fit	7 11.3%	2 11.1%	3 16.7%	-	4 21.1%	3 14.3%	-	-	1 8.3%	1 4.2%	5 25.0% J
Haven't gotten around to it	10 16.1%	3 16.7%	5 27.8%	1 10.0%	3 15.8%	4 19.0%	2 15.4%	1 14.3%	1 8.3%	7 29.2% ik	2 10.0%
Already have one	23 37.1%	3 16.7%	8 44.4% b	6 60.0% B	4 21.1%	6 28.6%	7 53.8% E	5 71.4% EF	5 41.7%	8 33.3%	7 35.0%
Water Pressure	-	-	-	-	-	-	-	-	-	-	-
Did not receive any	9 14.5%	4 22.2%	1 5.6%	1 10.0%	4 21.1%	4 19.0%	-	-	3 25.0%	3 12.5%	2 10.0%
DK	7 11.3%	3 16.7%	-	1 10.0%	2 10.5%	2 9.5%	2 15.4%	1 14.3%	2 16.7%	3 12.5%	2 10.0%
Refused	1 1.6%	-	-	-	-	-	1 7.7%	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table sh2m2o Page 65

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

SH2. Why hasn't the shower head you received been installed?

	Total	Income			Education				Year House was Built		
	------	< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	1 100.0%	-	1 100.0%	-	-	1 100.0%	-	-	-	1 100.0%	-
DIDNT NEED	1 100.0%	-	1 100.0%	-	-	1 100.0%	-	-	-	1 100.0%	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table sh3 Page 66

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

SH3. Is the low-flow shower head you received from Duke still installed in your home?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	71 100.0%	31 100.0%	19 100.0%	7 100.0%	29 100.0%	16 100.0%	7 100.0%	15 100.0%	30 100.0%	22 100.0%	14 100.0%
Yes	62 87.3%	28 90.3%	15 78.9%	7 100.0% bC	27 93.1%	16 100.0% gH	5 71.4%	11 73.3%	26 86.7%	18 81.8%	13 92.9%
No	9 12.7%	3 9.7%	4 21.1%	-	2 6.9%	-	2 28.6%	4 26.7%	4 13.3%	4 18.2%	1 7.1%
(Don't know)	-	-	-	-	-	-	-	-	-	-	-
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table sh4m1 Page 67

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

SH4. Why did you remove the low-flow shower head?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	9 100.0%	3 100.0%	4 100.0%	-	2 100.0%	-	2 100.0%	4 100.0%	4 100.0%	4 100.0%	1 100.0%
(Other, specify)	1 11.1%	-	-	-	-	-	-	-	1 25.0%	-	-
(The shower head was broken or leaked)	1 11.1%	1 33.3%	-	-	1 50.0%	-	-	-	1 25.0%	-	-
(The shower head had low water pressure)	4 44.4%	1 33.3%	2 50.0%	-	1 50.0%	-	2 100.0% H	1 25.0%	1 25.0%	2 50.0%	1 100.0%
(I disliked the look of the shower head)	-	-	-	-	-	-	-	-	-	-	-
(I purchased a better Shower head)	3 33.3%	1 33.3%	2 50.0%	-	-	-	-	3 75.0%	1 25.0%	2 50.0%	-
(Don't know)	-	-	-	-	-	-	-	-	-	-	-
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table sh4m1o Page 68

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

SH4. Why did you remove the low-flow shower head?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	1 100.0%	-	-	-	-	-	-	-	1 100.0%	-	-
IT WASN'T LONG ENOUGH	1 100.0%	-	-	-	-	-	-	-	1 100.0%	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table sh6 Page 69

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

SH6. Typically, how many showers per week are taken using this shower head?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	63 100.0%	28 100.0%	15 100.0%	7 100.0%	27 100.0%	16 100.0%	5 100.0%	11 100.0%	27 100.0%	18 100.0%	13 100.0%
0 to 4	17 27.0%	7 25.0%	6 40.0%	-	8 29.6%	4 25.0%	2 40.0%	2 18.2%	5 18.5%	6 33.3%	3 23.1%
5 to 10	25 39.7%	12 42.9%	3 20.0%	4 57.1% c	10 37.0%	6 37.5%	1 20.0%	6 54.5%	13 48.1%	5 27.8%	6 46.2%
11 to 15	10 15.9%	6 21.4%	2 13.3%	1 14.3%	4 14.8%	3 18.8%	1 20.0%	2 18.2%	4 14.8%	2 11.1%	3 23.1%
16 to 20	4 6.3%	1 3.6%	2 13.3%	1 14.3%	2 7.4%	2 12.5%	-	-	1 3.7%	3 16.7%	-
More than 20	5 7.9%	2 7.1%	1 6.7%	1 14.3%	2 7.4%	1 6.2%	1 20.0%	1 9.1%	2 7.4%	2 11.1%	1 7.7%
(Don't know)	2 3.2%	-	1 6.7%	-	1 3.7%	-	-	-	2 7.4%	-	-
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table sh7 Page 70

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

SH7. If you had not received the low-flow shower head from Duke, how likely is it that you would have purchased a high efficiency showerhead for your home?

	Total	Income			Education				Year House was Built		
	------	< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	136	49	38	18	47	35	23	26	42	50	34
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
0 - Not at all likely	58	25	11	9	21	9	12	13	20	21	14
	42.6%	51.0%	28.9%	50.0%	44.7%	25.7%	52.2%	50.0%	47.6%	42.0%	41.2%
		C			f		F	F			
1	4	1	2	-	-	2	1	1	-	1	3
	2.9%	2.0%	5.3%			5.7%	4.3%	3.8%		2.0%	8.8%
2	9	2	4	1	3	2	1	3	3	1	5
	6.6%	4.1%	10.5%	5.6%	6.4%	5.7%	4.3%	11.5%	7.1%	2.0%	14.7%
											J
3	6	-	3	1	2	1	3	-	1	2	1
	4.4%		7.9%	5.6%	4.3%	2.9%	13.0%		2.4%	4.0%	2.9%
4	1	1	-	-	-	1	-	-	-	-	1
	0.7%	2.0%				2.9%					2.9%
5	5	2	1	-	3	1	-	1	3	1	1
	3.7%	4.1%	2.6%		6.4%	2.9%		3.8%	7.1%	2.0%	2.9%
6	1	1	-	-	-	1	-	-	1	-	-
	0.7%	2.0%				2.9%			2.4%		
7	6	1	4	-	1	2	1	1	1	3	2
	4.4%	2.0%	10.5%		2.1%	5.7%	4.3%	3.8%	2.4%	6.0%	5.9%
8	10	2	4	2	4	2	1	3	4	5	1
	7.4%	4.1%	10.5%	11.1%	8.5%	5.7%	4.3%	11.5%	9.5%	10.0%	2.9%
9	3	1	1	-	1	1	-	1	1	1	-
	2.2%	2.0%	2.6%		2.1%	2.9%		3.8%	2.4%	2.0%	
10 - Extremely likely	21	5	7	5	6	7	4	3	6	11	3
	15.4%	10.2%	18.4%	27.8%	12.8%	20.0%	17.4%	11.5%	14.3%	22.0%	8.8%

k

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table sh7 Page 71
(Continued)
DEC Res Assessments Survey Results (Opinion Dynamics #7880)

SH7. If you had not received the low-flow shower head from Duke, how likely is it that you would have purchased a high efficiency showerhead for your home?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
(Don't know)	12	8	1	-	6	6	-	-	2	4	3
	8.8%	16.3%	2.6%		12.8%	17.1%			4.8%	8.0%	8.8%
		C									
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table sh8 Page 72

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

SH8. If you had not received the low-flow shower head from Duke, would you have installed the same number of high efficiency showerheads that were installed?

	Total	Income			Education				Year House was Built		
	------	< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	66 100.0%	16 100.0%	26 100.0%	9 100.0%	20 100.0%	20 100.0%	11 100.0%	13 100.0%	20 100.0%	25 100.0%	17 100.0%
I would have installed the SAME number of low-flow shower heads	39 59.1%	11 68.8%	17 65.4%	4 44.4%	13 65.0%	10 50.0%	5 45.5%	9 69.2%	13 65.0%	16 64.0%	9 52.9%
I would have installed more	5 7.6%	2 12.5%	1 3.8%	1 11.1%	1 5.0%	2 10.0%	1 9.1%	1 7.7%	3 15.0%	1 4.0%	1 5.9%
I would NOT have installed any	19 28.8%	3 18.8%	7 26.9%	3 33.3%	5 25.0%	7 35.0%	4 36.4%	3 23.1%	4 20.0%	6 24.0%	6 35.3%
(Don't know)	2 3.0%	-	1 3.8%	-	1 5.0%	1 5.0%	-	-	-	1 4.0%	1 5.9%
(Refused)	1 1.5%	-	-	1 11.1%	-	-	1 9.1%	-	-	1 4.0%	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table sh9 Page 73

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

SH9. If you had not received the low-flow shower head from Duke when would you have installed one?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	47 100.0%	13 100.0%	19 100.0%	6 100.0%	15 100.0%	13 100.0%	7 100.0%	10 100.0%	16 100.0%	19 100.0%	11 100.0%
At roughly the same time	11 23.4%	1 7.7%	7 36.8% B	2 33.3%	3 20.0%	-	4 57.1% e	3 30.0%	4 25.0%	5 26.3%	1 9.1%
Within 6 months	19 40.4%	7 53.8%	6 31.6%	3 50.0%	5 33.3%	8 61.5% G	1 14.3%	5 50.0% g	7 43.8%	8 42.1%	4 36.4%
Within a year	5 10.6%	1 7.7%	3 15.8%	-	1 6.7%	1 7.7%	1 14.3%	2 20.0%	1 6.2%	2 10.5%	2 18.2%
More than a year	3 6.4%	-	1 5.3%	1 16.7%	2 13.3%	-	1 14.3%	-	1 6.2%	-	2 18.2%
(Don't know)	8 17.0%	4 30.8% c	1 5.3%	-	3 20.0%	4 30.8%	-	-	3 18.8%	3 15.8%	2 18.2%
(Refused)	1 2.1%	-	1 5.3%	-	1 6.7%	-	-	-	-	1 5.3%	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table g0 Page 74

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

G0. How many outlet seals did you receive from Duke Energy?

	Total	Income			Education				Year House was Built		
	------	< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	150 100.0%	54 100.0%	40 100.0%	19 100.0%	52 100.0%	41 100.0%	25 100.0%	26 100.0%	46 100.0%	56 100.0%	37 100.0%
(Don't know)	55 36.7%	21 38.9%	12 30.0%	9 47.4%	20 38.5%	15 36.6%	8 32.0%	10 38.5%	15 32.6%	19 33.9%	17 45.9%
(Refused)	3 2.0%	-	-	-	1 1.9%	-	2 8.0%	-	-	-	1 2.7%
0	43 28.7%	14 25.9% d	12 30.0% d	2 10.5%	16 30.8%	11 26.8%	5 20.0%	8 30.8%	16 34.8% k	17 30.4%	7 18.9%
1	8 5.3%	2 3.7%	4 10.0%	1 5.3%	2 3.8%	3 7.3%	2 8.0%	1 3.8%	1 2.2%	5 8.9%	2 5.4%
2	13 8.7%	4 7.4%	4 10.0%	4 21.1%	2 3.8%	3 7.3%	6 24.0% Ef	2 7.7%	3 6.5%	5 8.9%	4 10.8%
3	2 1.3%	1 1.9%	-	-	-	1 2.4%	-	1 3.8%	1 2.2%	1 1.8%	-
4	5 3.3%	5 9.3%	-	-	4 7.7%	1 2.4%	-	-	2 4.3%	1 1.8%	1 2.7%
5	3 2.0%	2 3.7%	-	-	1 1.9%	1 2.4%	-	-	1 2.2%	2 3.6%	-
6	8 5.3%	2 3.7%	3 7.5%	1 5.3%	3 5.8%	3 7.3%	-	2 7.7%	4 8.7%	3 5.4%	1 2.7%
8	3 2.0%	-	2 5.0%	1 5.3%	-	1 2.4%	1 4.0%	1 3.8%	-	1 1.8%	2 5.4%
10	3 2.0%	-	3 7.5%	-	1 1.9%	2 4.9%	-	-	1 2.2%	-	2 5.4%

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table g0 Page 75
(Continued)
DEC Res Assessments Survey Results (Opinion Dynamics #7880)

G0. How many outlet seals did you receive from Duke Energy?

	Total	Income			Education				Year House was Built		
	------	< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
12	2 1.3%	1 1.9%	-	1 5.3%	-	-	1 4.0%	1 3.8%	-	2 3.6%	-
15	1 0.7%	1 1.9%	-	-	1 1.9%	-	-	-	1 2.2%	-	-
23	1 0.7%	1 1.9%	-	-	1 1.9%	-	-	-	1 2.2%	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table g1 Page 76

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

G1. Were the outlet seals you received from Duke installed?

	Total	Income			Education				Year House was Built		
	------	< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	107 100.0%	40 100.0%	28 100.0%	17 100.0%	36 100.0%	30 100.0%	20 100.0%	18 100.0%	30 100.0%	39 100.0%	30 100.0%
(Yes)	28 26.2%	10 25.0%	6 21.4%	6 35.3%	9 25.0%	8 26.7%	6 30.0%	4 22.2%	7 23.3%	13 33.3%	7 23.3%
(Some of them)	3 2.8%	2 5.0%	1 3.6%	-	2 5.6%	-	-	1 5.6%	2 6.7%	-	1 3.3%
(None of them)	57 53.3%	19 47.5%	16 57.1%	9 52.9%	18 50.0%	18 60.0%	10 50.0%	9 50.0%	14 46.7%	20 51.3%	17 56.7%
(Don't know)	17 15.9%	9 22.5% d	5 17.9%	1 5.9%	7 19.4%	4 13.3%	2 10.0%	4 22.2%	7 23.3%	5 12.8%	4 13.3%
(Refused)	2 1.9%	-	-	1 5.9%	-	-	2 10.0%	-	-	1 2.6%	1 3.3%

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table g1a Page 77

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

G1a. Did you or did the auditor install them?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	31 100.0%	12 100.0%	7 100.0%	6 100.0%	11 100.0%	8 100.0%	6 100.0%	5 100.0%	9 100.0%	13 100.0%	8 100.0%
I installed the outlet seals	19 61.3%	7 58.3%	4 57.1%	4 66.7%	6 54.5%	6 75.0%	3 50.0%	3 60.0%	6 66.7%	7 53.8%	6 75.0%
The auditor installed the outlet seals	9 29.0%	5 41.7%	3 42.9%	1 16.7%	4 36.4%	2 25.0%	1 16.7%	2 40.0%	3 33.3%	4 30.8%	2 25.0%
I installed some of the outlet seals and the auditor installed some of the outlet seals	-	-	-	-	-	-	-	-	-	-	-
(Don't know)	2 6.5%	-	-	1 16.7%	1 9.1%	-	1 16.7%	-	-	2 15.4%	-
(Refused)	1 3.2%	-	-	-	-	-	1 16.7%	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table g1aa Page 78

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

G1aa. How many of the outlet seals were installed?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	3 100.0%	2 100.0%	1 100.0%	-	2 100.0%	-	-	1 100.0%	2 100.0%	-	1 100.0%
(Don't know)	1 33.3%	-	1 100.0%	-	-	-	-	1 100.0%	-	-	1 100.0%
(Refused)	-	-	-	-	-	-	-	-	-	-	-
1	1 33.3%	1 50.0%	-	-	1 50.0%	-	-	-	1 50.0%	-	-
2	1 33.3%	1 50.0%	-	-	1 50.0%	-	-	-	1 50.0%	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table g1ab Page 79

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

G1ab. How many of the outlet seals were installed in interior walls?

	Total	Income			Education				Year House was Built		
	------	< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	31 100.0%	12 100.0%	7 100.0%	6 100.0%	11 100.0%	8 100.0%	6 100.0%	5 100.0%	9 100.0%	13 100.0%	8 100.0%
(Don't know)	9 29.0%	2 16.7%	2 28.6%	3 50.0%	4 36.4%	1 12.5%	2 33.3%	2 40.0%	1 11.1%	5 38.5%	3 37.5%
(Refused)	-	-	-	-	-	-	-	-	-	-	-
0	5 16.1%	1 8.3%	1 14.3%	1 16.7%	1 9.1%	2 25.0%	1 16.7%	1 20.0%	2 22.2%	1 7.7%	1 12.5%
1	5 16.1%	4 33.3%	1 14.3%	-	3 27.3%	1 12.5%	1 16.7%	-	2 22.2%	1 7.7%	2 25.0%
2	6 19.4%	1 8.3%	3 42.9% b	2 33.3%	1 9.1%	2 25.0%	2 33.3%	1 20.0%	1 11.1%	3 23.1%	2 25.0%
3	1 3.2%	1 8.3%	-	-	-	-	-	1 20.0%	1 11.1%	-	-
4	1 3.2%	1 8.3%	-	-	1 9.1%	-	-	-	-	1 7.7%	-
5	2 6.5%	1 8.3%	-	-	1 9.1%	-	-	-	1 11.1%	1 7.7%	-
6	2 6.5%	1 8.3%	-	-	-	2 25.0%	-	-	1 11.1%	1 7.7%	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table g1ac Page 80

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

G1ac. How many of the outlet seals were installed in exterior walls?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	24 100.0%	9 100.0%	6 100.0%	5 100.0%	8 100.0%	6 100.0%	5 100.0%	4 100.0%	5 100.0%	12 100.0%	7 100.0%
(Don't know)	7 29.2%	1 11.1%	2 33.3%	2 40.0%	3 37.5%	1 16.7%	2 40.0%	1 25.0%	-	4 33.3%	3 42.9%
(Refused)	-	-	-	-	-	-	-	-	-	-	-
0	7 29.2%	3 33.3%	2 33.3%	1 20.0%	1 12.5%	1 16.7%	3 60.0% e	1 25.0%	3 60.0% k	3 25.0%	1 14.3%
1	4 16.7%	3 33.3%	-	1 20.0%	2 25.0%	2 33.3%	-	-	1 20.0%	1 8.3%	2 28.6%
2	3 12.5%	-	2 33.3%	-	-	2 33.3%	-	1 25.0%	-	2 16.7%	1 14.3%
4	1 4.2%	1 11.1%	-	-	1 12.5%	-	-	-	-	1 8.3%	-
5	1 4.2%	1 11.1%	-	-	1 12.5%	-	-	-	1 20.0%	-	-
12	1 4.2%	-	-	1 20.0%	-	-	-	1 25.0%	-	1 8.3%	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table rec_g1bm1 Page 81

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

G1b. Why haven't the outlet seals you received been installed?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	61 100.0%	22 100.0%	17 100.0%	9 100.0%	20 100.0%	19 100.0%	10 100.0%	10 100.0%	16 100.0%	20 100.0%	19 100.0%
Already had them	11 18.0%	3 13.6%	4 23.5%	1 11.1%	3 15.0%	5 26.3%	-	3 30.0%	4 25.0%	3 15.0%	4 21.1%
Haven't had time	18 29.5%	7 31.8%	7 41.2% d	1 11.1%	6 30.0%	8 42.1% H	3 30.0%	1 10.0%	5 31.2%	7 35.0%	4 21.1%
Planning on installing them	2 3.3%	1 4.5%	-	-	2 10.0%	-	-	-	1 6.2%	-	1 5.3%
Didn't receive any	3 4.9%	1 4.5%	2 11.8%	-	-	1 5.3%	1 10.0%	1 10.0%	-	1 5.0%	2 10.5%
Didn't see a need	7 11.5%	-	2 11.8%	3 33.3%	1 5.0%	1 5.3%	4 40.0% EFh	1 10.0%	1 6.2%	3 15.0%	3 15.8%
No reason given	4 6.6%	1 4.5%	1 5.9%	2 22.2%	1 5.0%	-	2 20.0%	1 10.0%	-	1 5.0%	2 10.5%
Auditor didn't install/ Can't install myself	8 13.1%	6 27.3%	-	1 11.1%	4 20.0%	2 10.5%	-	2 20.0%	2 12.5%	4 20.0%	-
DK	8 13.1%	3 13.6%	1 5.9%	1 11.1%	3 15.0%	2 10.5%	-	1 10.0%	3 18.8%	1 5.0%	3 15.8%
Refused	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table g2 Page 82

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

G2. Are all of the outlet seals that were installed still in place?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	31 100.0%	12 100.0%	7 100.0%	6 100.0%	11 100.0%	8 100.0%	6 100.0%	5 100.0%	9 100.0%	13 100.0%	8 100.0%
Yes	30 96.8%	12 100.0%	7 100.0%	6 100.0%	10 90.9%	8 100.0%	6 100.0%	5 100.0%	9 100.0%	12 92.3%	8 100.0%
No	-	-	-	-	-	-	-	-	-	-	-
(Don't know)	1 3.2%	-	-	-	1 9.1%	-	-	-	-	1 7.7%	-
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table g3 Page 83

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

G3. How many outlet seals were removed from your home?

	Total	Income			Education				Year House was Built		
	------	< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	-	-	-	-	-	-	-	-	-	-	-
(Removed all of them)	-	-	-	-	-	-	-	-	-	-	-
(Don't know)	-	-	-	-	-	-	-	-	-	-	-
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table g5 Page 84

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

G5. If you had not received the outlet seals from Duke, how likely is it that you...

	Total	Income			Education				Year House was Built		
	------	< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	88	31	23	15	29	26	16	14	23	33	25
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
0 - Not at all likely	45	14	12	10	12	11	10	10	11	19	12
	51.1%	45.2%	52.2%	66.7%	41.4%	42.3%	62.5%	71.4%	47.8%	57.6%	48.0%
								Ef			
1	3	1	1	1	1	-	1	1	-	2	-
	3.4%	3.2%	4.3%	6.7%	3.4%		6.2%	7.1%		6.1%	
2	5	-	4	1	2	2	1	-	-	2	3
	5.7%		17.4%	6.7%	6.9%	7.7%	6.2%			6.1%	12.0%
3	4	-	1	1	-	2	2	-	1	1	1
	4.5%		4.3%	6.7%		7.7%	12.5%		4.3%	3.0%	4.0%
4	-	-	-	-	-	-	-	-	-	-	-
5	5	4	1	-	2	2	-	1	3	-	2
	5.7%	12.9%	4.3%		6.9%	7.7%		7.1%	13.0%		8.0%
6	4	3	-	-	4	-	-	-	2	1	1
	4.5%	9.7%			13.8%				8.7%	3.0%	4.0%
7	-	-	-	-	-	-	-	-	-	-	-
8	2	-	1	1	-	1	-	1	-	-	2
	2.3%		4.3%	6.7%		3.8%		7.1%			8.0%
9	1	-	-	-	-	1	-	-	-	-	1
	1.1%					3.8%					4.0%
10 - Extremely likely	12	6	1	1	5	4	1	1	4	5	2
	13.6%	19.4%	4.3%	6.7%	17.2%	15.4%	6.2%	7.1%	17.4%	15.2%	8.0%
		c									

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table g5 Page 85
(Continued)
DEC Res Assessments Survey Results (Opinion Dynamics #7880)

G5. If you had not received the outlet seals from Duke, how likely is it that you would have purchased any outlet seals for your home?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
(Don't know)	7	3	2	-	3	3	1	-	2	3	1
	8.0%	9.7%	8.7%		10.3%	11.5%	6.2%		8.7%	9.1%	4.0%
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table g6 Page 86

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

G6. If you had not received the outlet seals from Duke, would you have installed the same number of outlet seals that were installed?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	36 100.0%	14 100.0%	9 100.0%	5 100.0%	14 100.0%	12 100.0%	5 100.0%	4 100.0%	10 100.0%	11 100.0%	12 100.0%
I would have installed FEWER outlet seals	8 22.2%	3 21.4%	4 44.4%	-	4 28.6%	2 16.7%	2 40.0%	-	1 10.0%	3 27.3%	3 25.0%
I would have installed the SAME number of outlet seals	10 27.8%	4 28.6%	3 33.3%	2 40.0%	3 21.4%	3 25.0%	1 20.0%	3 75.0% EFg	4 40.0% j	1 9.1%	5 41.7% j
I would have installed more	7 19.4%	4 28.6%	-	-	3 21.4%	3 25.0%	-	-	3 30.0%	4 36.4%	-
I would NOT have installed any	6 16.7%	2 14.3%	1 11.1%	2 40.0%	2 14.3%	1 8.3%	2 40.0%	1 25.0%	-	2 18.2%	2 16.7%
(Don't know)	5 13.9%	1 7.1%	1 11.1%	1 20.0%	2 14.3%	3 25.0%	-	-	2 20.0%	1 9.1%	2 16.7%
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table g7 Page 87

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

G7. If you had not received the outlet seals from Duke when would you have installed them?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	30 100.0%	12 100.0%	8 100.0%	3 100.0%	12 100.0%	11 100.0%	3 100.0%	3 100.0%	10 100.0%	9 100.0%	10 100.0%
At roughly the same time	7 23.3%	1 8.3%	3 37.5%	-	3 25.0%	2 18.2%	-	2 66.7%	2 20.0%	3 33.3%	2 20.0%
Within 6 months	16 53.3%	11 91.7%	-	2 66.7%	7 58.3%	6 54.5%	1 33.3%	1 33.3%	8 80.0% J	2 22.2%	5 50.0%
Within a year	1 3.3%	-	1 12.5%	-	-	1 9.1%	-	-	-	1 11.1%	-
More than a year	2 6.7%	-	1 12.5%	-	1 8.3%	1 9.1%	-	-	-	1 11.1%	1 10.0%
(Don't know)	3 10.0%	-	2 25.0%	1 33.3%	1 8.3%	1 9.1%	1 33.3%	-	-	1 11.1%	2 20.0%
(Refused)	1 3.3%	-	1 12.5%	-	-	-	1 33.3%	-	-	1 11.1%	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table w0 Page 88

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

W0. How many feet of weather stripping did you receive from Duke Energy?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	150	54	40	19	52	41	25	26	46	56	37
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
1 to 5	31	15	6	4	15	10	4	2	12	9	7
	20.7%	27.8%	15.0%	21.1%	28.8%	24.4%	16.0%	7.7%	26.1%	16.1%	18.9%
					H	H					
6 to 10	12	4	5	2	4	4	2	1	3	5	3
	8.0%	7.4%	12.5%	10.5%	7.7%	9.8%	8.0%	3.8%	6.5%	8.9%	8.1%
11 to 17	2	-	1	1	1	-	-	1	2	-	-
	1.3%		2.5%	5.3%	1.9%			3.8%	4.3%		
18 or more	5	3	1	-	1	1	1	2	-	2	3
	3.3%	5.6%	2.5%		1.9%	2.4%	4.0%	7.7%		3.6%	8.1%
(None)	43	11	13	5	16	10	8	9	12	19	7
	28.7%	20.4%	32.5%	26.3%	30.8%	24.4%	32.0%	34.6%	26.1%	33.9%	18.9%
										k	
(Don't know)	57	21	14	7	15	16	10	11	17	21	17
	38.0%	38.9%	35.0%	36.8%	28.8%	39.0%	40.0%	42.3%	37.0%	37.5%	45.9%
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table w1 Page 89

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

W1. Was the weather stripping provided from Duke installed?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	107 100.0%	43 100.0%	27 100.0%	14 100.0%	36 100.0%	31 100.0%	17 100.0%	17 100.0%	34 100.0%	37 100.0%	30 100.0%
(Yes, all)	24 22.4%	10 23.3%	3 11.1%	3 21.4%	10 27.8%	8 25.8%	2 11.8%	2 11.8%	11 32.4% K	8 21.6% k	2 6.7%
(Yes, some of it)	11 10.3%	4 9.3%	3 11.1%	2 14.3%	3 8.3%	2 6.5%	4 23.5%	1 5.9%	4 11.8%	3 8.1%	3 10.0%
(No / None of it)	64 59.8%	25 58.1%	18 66.7%	9 64.3%	19 52.8%	20 64.5%	10 58.8%	12 70.6%	17 50.0%	25 67.6%	20 66.7%
(Don't know)	8 7.5%	4 9.3%	3 11.1%	-	4 11.1%	1 3.2%	1 5.9%	2 11.8%	2 5.9%	1 2.7%	5 16.7% j
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table w1a Page 90

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

W1a. Did you or did the auditor install it?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	35 100.0%	14 100.0%	6 100.0%	5 100.0%	13 100.0%	10 100.0%	6 100.0%	3 100.0%	15 100.0%	11 100.0%	5 100.0%
I installed all the weather stripping	25 71.4%	10 71.4%	6 100.0% Bd	3 60.0%	8 61.5%	9 90.0% e	4 66.7%	3 100.0% Eg	9 60.0%	10 90.9% I	4 80.0%
The auditor installed all the weather stripping	8 22.9%	3 21.4%	-	2 40.0%	4 30.8%	1 10.0%	2 33.3%	-	5 33.3%	1 9.1%	1 20.0%
I installed some of the weather stripping and the auditor installed some of the weather stripping	2 5.7%	1 7.1%	-	-	1 7.7%	-	-	-	1 6.7%	-	-
(Don't know)	-	-	-	-	-	-	-	-	-	-	-
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table rec_w1bm1 Page 91

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

W1b. Why hasn't the weather stripping you received been installed?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	80	30	23	11	23	23	15	15	21	31	24
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Already had it	12	3	4	4	1	5	3	3	3	4	5
	15.0%	10.0%	17.4%	36.4% b	4.3%	21.7% e	20.0%	20.0%	14.3%	12.9%	20.8%
Haven't had time	15	7	3	1	3	6	4	2	3	5	6
	18.8%	23.3%	13.0%	9.1%	13.0%	26.1%	26.7%	13.3%	14.3%	16.1%	25.0%
Planning on installing later	3	3	-	-	2	1	-	-	1	1	-
	3.8%	10.0%			8.7%	4.3%			4.8%	3.2%	
Didn't receive any/ enough	7	2	3	1	1	3	2	1	-	4	2
	8.8%	6.7%	13.0%	9.1%	4.3%	13.0%	13.3%	6.7%		12.9%	8.3%
Didn't see a need	20	5	9	3	6	6	4	4	6	9	5
	25.0%	16.7%	39.1% b	27.3%	26.1%	26.1%	26.7%	26.7%	28.6%	29.0%	20.8%
No reason given	4	1	-	1	1	-	1	-	2	1	1
	5.0%	3.3%		9.1%	4.3%		6.7%		9.5%	3.2%	4.2%
Auditor didn't install/ Can't install myself	8	3	1	1	4	-	-	4	2	4	2
	10.0%	10.0%	4.3%	9.1%	17.4%			26.7%	9.5%	12.9%	8.3%
Didn't work	3	3	-	-	2	1	-	-	1	-	2
	3.8%	10.0%			8.7%	4.3%			4.8%		8.3%
DK	8	3	3	-	3	1	1	1	3	3	1
	10.0%	10.0%	13.0%		13.0%	4.3%	6.7%	6.7%	14.3%	9.7%	4.2%

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table w2 Page 92

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

W2. How many feet were installed?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	35 100.0%	14 100.0%	6 100.0%	5 100.0%	13 100.0%	10 100.0%	6 100.0%	3 100.0%	15 100.0%	11 100.0%	5 100.0%
1 to 5	17 48.6%	7 50.0%	3 50.0%	2 40.0%	8 61.5%	6 60.0%	3 50.0%	-	6 40.0%	5 45.5%	4 80.0% i
6 to 10	4 11.4%	1 7.1%	2 33.3%	1 20.0%	2 15.4%	-	1 16.7%	1 33.3%	1 6.7%	2 18.2%	1 20.0%
11 to 17	2 5.7%	-	-	1 20.0%	-	-	-	2 66.7%	1 6.7%	1 9.1%	-
18 or more	-	-	-	-	-	-	-	-	-	-	-
(Don't know)	11 31.4%	6 42.9%	1 16.7%	-	3 23.1%	3 30.0%	2 33.3%	-	7 46.7%	2 18.2%	-
(Refused)	1 2.9%	-	-	1 20.0%	-	1 10.0%	-	-	-	1 9.1%	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table w2a Page 93

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

W2a. Did you remove any of the weather stripping?

	Total	Income			Education				Year House was Built		
	------	< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	35 100.0%	14 100.0%	6 100.0%	5 100.0%	13 100.0%	10 100.0%	6 100.0%	3 100.0%	15 100.0%	11 100.0%	5 100.0%
Yes	4 11.4%	1 7.1%	-	1 20.0%	1 7.7%	1 10.0%	-	1 33.3%	1 6.7%	2 18.2%	-
No	31 88.6%	13 92.9%	6 100.0%	4 80.0%	12 92.3%	9 90.0%	6 100.0%	2 66.7%	14 93.3%	9 81.8%	5 100.0%
(Don't know)	-	-	-	-	-	-	-	-	-	-	-
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table w2b Page 94

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

W2b. How many feet did you remove?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	4 100.0%	1 100.0%	-	1 100.0%	1 100.0%	1 100.0%	-	1 100.0%	1 100.0%	2 100.0%	-
1 to 5	1 25.0%	-	-	-	-	-	-	1 100.0%	-	1 50.0%	-
6 to 10	1 25.0%	-	-	1 100.0%	-	1 100.0%	-	-	-	1 50.0%	-
11 to 17	-	-	-	-	-	-	-	-	-	-	-
18 or more	-	-	-	-	-	-	-	-	-	-	-
(Don't know)	2 50.0%	1 100.0%	-	-	1 100.0%	-	-	-	1 100.0%	-	-
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table w3 Page 95

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

W3. If you had not received the weather stripping from Duke, how likely is it that you would have purchased it for your home?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	99 100.0%	39 100.0%	24 100.0%	14 100.0%	32 100.0%	30 100.0%	16 100.0%	15 100.0%	32 100.0%	36 100.0%	25 100.0%
0 - Not at all likely	28 28.3%	8 20.5%	8 33.3%	6 42.9%	7 21.9%	6 20.0%	8 50.0% eF	4 26.7%	8 25.0%	11 30.6%	9 36.0%
1	2 2.0%	1 2.6%	-	1 7.1%	-	2 6.7%	-	-	-	1 2.8%	1 4.0%
2	1 1.0%	-	-	1 7.1%	1 3.1%	-	-	-	-	-	1 4.0%
3	3 3.0%	-	1 4.2%	1 7.1%	-	-	1 6.2%	2 13.3%	-	2 5.6%	1 4.0%
4	1 1.0%	1 2.6%	-	-	-	-	-	1 6.7%	-	1 2.8%	-
5	14 14.1%	6 15.4%	4 16.7%	1 7.1%	5 15.6%	4 13.3%	3 18.8%	2 13.3%	5 15.6%	5 13.9%	4 16.0%
6	5 5.1%	-	1 4.2%	1 7.1%	4 12.5%	-	1 6.2%	-	1 3.1%	2 5.6%	1 4.0%
7	5 5.1%	1 2.6%	2 8.3%	2 14.3%	1 3.1%	1 3.3%	1 6.2%	2 13.3%	1 3.1%	3 8.3%	1 4.0%
8	7 7.1%	3 7.7%	2 8.3%	-	3 9.4%	-	1 6.2%	1 6.7%	3 9.4%	3 8.3%	-
9	-	-	-	-	-	-	-	-	-	-	-
10 - Extremely likely	26 26.3%	13 33.3% D	6 25.0%	1 7.1%	8 25.0% gh	15 50.0% EGH	1 6.2%	1 6.7%	12 37.5% J	5 13.9%	7 28.0%

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table w3 Page 96
(Continued)
DEC Res Assessments Survey Results (Opinion Dynamics #7880)

W3. If you had not received the weather stripping from Duke, how likely is it that you would have purchased it for your home?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
(Don't know)	6	5	-	-	2	2	-	2	2	2	-
	6.1%	12.8%			6.2%	6.7%		13.3%	6.2%	5.6%	
(Refused)	1	1	-	-	1	-	-	-	-	1	-
	1.0%	2.6%			3.1%					2.8%	

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table w4 Page 97

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

W4. If you had not received the weather stripping during from Duke, would you have installed the same amount of weather stripping than what was installed/

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	64 100.0%	25 100.0%	16 100.0%	8 100.0%	22 100.0%	22 100.0%	8 100.0%	9 100.0%	22 100.0%	22 100.0%	16 100.0%
We would have installed LESS weather stripping	4 6.2%	1 4.0%	3 18.8%	-	2 9.1%	-	1 12.5%	1 11.1%	1 4.5%	3 13.6%	-
We would have installed the SAME amount of weather stripping	29 45.3%	7 28.0%	6 37.5%	6 75.0% Bc	7 31.8%	9 40.9%	5 62.5%	6 66.7% e	10 45.5%	8 36.4%	8 50.0%
We would have installed more	17 26.6%	10 40.0%	5 31.2%	-	8 36.4%	8 36.4%	1 12.5%	-	7 31.8%	5 22.7%	4 25.0%
We would NOT have installed any	8 12.5%	5 20.0%	2 12.5%	1 12.5%	4 18.2%	2 9.1%	1 12.5%	1 11.1%	4 18.2%	2 9.1%	2 12.5%
(Don't know)	6 9.4%	2 8.0%	-	1 12.5%	1 4.5%	3 13.6%	-	1 11.1%	-	4 18.2%	2 12.5%
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table w5 Page 98

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

W5. If you had not received the weather stripping from Duke when would you have installed it?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	56 100.0%	20 100.0%	14 100.0%	7 100.0%	18 100.0%	20 100.0%	7 100.0%	8 100.0%	18 100.0%	20 100.0%	14 100.0%
At roughly the same time	14 25.0%	8 40.0%	3 21.4%	1 14.3%	7 38.9%	6 30.0%	-	-	6 33.3%	4 20.0%	2 14.3%
Within 6 months	28 50.0%	10 50.0%	8 57.1%	4 57.1%	6 33.3%	9 45.0%	6 85.7% EF	6 75.0% E	11 61.1%	10 50.0%	6 42.9%
Within a year	7 12.5%	1 5.0%	1 7.1%	1 14.3%	2 11.1%	3 15.0%	1 14.3%	1 12.5%	1 5.6%	1 5.0%	4 28.6% ij
More than a year	3 5.4%	-	1 7.1%	1 14.3%	3 16.7%	-	-	-	-	1 5.0%	2 14.3%
(Don't know)	4 7.1%	1 5.0%	1 7.1%	-	-	2 10.0%	-	1 12.5%	-	4 20.0%	-
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table b1 Page 99

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

B1. Do you recall receiving recommendations in the assessment report for how to save energy in your home from the auditor?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	150	54	40	19	52	41	25	26	46	56	37
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Yes	130	47	35	18	44	36	22	23	43	47	32
	86.7%	87.0%	87.5%	94.7%	84.6%	87.8%	88.0%	88.5%	93.5%	83.9%	86.5%
No	9	3	2	1	4	3	2	-	-	5	2
	6.0%	5.6%	5.0%	5.3%	7.7%	7.3%	8.0%			8.9%	5.4%
(Don't know)	11	4	3	-	4	2	1	3	3	4	3
	7.3%	7.4%	7.5%		7.7%	4.9%	4.0%	11.5%	6.5%	7.1%	8.1%
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table tb2 Page 100

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

B2. Can you please tell us which of the following assessment report recommendations you completed…

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	130 100.0%	47 100.0%	35 100.0%	18 100.0%	44 100.0%	36 100.0%	22 100.0%	23 100.0%	43 100.0%	47 100.0%	32 100.0%
continue	130 100.0%	47 100.0%	35 100.0%	18 100.0%	44 100.0%	36 100.0%	22 100.0%	23 100.0%	43 100.0%	47 100.0%	32 100.0%

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table b2a Page 101

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

B2a. Did you close crawl space vents?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	28	7	8	8	7	10	5	6	7	7	14
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Yes	11	4	3	2	3	6	1	1	4	1	6
	39.3%	57.1%	37.5%	25.0%	42.9%	60.0%	20.0%	16.7%	57.1%	14.3%	42.9%
						gH			j		
No	9	2	3	3	2	2	2	3	2	3	4
	32.1%	28.6%	37.5%	37.5%	28.6%	20.0%	40.0%	50.0%	28.6%	42.9%	28.6%
(Was not recommended)	7	1	2	3	1	2	2	2	1	3	3
	25.0%	14.3%	25.0%	37.5%	14.3%	20.0%	40.0%	33.3%	14.3%	42.9%	21.4%
(Don't know)	1	-	-	-	1	-	-	-	-	-	1
	3.6%				14.3%						7.1%
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table b2b Page 102

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

B2b. Did you seal air leaks in your duct system?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	28	7	8	8	7	10	5	6	7	7	14
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Yes	7	1	2	2	3	2	-	2	2	2	3
	25.0%	14.3%	25.0%	25.0%	42.9%	20.0%		33.3%	28.6%	28.6%	21.4%
No	17	5	4	6	3	7	3	4	4	4	9
	60.7%	71.4%	50.0%	75.0%	42.9%	70.0%	60.0%	66.7%	57.1%	57.1%	64.3%
(Was not recommended)	4	1	2	-	1	1	2	-	1	1	2
	14.3%	14.3%	25.0%		14.3%	10.0%	40.0%		14.3%	14.3%	14.3%
(Don't know)	-	-	-	-	-	-	-	-	-	-	-
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table b2c Page 103

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

B2c. Did you install duct insulation?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	28 100.0%	7 100.0%	8 100.0%	8 100.0%	7 100.0%	10 100.0%	5 100.0%	6 100.0%	7 100.0%	7 100.0%	14 100.0%
Yes	9 32.1%	2 28.6%	4 50.0%	2 25.0%	4 57.1% F	1 10.0%	1 20.0%	3 50.0% f	3 42.9%	1 14.3%	5 35.7%
No	16 57.1%	5 71.4%	3 37.5%	5 62.5%	3 42.9%	8 80.0%	2 40.0%	3 50.0%	4 57.1%	5 71.4%	7 50.0%
(Was not recommended)	3 10.7%	-	1 12.5%	1 12.5%	-	1 10.0%	2 40.0%	-	-	1 14.3%	2 14.3%
(Don't know)	-	-	-	-	-	-	-	-	-	-	-
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table b2d Page 104

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

B2d. Did you unplug or remove an extra appliance?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	28 100.0%	7 100.0%	8 100.0%	8 100.0%	7 100.0%	10 100.0%	5 100.0%	6 100.0%	7 100.0%	7 100.0%	14 100.0%
Yes	7 25.0%	2 28.6%	3 37.5%	1 12.5%	1 14.3%	3 30.0%	1 20.0%	2 33.3%	1 14.3%	3 42.9%	3 21.4%
No	20 71.4%	5 71.4%	5 62.5%	7 87.5%	6 85.7%	7 70.0%	3 60.0%	4 66.7%	6 85.7%	4 57.1%	10 71.4%
(Was not recommended)	1 3.6%	-	-	-	-	-	1 20.0%	-	-	-	1 7.1%
(Don't know)	-	-	-	-	-	-	-	-	-	-	-
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table b2e Page 105

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

B2e. Did you adjust how much you run your furnace fan?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	29 100.0%	7 100.0%	8 100.0%	8 100.0%	8 100.0%	10 100.0%	5 100.0%	6 100.0%	7 100.0%	7 100.0%	14 100.0%
Yes	7 24.1%	1 14.3%	2 25.0%	-	3 37.5%	3 30.0%	-	1 16.7%	2 28.6%	1 14.3%	3 21.4%
No	19 65.5%	5 71.4%	5 62.5%	8 100.0% bC	4 50.0%	7 70.0%	3 60.0%	5 83.3%	4 57.1%	5 71.4%	10 71.4%
(Was not recommended)	3 10.3%	1 14.3%	1 12.5%	-	1 12.5%	-	2 40.0%	-	1 14.3%	1 14.3%	1 7.1%
(Don't know)	-	-	-	-	-	-	-	-	-	-	-
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table b2f Page 106

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

B2f. Did you clean or replace your furnace filter?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	30 100.0%	8 100.0%	8 100.0%	8 100.0%	9 100.0%	10 100.0%	5 100.0%	6 100.0%	7 100.0%	7 100.0%	15 100.0%
Yes	24 80.0%	8 100.0% D	6 75.0%	5 62.5%	8 88.9% G	9 90.0% G	2 40.0%	5 83.3%	5 71.4%	6 85.7%	12 80.0%
No	5 16.7%	-	2 25.0%	3 37.5%	1 11.1%	1 10.0%	2 40.0%	1 16.7%	2 28.6%	1 14.3%	2 13.3%
(Was not recommended)	1 3.3%	-	-	-	-	-	1 20.0%	-	-	-	1 6.7%
(Don't know)	-	-	-	-	-	-	-	-	-	-	-
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table b2g Page 107

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

B2g. Did you replace an old or install a new heat pump?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	28 100.0%	7 100.0%	8 100.0%	8 100.0%	7 100.0%	10 100.0%	5 100.0%	6 100.0%	7 100.0%	7 100.0%	14 100.0%
Yes	3 10.7%	2 28.6%	1 12.5%	-	1 14.3%	2 20.0%	-	-	1 14.3%	1 14.3%	1 7.1%
No	21 75.0%	4 57.1%	6 75.0%	8 100.0% B	3 42.9%	8 80.0%	4 80.0%	6 100.0% E	4 57.1%	6 85.7%	11 78.6%
(Was not recommended)	2 7.1%	1 14.3%	-	-	1 14.3%	-	1 20.0%	-	1 14.3%	-	1 7.1%
(Don't know)	2 7.1%	-	1 12.5%	-	2 28.6%	-	-	-	1 14.3%	-	1 7.1%
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table b2h Page 108

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

B2h. Did you seal air leaks in your home?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	119 100.0%	43 100.0%	30 100.0%	18 100.0%	40 100.0%	33 100.0%	19 100.0%	22 100.0%	39 100.0%	42 100.0%	31 100.0%
Yes	57 47.9%	14 32.6%	15 50.0%	9 50.0%	18 45.0%	17 51.5%	7 36.8%	12 54.5%	16 41.0%	19 45.2%	18 58.1%
No	51 42.9%	25 58.1%	12 40.0%	8 44.4%	18 45.0%	12 36.4%	11 57.9%	8 36.4%	19 48.7%	19 45.2%	10 32.3%
(Was not recommended)	11 9.2%	4 9.3%	3 10.0%	1 5.6%	4 10.0%	4 12.1%	1 5.3%	2 9.1%	4 10.3%	4 9.5%	3 9.7%
(Don't know)	-	-	-	-	-	-	-	-	-	-	-
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table b2i Page 109

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

B2i. Did you install insulation in your home?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	84 100.0%	32 100.0%	22 100.0%	12 100.0%	30 100.0%	25 100.0%	14 100.0%	13 100.0%	31 100.0%	29 100.0%	20 100.0%
Yes	22 26.2%	7 21.9%	7 31.8%	3 25.0%	7 23.3%	5 20.0%	5 35.7%	5 38.5%	7 22.6%	9 31.0%	5 25.0%
No	58 69.0%	24 75.0%	15 68.2%	9 75.0%	21 70.0%	19 76.0%	8 57.1%	8 61.5%	22 71.0%	20 69.0%	13 65.0%
(Was not recommended)	3 3.6%	1 3.1%	-	-	1 3.3%	1 4.0%	1 7.1%	-	2 6.5%	-	1 5.0%
(Don't know)	1 1.2%	-	-	-	1 3.3%	-	-	-	-	-	1 5.0%
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table b2j Page 110

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

B2j. Did you turn down your hot water heater temperature?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	28 100.0%	7 100.0%	8 100.0%	8 100.0%	7 100.0%	10 100.0%	5 100.0%	6 100.0%	7 100.0%	7 100.0%	14 100.0%
Yes	12 42.9%	4 57.1%	4 50.0%	3 37.5%	3 42.9%	5 50.0%	1 20.0%	3 50.0%	3 42.9%	3 42.9%	6 42.9%
No	14 50.0%	2 28.6%	4 50.0%	5 62.5%	3 42.9%	5 50.0%	3 60.0%	3 50.0%	3 42.9%	4 57.1%	7 50.0%
(Was not recommended)	2 7.1%	1 14.3%	-	-	1 14.3%	-	1 20.0%	-	1 14.3%	-	1 7.1%
(Don't know)	-	-	-	-	-	-	-	-	-	-	-
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table b2k Page 111

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

B2k. Did you use window shades during summer months?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	29 100.0%	7 100.0%	8 100.0%	8 100.0%	8 100.0%	10 100.0%	5 100.0%	6 100.0%	7 100.0%	7 100.0%	14 100.0%
Yes	21 72.4%	5 71.4%	7 87.5%	5 62.5%	6 75.0%	7 70.0%	3 60.0%	5 83.3%	7 100.0% JK	4 57.1%	10 71.4%
No	8 27.6%	2 28.6%	1 12.5%	3 37.5%	2 25.0%	3 30.0%	2 40.0%	1 16.7%	-	3 42.9%	4 28.6%
(Was not recommended)	-	-	-	-	-	-	-	-	-	-	-
(Don't know)	-	-	-	-	-	-	-	-	-	-	-
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table b2aa Page 112

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

B2aa. Did you receive a utility incentive, rebate, or other discount for any of recommendations that you completed?

	Total	Income			Education				Year House was Built		
	------	< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	81	22	23	14	25	24	13	16	21	27	27
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Yes	3	3	-	-	2	1	-	-	2	-	-
	3.7%	13.6%			8.0%	4.2%			9.5%		
No	75	18	22	14	23	21	12	16	19	27	25
	92.6%	81.8%	95.7%	100.0%	92.0%	87.5%	92.3%	100.0%	90.5%	100.0%	92.6%
				B				f			
(Don't know)	3	1	1	-	-	2	1	-	-	-	2
	3.7%	4.5%	4.3%			8.3%	7.7%				7.4%
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table b2bbm1 Page 113

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

B2bb. For which recommendations did you receive a utility incentive, rebate, or other discount?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	3 100.0%	3 100.0%	-	-	2 100.0%	1 100.0%	-	-	2 100.0%	-	-
Close crawl space vents	-	-	-	-	-	-	-	-	-	-	-
Seal air leaks in your duct system	-	-	-	-	-	-	-	-	-	-	-
Install duct insulation	-	-	-	-	-	-	-	-	-	-	-
Unplug or remove an extra appliance	-	-	-	-	-	-	-	-	-	-	-
Adjust how much you run your furnace fan	-	-	-	-	-	-	-	-	-	-	-
Clean or replace your furnace filter	-	-	-	-	-	-	-	-	-	-	-
Replace an old or install a new heat pump	-	-	-	-	-	-	-	-	-	-	-
Seal air leaks in your home	2 66.7%	2 66.7%	-	-	1 50.0%	1 100.0%	-	-	1 50.0%	-	-
Install insulation in your home	-	-	-	-	-	-	-	-	-	-	-
Turn down your water heater temperature	-	-	-	-	-	-	-	-	-	-	-
Use window shades during summer months	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table b2bbm1 Page 114
(Continued)
DEC Res Assessments Survey Results (Opinion Dynamics #7880)

B2bb. For which recommendations did you receive a utility incentive, rebate, or discount?

	Total	Income			Education				Year House was Built		
	------	< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
(Don't know)	1 33.3%	1 33.3%	-	-	1 50.0%	-	-	-	1 50.0%	-	-
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table b3 Page 115

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

B3. Do you have any current plans to complete the remaining energy saving recommendations?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	95 100.0%	40 100.0%	21 100.0%	14 100.0%	33 100.0%	27 100.0%	16 100.0%	16 100.0%	31 100.0%	34 100.0%	23 100.0%
Yes, All	36 37.9%	13 32.5%	10 47.6%	5 35.7%	12 36.4%	13 48.1%	6 37.5%	5 31.2%	11 35.5%	16 47.1% k	6 26.1%
Yes, Some	22 23.2%	10 25.0%	5 23.8%	3 21.4%	5 15.2%	6 22.2%	3 18.8%	7 43.8% E	4 12.9%	9 26.5%	8 34.8% i
No	32 33.7%	15 37.5%	6 28.6%	6 42.9%	14 42.4% F	5 18.5%	7 43.8% f	4 25.0%	14 45.2% J	7 20.6%	8 34.8%
(Don't know)	5 5.3%	2 5.0%	-	-	2 6.1%	3 11.1%	-	-	2 6.5%	2 5.9%	1 4.3%
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table b3am1_1 Page 116

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

B3a. Which recommendations are you planning to complete within the next 12 months?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	22 100.0%	10 100.0%	5 100.0%	3 100.0%	5 100.0%	6 100.0%	3 100.0%	7 100.0%	4 100.0%	9 100.0%	8 100.0%
Close crawl space vents	-	-	-	-	-	-	-	-	-	-	-
Seal air leaks in your duct system	-	-	-	-	-	-	-	-	-	-	-
Install duct insulation	-	-	-	-	-	-	-	-	-	-	-
Unplug or remove an extra appliance	-	-	-	-	-	-	-	-	-	-	-
Adjust how much you run your furnace fan	-	-	-	-	-	-	-	-	-	-	-
Clean or replace your furnace filter	-	-	-	-	-	-	-	-	-	-	-
Replace an old or install a new heat pump	1 4.5%	-	-	1 33.3%	-	-	-	1 14.3%	-	1 11.1%	-
Seal air leaks in your home	3 13.6%	1 10.0%	1 20.0%	-	-	1 16.7%	-	2 28.6%	1 25.0%	1 11.1%	1 12.5%
Install insulation in your home	6 27.3%	4 40.0%	1 20.0%	1 33.3%	2 40.0%	2 33.3%	1 33.3%	1 14.3%	3 75.0% JK	2 22.2%	1 12.5%
Turn down your water heater temperature	-	-	-	-	-	-	-	-	-	-	-
Use window shades during summer months	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table b3am1_1 Page 117
(Continued)
DEC Res Assessments Survey Results (Opinion Dynamics #7880)

B3a. Which recommendations are you planning to complete within the next 12 months?

	Total	Income			Education				Year House was Built		
	------	< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
(I will eventually make all these improvements)	3 13.6%	2 20.0%	-	-	-	1 16.7%	-	2 28.6%	-	3 33.3%	-
(I am still deciding which recommendations to complete)	6 27.3%	3 30.0%	1 20.0%	-	2 40.0%	2 33.3%	1 33.3%	-	-	2 22.2%	3 37.5%
(Don't know)	4 18.2%	1 10.0%	2 40.0%	1 33.3%	1 20.0%	1 16.7%	1 33.3%	1 14.3%	1 25.0%	-	3 37.5%
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table so1 Page 118

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

SO1. Since participating in the Home Energy House Call program, have you made any energy saving home improvements, for which you did not receive a utility incentive, rebate, or other discount?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	150 100.0%	54 100.0%	40 100.0%	19 100.0%	52 100.0%	41 100.0%	25 100.0%	26 100.0%	46 100.0%	56 100.0%	37 100.0%
Yes	39 26.0%	11 20.4%	15 37.5% b	4 21.1%	9 17.3%	11 26.8%	9 36.0% e	8 30.8%	13 28.3%	14 25.0%	10 27.0%
No	109 72.7%	43 79.6% c	25 62.5%	15 78.9%	42 80.8%	30 73.2%	16 64.0%	18 69.2%	32 69.6%	41 73.2%	27 73.0%
(Don't know)	1 0.7%	-	-	-	-	-	-	-	1 2.2%	-	-
(Refused)	1 0.7%	-	-	-	1 1.9%	-	-	-	-	1 1.8%	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table so1b Page 119

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

SO1b. Did the Home Energy House Call program influence you in any way to make these additional improvements?

	Total	Income			Education				Year House was Built		
	------	< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	39 100.0%	11 100.0%	15 100.0%	4 100.0%	9 100.0%	11 100.0%	9 100.0%	8 100.0%	13 100.0%	14 100.0%	10 100.0%
Yes	18 46.2%	2 18.2%	11 73.3% BD	1 25.0%	5 55.6% f	2 18.2%	3 33.3%	8 100.0% EFG	4 30.8%	8 57.1%	6 60.0%
No	19 48.7%	9 81.8% C	3 20.0%	2 50.0%	4 44.4%	8 72.7%	5 55.6%	-	8 61.5%	6 42.9%	3 30.0%
(Don't know)	2 5.1%	-	1 6.7%	1 25.0%	-	1 9.1%	1 11.1%	-	1 7.7%	-	1 10.0%
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table so2 Page 120

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

SO2. How influential was your participation in the Home Energy House Call program on your decision to make additional energy efficiency improvements on your own?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	18 100.0%	2 100.0%	11 100.0%	1 100.0%	5 100.0%	2 100.0%	3 100.0%	8 100.0%	4 100.0%	8 100.0%	6 100.0%
0 - Not at all influential	1 5.6%	-	1 9.1%	-	1 20.0%	-	-	-	1 25.0%	-	-
1	-	-	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-	-	-	-
3	-	-	-	-	-	-	-	-	-	-	-
4	1 5.6%	-	1 9.1%	-	-	-	1 33.3%	-	-	1 12.5%	-
5	-	-	-	-	-	-	-	-	-	-	-
6	-	-	-	-	-	-	-	-	-	-	-
7	3 16.7%	-	1 9.1%	1 100.0%	1 20.0%	1 50.0%	-	1 12.5%	1 25.0%	2 25.0%	-
8	4 22.2%	1 50.0%	1 9.1%	-	1 20.0%	-	1 33.3%	2 25.0%	1 25.0%	2 25.0%	1 16.7%
9	2 11.1%	-	2 18.2%	-	-	-	-	2 25.0%	1 25.0%	1 12.5%	-
10 - Extremely influential	7 38.9%	1 50.0%	5 45.5%	-	2 40.0%	1 50.0%	1 33.3%	3 37.5%	-	2 25.0%	5 83.3%

J

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table so2 Page 121
(Continued)
DEC Res Assessments Survey Results (Opinion Dynamics #7880)

SO2. How influential was your participation in the Home Energy House Call program on your decision to make additional energy efficiency improvements on your own?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
(Don't know)	-	-	-	-	-	-	-	-	-	-	-
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table so3m1o Page 122

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

Table: so3m1o OPEN ENDS

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	12 100.0%	2 100.0%	7 100.0%	-	4 100.0%	2 100.0%	2 100.0%	4 100.0%	3 100.0%	3 100.0%	6 100.0%
BECAUSE OF THE PROGRAM OUR AWARENESS WAS RAISED TO THE INEFFICIENCIES	1 8.3%	-	-	-	-	-	-	1 25.0%	-	-	1 16.7%
HE ADE THE RECOMMENDATIPON AND INFORMED ME OF THE SAVING	1 8.3%	-	-	-	-	-	-	1 25.0%	-	-	1 16.7%
I SAW THE BRIGHTNESS OF THE LIGHT AND THIS MADE ME WANT TO GET THESE FOR MY HOME	1 8.3%	-	1 14.3%	-	1 25.0%	-	-	-	-	1 33.3%	-
I USE COLD WATER FOR ALL OF MY WASHING NOW	1 8.3%	-	1 14.3%	-	-	-	-	1 25.0%	1 33.3%	-	-
JUST TALKING ABOUT 19% OF BILL WAS LIGHTING RELATED	1 8.3%	-	1 14.3%	-	-	-	-	1 25.0%	-	-	1 16.7%
MADE ME MORE AWARE OF OPTIONS AND OPERTUNITIES REGARDING MY HOUSE AND ITS STRUCKTURE	1 8.3%	-	1 14.3%	-	-	-	1 50.0%	-	-	1 33.3%	-
POINTED INSTULATON AROUND MY RESSESS LIGHTS WEATER STRIPPING AROUDN MY TRAP DOOR	1 8.3%	-	1 14.3%	-	-	-	1 50.0%	-	-	-	1 16.7%
RESPONDENT REASSESS ENERGY USAGE	1 8.3%	-	-	-	-	1 50.0%	-	-	1 33.3%	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table so3m1o Page 123
(Continued)
DEC Res Assessments Survey Results (Opinion Dynamics #7880)

Table: so3m1o OPEN ENDS

	Total	Income			Education				Year House was Built		
	------	< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
SHOWED ME THAT I CAN MAKE SOME CHANGES AT MINIMUM COST THAT CAN SAVE ME MONEY	1 8.3%	-	1 14.3%	-	-	1 50.0%	-	-	-	-	1 16.7%
TAUGHT WAYS TO IMPROVE ON ENERGY CONSUMPTION	1 8.3%	1 50.0%	-	-	1 25.0%	-	-	-	-	-	1 16.7%
THEY TOLD ME WAYS TO SAVE ON MY ELECTRIC WHICH INFLUENCED ME	2 16.7%	1 50.0%	1 14.3%	-	2 50.0%	-	-	-	1 33.3%	1 33.3%	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table so4a Page 124

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

SO4a. Did you purchase an ENERGY STAR Appliance?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	16 100.0%	2 100.0%	9 100.0%	1 100.0%	4 100.0%	2 100.0%	2 100.0%	8 100.0%	3 100.0%	7 100.0%	6 100.0%
Yes	3 18.8%	1 50.0%	1 11.1%	-	1 25.0%	-	1 50.0%	1 12.5%	-	2 28.6%	1 16.7%
No	13 81.2%	1 50.0%	8 88.9%	1 100.0%	3 75.0%	2 100.0%	1 50.0%	7 87.5%	3 100.0% j	5 71.4%	5 83.3%
(Don't know)	-	-	-	-	-	-	-	-	-	-	-
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table so4b Page 125

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

SO4b. Did you purchase a new high-efficiency water heater?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	16 100.0%	2 100.0%	9 100.0%	1 100.0%	4 100.0%	2 100.0%	2 100.0%	8 100.0%	3 100.0%	7 100.0%	6 100.0%
Yes	3 18.8%	-	2 22.2%	-	-	-	2 100.0% H	1 12.5%	-	2 28.6%	1 16.7%
No	13 81.2%	2 100.0%	7 77.8%	1 100.0%	4 100.0%	2 100.0%	-	7 87.5%	3 100.0% j	5 71.4%	5 83.3%
(Don't know)	-	-	-	-	-	-	-	-	-	-	-
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table so4c Page 126

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

SO4c. Did you purchase a new ENERGY STAR room air conditioner?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	16	2	9	1	4	2	2	8	3	7	6
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Yes	1	-	1	-	-	-	1	-	-	1	-
	6.2%		11.1%				50.0%			14.3%	
No	15	2	8	1	4	2	1	8	3	6	6
	93.8%	100.0%	88.9%	100.0%	100.0%	100.0%	50.0%	100.0%	100.0%	85.7%	100.0%
(Don't know)	-	-	-	-	-	-	-	-	-	-	-
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table so4d Page 127

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

SO4d. Did you purchase a new energy-efficient furnace?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	16 100.0%	2 100.0%	9 100.0%	1 100.0%	4 100.0%	2 100.0%	2 100.0%	8 100.0%	3 100.0%	7 100.0%	6 100.0%
Yes	3 18.8%	1 50.0%	1 11.1%	-	1 25.0%	-	1 50.0%	1 12.5%	1 33.3%	2 28.6%	-
No	13 81.2%	1 50.0%	8 88.9%	1 100.0%	3 75.0%	2 100.0%	1 50.0%	7 87.5%	2 66.7%	5 71.4%	6 100.0% j
(Don't know)	-	-	-	-	-	-	-	-	-	-	-
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table so4e Page 128

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

SO4e. Did you purchase a new central air conditioning system or heat pump?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	16	2	9	1	4	2	2	8	3	7	6
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Yes	2	1	-	-	1	-	-	1	1	1	-
	12.5%	50.0%			25.0%			12.5%	33.3%	14.3%	
No	14	1	9	1	3	2	2	7	2	6	6
	87.5%	50.0%	100.0%	100.0%	75.0%	100.0%	100.0%	87.5%	66.7%	85.7%	100.0%
(Don't know)	-	-	-	-	-	-	-	-	-	-	-
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table so4f Page 129

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

SO4f. Did you purchase additional energy-efficient lighting, such as CFLs or LEDs?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	16 100.0%	2 100.0%	9 100.0%	1 100.0%	4 100.0%	2 100.0%	2 100.0%	8 100.0%	3 100.0%	7 100.0%	6 100.0%
Yes	10 62.5%	1 50.0%	5 55.6%	1 100.0%	2 50.0%	2 100.0% EH	1 50.0%	5 62.5%	1 33.3%	3 42.9%	6 100.0% IJ
No	6 37.5%	1 50.0%	4 44.4%	-	2 50.0%	-	1 50.0%	3 37.5%	2 66.7%	4 57.1%	-
(Don't know)	-	-	-	-	-	-	-	-	-	-	-
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table so4g Page 130

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

SO4g. Did you install additional weather stripping?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	16	2	9	1	4	2	2	8	3	7	6
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Yes	5	1	3	1	2	1	1	1	1	2	2
	31.2%	50.0%	33.3%	100.0%	50.0%	50.0%	50.0%	12.5%	33.3%	28.6%	33.3%
No	11	1	6	-	2	1	1	7	2	5	4
	68.8%	50.0%	66.7%		50.0%	50.0%	50.0%	87.5%	66.7%	71.4%	66.7%
(Don't know)	-	-	-	-	-	-	-	-	-	-	-
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table so4h Page 131

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

SO4h. Did you install additional faucet aerators?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	16	2	9	1	4	2	2	8	3	7	6
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Yes	1	1	-	-	1	-	-	-	-	-	1
	6.2%	50.0%			25.0%						16.7%
No	15	1	9	1	3	2	2	8	3	7	5
	93.8%	50.0%	100.0%	100.0%	75.0%	100.0%	100.0%	100.0%	100.0%	100.0%	83.3%
(Don't know)	-	-	-	-	-	-	-	-	-	-	-
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table so4i Page 132

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

SO4i. Did you install additional outlet seals?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	16 100.0%	2 100.0%	9 100.0%	1 100.0%	4 100.0%	2 100.0%	2 100.0%	8 100.0%	3 100.0%	7 100.0%	6 100.0%
Yes	1 6.2%	-	1 11.1%	-	-	-	1 50.0%	-	-	1 14.3%	-
No	15 93.8%	2 100.0%	8 88.9%	1 100.0%	4 100.0%	2 100.0%	1 50.0%	8 100.0%	3 100.0%	6 85.7%	6 100.0%
(Don't know)	-	-	-	-	-	-	-	-	-	-	-
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table so4j Page 133

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

SO4j. Did you install additional low-flow shower heads?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	16 100.0%	2 100.0%	9 100.0%	1 100.0%	4 100.0%	2 100.0%	2 100.0%	8 100.0%	3 100.0%	7 100.0%	6 100.0%
Yes	1 6.2%	-	-	-	-	1 50.0%	-	-	1 33.3%	-	-
No	15 93.8%	2 100.0%	9 100.0%	1 100.0%	4 100.0%	1 50.0%	2 100.0%	8 100.0%	2 66.7%	7 100.0%	6 100.0%
(Don't know)	-	-	-	-	-	-	-	-	-	-	-
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table so4k Page 134

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

SO4k. Did you make any other improvements?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	16 100.0%	2 100.0%	9 100.0%	1 100.0%	4 100.0%	2 100.0%	2 100.0%	8 100.0%	3 100.0%	7 100.0%	6 100.0%
Yes	5 31.2%	1 50.0%	3 33.3%	-	1 25.0%	2 100.0% EH	-	2 25.0%	1 33.3%	2 28.6%	2 33.3%
No	11 68.8%	1 50.0%	6 66.7%	1 100.0%	3 75.0%	-	2 100.0%	6 75.0%	2 66.7%	5 71.4%	4 66.7%
(Don't know)	-	-	-	-	-	-	-	-	-	-	-
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table so5am1_1 Page 135

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

SO5a. What type of ENERGY STAR appliance did you purchase... was it a refrigerator, a dishwasher, a clothes washer, a freezer, or something else?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	3 100.0%	1 100.0%	1 100.0%	-	1 100.0%	-	1 100.0%	1 100.0%	-	2 100.0%	1 100.0%
(Other, Specify:)	2 66.7%	1 100.0%	-	-	1 100.0%	-	-	1 100.0%	-	1 50.0%	1 100.0%
(Refrigerator)	1 33.3%	-	1 100.0%	-	-	-	1 100.0%	-	-	1 50.0%	-
(Dishwasher)	-	-	-	-	-	-	-	-	-	-	-
(Clothes washer)	1 33.3%	1 100.0%	-	-	1 100.0%	-	-	-	-	-	1 100.0%
(Freezer)	-	-	-	-	-	-	-	-	-	-	-
(Did not purchase ENERGY STAR appliance)	-	-	-	-	-	-	-	-	-	-	-
(Don't know)	-	-	-	-	-	-	-	-	-	-	-
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table so5b Page 136

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

SO5b.Was the water heater you purchased an electric or gas water heater?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	3 100.0%	-	2 100.0%	-	-	-	2 100.0%	1 100.0%	-	2 100.0%	1 100.0%
Electric water heater	1 33.3%	-	1 50.0%	-	-	-	1 50.0%	-	-	-	1 100.0%
Electric heat pump water heater	1 33.3%	-	-	-	-	-	-	1 100.0%	-	1 50.0%	-
ENERGY STAR Gas water heater	1 33.3%	-	1 50.0%	-	-	-	1 50.0%	-	-	1 50.0%	-
(Don't know)	-	-	-	-	-	-	-	-	-	-	-
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table so5bb Page 137

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

SO5bb. Was it a storage or tankless water heater?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	2 100.0%	-	2 100.0%	-	-	-	2 100.0%	-	-	1 100.0%	1 100.0%
Tankless water heater	-	-	-	-	-	-	-	-	-	-	-
Storage water heater	2 100.0%	-	2 100.0%	-	-	-	2 100.0%	-	-	1 100.0%	1 100.0%
(Don't know)	-	-	-	-	-	-	-	-	-	-	-
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table so5c Page 138

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

SO5c. How many ENERGY STAR room air conditioners did you purchase?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	1 100.0%	-	1 100.0%	-	-	-	1 100.0%	-	-	1 100.0%	-
(Don't know)	-	-	-	-	-	-	-	-	-	-	-
(Refused)	-	-	-	-	-	-	-	-	-	-	-
0	1 100.0%	-	1 100.0%	-	-	-	1 100.0%	-	-	1 100.0%	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table so5da Page 139

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

SO5da. What fuel does the furnace use?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	3 100.0%	1 100.0%	1 100.0%	-	1 100.0%	-	1 100.0%	1 100.0%	1 100.0%	2 100.0%	-
(Other: Specify)	-	-	-	-	-	-	-	-	-	-	-
Electricity	2 66.7%	1 100.0%	-	-	1 100.0%	-	-	1 100.0%	1 100.0%	1 50.0%	-
Natural Gas	-	-	-	-	-	-	-	-	-	-	-
Oil	-	-	-	-	-	-	-	-	-	-	-
(Don't know)	1 33.3%	-	1 100.0%	-	-	-	1 100.0%	-	-	1 50.0%	-
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table so5db Page 140

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

SO5db. Is the new furnace a high-efficiency model?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	3 100.0%	1 100.0%	1 100.0%	-	1 100.0%	-	1 100.0%	1 100.0%	1 100.0%	2 100.0%	-
Yes	2 66.7%	-	1 100.0%	-	-	-	1 100.0%	1 100.0%	-	2 100.0%	-
No	1 33.3%	1 100.0%	-	-	1 100.0%	-	-	-	1 100.0%	-	-
(Don't know)	-	-	-	-	-	-	-	-	-	-	-
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table so5dc Page 141

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

SO5dc. How old was the furnace you replaced?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	3 100.0%	1 100.0%	1 100.0%	-	1 100.0%	-	1 100.0%	1 100.0%	1 100.0%	2 100.0%	-
(Don't know)	1 33.3%	1 100.0%	-	-	1 100.0%	-	-	-	1 100.0%	-	-
(Refused)	-	-	-	-	-	-	-	-	-	-	-
17	1 33.3%	-	1 100.0%	-	-	-	1 100.0%	-	-	1 50.0%	-
22	1 33.3%	-	-	-	-	-	-	1 100.0%	-	1 50.0%	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table so6a Page 142

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

SO6a. How many CFLs have you purchased since you participated in the program?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	10 100.0%	1 100.0%	5 100.0%	1 100.0%	2 100.0%	2 100.0%	1 100.0%	5 100.0%	1 100.0%	3 100.0%	6 100.0%
(Don't know)	-	-	-	-	-	-	-	-	-	-	-
(Refused)	-	-	-	-	-	-	-	-	-	-	-
0	7 70.0%	1 100.0%	3 60.0%	1 100.0%	1 50.0%	-	1 100.0%	5 100.0%	-	2 66.7%	5 83.3%
4	1 10.0%	-	-	-	-	1 50.0%	-	-	1 100.0%	-	-
20	1 10.0%	-	1 20.0%	-	-	1 50.0%	-	-	-	-	1 16.7%
60	1 10.0%	-	1 20.0%	-	1 50.0%	-	-	-	-	1 33.3%	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table so6b Page 143

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

SO6b. How many LEDs have you purchased since you participated in the program?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	10 100.0%	1 100.0%	5 100.0%	1 100.0%	2 100.0%	2 100.0%	1 100.0%	5 100.0%	1 100.0%	3 100.0%	6 100.0%
(Don't know)	-	-	-	-	-	-	-	-	-	-	-
(Refused)	-	-	-	-	-	-	-	-	-	-	-
0	3 30.0%	-	2 40.0%	-	1 50.0%	1 50.0%	1 100.0%	-	1 100.0%	1 33.3%	1 16.7%
5	1 10.0%	-	-	-	-	-	-	1 20.0%	-	-	1 16.7%
6	1 10.0%	-	-	-	-	-	-	1 20.0%	-	-	1 16.7%
10	1 10.0%	1 100.0%	-	-	1 50.0%	-	-	-	-	-	1 16.7%
20	4 40.0%	-	3 60.0%	1 100.0%	-	1 50.0%	-	3 60.0%	-	2 66.7%	2 33.3%

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table so7a Page 144

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

SO7a. How many feet of additional weather stripping have you installed, since you participated in the program?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	5 100.0%	1 100.0%	3 100.0%	1 100.0%	2 100.0%	1 100.0%	1 100.0%	1 100.0%	1 100.0%	2 100.0%	2 100.0%
(Don't know)	-	-	-	-	-	-	-	-	-	-	-
(Refused)	-	-	-	-	-	-	-	-	-	-	-
0	2 40.0%	-	1 33.3%	1 100.0%	-	1 100.0%	-	1 100.0%	-	1 50.0%	1 50.0%
4	1 20.0%	-	1 33.3%	-	-	-	1 100.0%	-	-	-	1 50.0%
20	2 40.0%	1 100.0%	1 33.3%	-	2 100.0%	-	-	-	1 100.0%	1 50.0%	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table so7b Page 145

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

SO7b. How many additional faucet aerators have you installed, since you participated in the program?

	Total	Income			Education				Year House was Built		
	------	< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	1 100.0%	1 100.0%	-	-	1 100.0%	-	-	-	-	-	1 100.0%
(Don't know)	-	-	-	-	-	-	-	-	-	-	-
(Refused)	-	-	-	-	-	-	-	-	-	-	-
1	1 100.0%	1 100.0%	-	-	1 100.0%	-	-	-	-	-	1 100.0%

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table so7c Page 146

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

SO7c. How many additional outlet seals have you installed, since you participated in the program?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	1 100.0%	-	1 100.0%	-	-	-	1 100.0%	-	-	1 100.0%	-
(Don't know)	-	-	-	-	-	-	-	-	-	-	-
(Refused)	-	-	-	-	-	-	-	-	-	-	-
2	1 100.0%	-	1 100.0%	-	-	-	1 100.0%	-	-	1 100.0%	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table so7d Page 147

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

SO7d. How many additional low-flow shower heads have you installed, since you participated in the program?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	1 100.0%	-	-	-	-	1 100.0%	-	-	1 100.0%	-	-
(Don't know)	-	-	-	-	-	-	-	-	-	-	-
(Refused)	-	-	-	-	-	-	-	-	-	-	-
1	1 100.0%	-	-	-	-	1 100.0%	-	-	1 100.0%	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table so8m1 Page 148

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

SO8. What other improvements did you make?

	Total	Income			Education				Year House was Built		
	------	< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	5 100.0%	1 100.0%	3 100.0%	-	1 100.0%	2 100.0%	-	2 100.0%	1 100.0%	2 100.0%	2 100.0%
Please enter your response in the box below	4 80.0%	1 100.0%	2 66.7%	-	1 100.0%	2 100.0%	-	1 50.0%	1 100.0%	1 50.0%	2 100.0%
(Don't know)	1 20.0%	-	1 33.3%	-	-	-	-	1 50.0%	-	1 50.0%	-
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table so8m1o Page 149

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

Table: so8m1o OPEN ENDS

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	2 100.0%	-	2 100.0%	-	-	1 100.0%	-	1 100.0%	-	1 100.0%	1 100.0%
CAULKING	1 50.0%	-	1 50.0%	-	-	-	-	1 100.0%	-	1 100.0%	-
THAT'S IT	1 50.0%	-	1 50.0%	-	-	1 100.0%	-	-	-	-	1 100.0%
WASHER, DRYER	-	-	-	-	-	-	-	-	-	-	-
WINDOWS, FIXED AIR CONDITIONER UNIT	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

BC1. As part of the energy efficiency kit, you received a "Department of Energy, Energy Savers Booklet" which provided information about energy efficiency in the home, and tips on how to save energy. Do you recall receiving it?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	150 100.0%	54 100.0%	40 100.0%	19 100.0%	52 100.0%	41 100.0%	25 100.0%	26 100.0%	46 100.0%	56 100.0%	37 100.0%
Yes	117 78.0%	41 75.9%	32 80.0%	14 73.7%	37 71.2%	35 85.4% e	20 80.0%	20 76.9%	38 82.6%	40 71.4%	28 75.7%
No	21 14.0%	8 14.8%	5 12.5%	4 21.1%	10 19.2%	6 14.6%	2 8.0%	3 11.5%	4 8.7%	13 23.2% I	4 10.8%
(Don't recall receiving booklet)	10 6.7%	4 7.4%	3 7.5%	1 5.3%	4 7.7%	-	3 12.0%	3 11.5%	2 4.3%	3 5.4%	5 13.5%
(Don't know)	2 1.3%	1 1.9%	-	-	1 1.9%	-	-	-	2 4.3%	-	-
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

BC2. Did you read the booklet provided to you during your energy assessment?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	117 100.0%	41 100.0%	32 100.0%	14 100.0%	37 100.0%	35 100.0%	20 100.0%	20 100.0%	38 100.0%	40 100.0%	28 100.0%
Yes	88 75.2%	29 70.7%	27 84.4%	12 85.7%	28 75.7%	23 65.7%	17 85.0% f	16 80.0%	27 71.1%	35 87.5% ik	19 67.9%
No	29 24.8%	12 29.3%	5 15.6%	2 14.3%	9 24.3%	12 34.3% g	3 15.0%	4 20.0%	11 28.9% j	5 12.5%	9 32.1% j
(Don't know)	-	-	-	-	-	-	-	-	-	-	-
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table tbc3_new Page 152

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

BC3_new. Since participating in the program, has the frequency of the following behaviors increased?

	Total	Income			Education				Year House was Built		
	------	< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	141 100.0%	51 100.0%	38 100.0%	19 100.0%	49 100.0%	37 100.0%	24 100.0%	26 100.0%	43 100.0%	53 100.0%	35 100.0%
continue	141 100.0%	51 100.0%	38 100.0%	19 100.0%	49 100.0%	37 100.0%	24 100.0%	26 100.0%	43 100.0%	53 100.0%	35 100.0%

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table bc3a_new Page 153

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

BC3a. Close curtains and shades at night to protect against drafts during cooler months?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	150 100.0%	54 100.0%	40 100.0%	19 100.0%	52 100.0%	41 100.0%	25 100.0%	26 100.0%	46 100.0%	56 100.0%	37 100.0%
Yes	121 80.7%	48 88.9% C	28 70.0%	15 78.9%	41 78.8%	33 80.5%	20 80.0%	22 84.6%	40 87.0%	42 75.0%	28 75.7%
No	26 17.3%	6 11.1%	12 30.0% B	4 21.1%	10 19.2%	7 17.1%	4 16.0%	4 15.4%	5 10.9%	14 25.0% i	7 18.9%
(Not applicable)	3 2.0%	-	-	-	1 1.9%	1 2.4%	1 4.0%	-	1 2.2%	-	2 5.4%
(Don't know)	-	-	-	-	-	-	-	-	-	-	-
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table bc3b_new Page 154

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

BC3b. Open curtains and shades during the day to let in warming sunlight during cooler months?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	150 100.0%	54 100.0%	40 100.0%	19 100.0%	52 100.0%	41 100.0%	25 100.0%	26 100.0%	46 100.0%	56 100.0%	37 100.0%
Yes	122 81.3%	46 85.2%	29 72.5%	15 78.9%	43 82.7%	31 75.6%	22 88.0%	21 80.8%	39 84.8%	44 78.6%	29 78.4%
No	24 16.0%	8 14.8%	9 22.5%	4 21.1%	8 15.4%	9 22.0% g	2 8.0%	4 15.4%	6 13.0%	11 19.6%	6 16.2%
(Not applicable)	2 1.3%	-	-	-	-	1 2.4%	1 4.0%	-	-	-	2 5.4%
(Don't know)	2 1.3%	-	2 5.0%	-	1 1.9%	-	-	1 3.8%	1 2.2%	1 1.8%	-
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table bc3c_new Page 155

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

BC3c. Turn lights off when rooms are not in use?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	150 100.0%	54 100.0%	40 100.0%	19 100.0%	52 100.0%	41 100.0%	25 100.0%	26 100.0%	46 100.0%	56 100.0%	37 100.0%
Yes	131 87.3%	48 88.9%	35 87.5%	16 84.2%	46 88.5%	33 80.5%	22 88.0%	24 92.3%	39 84.8%	49 87.5%	33 89.2%
No	18 12.0%	6 11.1%	4 10.0%	3 15.8%	6 11.5%	7 17.1%	3 12.0%	2 7.7%	6 13.0%	7 12.5%	4 10.8%
(Not applicable)	-	-	-	-	-	-	-	-	-	-	-
(Don't know)	-	-	-	-	-	-	-	-	-	-	-
(Refused)	1 0.7%	-	1 2.5%	-	-	1 2.4%	-	-	1 2.2%	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table bc3d_new Page 156

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

BC3d. Make sure the dishwasher is full before it is run?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	150 100.0%	54 100.0%	40 100.0%	19 100.0%	52 100.0%	41 100.0%	25 100.0%	26 100.0%	46 100.0%	56 100.0%	37 100.0%
Yes	90 60.0%	26 48.1%	30 75.0% B	15 78.9% B	22 42.3%	23 56.1%	21 84.0% EF	22 84.6% EF	19 41.3%	38 67.9% I	28 75.7% I
No	28 18.7%	7 13.0%	7 17.5%	4 21.1%	9 17.3% H	11 26.8% H	4 16.0%	1 3.8%	9 19.6%	11 19.6%	6 16.2%
(Not applicable)	31 20.7%	20 37.0% C	3 7.5%	-	20 38.5% FH	7 17.1%	-	3 11.5%	17 37.0% JK	7 12.5%	3 8.1%
(Don't know)	1 0.7%	1 1.9%	-	-	1 1.9%	-	-	-	1 2.2%	-	-
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table bc3e_new Page 157

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

BC3e. Defrost freezers and refrigerators?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	150 100.0%	54 100.0%	40 100.0%	19 100.0%	52 100.0%	41 100.0%	25 100.0%	26 100.0%	46 100.0%	56 100.0%	37 100.0%
Yes	49 32.7%	21 38.9%	13 32.5%	4 21.1%	18 34.6%	14 34.1%	5 20.0%	11 42.3% g	19 41.3% J	13 23.2%	14 37.8%
No	57 38.0%	16 29.6%	16 40.0%	9 47.4%	17 32.7%	15 36.6%	11 44.0%	12 46.2%	11 23.9%	27 48.2% I	14 37.8%
(Not applicable)	42 28.0%	17 31.5%	9 22.5%	6 31.6%	16 30.8% H	11 26.8%	9 36.0% H	3 11.5%	15 32.6%	15 26.8%	9 24.3%
(Don't know)	-	-	-	-	-	-	-	-	-	-	-
(Refused)	2 1.3%	-	2 5.0%	-	1 1.9%	1 2.4%	-	-	1 2.2%	1 1.8%	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table bc3f_new Page 158

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

BC3f. Use a toaster oven instead of a full-size oven?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	150 100.0%	54 100.0%	40 100.0%	19 100.0%	52 100.0%	41 100.0%	25 100.0%	26 100.0%	46 100.0%	56 100.0%	37 100.0%
Yes	48 32.0%	16 29.6%	13 32.5%	7 36.8%	16 30.8%	13 31.7%	5 20.0%	12 46.2% G	16 34.8%	18 32.1%	12 32.4%
No	77 51.3%	30 55.6%	21 52.5%	12 63.2%	28 53.8%	18 43.9%	19 76.0% EFH	10 38.5%	22 47.8%	31 55.4%	17 45.9%
(Not applicable)	23 15.3%	8 14.8%	6 15.0%	-	7 13.5%	10 24.4% G	1 4.0%	4 15.4%	7 15.2%	6 10.7%	8 21.6%
(Don't know)	2 1.3%	-	-	-	1 1.9%	-	-	-	1 2.2%	1 1.8%	-
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table bc3g_new Page 159

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

BC3g. Wash clothes in cold water?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	150 100.0%	54 100.0%	40 100.0%	19 100.0%	52 100.0%	41 100.0%	25 100.0%	26 100.0%	46 100.0%	56 100.0%	37 100.0%
Yes	98 65.3%	34 63.0%	25 62.5%	11 57.9%	32 61.5%	29 70.7%	15 60.0%	17 65.4%	31 67.4%	32 57.1%	27 73.0%
No	47 31.3%	19 35.2%	13 32.5%	7 36.8%	17 32.7%	12 29.3%	9 36.0%	8 30.8%	14 30.4%	22 39.3% k	8 21.6%
(Not applicable)	1 0.7%	-	-	1 5.3%	-	-	1 4.0%	-	-	-	1 2.7%
(Don't know)	3 2.0%	1 1.9%	1 2.5%	-	2 3.8%	-	-	1 3.8%	1 2.2%	1 1.8%	1 2.7%
(Refused)	1 0.7%	-	1 2.5%	-	1 1.9%	-	-	-	-	1 1.8%	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table bc3h_new Page 160

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

BC3h. Clean the lint screen in the dryer?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	150 100.0%	54 100.0%	40 100.0%	19 100.0%	52 100.0%	41 100.0%	25 100.0%	26 100.0%	46 100.0%	56 100.0%	37 100.0%
Yes	118 78.7%	41 75.9%	32 80.0%	15 78.9%	39 75.0%	30 73.2%	22 88.0%	22 84.6%	33 71.7%	45 80.4%	30 81.1%
No	28 18.7%	11 20.4%	7 17.5%	4 21.1%	10 19.2%	10 24.4%	3 12.0%	4 15.4%	10 21.7%	11 19.6%	6 16.2%
(Not applicable)	4 2.7%	2 3.7%	1 2.5%	-	3 5.8%	1 2.4%	-	-	3 6.5%	-	1 2.7%
(Don't know)	-	-	-	-	-	-	-	-	-	-	-
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table bc3i_new Page 161

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

BC3i. Check dryer vent to be sure it is not blocked?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	150 100.0%	54 100.0%	40 100.0%	19 100.0%	52 100.0%	41 100.0%	25 100.0%	26 100.0%	46 100.0%	56 100.0%	37 100.0%
Yes	117 78.0%	41 75.9%	32 80.0%	17 89.5%	38 73.1%	32 78.0%	19 76.0%	23 88.5% e	32 69.6%	44 78.6%	31 83.8%
No	27 18.0%	10 18.5%	8 20.0%	2 10.5%	11 21.2%	7 17.1%	5 20.0%	3 11.5%	11 23.9% K	12 21.4% k	3 8.1%
(Not applicable)	6 4.0%	3 5.6%	-	-	3 5.8%	2 4.9%	1 4.0%	-	3 6.5%	-	3 8.1%
(Don't know)	-	-	-	-	-	-	-	-	-	-	-
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table bc3j_new Page 162

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

BC3j. Turn off electronics, such as a laptop, when they are not in use?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	150 100.0%	54 100.0%	40 100.0%	19 100.0%	52 100.0%	41 100.0%	25 100.0%	26 100.0%	46 100.0%	56 100.0%	37 100.0%
Yes	111 74.0%	38 70.4%	33 82.5%	12 63.2%	35 67.3%	32 78.0%	19 76.0%	21 80.8%	36 78.3%	42 75.0%	24 64.9%
No	27 18.0%	9 16.7%	7 17.5%	6 31.6%	9 17.3%	6 14.6%	5 20.0%	5 19.2%	3 6.5%	9 16.1%	13 35.1% IJ
(Not applicable)	12 8.0%	7 13.0%	-	1 5.3%	8 15.4% g	3 7.3%	1 4.0%	-	7 15.2%	5 8.9%	-
(Don't know)	-	-	-	-	-	-	-	-	-	-	-
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table bc3k_new Page 163

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

BC3k. Clean or change heat pump filters?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	150 100.0%	54 100.0%	40 100.0%	19 100.0%	52 100.0%	41 100.0%	25 100.0%	26 100.0%	46 100.0%	56 100.0%	37 100.0%
Yes	97 64.7%	36 66.7%	27 67.5%	11 57.9%	36 69.2%	25 61.0%	15 60.0%	17 65.4%	30 65.2%	36 64.3%	24 64.9%
No	40 26.7%	11 20.4%	12 30.0%	7 36.8%	10 19.2%	12 29.3%	8 32.0%	8 30.8%	10 21.7%	18 32.1%	10 27.0%
(Not applicable)	12 8.0%	7 13.0% C	1 2.5%	1 5.3%	6 11.5%	4 9.8%	1 4.0%	1 3.8%	6 13.0% j	2 3.6%	3 8.1%
(Don't know)	1 0.7%	-	-	-	-	-	1 4.0%	-	-	-	-
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table v1a Page 164

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

V1a. Which piece of equipment that you were given during the Home Energy Assessment did you find most valuable?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	150 100.0%	54 100.0%	40 100.0%	19 100.0%	52 100.0%	41 100.0%	25 100.0%	26 100.0%	46 100.0%	56 100.0%	37 100.0%
(LED Light bulbs)	101 67.3%	29 53.7%	31 77.5% B	16 84.2% B	29 55.8%	27 65.9%	22 88.0% EFh	18 69.2%	29 63.0%	40 71.4%	27 73.0%
(Faucet aerators)	15 10.0%	6 11.1%	2 5.0%	1 5.3%	8 15.4%	4 9.8%	-	3 11.5%	3 6.5%	5 8.9%	3 8.1%
(High-efficiency Shower head)	13 8.7%	8 14.8%	3 7.5%	1 5.3%	7 13.5%	3 7.3%	1 4.0%	2 7.7%	5 10.9%	4 7.1%	3 8.1%
(Outlet seals)	3 2.0%	1 1.9%	-	1 5.3%	2 3.8%	1 2.4%	-	-	2 4.3%	1 1.8%	-
(Weather stripping)	4 2.7%	3 5.6%	-	-	3 5.8%	-	-	-	4 8.7%	-	-
(Don't know)	12 8.0%	6 11.1%	4 10.0%	-	2 3.8%	5 12.2%	2 8.0%	3 11.5%	2 4.3%	6 10.7%	3 8.1%
(Refused)	2 1.3%	1 1.9%	-	-	1 1.9%	1 2.4%	-	-	1 2.2%	-	1 2.7%

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table v1b Page 165

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

V1b. Which piece of equipment was the second-most valuable?

	Total	Income			Education				Year House was Built		
	------	< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	136	47	36	19	49	35	23	23	43	50	33
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
(LED Light bulbs)	16	7	4	1	10	2	1	3	4	3	4
	11.8%	14.9%	11.1%	5.3%	20.4%	5.7%	4.3%	13.0%	9.3%	6.0%	12.1%
					FG						
(Faucet aerators)	34	11	10	4	10	11	5	6	13	11	7
	25.0%	23.4%	27.8%	21.1%	20.4%	31.4%	21.7%	26.1%	30.2%	22.0%	21.2%
(High-efficiency Shower head)	26	9	9	4	8	6	3	7	8	9	8
	19.1%	19.1%	25.0%	21.1%	16.3%	17.1%	13.0%	30.4%	18.6%	18.0%	24.2%
(Outlet seals)	6	3	1	-	2	2	1	1	1	4	1
	4.4%	6.4%	2.8%		4.1%	5.7%	4.3%	4.3%	2.3%	8.0%	3.0%
(Weather stripping)	20	3	5	5	6	6	6	1	6	6	7
	14.7%	6.4%	13.9%	26.3%	12.2%	17.1%	26.1%	4.3%	14.0%	12.0%	21.2%
				b		h	H				
(Don't know)	29	12	7	4	11	8	5	5	9	16	4
	21.3%	25.5%	19.4%	21.1%	22.4%	22.9%	21.7%	21.7%	20.9%	32.0%	12.1%
										K	
(Refused)	5	2	-	1	2	-	2	-	2	1	2
	3.7%	4.3%		5.3%	4.1%		8.7%		4.7%	2.0%	6.1%

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table rec_v2m1_1 Page 166

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

V2. What equipment would you have liked to receive?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	150 100.0%	54 100.0%	40 100.0%	19 100.0%	52 100.0%	41 100.0%	25 100.0%	26 100.0%	46 100.0%	56 100.0%	37 100.0%
More LED bulbs	8 5.3%	4 7.4%	2 5.0%	2 10.5%	3 5.8%	3 7.3%	1 4.0%	1 3.8%	2 4.3%	3 5.4%	2 5.4%
Insulation	2 1.3%	-	1 2.5%	1 5.3%	-	-	1 4.0%	1 3.8%	-	2 3.6%	-
Water Heater Heat Pump	3 2.0%	3 5.6%	-	-	1 1.9%	1 2.4%	1 4.0%	-	2 4.3%	1 1.8%	-
HVAC Filters	2 1.3%	1 1.9%	1 2.5%	-	1 1.9%	1 2.4%	-	-	-	1 1.8%	-
More equipment (Outlet seals, weather stripping)	7 4.7%	3 5.6%	1 2.5%	1 5.3%	2 3.8%	4 9.8%	-	1 3.8%	2 4.3%	3 5.4%	1 2.7%
Other	13 8.7%	5 9.3%	3 7.5%	1 5.3%	5 9.6%	4 9.8%	2 8.0%	2 7.7%	4 8.7%	7 12.5% k	1 2.7%
Nothing Else	104 69.3%	31 57.4%	32 80.0% B	14 73.7%	34 65.4%	27 65.9%	17 68.0%	21 80.8%	33 71.7%	37 66.1%	29 78.4%
Don't know	12 8.0%	7 13.0% C	1 2.5%	-	6 11.5%	2 4.9%	3 12.0%	-	3 6.5%	3 5.4%	4 10.8%

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table v3 Page 167

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

V3. The Home Energy House Call program is also considering adding a Home Energy Score…How interested would you have been to receive this as part of your assessment?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	150 100.0%	54 100.0%	40 100.0%	19 100.0%	52 100.0%	41 100.0%	25 100.0%	26 100.0%	46 100.0%	56 100.0%	37 100.0%
Very interested	77 51.3%	27 50.0%	23 57.5%	12 63.2%	28 53.8%	18 43.9%	15 60.0%	14 53.8%	25 54.3%	28 50.0%	20 54.1%
Somewhat interested	42 28.0%	15 27.8%	11 27.5%	5 26.3%	16 30.8%	9 22.0%	7 28.0%	7 26.9%	10 21.7%	16 28.6%	12 32.4%
Not very interested	9 6.0%	3 5.6%	2 5.0%	1 5.3%	1 1.9%	4 9.8%	2 8.0%	2 7.7%	3 6.5%	4 7.1%	1 2.7%
Not at all interested	16 10.7%	6 11.1%	3 7.5%	1 5.3%	5 9.6%	7 17.1% g	1 4.0%	2 7.7%	7 15.2%	6 10.7%	2 5.4%
(Don't know)	5 3.3%	3 5.6%	1 2.5%	-	1 1.9%	3 7.3%	-	1 3.8%	1 2.2%	2 3.6%	1 2.7%
(Refused)	1 0.7%	-	-	-	1 1.9%	-	-	-	-	-	1 2.7%

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

Using a scale where 0 is extremely dissatisfied and 10 is extremely satisfied, how satisfied were you with…

SAT0a. The amount of time between when you called to schedule the assessment and when the assessment was completed.

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	150 100.0%	54 100.0%	40 100.0%	19 100.0%	52 100.0%	41 100.0%	25 100.0%	26 100.0%	46 100.0%	56 100.0%	37 100.0%
Total Answering	143 100.0%	50 100.0%	40 100.0%	19 100.0%	48 100.0%	40 100.0%	25 100.0%	25 100.0%	43 100.0%	55 100.0%	37 100.0%
0-4	16 11.2%	6 12.0%	5 12.5%	2 10.5%	2 4.2%	8 20.0% E	2 8.0%	3 12.0%	8 18.6%	4 7.3%	3 8.1%
5-7	26 18.2%	8 16.0%	11 27.5%	4 21.1%	13 27.1% Fh	4 10.0%	6 24.0%	3 12.0%	9 20.9% k	12 21.8% k	3 8.1%
8-10	101 70.6%	36 72.0%	24 60.0%	13 68.4%	33 68.8%	28 70.0%	17 68.0%	19 76.0%	26 60.5%	39 70.9%	31 83.8% I
(Don't know)	6 4.0%	4 7.4%	-	-	4 7.7%	1 2.4%	-	1 3.8%	3 6.5%	1 1.8%	-
(Refused)	1 0.7%	-	-	-	-	-	-	-	-	-	-
Mean	7.99	8.04	7.50	8.16	8.29	7.50	7.96	8.40	7.44	8.11	8.62

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table sat0b Page 169

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

SAT0b. The professionalism of the auditor who visited your home?

	Total	Income			Education				Year House was Built		
	------	< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	150 100.0%	54 100.0%	40 100.0%	19 100.0%	52 100.0%	41 100.0%	25 100.0%	26 100.0%	46 100.0%	56 100.0%	37 100.0%
Total Answering	148 100.0%	54 100.0%	40 100.0%	19 100.0%	51 100.0%	41 100.0%	25 100.0%	26 100.0%	46 100.0%	55 100.0%	37 100.0%
0-4	4 2.7%	2 3.7%	-	-	1 2.0%	3 7.3%	-	-	2 4.3%	1 1.8%	-
5-7	9 6.1%	6 11.1%	-	2 10.5%	6 11.8%	2 4.9%	1 4.0%	-	3 6.5%	3 5.5%	2 5.4%
8-10	135 91.2%	46 85.2%	40 100.0% B	17 89.5%	44 86.3%	36 87.8%	24 96.0%	26 100.0% EF	41 89.1%	51 92.7%	35 94.6%
(Don't know)	1 0.7%	-	-	-	1 1.9%	-	-	-	-	1 1.8%	-
(Refused)	1 0.7%	-	-	-	-	-	-	-	-	-	-
Mean	9.26	9.02	9.75	9.42	9.18	8.71	9.60	9.88	9.13	9.31	9.59

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table sat0c Page 170

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

SAT0c. The quality of work performed by the auditor?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	149 100.0%	53 100.0%	40 100.0%	19 100.0%	52 100.0%	40 100.0%	25 100.0%	26 100.0%	46 100.0%	56 100.0%	37 100.0%
Total Answering	145 100.0%	52 100.0%	40 100.0%	19 100.0%	50 100.0%	39 100.0%	25 100.0%	26 100.0%	46 100.0%	54 100.0%	36 100.0%
0-4	8 5.5%	3 5.8%	1 2.5%	1 5.3%	2 4.0%	5 12.8%	1 4.0%	-	4 8.7%	3 5.6%	1 2.8%
5-7	17 11.7%	11 21.2% C	1 2.5%	2 10.5%	9 18.0% H	3 7.7%	4 16.0%	1 3.8%	5 10.9%	6 11.1%	3 8.3%
8-10	120 82.8%	38 73.1%	38 95.0% B	16 84.2%	39 78.0%	31 79.5%	20 80.0%	25 96.2% EFg	37 80.4%	45 83.3%	32 88.9%
(Don't know)	2 1.3%	1 1.9%	-	-	1 1.9%	1 2.5%	-	-	-	2 3.6%	-
(Refused)	2 1.3%	-	-	-	1 1.9%	-	-	-	-	-	1 2.7%
Mean	8.73	8.52	9.25	8.84	8.72	8.33	8.60	9.35	8.46	8.69	9.22

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table sat0d Page 171

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

SAT0d. The time it took to complete the assessment?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	150 100.0%	54 100.0%	40 100.0%	19 100.0%	52 100.0%	41 100.0%	25 100.0%	26 100.0%	46 100.0%	56 100.0%	37 100.0%
Total Answering	146 100.0%	53 100.0%	40 100.0%	19 100.0%	50 100.0%	40 100.0%	25 100.0%	26 100.0%	45 100.0%	55 100.0%	36 100.0%
0-4	4 2.7%	2 3.8%	-	-	-	4 10.0%	-	-	2 4.4%	1 1.8%	-
5-7	12 8.2%	7 13.2%	4 10.0%	1 5.3%	6 12.0%	2 5.0%	3 12.0%	1 3.8%	4 8.9%	5 9.1%	2 5.6%
8-10	130 89.0%	44 83.0%	36 90.0%	18 94.7%	44 88.0%	34 85.0%	22 88.0%	25 96.2%	39 86.7%	49 89.1%	34 94.4%
(Don't know)	2 1.3%	1 1.9%	-	-	1 1.9%	1 2.4%	-	-	1 2.2%	1 1.8%	-
(Refused)	2 1.3%	-	-	-	1 1.9%	-	-	-	-	-	1 2.7%
Mean	9.10	8.98	9.40	9.37	9.36	8.62	9.04	9.54	8.89	9.20	9.44

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table sat1a Page 172

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

SAT1a. The types of equipment included in the energy efficiency kit?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	150 100.0%	54 100.0%	40 100.0%	19 100.0%	52 100.0%	41 100.0%	25 100.0%	26 100.0%	46 100.0%	56 100.0%	37 100.0%
Total Answering	142 100.0%	51 100.0%	39 100.0%	19 100.0%	50 100.0%	38 100.0%	25 100.0%	23 100.0%	45 100.0%	52 100.0%	35 100.0%
0-4	7 4.9%	4 7.8%	2 5.1%	-	2 4.0%	4 10.5%	1 4.0%	-	3 6.7%	-	4 11.4%
5-7	31 21.8%	10 19.6%	7 17.9%	3 15.8%	11 22.0%	10 26.3%	5 20.0%	4 17.4%	9 20.0%	12 23.1%	9 25.7%
8-10	104 73.2%	37 72.5%	30 76.9%	16 84.2%	37 74.0%	24 63.2%	19 76.0%	19 82.6% f	33 73.3%	40 76.9%	22 62.9%
(Don't know)	7 4.7%	3 5.6%	1 2.5%	-	1 1.9%	3 7.3%	-	3 11.5%	1 2.2%	4 7.1%	1 2.7%
(Refused)	1 0.7%	-	-	-	1 1.9%	-	-	-	-	-	1 2.7%
Mean	8.32	8.37	8.41	8.95	8.34	7.79	8.40	8.96	8.24	8.69	7.63

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table sat1b Page 173

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

SAT1b. The quality of the equipment included in the energy efficiency kit?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	150 100.0%	54 100.0%	40 100.0%	19 100.0%	52 100.0%	41 100.0%	25 100.0%	26 100.0%	46 100.0%	56 100.0%	37 100.0%
Total Answering	142 100.0%	51 100.0%	40 100.0%	19 100.0%	50 100.0%	38 100.0%	25 100.0%	23 100.0%	44 100.0%	53 100.0%	35 100.0%
0-4	5 3.5%	3 5.9%	1 2.5%	1 5.3%	2 4.0%	2 5.3%	1 4.0%	-	1 2.3%	3 5.7%	1 2.9%
5-7	23 16.2%	10 19.6%	8 20.0%	-	7 14.0%	8 21.1%	5 20.0%	2 8.7%	10 22.7%	8 15.1%	4 11.4%
8-10	114 80.3%	38 74.5%	31 77.5%	18 94.7% BC	41 82.0%	28 73.7%	19 76.0%	21 91.3% f	33 75.0%	42 79.2%	30 85.7%
(Don't know)	7 4.7%	3 5.6%	-	-	1 1.9%	3 7.3%	-	3 11.5%	2 4.3%	3 5.4%	1 2.7%
(Refused)	1 0.7%	-	-	-	1 1.9%	-	-	-	-	-	1 2.7%
Mean	8.66	8.57	8.52	9.32	8.84	8.18	8.56	9.26	8.55	8.60	8.71

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table sat1c Page 174

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

SAT1c. The assessment report in helping you understand your home's energy usage?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	150 100.0%	54 100.0%	40 100.0%	19 100.0%	52 100.0%	41 100.0%	25 100.0%	26 100.0%	46 100.0%	56 100.0%	37 100.0%
Total Answering	140 100.0%	49 100.0%	39 100.0%	18 100.0%	48 100.0%	37 100.0%	25 100.0%	25 100.0%	43 100.0%	53 100.0%	34 100.0%
0-4	6 4.3%	4 8.2%	-	-	3 6.2%	2 5.4%	1 4.0%	-	3 7.0%	2 3.8%	1 2.9%
5-7	22 15.7%	5 10.2%	6 15.4%	3 16.7%	7 14.6%	6 16.2%	5 20.0%	3 12.0%	5 11.6%	8 15.1%	7 20.6%
8-10	112 80.0%	40 81.6%	33 84.6%	15 83.3%	38 79.2%	29 78.4%	19 76.0%	22 88.0%	35 81.4%	43 81.1%	26 76.5%
(Don't know)	7 4.7%	4 7.4%	1 2.5%	1 5.3%	2 3.8%	3 7.3%	-	1 3.8%	3 6.5%	1 1.8%	2 5.4%
(Refused)	3 2.0%	1 1.9%	-	-	2 3.8%	1 2.4%	-	-	-	2 3.6%	1 2.7%
Mean	8.71	8.90	8.87	9.06	8.65	8.73	8.32	9.20	8.70	8.68	8.65

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table sat1d Page 175

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

SAT1d. The assessment report in helping you understand where energy improvements could be made in your home?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	150 100.0%	54 100.0%	40 100.0%	19 100.0%	52 100.0%	41 100.0%	25 100.0%	26 100.0%	46 100.0%	56 100.0%	37 100.0%
Total Answering	147 100.0%	53 100.0%	40 100.0%	19 100.0%	49 100.0%	41 100.0%	25 100.0%	26 100.0%	45 100.0%	55 100.0%	36 100.0%
0-4	8 5.4%	6 11.3%	-	-	3 6.1%	4 9.8%	1 4.0%	-	2 4.4%	3 5.5%	2 5.6%
5-7	20 13.6%	8 15.1%	4 10.0%	1 5.3%	7 14.3%	6 14.6%	5 20.0%	2 7.7%	5 11.1%	8 14.5%	4 11.1%
8-10	119 81.0%	39 73.6%	36 90.0% B	18 94.7% B	39 79.6%	31 75.6%	19 76.0%	24 92.3% F	38 84.4%	44 80.0%	30 83.3%
(Don't know)	1 0.7%	1 1.9%	-	-	1 1.9%	-	-	-	1 2.2%	-	-
(Refused)	2 1.3%	-	-	-	2 3.8%	-	-	-	-	1 1.8%	1 2.7%
Mean	8.57	8.28	9.10	9.05	8.69	8.17	8.36	9.19	8.78	8.56	8.58

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table sat1om1 Page 176

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

SAT1o. Can you briefly explain which equipment from the kit you were dissatisfied with?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	8 100.0%	6 100.0%	1 100.0%	-	2 100.0%	5 100.0%	1 100.0%	-	3 100.0%	2 100.0%	3 100.0%
Please enter your response in the box below	7 87.5%	5 83.3%	1 100.0%	-	1 50.0%	5 100.0%	1 100.0%	-	3 100.0%	1 50.0%	3 100.0%
(Don't know)	1 12.5%	1 16.7%	-	-	1 50.0%	-	-	-	-	1 50.0%	-
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table sat1om1o Page 177

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

Table: sat1om1o OPEN ENDS

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	7 100.0%	5 100.0%	1 100.0%	-	1 100.0%	5 100.0%	1 100.0%	-	3 100.0%	1 100.0%	3 100.0%
ALL DIDN'T GET ANYTHING BUT LIGHT BULBS	1 14.3%	-	-	-	-	-	1 100.0%	-	-	-	1 33.3%
EQUIPMENT JUST DIDN'T MATCH HIS DECOR AND WASN'T EXPECTING A KIT	1 14.3%	1 20.0%	-	-	-	1 20.0%	-	-	-	1 100.0%	-
HE COULDVE KEPT THE WHOLE THING	1 14.3%	1 20.0%	-	-	1 100.0%	-	-	-	1 33.3%	-	-
HT E PLUG COVERS HAVEN'T USED THERM,	1 14.3%	1 20.0%	-	-	-	1 20.0%	-	-	1 33.3%	-	-
I WASN'T DISSATISFIED I ALREADY HAD THEM	1 14.3%	1 20.0%	-	-	-	1 20.0%	-	-	1 33.3%	-	-
WEATHER STRIPPING	2 28.6%	1 20.0%	1 100.0%	-	-	2 40.0%	-	-	-	-	2 66.7%

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

SAT2. Using a scale where 0 is extremely dissatisfied and 10 is extremely satisfied, how satisfied were you with the program overall?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	150 100.0%	54 100.0%	40 100.0%	19 100.0%	52 100.0%	41 100.0%	25 100.0%	26 100.0%	46 100.0%	56 100.0%	37 100.0%
Total Answering	148 100.0%	54 100.0%	40 100.0%	19 100.0%	51 100.0%	41 100.0%	24 100.0%	26 100.0%	46 100.0%	55 100.0%	36 100.0%
0-4	8 5.4%	5 9.3%	1 2.5%	-	3 5.9%	4 9.8%	1 4.2%	-	5 10.9% j	1 1.8%	1 2.8%
5-7	20 13.5%	9 16.7%	4 10.0%	2 10.5%	6 11.8%	5 12.2%	5 20.8%	3 11.5%	6 13.0%	10 18.2%	3 8.3%
8-10	120 81.1%	40 74.1%	35 87.5% b	17 89.5% b	42 82.4%	32 78.0%	18 75.0%	23 88.5%	35 76.1%	44 80.0%	32 88.9%
(Don't know)	2 1.3%	-	-	-	1 1.9%	-	1 4.0%	-	-	1 1.8%	1 2.7%
(Refused)	-	-	-	-	-	-	-	-	-	-	-
Mean	8.66	8.39	8.90	9.11	8.73	8.29	8.50	9.12	8.41	8.65	8.97

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table sat3m1 Page 179

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

SAT3. Why do you give it that rating?

	Total	Income			Education				Year House was Built		
	------	< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	8 100.0%	5 100.0%	1 100.0%	-	3 100.0%	4 100.0%	1 100.0%	-	5 100.0%	1 100.0%	1 100.0%
Please enter your response in the box below	7 87.5%	4 80.0%	1 100.0%	-	2 66.7%	4 100.0%	1 100.0%	-	4 80.0%	1 100.0%	1 100.0%
(Don't know)	1 12.5%	1 20.0%	-	-	1 33.3%	-	-	-	1 20.0%	-	-
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table sat3m1o Page 180

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

Table: sat3m1o OPEN ENDS

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	7 100.0%	4 100.0%	1 100.0%	-	2 100.0%	4 100.0%	1 100.0%	-	4 100.0%	1 100.0%	1 100.0%
BECAUSE IT WAS USELESS FOR THEM TO COME, I ALREADY HAVE DONE EVERYTHING I CAN TO HELP REDUCE THE BILLS, NOTHING IS HELPING	1 14.3%	-	1 100.0%	-	-	1 25.0%	-	-	1 25.0%	-	-
DIDN'T MEET M,Y NEEDS	1 14.3%	1 25.0%	-	-	-	1 25.0%	-	-	1 25.0%	-	-
HAD A DIFFERENT PICTURE OF WHAT HE CAME TO DO CHANGED THINGS WITHOUT PERMITTION	1 14.3%	-	-	-	1 50.0%	-	-	-	-	1 100.0%	-
I DIDNT NEED IT AND WHEN I FIRST BOUGHT THIS HOUSE I DID ALL THE INSULATION.	1 14.3%	1 25.0%	-	-	1 50.0%	-	-	-	1 25.0%	-	-
I WAS EXPECTING TO HEARS OMETHING ABOUT SOLAR ENERGY. I DIDN'T HEAR ANYTHING ABOUT THAT	1 14.3%	1 25.0%	-	-	-	1 25.0%	-	-	-	-	-
NOT SAVING MONEY	1 14.3%	-	-	-	-	-	1 100.0%	-	-	-	1 100.0%
THE REASON I CALLED THEJM I DJIDNT GET A SATISFACTORY ANSWER TO MY PROBLEM	1 14.3%	1 25.0%	-	-	-	1 25.0%	-	-	1 25.0%	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table sat8 Page 181

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

SAT8. Have you noticed any savings on your electric bill since completing your energy assessment?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	150 100.0%	54 100.0%	40 100.0%	19 100.0%	52 100.0%	41 100.0%	25 100.0%	26 100.0%	46 100.0%	56 100.0%	37 100.0%
Yes	57 38.0%	28 51.9% CD	11 27.5%	4 21.1%	22 42.3% H	17 41.5% H	11 44.0% H	5 19.2%	20 43.5%	20 35.7%	12 32.4%
No	73 48.7%	24 44.4%	21 52.5%	11 57.9%	22 42.3%	21 51.2%	13 52.0%	14 53.8%	22 47.8%	24 42.9%	21 56.8%
Not sure	17 11.3%	1 1.9%	6 15.0% B	4 21.1% B	6 11.5%	3 7.3%	-	7 26.9% F	2 4.3%	12 21.4% Ik	3 8.1%
(Don't know)	3 2.0%	1 1.9%	2 5.0%	-	2 3.8%	-	1 4.0%	-	2 4.3%	-	1 2.7%
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table sat9 Page 182

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

SAT9. Would you say your bill savings are...

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	57 100.0%	28 100.0%	11 100.0%	4 100.0%	22 100.0%	17 100.0%	11 100.0%	5 100.0%	20 100.0%	20 100.0%	12 100.0%
About what you expected	24 42.1%	9 32.1%	4 36.4%	4 100.0% BC	6 27.3%	7 41.2%	7 63.6% E	2 40.0%	7 35.0%	10 50.0%	6 50.0%
More than you expected	17 29.8%	10 35.7%	4 36.4%	-	7 31.8%	5 29.4%	4 36.4%	1 20.0%	8 40.0%	5 25.0%	2 16.7%
Less than you expected	15 26.3%	8 28.6%	3 27.3%	-	8 36.4%	5 29.4%	-	2 40.0%	4 20.0%	5 25.0%	4 33.3%
(Don't know)	1 1.8%	1 3.6%	-	-	1 4.5%	-	-	-	1 5.0%	-	-
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table rec_sat10m1 Page 183

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

SAT10. What could be improved?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	150 100.0%	54 100.0%	40 100.0%	19 100.0%	52 100.0%	41 100.0%	25 100.0%	26 100.0%	46 100.0%	56 100.0%	37 100.0%
Improve measures/ Increase measures amounts	4 2.7%	1 1.9%	-	-	1 1.9%	1 2.4%	-	1 3.8%	3 6.5%	1 1.8%	-
Lower energy costs/Cost issues	8 5.3%	4 7.4%	3 7.5%	-	5 9.6%	1 2.4%	1 4.0%	1 3.8%	3 6.5%	1 1.8%	3 8.1%
More measures	8 5.3%	2 3.7%	3 7.5%	-	2 3.8%	2 4.9%	2 8.0%	1 3.8%	1 2.2%	5 8.9%	-
List of certified contractors/Contractor issues	7 4.7%	4 7.4%	2 5.0%	-	2 3.8%	4 9.8%	-	1 3.8%	2 4.3%	3 5.4%	1 2.7%
Have a pre- or post-audit/follow-up/ communicate	6 4.0%	2 3.7%	-	1 5.3%	3 5.8%	-	1 4.0%	2 7.7%	3 6.5%	1 1.8%	2 5.4%
Have auditor install all measures/Thorough assessment	12 8.0%	5 9.3%	3 7.5%	2 10.5%	3 5.8%	5 12.2%	2 8.0%	2 7.7%	3 6.5%	4 7.1%	5 13.5%
Scheduling/Timing issues	9 6.0%	2 3.7%	2 5.0%	3 15.8%	1 1.9%	-	3 12.0%	5 19.2% E	2 4.3%	4 7.1%	3 8.1%
Could not access report/ Didn't understand all or some of report/More details	5 3.3%	1 1.9%	2 5.0%	1 5.3%	2 3.8%	1 2.4%	1 4.0%	1 3.8%	1 2.2%	3 5.4%	1 2.7%
Other	7 4.7%	1 1.9%	1 2.5%	2 10.5%	4 7.7%	-	2 8.0%	1 3.8%	1 2.2%	3 5.4%	3 8.1%

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table rec_sat10m1 Page 184
(Continued)
DEC Res Assessments Survey Results (Opinion Dynamics #7880)

SAT10. What could be improved?

	Total	Income			Education				Year House was Built		
	------	< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
96	61 40.7%	21 38.9%	22 55.0%	8 42.1%	17 32.7%	21 51.2% e	11 44.0%	10 38.5%	17 37.0%	26 46.4%	15 40.5%
98	27 18.0%	14 25.9% Cd	3 7.5%	2 10.5%	14 26.9% gH	6 14.6%	3 12.0%	2 7.7%	11 23.9%	8 14.3%	4 10.8%

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

D1. Which of the following best describes your home/residence? (READ LIST)

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	150 100.0%	54 100.0%	40 100.0%	19 100.0%	52 100.0%	41 100.0%	25 100.0%	26 100.0%	46 100.0%	56 100.0%	37 100.0%
(Other: Specify)	-	-	-	-	-	-	-	-	-	-	-
Single-family home, detached construction (NOT A DUPLEX, TOWNHOME, OR APARTMENT.)	144 96.0%	54 100.0% C	36 90.0%	19 100.0% C	50 96.2%	41 100.0%	24 96.0%	24 92.3%	45 97.8%	54 96.4%	35 94.6%
Single family home, factory manufactured/ modular (OFTEN REFERRED TO AS A MOBILE HOME, THESE HOMES DO NOT HAVE A CONVENTI	-	-	-	-	-	-	-	-	-	-	-
Single family home, modular (MODULAR HOMES ARE ASSEMBLED AT A BUILDING SITE ON TOP OF A CONVENTIONAL CONCRETE FOUNDATION	1 0.7%	-	1 2.5%	-	-	-	-	1 3.8%	-	1 1.8%	-
Single family, mobile home	1 0.7%	-	1 2.5%	-	1 1.9%	-	-	-	1 2.2%	-	-
Row House	-	-	-	-	-	-	-	-	-	-	-
Two or Three family attached residence-traditional structure	1 0.7%	-	1 2.5%	-	-	-	1 4.0%	-	-	-	1 2.7%
Apartment (4 + families)---traditional structure	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table d1 Page 186
(Continued)
DEC Res Assessments Survey Results (Opinion Dynamics #7880)

D1. Which of the following best describes your home/residence? (READ LIST)

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Condominium---traditional structure	1 0.7%	-	-	-	1 1.9%	-	-	-	-	1 1.8%	-
(Don't know)	2 1.3%	-	1 2.5%	-	-	-	-	1 3.8%	-	-	1 2.7%
(Refused)	-	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table d1o Page 187

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

Table: d1o OPEN ENDS

	Total	Income			Education				Year House was Built		
	------	< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	1 100.0%	-	1 100.0%	-	-	-	-	1 100.0%	-	-	1 100.0%
VILLA	1 100.0%	-	1 100.0%	-	-	-	-	1 100.0%	-	-	1 100.0%

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table d1a Page 188

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

D1a. Do you rent or own this residence?

	Total	Income			Education				Year House was Built		
	------	< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	150 100.0%	54 100.0%	40 100.0%	19 100.0%	52 100.0%	41 100.0%	25 100.0%	26 100.0%	46 100.0%	56 100.0%	37 100.0%
Rent	5 3.3%	2 3.7%	2 5.0%	-	2 3.8%	1 2.4%	1 4.0%	1 3.8%	3 6.5%	2 3.6%	-
Own	144 96.0%	52 96.3%	38 95.0%	19 100.0%	50 96.2%	40 97.6%	24 96.0%	25 96.2%	43 93.5%	54 96.4%	37 100.0% i
(Don't know)	-	-	-	-	-	-	-	-	-	-	-
(Refused)	1 0.7%	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table d1b Page 189

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

D1b. Including yourself, how many people currently live in your residence year-round?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	150 100.0%	54 100.0%	40 100.0%	19 100.0%	52 100.0%	41 100.0%	25 100.0%	26 100.0%	46 100.0%	56 100.0%	37 100.0%
(Don't know)	2 1.3%	-	1 2.5%	1 5.3%	1 1.9%	1 2.4%	-	-	-	2 3.6%	-
(Refused)	2 1.3%	-	-	-	-	-	-	-	-	-	-
1	28 18.7%	19 35.2% C	3 7.5%	-	16 30.8% GH	7 17.1%	3 12.0%	2 7.7%	11 23.9%	8 14.3%	4 10.8%
2	59 39.3%	17 31.5%	17 42.5%	7 36.8%	19 36.5%	16 39.0%	8 32.0%	13 50.0%	21 45.7%	23 41.1%	12 32.4%
3	26 17.3%	10 18.5%	7 17.5%	5 26.3%	8 15.4%	8 19.5%	6 24.0%	4 15.4%	7 15.2%	9 16.1%	10 27.0%
4	20 13.3%	6 11.1%	7 17.5%	3 15.8%	5 9.6%	7 17.1%	5 20.0%	3 11.5%	3 6.5%	10 17.9% i	6 16.2%
5	8 5.3%	2 3.7%	2 5.0%	1 5.3%	3 5.8%	1 2.4%	2 8.0%	1 3.8%	3 6.5%	3 5.4%	2 5.4%
6	4 2.7%	-	3 7.5%	1 5.3%	-	1 2.4%	-	3 11.5%	1 2.2%	-	3 8.1%
7	1 0.7%	-	-	1 5.3%	-	-	1 4.0%	-	-	1 1.8%	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Docket No. E-7, Sub 1192

Table d2 Page 190

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

D2. Approximately when was your home constructed? (DO NOT READ)

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	150	54	40	19	52	41	25	26	46	56	37
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
(Before 1960)	29	20	3	1	16	8	1	3	29	-	-
	19.3%	37.0%	7.5%	5.3%	30.8%	19.5%	4.0%	11.5%	63.0%		
		CD			GH	G					
(1960-1969)	17	9	4	-	11	3	1	1	17	-	-
	11.3%	16.7%	10.0%		21.2%	7.3%	4.0%	3.8%	37.0%		
					FGH						
(1970-1979)	26	5	11	3	8	5	5	8	-	26	-
	17.3%	9.3%	27.5%	15.8%	15.4%	12.2%	20.0%	30.8%		46.4%	
			B					f			
(1980-1989)	13	5	2	3	1	4	5	2	-	13	-
	8.7%	9.3%	5.0%	15.8%	1.9%	9.8%	20.0%	7.7%		23.2%	
							E				
(1990-1999)	17	2	7	4	2	6	5	3	-	17	-
	11.3%	3.7%	17.5%	21.1%	3.8%	14.6%	20.0%	11.5%		30.4%	
			B	b		e	e				
(2000-2005)	18	3	6	4	4	5	4	5	-	-	18
	12.0%	5.6%	15.0%	21.1%	7.7%	12.2%	16.0%	19.2%			48.6%
(2006 OR LATER)	19	5	7	4	5	7	3	4	-	-	19
	12.7%	9.3%	17.5%	21.1%	9.6%	17.1%	12.0%	15.4%			51.4%
(Don't know)	8	5	-	-	5	3	-	-	-	-	-
	5.3%	9.3%			9.6%	7.3%					
(Refused)	3	-	-	-	-	-	1	-	-	-	-
	2.0%						4.0%				

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table d3 Page 191

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

D3. What is the approximate total square feet of heated or cooled indoor space in your home?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	150 100.0%	54 100.0%	40 100.0%	19 100.0%	52 100.0%	41 100.0%	25 100.0%	26 100.0%	46 100.0%	56 100.0%	37 100.0%
(Don't know)	30 20.0%	20 37.0% C	2 5.0%	-	22 42.3% FH	6 14.6%	-	1 3.8%	16 34.8% JK	5 8.9%	3 8.1%
(Refused)	4 2.7%	-	-	-	-	-	1 4.0%	-	-	1 1.8%	-
18	1 0.7%	-	1 2.5%	-	-	-	-	1 3.8%	-	1 1.8%	-
800	1 0.7%	-	1 2.5%	-	1 1.9%	-	-	-	-	1 1.8%	-
950	1 0.7%	-	-	-	1 1.9%	-	-	-	-	-	1 2.7%
955	1 0.7%	-	1 2.5%	-	1 1.9%	-	-	-	1 2.2%	-	-
970	1 0.7%	1 1.9%	-	-	1 1.9%	-	-	-	-	-	1 2.7%
980	1 0.7%	1 1.9%	-	-	-	1 2.4%	-	-	-	-	-
1000	2 1.3%	2 3.7%	-	-	2 3.8%	-	-	-	2 4.3%	-	-
1100	5 3.3%	4 7.4%	1 2.5%	-	2 3.8%	3 7.3%	-	-	2 4.3%	3 5.4%	-
1148	1 0.7%	1 1.9%	-	-	-	1 2.4%	-	-	1 2.2%	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table d3 Page 192
(Continued)
DEC Res Assessments Survey Results (Opinion Dynamics #7880)

D3. What is the approximate total square feet of heated or cooled indoor space in your home?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
1300	1 0.7%	1 1.9%	-	-	1 1.9%	-	-	-	1 2.2%	-	-
1350	1 0.7%	-	1 2.5%	-	-	-	-	1 3.8%	-	-	1 2.7%
1400	2 1.3%	1 1.9%	1 2.5%	-	1 1.9%	1 2.4%	-	-	1 2.2%	-	1 2.7%
1450	1 0.7%	-	1 2.5%	-	1 1.9%	-	-	-	1 2.2%	-	-
1476	1 0.7%	-	1 2.5%	-	-	-	1 4.0%	-	-	1 1.8%	-
1500	7 4.7%	4 7.4%	-	-	3 5.8%	1 2.4%	3 12.0%	-	2 4.3%	4 7.1%	1 2.7%
1534	1 0.7%	-	1 2.5%	-	-	1 2.4%	-	-	1 2.2%	-	-
1545	1 0.7%	1 1.9%	-	-	-	1 2.4%	-	-	-	1 1.8%	-
1600	5 3.3%	3 5.6%	1 2.5%	-	3 5.8%	1 2.4%	-	-	4 8.7%	1 1.8%	-
1700	1 0.7%	-	1 2.5%	-	1 1.9%	-	-	-	-	1 1.8%	-
1750	1 0.7%	1 1.9%	-	-	-	-	-	1 3.8%	-	1 1.8%	-
1759	1 0.7%	-	1 2.5%	-	-	-	-	1 3.8%	-	1 1.8%	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table d3 Page 193
(Continued)
DEC Res Assessments Survey Results (Opinion Dynamics #7880)

D3. What is the approximate total square feet of heated or cooled indoor space in your home?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
1760	1 0.7%	1 1.9%	-	-	-	1 2.4%	-	-	-	-	1 2.7%
1800	5 3.3%	2 3.7%	1 2.5%	1 5.3%	2 3.8%	2 4.9%	1 4.0%	-	1 2.2%	1 1.8%	3 8.1%
1825	1 0.7%	-	-	-	-	1 2.4%	-	-	1 2.2%	-	-
1850	2 1.3%	1 1.9%	-	-	-	-	-	1 3.8%	1 2.2%	1 1.8%	-
1900	2 1.3%	-	1 2.5%	-	-	2 4.9%	-	-	1 2.2%	1 1.8%	-
2000	4 2.7%	1 1.9%	3 7.5%	-	1 1.9%	2 4.9%	-	1 3.8%	1 2.2%	1 1.8%	2 5.4%
2050	1 0.7%	-	1 2.5%	-	-	-	1 4.0%	-	-	1 1.8%	-
2200	3 2.0%	-	1 2.5%	-	1 1.9%	1 2.4%	-	1 3.8%	-	2 3.6%	1 2.7%
2240	1 0.7%	-	1 2.5%	-	-	-	1 4.0%	-	-	1 1.8%	-
2250	1 0.7%	1 1.9%	-	-	1 1.9%	-	-	-	-	-	1 2.7%
2300	5 3.3%	1 1.9%	4 10.0%	-	1 1.9%	-	1 4.0%	3 11.5%	-	4 7.1%	1 2.7%
2400	4 2.7%	-	1 2.5%	1 5.3%	1 1.9%	1 2.4%	1 4.0%	1 3.8%	-	2 3.6%	2 5.4%

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table d3 Page 194
(Continued)
DEC Res Assessments Survey Results (Opinion Dynamics #7880)

D3. What is the approximate total square feet of heated or cooled indoor space in your home?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
2500	5 3.3%	-	3 7.5%	1 5.3%	1 1.9%	2 4.9%	2 8.0%	-	2 4.3%	1 1.8%	2 5.4%
2600	4 2.7%	1 1.9%	1 2.5%	-	-	1 2.4%	1 4.0%	2 7.7%	2 4.3%	2 3.6%	-
2700	2 1.3%	-	2 5.0%	-	-	-	1 4.0%	1 3.8%	-	1 1.8%	1 2.7%
2800	7 4.7%	-	2 5.0%	4 21.1%	-	2 4.9%	4 16.0%	1 3.8%	-	2 3.6%	5 13.5%
2850	1 0.7%	1 1.9%	-	-	-	-	1 4.0%	-	-	1 1.8%	-
3000	8 5.3%	1 1.9%	2 5.0%	3 15.8%	-	2 4.9%	1 4.0%	5 19.2% fg	1 2.2%	5 8.9%	2 5.4%
3100	1 0.7%	-	-	-	1 1.9%	-	-	-	-	1 1.8%	-
3192	1 0.7%	-	1 2.5%	-	-	-	-	1 3.8%	-	-	1 2.7%
3200	1 0.7%	-	-	1 5.3%	-	-	1 4.0%	-	-	1 1.8%	-
3300	1 0.7%	-	-	1 5.3%	1 1.9%	-	-	-	-	-	1 2.7%
3400	1 0.7%	-	-	1 5.3%	-	1 2.4%	-	-	-	-	1 2.7%
3500	2 1.3%	-	-	-	-	1 2.4%	-	1 3.8%	-	1 1.8%	1 2.7%

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table d3 Page 195
(Continued)
DEC Res Assessments Survey Results (Opinion Dynamics #7880)

D3. What is the approximate total square feet of heated or cooled indoor space in your home?

	Total	Income			Education				Year House was Built		
	------	< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
3600	1	-	-	1	-	1	-	-	-	1	-
	0.7%			5.3%		2.4%				1.8%	
3800	2	-	-	1	-	-	-	2	1	-	1
	1.3%			5.3%				7.7%	2.2%		2.7%
4000	2	2	-	-	-	2	-	-	1	-	1
	1.3%	3.7%				4.9%			2.2%		2.7%
4500	1	-	-	1	1	-	-	-	-	-	1
	0.7%			5.3%	1.9%						2.7%
5000	1	1	-	-	-	1	-	-	-	1	-
	0.7%	1.9%				2.4%				1.8%	
5800	1	-	-	1	-	-	1	-	-	1	-
	0.7%			5.3%			4.0%			1.8%	
6500	1	-	-	-	-	-	1	-	-	-	1
	0.7%						4.0%				2.7%
10000	1	-	-	1	-	1	-	-	-	1	-
	0.7%			5.3%		2.4%				1.8%	
19000	1	-	1	-	-	-	1	-	1	-	-
	0.7%		2.5%				4.0%		2.2%		
25008	1	-	-	1	-	-	-	1	-	1	-
	0.7%			5.3%				3.8%		1.8%	
26300	1	-	1	-	-	-	1	-	-	1	-
	0.7%		2.5%				4.0%			1.8%	
99998	1	1	-	-	1	-	-	-	-	-	-
	0.7%	1.9%			1.9%						

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table d3 Page 196
(Continued)
DEC Res Assessments Survey Results (Opinion Dynamics #7880)

D3. What is the approximate total square feet of heated or cooled indoor space in your home?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
160000	1 0.7%	-	-	-	-	1 2.4%	-	-	1 2.2%	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

D3a. Would you estimate the heated or cooled indoor space in your home to be:

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	35 100.0%	21 100.0%	2 100.0%	-	23 100.0%	6 100.0%	1 100.0%	1 100.0%	17 100.0%	6 100.0%	3 100.0%
Less than 1,000 sqft	6 17.1%	5 23.8%	-	-	4 17.4%	1 16.7%	1 100.0%	-	3 17.6%	-	1 33.3%
1,001-2,000 sqft	6 17.1%	3 14.3%	-	-	6 26.1%	-	-	-	2 11.8%	1 16.7%	-
2,001-3,000 sqft	1 2.9%	-	-	-	-	-	-	-	-	-	-
3,001-4,000 sqft	2 5.7%	1 4.8%	1 50.0%	-	1 4.3%	1 16.7%	-	-	1 5.9%	1 16.7%	-
4,001-5,000 sqft	-	-	-	-	-	-	-	-	-	-	-
Greater than 5,000 sqft	1 2.9%	1 4.8%	-	-	1 4.3%	-	-	-	1 5.9%	-	-
(Don't know)	18 51.4%	11 52.4%	1 50.0%	-	11 47.8%	4 66.7%	-	1 100.0%	10 58.8%	4 66.7%	2 66.7%
(Refused)	1 2.9%	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

D4. Does your home have central air conditioning?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	150 100.0%	54 100.0%	40 100.0%	19 100.0%	52 100.0%	41 100.0%	25 100.0%	26 100.0%	46 100.0%	56 100.0%	37 100.0%
Yes	134 89.3%	47 87.0%	39 97.5% B	18 94.7%	42 80.8%	39 95.1% E	25 100.0% E	24 92.3%	41 89.1%	51 91.1%	35 94.6%
No	15 10.0%	7 13.0% C	1 2.5%	1 5.3%	10 19.2% F	2 4.9%	-	2 7.7%	5 10.9%	5 8.9%	2 5.4%
(Don't know)	-	-	-	-	-	-	-	-	-	-	-
(Refused)	1 0.7%	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table d5 Page 199

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

D5. Does your home have electric heat?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	150 100.0%	54 100.0%	40 100.0%	19 100.0%	52 100.0%	41 100.0%	25 100.0%	26 100.0%	46 100.0%	56 100.0%	37 100.0%
Yes	86 57.3%	37 68.5% C	17 42.5%	10 52.6%	31 59.6%	26 63.4%	13 52.0%	12 46.2%	28 60.9%	29 51.8%	23 62.2%
No	61 40.7%	16 29.6%	23 57.5% B	9 47.4%	19 36.5%	15 36.6%	12 48.0%	14 53.8%	17 37.0%	27 48.2%	14 37.8%
(Don't know)	2 1.3%	1 1.9%	-	-	2 3.8%	-	-	-	1 2.2%	-	-
(Refused)	1 0.7%	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table d6 Page 200

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

D6. Does your home have electric hot water heating?

	Total	Income			Education				Year House was Built		
	------	< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	150 100.0%	54 100.0%	40 100.0%	19 100.0%	52 100.0%	41 100.0%	25 100.0%	26 100.0%	46 100.0%	56 100.0%	37 100.0%
Yes	103 68.7%	45 83.3% CD	22 55.0%	9 47.4%	40 76.9% g	29 70.7%	14 56.0%	16 61.5%	33 71.7% k	42 75.0% K	20 54.1%
No	45 30.0%	9 16.7%	18 45.0% B	10 52.6% B	11 21.2%	12 29.3%	11 44.0% E	10 38.5%	13 28.3%	14 25.0%	17 45.9% iJ
(Don't know)	1 0.7%	-	-	-	1 1.9%	-	-	-	-	-	-
(Refused)	1 0.7%	-	-	-	-	-	-	-	-	-	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table d7 Page 201

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

D7. In what year were you born?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	150 100.0%	54 100.0%	40 100.0%	19 100.0%	52 100.0%	41 100.0%	25 100.0%	26 100.0%	46 100.0%	56 100.0%	37 100.0%
(Don't know)	3 2.0%	1 1.9%	-	-	-	1 2.4%	-	-	-	1 1.8%	-
(Refused)	12 8.0%	2 3.7%	-	-	4 7.7%	2 4.9%	2 8.0%	-	3 6.5%	5 8.9%	2 5.4%
1924	1 0.7%	1 1.9%	-	-	1 1.9%	-	-	-	1 2.2%	-	-
1931	1 0.7%	1 1.9%	-	-	1 1.9%	-	-	-	1 2.2%	-	-
1932	2 1.3%	2 3.7%	-	-	2 3.8%	-	-	-	2 4.3%	-	-
1935	5 3.3%	2 3.7%	2 5.0%	1 5.3%	2 3.8%	-	2 8.0%	1 3.8%	2 4.3%	2 3.6%	1 2.7%
1936	1 0.7%	-	-	-	1 1.9%	-	-	-	1 2.2%	-	-
1937	2 1.3%	2 3.7%	-	-	1 1.9%	1 2.4%	-	-	2 4.3%	-	-
1938	5 3.3%	2 3.7%	2 5.0%	-	2 3.8%	1 2.4%	2 8.0%	-	2 4.3%	3 5.4%	-
1939	3 2.0%	-	1 2.5%	-	3 5.8%	-	-	-	1 2.2%	2 3.6%	-
1940	2 1.3%	1 1.9%	-	-	1 1.9%	1 2.4%	-	-	1 2.2%	1 1.8%	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table d7 Page 202
(Continued)
DEC Res Assessments Survey Results (Opinion Dynamics #7880)

D7. In what year were you born?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
1941	2 1.3%	1 1.9%	-	-	1 1.9%	1 2.4%	-	-	1 2.2%	1 1.8%	-
1942	4 2.7%	2 3.7%	2 5.0%	-	1 1.9%	-	-	3 11.5%	1 2.2%	2 3.6%	1 2.7%
1943	2 1.3%	1 1.9%	-	-	-	2 4.9%	-	-	1 2.2%	1 1.8%	-
1944	4 2.7%	-	2 5.0%	2 10.5%	1 1.9%	1 2.4%	-	2 7.7%	-	2 3.6%	2 5.4%
1946	7 4.7%	5 9.3%	-	1 5.3%	6 11.5%	-	-	1 3.8%	4 8.7%	2 3.6%	1 2.7%
1947	4 2.7%	1 1.9%	3 7.5%	-	-	2 4.9%	-	2 7.7%	2 4.3%	2 3.6%	-
1948	3 2.0%	2 3.7%	1 2.5%	-	1 1.9%	1 2.4%	-	1 3.8%	1 2.2%	-	1 2.7%
1949	6 4.0%	4 7.4%	1 2.5%	-	1 1.9%	4 9.8%	1 4.0%	-	1 2.2%	3 5.4%	1 2.7%
1950	3 2.0%	-	-	2 10.5%	1 1.9%	1 2.4%	1 4.0%	-	-	1 1.8%	1 2.7%
1952	6 4.0%	2 3.7%	2 5.0%	-	3 5.8%	2 4.9%	-	1 3.8%	1 2.2%	3 5.4%	-
1953	2 1.3%	1 1.9%	1 2.5%	-	1 1.9%	-	1 4.0%	-	1 2.2%	1 1.8%	-
1954	2 1.3%	2 3.7%	-	-	1 1.9%	-	1 4.0%	-	1 2.2%	1 1.8%	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table d7 Page 203
(Continued)
DEC Res Assessments Survey Results (Opinion Dynamics #7880)

D7. In what year were you born?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
1955	5 3.3%	4 7.4%	-	-	2 3.8%	2 4.9%	-	1 3.8%	2 4.3%	2 3.6%	1 2.7%
1956	4 2.7%	-	2 5.0%	1 5.3%	-	2 4.9%	1 4.0%	1 3.8%	1 2.2%	2 3.6%	1 2.7%
1957	4 2.7%	2 3.7%	1 2.5%	-	2 3.8%	1 2.4%	-	1 3.8%	2 4.3%	2 3.6%	-
1958	2 1.3%	-	1 2.5%	1 5.3%	-	-	1 4.0%	1 3.8%	1 2.2%	-	1 2.7%
1959	4 2.7%	1 1.9%	3 7.5%	-	3 5.8%	-	1 4.0%	-	2 4.3%	1 1.8%	1 2.7%
1961	3 2.0%	2 3.7%	1 2.5%	-	-	1 2.4%	-	2 7.7%	1 2.2%	1 1.8%	1 2.7%
1962	1 0.7%	-	-	-	-	-	1 4.0%	-	1 2.2%	-	-
1963	2 1.3%	-	-	-	-	2 4.9%	-	-	-	1 1.8%	1 2.7%
1965	5 3.3%	1 1.9%	2 5.0%	-	2 3.8%	3 7.3%	-	-	3 6.5%	-	2 5.4%
1966	5 3.3%	1 1.9%	1 2.5%	1 5.3%	2 3.8%	-	-	3 11.5%	-	2 3.6%	2 5.4%
1967	7 4.7%	1 1.9%	2 5.0%	4 21.1% B	1 1.9%	3 7.3%	1 4.0%	2 7.7%	1 2.2%	1 1.8%	5 13.5% iJ
1968	1 0.7%	-	-	-	1 1.9%	-	-	-	-	-	1 2.7%

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table d7 Page 204
(Continued)
DEC Res Assessments Survey Results (Opinion Dynamics #7880)

D7. In what year were you born?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
1969	1 0.7%	-	1 2.5%	-	-	1 2.4%	-	-	-	-	1 2.7%
1970	2 1.3%	1 1.9%	-	1 5.3%	-	1 2.4%	1 4.0%	-	-	1 1.8%	1 2.7%
1971	2 1.3%	1 1.9%	-	-	-	1 2.4%	-	1 3.8%	-	-	2 5.4%
1972	3 2.0%	-	2 5.0%	1 5.3%	1 1.9%	-	2 8.0%	-	-	2 3.6%	1 2.7%
1973	1 0.7%	1 1.9%	-	-	-	-	-	1 3.8%	1 2.2%	-	-
1974	1 0.7%	1 1.9%	-	-	1 1.9%	-	-	-	-	-	-
1975	2 1.3%	1 1.9%	1 2.5%	-	1 1.9%	-	1 4.0%	-	-	1 1.8%	1 2.7%
1977	1 0.7%	1 1.9%	-	-	1 1.9%	-	-	-	1 2.2%	-	-
1978	1 0.7%	-	-	1 5.3%	-	-	-	1 3.8%	-	-	1 2.7%
1979	3 2.0%	-	2 5.0%	1 5.3%	-	2 4.9%	1 4.0%	-	-	2 3.6%	1 2.7%
1980	1 0.7%	-	1 2.5%	-	-	-	-	1 3.8%	-	1 1.8%	-
1981	1 0.7%	-	1 2.5%	-	-	1 2.4%	-	-	-	-	1 2.7%

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table d7 Page 205
(Continued)
DEC Res Assessments Survey Results (Opinion Dynamics #7880)

D7. In what year were you born?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
1983	1 0.7%	-	-	-	-	-	1 4.0%	-	-	-	1 2.7%
1986	2 1.3%	-	2 5.0%	-	-	-	2 8.0%	-	-	2 3.6%	-
1987	1 0.7%	1 1.9%	-	-	-	1 2.4%	-	-	-	-	1 2.7%
1988	1 0.7%	-	-	1 5.3%	-	-	1 4.0%	-	-	1 1.8%	-
1989	1 0.7%	-	-	1 5.3%	-	-	1 4.0%	-	-	1 1.8%	-

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table d8 Page 206

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

D8. What is your highest level of education?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	150 100.0%	54 100.0%	40 100.0%	19 100.0%	52 100.0%	41 100.0%	25 100.0%	26 100.0%	46 100.0%	56 100.0%	37 100.0%
Less than a high school degree	13 8.7%	11 20.4%	-	-	13 25.0%	-	-	-	6 13.0% jk	2 3.6%	1 2.7%
High school degree	29 19.3%	15 27.8% c	5 12.5%	3 15.8%	29 55.8%	-	-	-	16 34.8% J	4 7.1%	8 21.6% j
Technical/trade school program	10 6.7%	4 7.4%	3 7.5%	-	10 19.2%	-	-	-	5 10.9%	5 8.9%	-
Associates degree or some college	41 27.3%	18 33.3%	10 25.0%	4 21.1%	-	41 100.0%	-	-	11 23.9%	15 26.8%	12 32.4%
Bachelor	25 16.7%	2 3.7%	10 25.0% B	8 42.1% B	-	-	25 100.0%	-	2 4.3%	15 26.8% I	7 18.9% I
Graduate / professional degree, e.g., J.D., MBA, MD, etc.	26 17.3%	4 7.4%	12 30.0% B	4 21.1%	-	-	-	26 100.0%	4 8.7%	13 23.2% I	9 24.3% i
(Don't know)	-	-	-	-	-	-	-	-	-	-	-
(Refused)	6 4.0%	-	-	-	-	-	-	-	2 4.3%	2 3.6%	-

```
Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.
```

Table d9 Page 207

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

D9. Which of the following best describes your current employment status?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	150 100.0%	54 100.0%	40 100.0%	19 100.0%	52 100.0%	41 100.0%	25 100.0%	26 100.0%	46 100.0%	56 100.0%	37 100.0%
Employed full-time	47 31.3%	8 14.8%	21 52.5% B	12 63.2% B	9 17.3%	15 36.6% E	12 48.0% E	11 42.3% E	8 17.4%	17 30.4%	21 56.8% IJ
Employed part-time	11 7.3%	5 9.3%	1 2.5%	1 5.3%	4 7.7%	4 9.8%	3 12.0%	-	3 6.5%	1 1.8%	5 13.5% J
Retired	76 50.7%	35 64.8% CD	16 40.0%	6 31.6%	33 63.5% fG	19 46.3%	10 40.0%	13 50.0%	28 60.9% K	36 64.3% K	7 18.9%
Not employed, but actively looking	-	-	-	-	-	-	-	-	-	-	-
Not employed, and not looking	9 6.0%	6 11.1% c	1 2.5%	-	4 7.7%	3 7.3%	-	2 7.7%	4 8.7%	1 1.8%	3 8.1%
(Don't know)	1 0.7%	-	1 2.5%	-	1 1.9%	-	-	-	1 2.2%	-	-
(Refused)	6 4.0%	-	-	-	1 1.9%	-	-	-	2 4.3%	1 1.8%	1 2.7%

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table d10 Page 208

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

D10. Which category best describes your annual household income in 2016?

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	150 100.0%	54 100.0%	40 100.0%	19 100.0%	52 100.0%	41 100.0%	25 100.0%	26 100.0%	46 100.0%	56 100.0%	37 100.0%
Less than $25,000	37 24.7%	37 68.5%	-	-	23 44.2% H	13 31.7% H	-	1 3.8%	22 47.8% JK	7 12.5%	4 10.8%
$25,000 to just under $50,000	17 11.3%	17 31.5%	-	-	7 13.5%	5 12.2%	2 8.0%	3 11.5%	7 15.2%	5 8.9%	4 10.8%
$50,000 to just under $75,000	25 16.7%	-	25 62.5%	-	4 7.7%	7 17.1%	8 32.0% E	6 23.1% e	3 6.5%	15 26.8% I	7 18.9% i
$75,000 to just under $100,000	15 10.0%	-	15 37.5%	-	4 7.7%	3 7.3%	2 8.0%	6 23.1% ef	4 8.7%	5 8.9%	6 16.2%
$100,000 to just under $150,000	12 8.0%	-	-	12 63.2%	2 3.8%	2 4.9%	5 20.0% ef	3 11.5%	-	8 14.3%	4 10.8%
$150,000 or more	7 4.7%	-	-	7 36.8%	1 1.9%	2 4.9%	3 12.0%	1 3.8%	1 2.2%	2 3.6%	4 10.8%
(Don't know)	2 1.3%	-	-	-	-	2 4.9%	-	-	1 2.2%	-	-
(Refused)	35 23.3%	-	-	-	11 21.2%	7 17.1%	5 20.0%	6 23.1%	8 17.4%	14 25.0%	8 21.6%

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Table d11 Page 209

DEC Res Assessments Survey Results (Opinion Dynamics #7880)

(RECORD GENDER)

	Total	Income			Education				Year House was Built		
		< 50k	50k-100k	> 100k	No Coll	Some Coll	Bachelor	Graduate	< 1970	1970-1999	2000+
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Total	150	54	40	19	52	41	25	26	46	56	37
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Male	67	14	27	12	21	20	12	13	17	31	16
	44.7%	25.9%	67.5%	63.2%	40.4%	48.8%	48.0%	50.0%	37.0%	55.4%	43.2%
			B	B						i	
Female	83	40	13	7	31	21	13	13	29	25	21
	55.3%	74.1%	32.5%	36.8%	59.6%	51.2%	52.0%	50.0%	63.0%	44.6%	56.8%
		CD							j		

Comparison Groups: BCD/EFGH/IJK
Z-Test for Percentages
Uppercase letters indicate significance at the 95% level.
Lowercase letters indicate significance at the 90% level.

Appendix C. Detailed Free-Ridership Methodology

In this section, we detail the free-ridership (FR) algorithms used in this evaluation. We used one algorithm for LED FR and a separate algorithm for all other program measures (including the assessment itself). We chose to use a separate LED FR algorithm to ensure consistency across Duke Energy program evaluations. Specifically, we chose to adopt the LED FR battery used to evaluate the Residential Lighting Program and we describe this approach below.

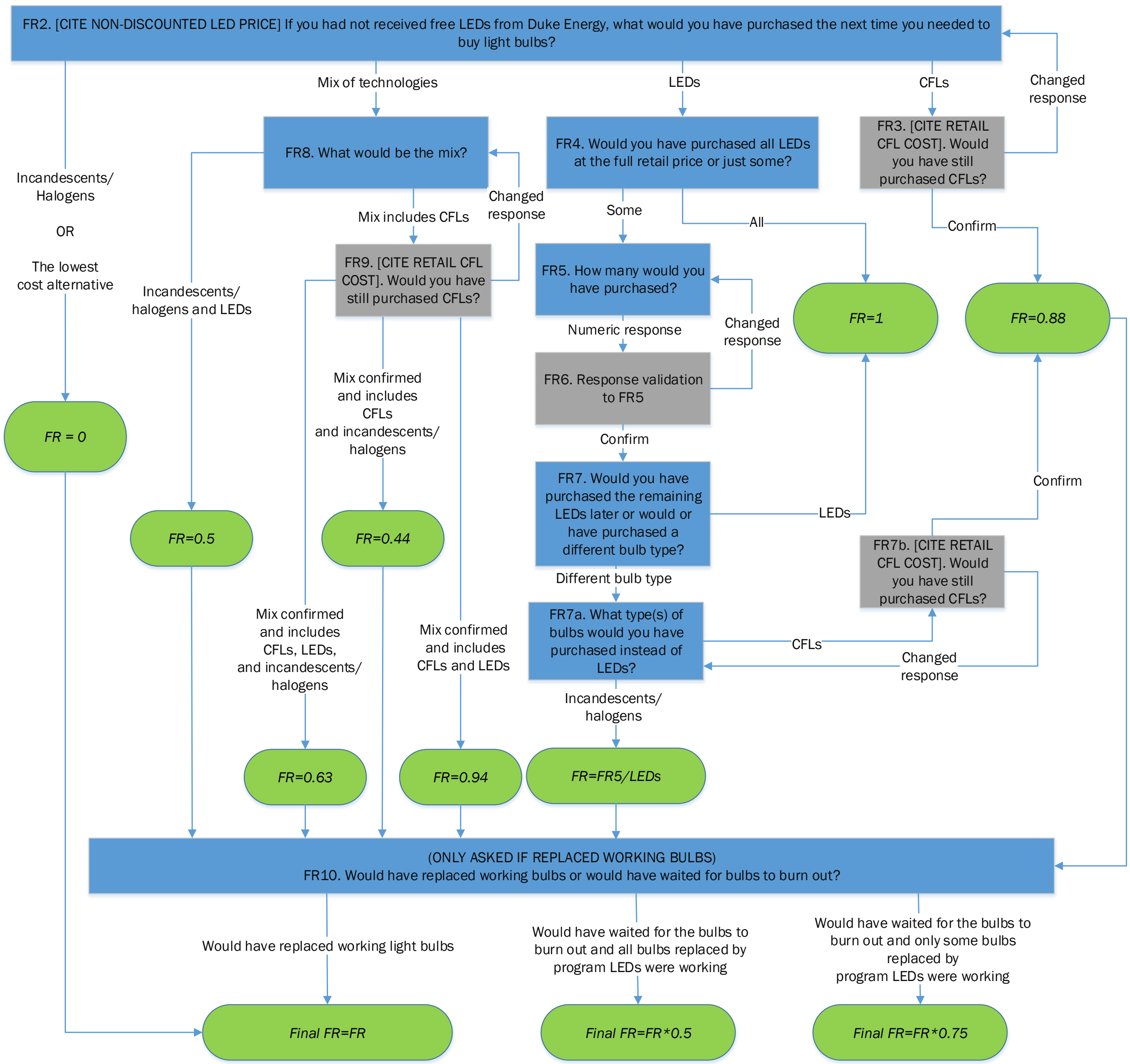
LED Free-Ridership Algorithm Description

Participants of the Residential Energy Assessment (REA) program received free LEDs in Energy Efficiency Starter Kits. As such, we asked participants questions about their purchase behaviors and decisions **in the absence** of the free LED kit offering. If they would have purchased the same level of efficiency, then these participants would be considered free-riders. Figure C-1 provides details of the FR algorithm. Blue boxes in the graphic are questions used in the calculation of the FR score, grey boxes are validation and consistency check questions, and green boxes are FR calculations.

We first asked participants what they would have purchased the next time they needed light bulbs if they had not received free LEDs in their energy efficiency kit. We included retail LED pricing as part of the question to make sure that participants provided responses with consideration of LED costs. Participants who said that they would have purchased incandescents, halogens, or the lowest-cost light bulb option were classified as non-free-riders. Participants who said that they would have purchased LEDs received follow-up questions asking about the timing and the quantity of the counterfactual LED purchase. Participants who reported purchasing CFLs in the absence of the program received a follow-up question validating their response. As part of the question, we provided retail prices for CFLs and asked participants to confirm their counterfactual product choice. Participants who reported purchasing a mix of products in the absence of the program received follow-up questions exploring the mix and validating respondent choices of the products in the mix.

Finally, as part of the FR algorithm, we explored installation patterns of program LEDs and gave the program additional credit in cases where it motivated customers to replace **working**, less-efficient products instead of waiting for those bulbs to burn out. By encouraging participants to replace working light bulbs, the program accelerates energy savings and therefore deserves a credit. In cases where participants said that in the absence of the program they would have waited for their bulbs to burn out, we gave the program the credit depending on the number of **working** light bulbs that program LEDs replaced.

Figure C-1. LED Free-Ridership Algorithm



As part of calculating the FR, we made reasonable imputations where participant responses were missing or contradictory.

Using the above-outlined algorithm, we calculated a FR rate for each respondent. We aggregated respondent results to the program level by weighting individual participant responses by the energy savings associated with installed LEDs.

All Other Measures Free-Ridership Algorithm Description

Evaluations of energy efficiency programs typically measure the program influence on *what* customers install, *when* they install it, and *how much* they install. As such, the FR algorithm used for all other program measures combines the estimates of each of these concepts:

- **Efficiency:** Did the program intervention cause participants to install a higher-efficiency measure than they otherwise would have?
- **Quantity:** Did the program intervention cause participants to install more of the equipment than they would have if they had to pay full retail price?
- **Timing:** Did the program intervention cause participants to install equipment in place of *working*, less-efficient equipment rather than waiting for the equipment to stop functioning?

To assess FR for all other program measures (including the energy assessment itself), the evaluation team used a multiplicative algorithm based on the likelihood that the participant would have installed the measure on his/her own within the next year (PI), adjusted by the program's influence on measure quantity (PQ) and installation timing (PT).

Table C-1 shows how responses to the FR questions are scored for non-lighting measures, i.e., faucet aerators, low-flow shower heads, outlet covers, and weather stripping.

Table C-1. FR Algorithm Framework

Question Type	Algorithm Component*	Survey Questions	Response and Scoring
PI	If you had not received free FA/SH/G/W during the energy audit, how likely is it that you would have installed any FA/SH/G/W on your own within the next year?	FA4, SH7, G5, W3	Scalar 0 to 10; 0=not at all likely, 10= extremely likely • PI = x ÷ 10 • DK/Ref: Removed from FR analysis
PQ	If you had not received free FA/SH/G/W during the energy audit, would you have installed the same number or fewer FA/SH/G/W than were installed?	FA5, SH8, G6, W4	• None = 0 • Fewer = 0.5 • The same = 1 • More = 1 • DK/Ref = Removed from FR analysis
PT	If you had not received free FA/SH/G/W from the energy audit, when would you have installed FA/SH/G/W on your own?	FA6, SH9, G7, W5	• Same time = 1 • Within 6 months = 0.5 • Within a year = 0.33 • More than a year = 0 • DK/Ref = Removed from FR analysis

* FA = Faucet aerators, SH = Shower heads, G = Outlet seals, W = Weather stripping, DK/Ref = Don't know/Refused.

To calculate the measure-level FR score, we multiply the three components together as shown below:

$$FR = PI * PQ * PT$$

A FR score of 1 means that the participant is a full free-rider (the program gets no credit for the measure), while a FR score of 0 means the participant is not at all a free-rider (the program gets full credit for the measure). Program-level FR for each measure is calculated as the average across all participant-level FR scores.

Appendix D. Impact Calculation Tables

The impact calculations tables contain the detailed engineering analysis of program gross and net impacts. A separately provided Microsoft Excel file contains all of the gross savings assumptions, evaluated gross savings, net-to-gross ratios (NTGRs), evaluated net savings, and recommended gross savings.

Appendix E. Engineering Algorithms and Assumptions

This appendix presents the deemed savings memorandum for the Duke Energy Carolinas (DEC) Residential Energy Assessment (REA) program, delivered under separate cover by Opinion Dynamics and originally dated January 1, 2017. The deemed savings review was revised and resubmitted to Duke Energy on April 6, 2018.

LEDs

Table E- documents the proposed inputs and methodology for estimating savings for LEDs for the 2016–2017 REA program.

Table E-1. Algorithms and Inputs for LEDs

Algorithms		
kWh Savings	= (Baseline Watts – LED Watts) ÷ 1,000 * Hours * (1 + WHFe)	
kW Savings (summer)	= (Baseline Watts – LED Watts) ÷ 1,000 * CF_s * (1 + $WHFd_s$)	
kW Savings (winter)	= (Baseline Watts – LED Watts) ÷ 1,000 * CF_w * (1 + $WHFd_w$)	
Parameter	**Value**	**Source/Notes**
Baseline Watts	43	From ENERGY STAR® website, converts LED wattage (9W) to equivalent incandescent wattage (60W) and then adjusts based on Energy Independence and Security Act (EISA) requirements (43W).
LED Watts	9	Wattage of bulbs contained in kit.
Hours	1,052	2017 DEC/DEP Residential Lighting Hours of Use Study.
Summer Coincidence Factor (CF_s)	0.13	
Winter Coincidence Factor (CF_w)	0.15	
Energy Waste Heat Factor (WHFe)	−0.037	2012 DEC Smart $aver Program Evaluation. This is the best available source for energy and demand waste heat factor for this evaluation.
Summer Demand Waste Heat Factor ($WHFd_s$)	0.168	
Winter Demand Waste Heat Factor ($WHFd_w$)	−0.500	2012 DEP Energy Efficient Lighting Program Evaluation.

Table E-2 displays the proposed per-measure deemed savings for LEDs for the 2017 evaluation.

Table E-2. Per-Measure Savings for LEDs

Measure (per bulb)	Savings Unit	Savings
9W LEDs	Energy Savings (kWh)	34.50
	Summer Demand Savings (kW)	0.0051
	Winter Demand Savings (kW)	0.0025

Low-Flow Shower Heads

Table E-3 documents the proposed inputs and methodology for estimating low-flow shower head savings for the 2016–2017 REA program.

Table E-3. Algorithms and Inputs for Low-Flow Shower Heads

Algorithms		
kWh Savings	= (Baseline GPM – Efficient GPM) * (Mins/shower) * (Showers/shower head/week) * (weeks/year) * (Tmix – Tinlet) * 8.33 ÷ 3,412 ÷ RE * %ElecWH	
kW Savings	= (Baseline GPM – Efficient GPM) * 60 * 8.33 * (Tmix – Tinlet) ÷ RE ÷ 3,412 * CF * %ElecWH	
Parameter	**Value**	**Source/Notes**
Baseline GPM	2.63	Indiana Technical Reference Manual V2.2 (IN TRM V2.2), based on Residential Core Plus Evaluation, Multifamily Direct Install Program. 2012.
Efficient GPM	1.74	
Mins/shower	7.80	IN TRM V2.2, based on Michigan Evaluation Working Group Showerhead and Faucet Aerator Meter Study. June 2013 (Michigan Showerhead/Faucet Aerator Study).
Showers/shower head/ week	8.99	2017 DEC participant survey.
Weeks/year	52.18	Weeks per year conversion.
Shower Water Temperature (Tmix)	101 °F	Michigan Showerhead/Faucet Aerator Study.
Inlet water Temperature (Tinlet)	65.1 °F	NREL Domestic Hot Water Event Generator calculator for average between Charlotte, NC; Greensboro, NC; and Greenville, SC.
Conversion	8.33	Specific heat of water (Btu/Gal °F)
Conversion	3,412	Btu to kWh conversion (Btu/kWh)
Conversion	60	Minutes to hour conversion (min/hour)
Recovery Efficiency (RE)	0.98	Recovery efficiency for standard electric resistance water heaters (consistent assumption across Illinois [IL] TRM, IN TRM, and Arkansas [ARK] TRM).
%ElecWH	69%	2017 DEC participant survey.
Summer Coincidence Factor (CF)	0.0023	IN TRM V2.2.
Winter CF	0.0046	According to Duke, the winter peak is from 7 AM to 8 AM. Reliable data do not exist for winter CFs for showers during the 7–8 AM hour. We expect customers to use showers more frequently during the winter peak hour than the summer peak hour (4–5 PM). We assume the frequency is approximately double, and therefore double the summer CF to estimate winter CF.

Table E-4 displays the proposed per-measure deemed savings for low-flow shower heads for the 2016–2017 evaluation.

Table E-4. Per-Measure Savings for Low-Flow Shower Heads

Measure (per shower head)	Savings Unit	Savings
Low-Flow Shower Head	Energy Savings (kWh)	200.92
	Summer Demand Savings (kW)	0.0076
	Winter Demand Savings (kW)	0.0152

Faucet Aerators

Table E-5 documents the proposed inputs and methodology for estimating aerator savings for the 2016–2017 REA program. We estimate savings for bathroom aerators and kitchen aerators separately, as the two measures perform differently in their use. For example, households tend to use kitchen faucets more than bathroom faucets throughout the day and they typically have a higher flow rate.

Table E-5. Algorithms and Inputs for Aerators

Algorithms		
kWh Savings	= (Baseline GPM − Efficient GPM) * (Mins/person/day) * (people/household) ÷ (faucets/household) * 365.25 * (Tmix − Tinlet) * 8.33 ÷ 3,412 ÷ RE * DF * %ElecWH	
kW Savings	= (Baseline GPM − Efficient GPM) * 60 * 8.3 * (Tmix − Tinlet) ÷ RE ÷ 3,412 * CF * DF * %ElecWH	
Parameter	**Value**	**Source/Notes**
Baseline GPM (bathroom)	1.90	IN TRM V2.2, based on Residential Core Plus Evaluation, Multifamily Direct Install Program. 2012.
Baseline GPM (kitchen)	2.44	
Efficient GPM (bathroom)	1.01	IN TRM V2.2, based on Residential Core Plus Evaluation, Multifamily Direct Install Program. 2012.
Efficient GPM (kitchen)	1.49	
Minutes/person/day (bathroom)	1.60	Michigan Showerhead/Faucet Aerator Study.
Minutes/person/day (kitchen)	4.50	
People/household	2.6	2017 DEC participant survey.
Conversion	8.33	Specific heat of water (Btu/Gal °F)
Conversion	3,412	Btu to kWh conversion (Btu/kWh)
Conversion	60	Minutes to hour conversion (min/hour)
Conversion	365.25	Days in a year (days/year)
Faucets/household (bathroom)	1.91	Michigan Showerhead/Faucet Aerator Study.
Faucets/household (kitchen)	1.00	
Faucet water temperature (Tmix) (bathroom)	86 °F	IL TRM V5.0, based on Michigan Showerhead/Faucet Aerator Study
Faucet water temperature (Tmix) (kitchen)	93 °F	
Inlet Water Temperature (Tinlet)	65.1 °F	NREL Domestic Hot Water Event Generator calculator for average between Charlotte, NC; Greensboro, NC; and Greenville, SC.
Recovery Efficiency (RE)	0.98	Recovery efficiency for standard electric resistance water heaters (consistent assumption across IL TRM, IN TRM, and ARK TRM).
%ElecWH	69%	2017 DEC participant survey.
Summer Coincidence Factor (CF) (bathroom)	0.0012	IN TRM V2.2.
Summer CF (kitchen)	0.0033	
Winter CF (bathroom)	0.0024	According to Duke, the winter peak is from 7 AM to 8 AM. Reliable data do not exist for winter CFs for faucets during the 7–8 AM hour. We expect customers to use faucets more frequently during the winter peak hour than the summer peak hour (4–5 PM). We assume the frequency is approximately double, and therefore double the summer CF to estimate winter CF.
Winter CF (kitchen)	0.0066	

Parameter	Value	Source/Notes
Drain Factor (DF) (bathroom)	90%	IL TRM V5.0. This represents the portion of the water that flows directly down the drain and not collected for another purpose. If the water is collected, it will not save any energy, as the volume is constant regardless of the flow rate.
DF (kitchen)	75%	

Table E-6 displays the proposed per-measure deemed savings for faucet aerators for the 2016–2017 evaluation.

Table E-6. Per-Measure Savings Comparison for Faucet Aerators

Measure (per aerator)	Savings Unit	Savings
Faucet Aerator (bathroom)	Energy Savings (kWh)	22.60
	Summer Demand Savings (kW)	0.0021
	Winter Demand Savings (kW)	0.0041
Faucet Aerator (kitchen)	Energy Savings (kWh)	144.19
	Summer Demand Savings (kW)	0.0068
	Winter Demand Savings (kW)	0.0135
Weighted Average	Energy Savings (kWh)	83.40
	Summer Demand Savings (kW)	0.0044
	Winter Demand Savings (kW)	0.0088

Outlet Seals

Table E-7 documents the inputs and methodology for estimating savings from outlet gaskets for the 2016–2017 REA program. We originally grouped the savings for this measure with the weather stripping measure as calculating savings for both measures separately can be imprecise when using algorithms and engineering assumptions. Also, outlet gaskets and weather stripping are both related to air sealing a home, so we felt it would be more accurate to group the savings together. We present savings below for outlet gaskets and weather stripping separately, but note that there is large uncertainty around engineering estimates for these types of measures.

Table E-7. Algorithms and Inputs for Outlet Gaskets

Algorithms		
kWh Savings	Cooling Savings = (Home Size * Height * ACH * Infil% ÷ Outlets * 0.018 * CDD * 24 ÷ 1,000 ÷ nCool * %AC * DUA) Heating Savings = (Home Size * Height * ACH * Infil% ÷ Outlets * 0.018 * HDD * 24 ÷ 3,412 ÷ nHeat * %ElecHeat)	
kW Savings (summer)	Cooling kWh Savings ÷ FLHcool * CFs	
kW Savings (winter)	Heating kWh Savings ÷ FLHheat * CFw	
Parameter	**Value**	**Source/Notes**
Home Size (ft^2)	2,776	2017 DEC participant survey.
Height (ft)	8	Assume ceiling height of 8 ft. Default assumption using outlet cover savings calculator: https://www.energyearth.com/product/calculatesavings/am-foam-outlet-gaskets.

Parameter	Value	Source/Notes
Air Change per Hour (ACH)	0.9	Assumes older home that has weather stripping. https://www.energyearth.com/product/calculatesavings/am-foam-outlet-gaskets.
Infil%	1%	Infiltration percentage. The following website assumes 2% as default. Assumed 1% to be conservative. https://www.energyearth.com/product/calculatesavings/am-foam-outlet-gaskets.
Outlets	30	Number of exterior outlets in the home. The following website assumes 20 as default, but air can leak through all outlets and switches based on a review of several sources. Assumed 30 to be conservative. https://www.energyearth.com/product/calculatesavings/am-foam-outlet-gaskets.
Heat capacity	0.018	Volumetric heat capacity of air.
Cooling Degree-Days (CDD)	1,596	ASHRAE Fundamentals 2013. Average of cities across DEC service territory - Charlotte, NC; Greensboro, NC; and Greenville, SC.
Heating Degree-Days (HDD)	3,250	ASHRAE Fundamentals 2013. Average of cities across DEC service territory - Charlotte, NC; Greensboro, NC; and Greenville, SC.
Conversion	24	Hours per day.
Conversion	1,000	Watts per kilowatt.
Conversion	3,412	Btus per kilowatt hour.
Efficiency of air conditioning (nCool)	13	Assume 13 seasonal energy efficiency ratio (SEER) based on several TRMs. Assume equipment installed after 2006.
%AC	89%	2017 DEC participant survey.
Discretionary Use Adjustment (DUA)	0.75	Discretionary Use Adjustment. Common to most TRMs. Represents the fact that not all people use air conditioning when the temperature calls for it.
Cooling kWh Savings	0.24	Calculated (per outlet gasket).
nHeat	1.52	Calculated. Weighted average based on type of heating in North Carolina and South Carolina from Residential Energy Consumption Survey (RECS) data.
%ElecHeat	57%	2017 DEC participant survey.
% heat pump	46%	2009 RECS data for North Carolina and South Carolina.
% resistance	49%	
COP heat pump	2.26	Mid-Atlantic TRM.
COP electric resistance	1.0	
Heating kWh Savings	1.0	Calculated (per outlet seal).
FLHcool	1,305	EPA Calculator. Average of cities across DEC service territory (Charlotte, NC; Greensboro, NC; and Greenville, SC).
Summer CF (CFs)	0.88	IN TRM V2.2. Duke Energy data for residential air conditioning loads.
Winter CF (CFw)	1.0	Review of several TRMs. Assume heating operates during peak winter hour.
FLHheat	1,884	EPA Calculator. Average of cities across DEC service territory (Charlotte, NC; Greensboro, NC; and Greenville, SC).

Table E-8 displays the deemed savings for the 2017 evaluation for outlet gaskets (per gasket and for the total six gaskets included in each kit).

Table E-8. Per-Measure Savings for Outlet Gaskets

Measure	Savings Units	Savings
Outlet seals (per seal)	Energy Savings (kWh)	1.20
	Summer Demand Savings (kW)	0.0002
	Winter Demand Savings (kW)	0.0005
Outlet seals (per home/six seals)	Energy Savings (kWh)	7.50
	Summer Demand Savings (kW)	0.0010
	Winter Demand Savings (kW)	0.0033

Weather stripping

Table E-9 documents the inputs and methodology for estimating weather stripping for the 2016–2017 REA program. Since our original method for calculating savings included both weather stripping and outlet gaskets, we have netted out the outlet gasket savings from the calculated savings below.

Table E-9. Algorithms and Inputs for Weather stripping

Algorithms		
kWh Savings	Cooling Savings = (CFM50Baseline − CFM50Upgrade) ÷ Nfactor * 1,440 * CDD * DUA * 0.018 ÷ 1000 ÷ nCool * LM * %AC * AF Heating Savings = (CFM50Baseline − CFM50Upgrade) ÷ Nfactor * 1,440 * HDD * 0.018 ÷ 3,412 ÷ nHeat * AF * %ElecHeat	
kW Savings (summer)	= Cooling kWh Savings ÷ FLHcool * CFs	
kW Savings (winter)	= Heating kWh Savings ÷ FLHheat * CFw	
Parameter	**Value**	**Source/Notes**
Baseline ACH50	17.80	ENERGY STAR savings analysis assumptions for North Carolina and South Carolina (Average IECC Climate Zones 3 and 4). https://energycode.pnl.gov/EnergyCodeReqs/. Assume air sealing for “Windows, Doors and Walls.” https://www.energystar.gov/ia/home_improvement/home_sealing/Measure_Upgrade_Assumptions.pdf?945a-eddc.
Upgrade ACH50	17.35	
Home volume (ft³)	22,206	2017 DEC participant survey yields average home sf of 2,776 ft². Assume 8 ft ceilings.
CFM50Baseline	6,588	Calculated from ACH50 and home volume (= ACH50 * Home volume ÷ 60 minutes). http://www.pureenergyaudits.com/docs/Blower_Door_Handout_ACI_Baltimore.pdf.
CFM50Upgrade	6,421	
Nfactor	18.89	LBNL Study: http://www.waptac.org/data/files/Website_docs/Technical_Tools/Building%20Tightness%20Limits.pdf. Average of all exposure levels and number of stories values for Zone 3 (North Carolina and South Carolina). Nfactor is a conversion from measured airflows to natural airflows based on exposure level.
Conversion	1,440	Minutes per day (min/day).
CDD	1,596	American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) Fundamentals 2013. Average of cities across DEC service territory (Charlotte, NC; Greensboro, NC; and Greenville, SC).

DUA	0.75	Discretionary Use Adjustment. Common to most TRMs.
Parameter	**Value**	**Source/Notes**
Heat capacity	0.018	Volumetric heat capacity of air.
Conversion	1,000	Watts per kilowatt.
Efficiency of air conditioning (nCool)	13	Assume 13 SEER based on several TRMs. Assume equipment installed after 2006.
Latent multiplier (LM)	8.1	LM to account for latent cooling demand. This is used to convert the sensible cooling savings to a value representing both sensible and latent cooling loads. The value is derived from Harriman et al., “Dehumidification and Cooling Loads from Ventilation Air,” ASHRAE Journal, November 1997. We used an average of Raleigh, NC and Charleston, NC as the cities to represent DEC territory. We calculate the multiplier by adding the latent (NC:6.0, SC:9.0) and sensible (0.6) and dividing by the sensible (NC:0.9, SC:1.2).
%AC	89%	2017 DEC participant survey.
Weather stripping adjustment factor (AF)	33%	Adjustment to account for the fact that this is weather stripping only and not air sealing. ASHRAE recommends buildings that are weatherstripped will reduce infiltration by 1/3 (Energy Management Handbook, 8th Edition, Turner, Doty, 2013).
Cooling kWh Savings	49.93	Calculated.
HDD	3,250	ASHRAE Fundamentals 2013. Average of cities across DEC service territory: Charlotte, NC; Greensboro, NC; and Greenville, SC.
Conversion	3,412	Btus per kWh.
nHeat	1.5	Calculated. Weighted average efficiency based on % heat pump and % resistance heating in North Carolina and South Carolina from RECS data.
%ElecHeat	57%	2017 DEC participant survey.
% heat pump	46%	2009 RECS data for North Carolina and South Carolina.
% resistance	49%	
COP heat pump	2.26	Mid-Atlantic TRM V4.0.
COP electric resistance	1.0	
Heating kWh Savings	26.51	Calculated.
FLHcool	1,305	EPA Calculator. Average of cities across DEC service territory (Charlotte, NC; Greensboro, NC; and Greenville, SC).
Summer CF (CFs)	0.88	IN TRM V2.2. Duke Energy data for residential air conditioning loads.
Winter CF (CFw)	1.0	Review of several TRMs. Assume heating operates during peak winter hours.
FLHheat	1,884	EPA Calculator. Average of cities across DEC service territory (Charlotte, NC; Greensboro, NC; and Greenville, SC).

Table E-10 displays the proposed deemed savings for the 2016–2017 evaluation for weather stripping. Our methodology for weather stripping originally included the savings for outlet seals, so we continue to show those combined savings in Table E-10. We also separate out savings for weather stripping only, which net out the outlet seal savings calculated above.

Table E-10. Per-Measure Savings for Weather stripping

Measure	Savings Units	Savings
Combined weather stripping and outlet seals (per home)	Energy Savings (kWh)	83.90
	Summer Demand Savings (kW)	0.0346
	Winter Demand Savings (kW)	0.0173
Weather stripping only (per home)	Energy Savings (kWh)	76.40
	Summer Demand Savings (kW)	0.0337
	Winter Demand Savings (kW)	0.0141

Key References

Reference	Source
ASHRAE 2017	American Society of Heating, Refrigerating and Air-Conditioning Engineers: 2017 Fundamentals.
DEC/DEP lighting logger study	2017 DEC and DEP residential lighting logger study (Opinion Dynamics).
ENERGY STAR	ENERGY STAR savings analysis assumptions.
EPA Study	EPA Study for HVAC hours of use. 2002.
Harriman et al	“Dehumidification and Cooling Loads from Ventilation Air,” ASHRAE Journal, November 1997. http://www.gastechnology.org/reports_software/Documents/BinMaker-Pro-Vent-Cool-Loads.pdf.
Illinois TRM	Illinois Statewide Technical Reference Manual. Version 5.0. February 11, 2016.
Indiana TRM	Indiana Technical Reference Manual. Version 2.2. July 28, 2015.
Michigan Showerhead/Faucet Aerator Study	Michigan Evaluation Working Group Showerhead and Faucet Aerator Meter Study Memorandum. June 2013.
Mid-Atlantic TRM	Mid-Atlantic Technical Reference Manual. Version 7.0. May 2017.
NREL Domestic Hot Water Event generator	National Renewable Energy Laboratory (NREL) Domestic Hot Water Event generator. 2013.
RECS Data	U.S. Energy Information Administration, 2009 Residential Energy Consumption Survey (RECS), North Carolina and South Carolina.
2017 DEO Participant Survey	Opinion Dynamics survey completed in 2017 with DEO Residential Assessment participants.

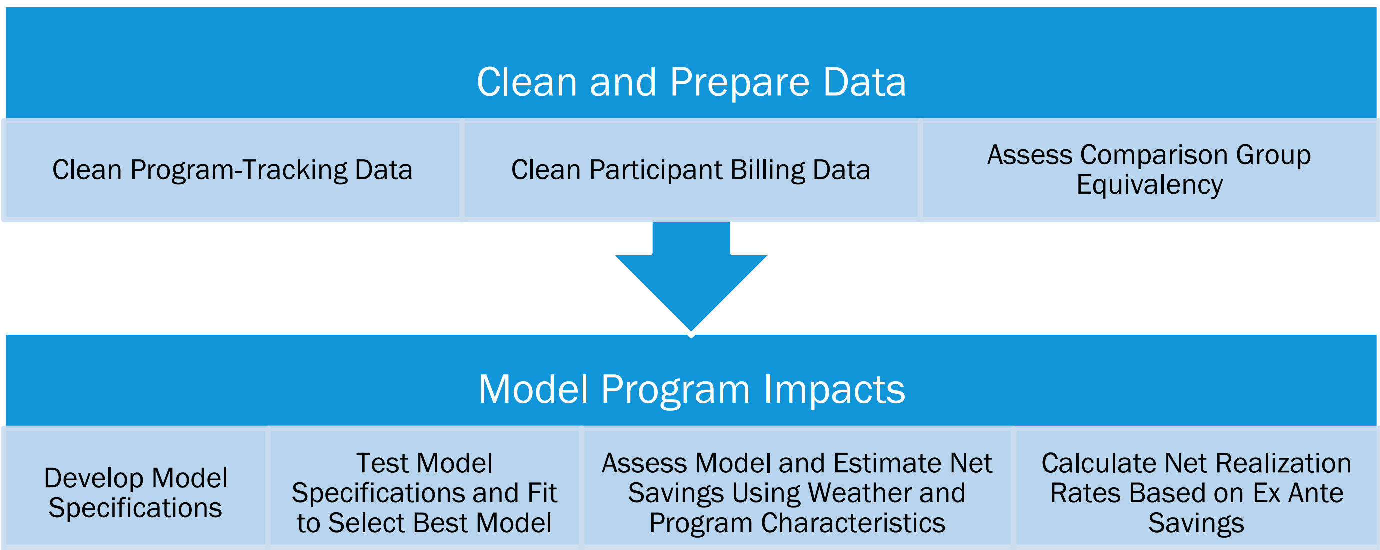
Appendix F. Detailed Methodology: Billing Analysis

The evaluation team conducted a billing analysis using a linear fixed effects regression (LFER) model, with the goal of determining the overall ex post net program savings of the Duke Energy Carolinas (DEC) Residential Energy Assessment (REA) program. The fixed effect in the model is at the individual account level, which allows all household factors that do not vary over time to be controlled for by the model.

Data Collection

As part of the billing analysis of REA program participants, the evaluation team followed a standard series of steps for data collection, model specification, and analysis. Section 5.1.1 in the body of the report provides a summary of our billing analysis approach, and Figure F-1 outlines the steps.

Figure F-1. Billing Analysis Approach



Comparison Group Selection

A key challenge for estimating energy savings through a billing analysis is the identification of an appropriate comparison group or “counterfactual” to represent a baseline for what participants would have done (and how much energy they would have consumed) in the absence of a program. There are two key considerations in the design of a comparison group. A good comparison group has similar energy usage patterns (compared to participants) before participation (i.e., pre-participation period) and effectively addresses self-selection bias (the correlation between the propensity to participate in a program and energy use). Given this, we aim to use a comparison group that, on average, exhibits very similar usage patterns prior to participation. If there are some differences in energy use patterns between participants and comparison group customers, those differences must be addressed in the model. Achieving this ensures that estimates from our quasi-experiment are representative of the actual effects that the program has on a customer’s energy use. For our comparison group, we use customers who participated from May 2017 to December 2017. In the context of the evaluation period, these customers have not yet participated in the program, but will do so in the future. Using future participants as a comparison group is attractive because we know that both groups will eventually participate, allowing us to assume that they are similar in many respects, most notably self-selection.

Billing analyses, when using an appropriate comparison group, incorporate the effects of both free-ridership (FR) and participant spillover (SO), thus providing program net savings. For example, the energy use patterns of the members of the comparison group, during their pre-participation period, reflect equipment installations and behavioral changes that treatment group participants might have performed in the absence of the program. In addition, any measures installed during the evaluation period beyond program measures (SO) are a factor in an increased coefficient for the participation variables. To investigate how similar the groups are, we first compare the energy usage of the treatment and comparison groups prior to participation.

Weather is also of interest when selecting a comparison group, as stark differences in weather between the treatment and comparison groups can introduce bias. We found that participants from each group experienced nearly identical weather.

Our billing analysis used participants from the evaluation period as the treatment group and future participants as the comparison group. Our method requires post-installation electricity usage data for at least 9 months after participation. Pre-participation energy usage of our comparison group was somewhat different from that of the treatment group (see the section on baseline average daily energy consumption, below). The evaluation team incorporated several adjustments into our fixed effects models to adjust for these differences in pre-participation period usage between treatment and comparison groups.

Data Cleaning and Preparation

This section summarizes how we cleaned and prepared the program participant databases and billing data for the billing analysis.

Program-Tracking Data

As a first step, the evaluation team prepared a master participant dataset that combined the program-tracking data from each year with dates of participation in other Duke Energy programs. This master dataset was composed of customer information that included:

- **Participation date:** The date of participation in the REA program to ensure that customers participated during the evaluation period.
- **Participation in other programs:** Customers who participated in multiple energy efficiency programs during the time period being analyzed may skew the observed effect of the REA program if they are not accounted for or removed.
- **Location:** We used the address and zip code of each customer to incorporate regional weather data.

Participant Billing Data

The participant monthly billing data from March 2014 to January 2017 were provided directly by Duke Energy. To develop the final dataset used for statistical analysis, we used a multistep approach to combining and cleaning the data. We describe each billing data-cleaning step below.

- **Cleaned individual billing periods:** After adjusting billing periods based on flags in the data indicating “estimated” or “adjusted” meter reads, we removed billing periods with a duration of 0 days or missing information. Usage records for these billing periods recorded either 0 kWh or positive kWh; many were the first meter read in the available billing history or a “turn-on” read. Nearly all accounts had typical billing periods of around 30 days. Additionally, we determined average usage for each observation (based on usage and number of billing days in the period), and assigned seasonal dummy variables to each of the monthly observations:

- Winter: December, January, February
- Spring: March, April, May
- Summer: June, July, August
- Fall: September, October, November

- **Removed all duplicate billing records:** Duplicate records represented fewer than 0.75% of the records in the data pulled from the data warehouse. In cases where the kWh values matched, one copy of the record was retained in the dataset and the duplicate was removed. Duplicate billing records with conflicting kWh values were dropped entirely.

- **Combined participant data with billing records:** We merged usage data with account-level data, including measure installation dates. We then assigned pre- and post-treatment billing periods based on those dates. We assigned billing periods before the first measure installation date to the pre-participation period, all bills following the last measure installation date as the post-participation period, and any bills occurring between installation dates (or in the month of the audit and measure installations) to a “dead-band” period that was not included in the analysis.

After individual billing records were cleaned and all data were combined, we removed accounts that did not meet certain criteria. We use the following criteria to ensure that all accounts in the final analysis file had sufficient data to allow for robust analysis:

- **Extremely high or low average daily consumption (ADC):** We removed customers with very high (>300 kWh/day on average) or very low (<2 kWh/day on average) pre- or post-participation usage. These data points were removed because their atypical usage patterns were likely due to factors that could not easily be controlled for in the model, and thus could have biased results.

- **Inadequate billing history before or after program participation:** The measures included in the kit were expected to generate energy savings throughout the year. To be able to assess changes in consumption due to program measures before and after installation, we included participants with a billing history covering, at a minimum, nine billing records before the first day of program participation, and the same amount of time after participation for our treatment group.

- **Inadequate billing history in the cooling season before and after program participation:** Participants with fewer than two billing records in the summer (cooling season) were excluded because we expected the measures installed to be generally weather sensitive both in terms of temperature and in terms of daylight hours. By ensuring that we have enough billing data in the months of June, July, and August, we allow for more rigorous savings estimates.

- **Participated in other Duke Energy programs:** We defined cross-participation as participants who received other program benefits (such as an appliance rebate) from another Duke Energy program. Due to the high rate of overlap in the MyHER program, those customers who participated only in MyHER and no other programs were not counted as cross-participants. Cross-participants were removed from our analysis to limit the risk of the effects of other programs being confounded with the treatment effect of the REA program.

Table F- shows how many accounts were removed from the analysis overall for each reason.

Table F-1. Accounts Removed from Analysis

Reason for Dropping Account	Comparison		Treatment	
	Accounts	Percent of Total	Accounts	Percent of Total
Total Unique Accounts	**8,260**		**8,140**	
Too few post-participation period bills (fewer than 9)	0	0%	298	4%
Too few pre-participation period bills (fewer than 9)	899	11%	1,033	13%
Low overall average usage (<2 kWh/day)	0	0%	5	0%
High overall average usage (>300 kWh/day)	0	0%	0	0%
Cross-participation	5,714	69%	4,879	60%
Accounts Remaining for Analysis	**1,647**	**20%**	**1,925**	**24%**

Comparison Group Equivalency

The comparison group was integral to our billing analysis methods and was used to develop a counterfactual representation of baseline energy used by participants in the absence of the program. Using future participants mitigates self-selection bias that may be present when comparing treatment participants to a general group of nonparticipating customers. It is important to check that the two groups of participants are equivalent on as many dimensions as possible and to correct for any observed differences in the model. Based on the information at our disposal, we analyzed two main criteria to determine that treatment group participants were equivalent to the comparison group participants, and could be used as a valid comparison group. These criteria are:

- **Weather:** Compared average monthly HDD and CDD.[1]
- **Baseline period ADC**: Similarity in ADC before engaging with the program might be a general proxy for behavioral similarities. As such, the evaluation team compared the baseline monthly ADC of participants in each group.

Based on the results of this equivalency check, we determined that the treatment and comparison participant groups used energy differently, but provided a reasonable comparison to analyze program impacts. We discuss each of these criteria in more detail below.

Weather

In order to include weather patterns in our model, we used daily weather data from numerous weather stations across the DEC territory, utilizing the site closest to each account's geographic location. By using multiple sites, we increased the accuracy of the weather data being applied to each account. We obtained these data from the National Climatic Data Center (NCDC).

The daily data were based on hourly average temperature readings from each day. We calculated CDD and HDD for each day (in the analysis and historical periods) based on average daily temperature using the same

[1] A "degree-day" is a unit of measure for recording how hot or how cold it has been over a 24-hour period. The number of degree-days applied to any particular day of the week is determined by calculating the mean temperature for the day and then comparing the mean temperature to a base value of 65 (HDD) and 75 (CDD) degrees F. (The "mean" temperature is calculated by adding together the high for the day and the low for the day, and then dividing the result by 2.) If the mean temperature for the day is 5 degrees higher than 75, then there have been 5 cooling degree-days. On the other hand, if the weather has been cool, and the mean temperature is, say, 55 degrees, then there have been 10 heating degree-days (65 minus 55). http://www.srh.noaa.gov/ffc/?n=degdays.

formula used in weather forecasting. We merged daily weather data into the billing dataset so that each billing period captured the HDD and CDD for each day within that billing period (including start and end dates[2]). For analysis purposes, we then calculated average daily HDD and average daily CDD, based on the number of days within each billing period.

Figure F-2 and Figure F-3 show participants in the treatment and comparison groups experienced almost exactly the same weather over time.

Figure F-2. Average HDD of Customers Included in Billing Analysis

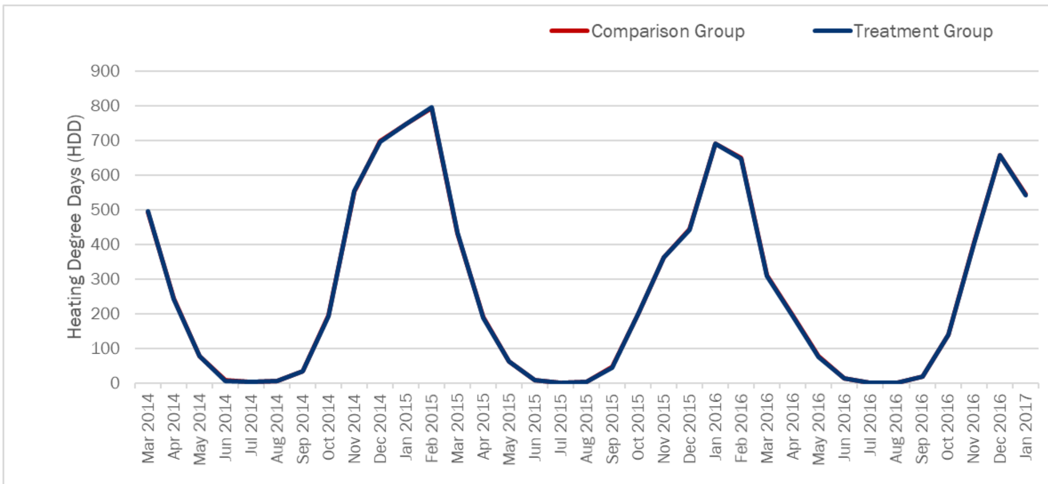
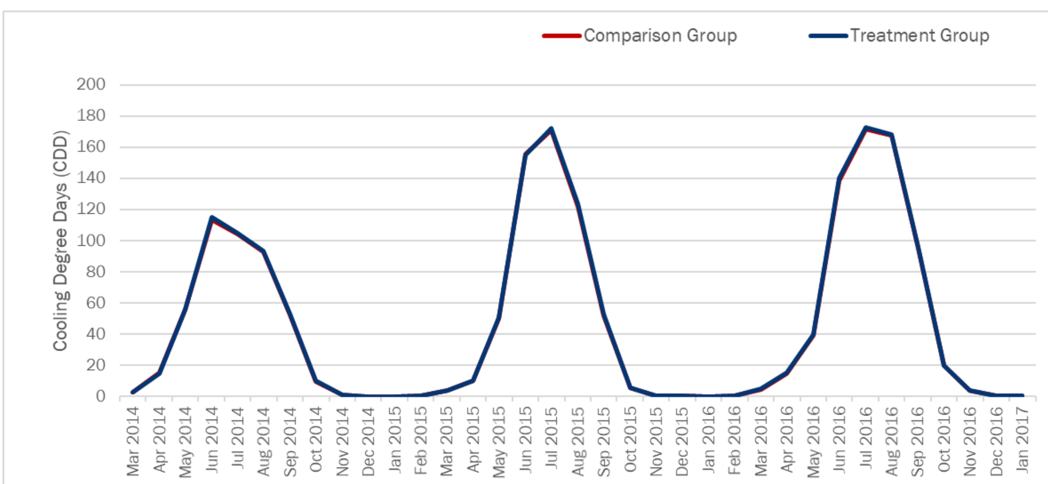


Figure F-3. Average CDD of Customers Included in Billing Analysis

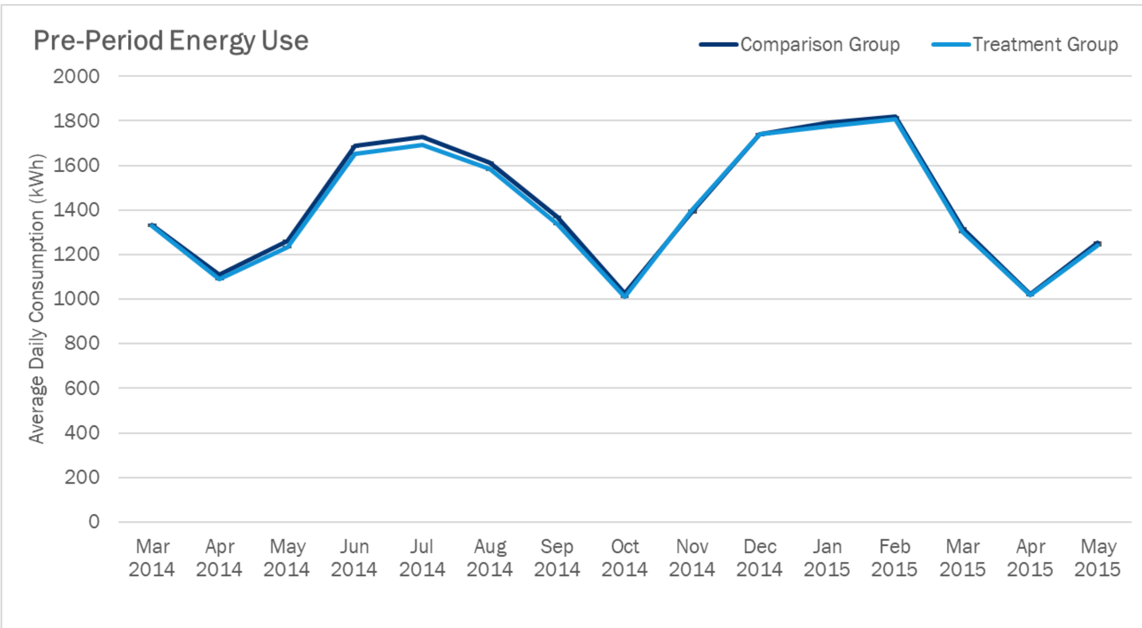


[2] See previous footnote.

Baseline Average Daily Energy Consumption

Opinion Dynamics examined the average daily energy consumption for months during each participant's pre-participation period to compare energy consumption patterns. As shown in Figure F-4, participants in the treatment group and in the comparison group had very similar energy use patterns.

Figure F-4. Comparison of Average Baseline Monthly kWh Consumption between Treatment and Comparison Customers



Model Specifications

To estimate savings for the REA program, Opinion Dynamics utilized a LFER model that incorporated weather and monthly changes in energy usage, as well as interaction terms to account for baseline differences between the treatment and comparison groups. As described in more detail below, we fit a series of models to the data and settled on our final model based on fit statistics and model diagnostics.

Develop and Test Model Specifications

In the development of our final model, we aimed to explain as much variation in the dependent variable as possible. The most direct measure of this is the overall R-squared, which gives an estimate of how much variability in post-participation period usage is explained by the variables included in the model. An R-squared of 1.0 indicates that a model explains 100% of the variance in the dependent variable, and an R-squared of 0.5 explains 50%.

As previously mentioned, we did not include customers who participated in other programs, except for customers who participated only in the MyHER program. We considered not removing these customers and entering indicator variables for each of the other utility programs. Doing this could lead to interference between the influences of each program on energy use, making it difficult to draw valid conclusions about the effects of REA program participation separate of the other programs. As such, we believe it is more appropriate to remove those customers from the analysis.

In the development of our model, we investigated average energy consumption before and after participation, how changes in weather affect the amount of energy used, and differences in energy use in each month. In this investigation, we found a clear relationship between energy use and weather and saw expected fluctuations in energy use through the year.

To control for seasonal changes in energy use, our model includes terms for each month of the year (January–December). This allows a month to be present in both the pre-participation period and the post-participation period, thus capturing the change in usage during said month. Our use of these monthly terms in conjunction with a comparison group creates an improved counterfactual and increases the accuracy of program savings estimates.

We also tested models that included terms that interact the effects of each month with the post-participation period. Additionally, we checked the effect of adding interaction terms of weather and the post-participation period to account for the relationship between weather and consumption following treatment. Failing to account for non-program-related changes that occur during the post-participation period, for example, the warmer summers that have been experienced, could undervalue the treatment effect. We tested different combinations of these potential interaction terms to determine the most representative model corrections across participants.

Final Model for REA Program Participants

Our final model, shown in Equation F-1, had an R-squared of 0.69. Although this model was the best fit to the data, it is worth noting that the results reported here were robust to changes in model specification.

Equation F-1. Model Specification

$$\begin{aligned} \boldsymbol{ADC_{it} = B_i + B_1 Post_{it} + B_2 HDD_{it} + B_3 CDD_{it} + B_4 Post \cdot HDD_{it}} \\ \boldsymbol{+ B_5 Post \cdot CDD_{it} + B_t Month + B_{t1} Month \cdot Post + \varepsilon_{it}} \end{aligned}$$

Where:

ADC_{it} = Average daily consumption (in kWh) for the billing period
$Post$ = Indicator for treatment group in post-participation period (coded “0” if treatment group in pre-participation period or comparison group in all periods, coded “1” in post-participation period for treatment group)
HDD = Average daily heating degree-days from NCDC
CDD = Average daily cooling degree-days from NCDC
$Month$ = Month indicator
B_i = Average household-specific constant
B_1 = Main program effect (change in ADC associated with being a participant in the post-program period)
B_2 = Change in ADC associated with one-unit increase in HDD
B_3 = Change in ADC associated with one-unit increase in CDD
B_4 = Change in ADC associated with each increment increase of HDD for participants in the post-program period (the additional program effect due to HDD)
B_5 = Change in ADC associated with each increment increase of CDD for participants in the post-program period (the additional program effect due to CDD)
B_t = Coefficients for each month
B_{t1} = Coefficients for each month in the post-participation period
ε_{it} = Error term
i = household
t = month

Estimated Savings and Realization Rates

This section contains the observed net savings and realization rates resulting from our billing analysis. The results account for FR and reflect savings associated with installed measures, participant SO, and behavioral changes from energy efficiency knowledge gained during the assessment.

Estimated Savings

The regression model results presented in Table F-2 shows a reduction in electricity use after customers participate in the REA program, controlling for weather, time, and the household characteristics (reflected in the constant term).

Table F-2. Final Model

Variable	Coefficient
Post (REA program participation)	−5.694856247*
CDD[a]	0.167953842*
HDD[a]	0.03990706*
Post-participation period CDD	0.012616119**
Post-participation period HDD	0.004052238*
Constant	28.81924207*
R-squared	0.691334427
Additional Terms	**Included**
Monthly effects included	YES
Post-participation period interacted with months included	YES

* p<0.01, ** p<0.05.

[a] A "degree-day" is a unit of measure for recording how hot or how cold it has been over a 24-hour period. The number of degree-days applied to any particular day of the week is determined by calculating the mean temperature for the day and then comparing the mean temperature to a base value of 65 (HDD) and 75 (CDD) degrees F. (The "mean" temperature is calculated by adding together the high for the day and the low for the day, and then dividing the result by 2.) If the mean temperature for the day is 5 degrees higher than 75, then there have been 5 CDD. On the other hand, if the weather has been cool, and the mean temperature is, say, 55 degrees, then there have been 10 HDD (65 minus 55).

Due to the weather and monthly interaction terms in the model, it was necessary to recalculate the coefficient of the treatment effect (Treatment) by combining the average value with the coefficient for each interaction term. The coefficient seen in the regression represents the reduction of daily consumption during the post-treatment period, including any reduction caused by milder temperatures. Utilizing a simple linear equation, shown in Equation F-2, which combines the coefficients of those interaction terms with the average post-participation period values for each, we estimated the overall savings associated with the program.

Equation F-2. Model Specification for Change in ADC

$$\Delta ADC = B_1 Post + AvgPostHDD_t \cdot (B_2 Post \cdot HDD) + AvgPostCDD_t \cdot (B_3 Post \cdot CDD) + B_t Month_t$$

Where:

ΔADC = Change in ADC
$AvgPostHDD_t$ = Average number of HDD during month t of the post-participation period
$AvgPostCDD_t$ = Average number of CDD during month t of the post-participation period

Table F-3. Adjusted Estimate of Daily Program Savings

REA Program Estimate	Standard Error	T	P>|t|	90% Confidence Interval	
				Lower	Upper
−1.9	0.2738	−6.8278	0.0000	−2.3	−1.4

The value of the new REA program estimate seen in Table F-3 represents a 1.9 kWh reduction in ADC associated with moving from pre-treatment to post-treatment. There is a 90% probability that overall program savings range between 1.4 kWh and 2.3 kWh per day for REA program participants. We extrapolated these estimates to calculate the overall net program savings for DEC REA program participants. To facilitate a clear comparison of program performance across Duke Energy territories, we provided savings as a percentage of the baseline usage (Table F-4), since customers may differ in their energy use across territories. We calculated baseline usage using a similar equation to Equation F-2, but included coefficients from variables that did not feed directly into the treatment effect. Doing this shows the energy that customers would have used on average if they did not participate, i.e., the counterfactual. To estimate the percent savings from participant's baseline energy consumption, we divide the coefficient for REA, representing the change in daily usage, by the mean baseline ADC to arrive at the percentage of savings.

Table F-4. Estimated Savings from Billing Analysis Compared to Baseline Usage

	Baseline Usage (kWh)	Standard Error	90% Confidence Interval of Baseline kWh		Savings (kWh)	Percent Savings
Overall Daily Savings*	47.6	0.1131	47.4	47.8	1.9	4.0%

* Daily savings estimate is the inverse of the coefficient for the REA program shown in Table F-3.

Based on our analyses, we found an average savings of 694 kWh annually for REA participants. With 9,232 participants in the evaluation period (May 2016–April 2017), the program saved 6,402 MWh, as shown in Table F-5.

Table F-5. Savings for 2015 REA Program

Participants	Annual Baseline Usage (kWh)	Percent Savings	Annual Energy Savings (kWh)	
			Per-Home Savings	2016 REA Program
9,232	17,385	4.0%	694	6,402,392

Full Model Results

Term	Estimate	Standard Error	T-statistic	p-value
Post	−5.69486	0.97952	−5.81395	0.00000
CDD	0.16795	0.00199	84.4653	0.00000
HDD	0.03991	0.00056	71.5165	0.00000
month2	0.40648	0.25863	1.57169	0.11602
month3	−4.57465	0.29221	−15.6556	0.00000
month4	−4.34906	0.37097	−11.7235	0.00000
month5	1.32032	0.43442	3.03925	0.00237
month6	5.04188	0.51811	9.73132	0.00000
month7	7.34297	0.5407	13.5805	0.00000
month8	7.39775	0.51706	14.3075	0.00000
month9	4.40661	0.46019	9.57563	0.00000
month10	−3.42293	0.37992	−9.00954	0.00000
month11	−5.03312	0.28791	−17.4818	0.00000
month12	−2.02125	0.25843	−7.82127	0.00000
post:CDD	0.01262	0.00557	2.26685	0.02340
post:HDD	0.00405	0.00128	3.17376	0.00151
post:month2	−1.4889	0.73266	−2.03219	0.04214
post:month3	1.63689	0.7112	2.30159	0.02136
post:month4	5.75266	0.9081	6.33485	0.00000
post:month5	3.36501	0.99681	3.37576	0.00074
post:month6	4.23023	1.12877	3.74763	0.00018
post:month7	2.40666	1.25767	1.91358	0.05568
post:month8	0.85235	1.17428	0.72585	0.46793
post:month9	1.45864	1.03185	1.41362	0.15748
post:month10	4.6512	0.87122	5.33872	0.00000
post:month11	2.11559	0.63553	3.32886	0.00087
post:month12	1.67417	0.55428	3.02045	0.00252

For more information, please contact:

Aaiysha Khursheed, Ph.D.
Principal Consultant

858 401 7638 tel
akhursheed@opiniondynamics.com

7590 Fay Avenue, Suite 406
La Jolla, CA 92037

Opinion Dynamics

Boston | Headquarters

617 492 1400 tel
617 497 7944 fax
800 966 1254 toll free

1000 Winter St
Waltham, MA 02451

Duke Energy Carolinas and Progress

EnergyWise Business
Evaluation Report – Final

November 9, 2018

Contributors

EMI CONSULTING

Table of Contents

Table of Tables

Table of Figures

Table of Equations

Page intentionally left blank

1. Evaluation Summary

1.1 Program Summary

The Duke Energy Carolinas (DEC) and Duke Energy Progress (DEP) EnergyWise Business (EWB) program is an integrated demand response (DR) and energy efficiency (EE) program that provides small businesses with the opportunity to participate in DR Conservation Period events, earn bill credits, and realize additional energy savings benefits. The program was introduced in 2016 and offers participants either a free programmable, two-way Wi-Fi Thermostat or a Load Control Switch if participants agree to participate in summer Conservation Period events. Participants can select one of three levels of demand response participation—30% cycling, 50% cycling, and 75% cycling—with varying levels of earned bill credits based on the selected cycling strategy. Thermostat participants who have a heat pump with electric resistance heat strips are also offered the option of participating in winter Conservation Period events and can earn additional bill credits per season. Alongside the hardware, participants who install a thermostat also have access to a web-based customer portal via their personal computer, tablet, or mobile phone that allows customers to manage their thermostats remotely, including presets, and advanced control and scheduling options. Duke Energy contracted with Itron (formerly Comverge)[1] to implement this program.

The program targets small businesses with a qualifying central air conditioning system and an average minimum usage of 1,000 kWh per month during the billing months of May through September. By the end of 2017, the program had enrolled a total of 4,561 customers and 8,511 devices. The program called five summer Conservation Period demand response events in 2017 and did not call any winter Conservation Period demand response events.

1.2 Evaluation Objectives

This evaluation of the EWB program includes process and impact assessments and addresses several major research objectives:

- Determine the estimated gross demand response impacts from the program;
- Determine the estimated net energy efficiency impacts from the program;
- Explore how participating customers are interacting with the program, and how satisfied they are; and
- Determine whether any modifications or improvements can be made to program design, program operations, or program equipment/software to reduce customer barriers to enrollment and support increasing enrollment and event participation.

[1] The company Itron acquired Comverge in June 2017. For consistency, this evaluation refers to the implementer as Itron.

1.3 High-Level Findings

Our impact evaluation assessed program performance in terms of program enrollment and participation, as well as summer Conservation Period demand response impacts and energy efficiency savings. The program overachieved device and thermostat installation goals, but did not meet its per device energy or demand impact goals. Overall, the energy efficiency savings impact analysis found realization rates of 204% for DEC and 5% for DEP; the demand response event analysis found realization rates of 72% for DEC and 70% for DEP.

In 2017, EWB program staff, working in coordination with Itron, enrolled a total of 6,793 devices. The majority of these devices were enrolled in the DEC territory (72% of devices). In terms of devices, the majority of new enrollees selected thermostats (91%), and the majority enrolled in the 30% cycling strategy (84% for DEC and 53% for DEP). Notably, the average size of HVAC units controlled by devices installed in 2017 remained relatively unchanged from 2016, at 4.2 tons,[2] but the DEC program saw enrollment shift towards lower cycling strategies in 2017 compared to 2016.

In terms of gross demand response impacts, the EWB program achieved an average of 2,582 kW per event in DEC and an average of 1,421 kW per event in DEP. Opinion Dynamics conducted a gross demand response analysis to estimate event-specific hourly load impacts for installed devices, by jurisdiction, device type, and cycling strategy. We conducted this analysis using device log data supplied by Itron (which provides device run-time data) in combination with program-tracking data, event data, and weather data. Notably, because the data is at the device level and not the facility level, this analysis produces gross impacts. These gross impacts are not adjusted for participant takeback actions caused by increased temperatures due to central air conditioning (CAC) cycling, such as running fans or increased run-time for refrigeration and/or process cooling equipment.[3]

Despite exceeding enrollment goals, per device demand response load impacts were lower than anticipated across jurisdictions (realization rates of 56% for DEC and 55% for DEP) and cycling strategies. As noted above, device enrollment was heavily distributed towards lower cycling strategies. Device operational rates and opt-out rates were consistent with Itron's expectations for program events (91% of eligible units cycled during an event, and 4% to 7% of devices opt-outed on average per event). Table 1-1 provides average per-unit gross demand response load impacts across all cycling strategies by device type and jurisdiction for all operational devices installed before the end of the 2017 cooling season.

---

[2] In 2016, the evaluation team found that the tonnage values tracked in the program participation database suggested that Duke Energy's planning values were too high. Duke Energy subsequently lowered their tonnage planning value as a result of the evaluation.

[3] Participant spillover will occur due to takeback actions (see above), likely increasing energy consumption before, during or after an event. Notably, because the data used to conduct this analysis is at the device level (thermostat or switch), this analysis produces gross impacts (e.g., not corrected for participant spillover).

Table 1-1. Summary of 2017 EWB *Ex Post* Gross Per-Device and Program Demand Response Impacts

DR Load Impact Estimates	Average Reference Load (kW)	Average Load Impact (kW)	Average % of Load
DEC Device Level			
Thermostat	3.28	0.88	27%
Switch	3.07	0.74	24%
Weighted Average	3.27	0.87	27%
DEP Device Level			
Thermostat	2.76	0.80	29%
Switch	2.77	0.65	24%
Weighted Average	2.76	0.79	29%
Program Level[A]			
DEC	9,724	2,582	27%
DEP	4,973	1,421	29%

[A] Reflects per-device load impact multiplied by the average number of devices eligible to participate on an event day and which were cycled (e.g., participated or opted-out) in an event.

For energy efficiency savings, we conducted a consumption analysis using monthly billing data to develop an average energy savings estimate for thermostats enrolled in 2017. The results of this analysis reflect net savings from participation in the EWB program plus any effect of participation in other Duke Energy programs.[4] To estimate net energy savings, we adjusted the billing analysis results using a cross-participation analysis. The purpose of the cross-participation analysis is to determine energy efficiency savings realized by EWB participants as a result of their participation in other Duke Energy non-residential programs. To do so, we identified measures installed through the Non-Residential Prescriptive and Small Business Energy Saver (SBES) Programs, and their savings, during the post-participation period. Once identified, we adjusted billing analysis results by the difference between cross-participation savings of EWB participants and cross-participation savings of the comparison group used in the consumption analysis.[5] This approach accounts for the fact that the consumption analysis already nets out equal cross-participation savings for the comparison group and participants.

Despite overachieving thermostat installation goals across both jurisdictions, per device energy savings realization rates were lower than goals for both jurisdictions. In addition, cross-participation adjustments substantially reduced the program's energy impacts. Table 1-2 provides a summary of the EWB ex post net energy savings in 2017.

[4] This analysis includes a comparison group in the model to adjust for operational changes that non-participating customers are making. Additional changes made by participating customers (within-participant spillover) are captured in the net savings.

[5] Cross-participation savings reflect pro-rated net ex post impacts based on the date of installation.

Table 1-2. Summary of 2017 EWB *Ex Post* Net Energy Efficiency Savings

Energy Savings Estimates	Unadjusted Energy Savings (kWh)	Cross Participation Adjustment (kWh)	Adjusted Energy Savings (kWh)
Device Level[A]			
DEC	1,060	-549	511
DEP	394	-376	18
Program Level			
DEC	4,759,461	-2,463,014	2,296,448
DEP	677,283	-645,546	31,737

[A] Device-level results reflect all devices enrolled from January 2017-December 2017, including devices that were deactivated.

We identified substantial variation in energy efficiency savings between DEC and DEP: Billing analysis results showed unadjusted energy savings for DEC participants more than 2.5 times those of DEP participants. While the cross-participation analysis found a smaller savings adjustment for DEP participants in absolute terms, it was much higher than for DEC participants as a percentage of unadjusted energy savings. The resulting adjusted energy savings are estimated to be 511 kWh per DEC participant and only 18 kWh per DEP participant.

The evaluation team conducted a series of checks to identify what may be driving lower energy savings in the DEP territory compared to the DEC territory. According to program staff, program design and implementation is relatively consistent across both territories, as are the type of facilities targeted and enrolled in the program. Our analysis found that DEP participants tend to have lower annual average baseline usage and summer average baseline usage than DEC participants, as well as slightly lower average tonnage in terms of the HVAC units being controlled. Other factors, such as customer behavior, e.g., engagement with their thermostat, may play a role. Survey results suggest that DEP customers may change their set points more frequently than DEC customers.

Table 1-3 provides a summary of participation, per-device impacts and total impacts for energy efficiency and demand response impacts.

Table 1-3. Summary of 2017 EWB *Ex Post* Energy Efficiency and Demand Impacts and Realization Rates

Metric	2017 Ex Ante		2017 Ex Post		Realization Rate	
	DEC	DEP	DEC	DEP	DEC	DEP
Demand Response Impacts						
Participation (devices)	2,310	1,414	2,978	1,800	129%	127%
Per Participant Weighted Average Summer Coincident Savings (kW)	1.56	1.44	0.87	0.79	56%	55%
Total Summer Coincident Demand Savings (kW)	3,605	2,035	2,582	1,421	72%	70%
Energy Efficiency Impacts						
Participation (thermostats)	1,755	1,076	4,490	1,719	256%	160%
Per Participant Average Annual kWh	641	562	511	18	80%	3%
Total Energy Savings (kWh)	1,124,522	605,111	2,296,448	31,737	204%	5%

Source: Ex Ante: Duke-provided goals; Ex Post: 2017 evaluation.

1.4 Evaluation Recommendations

Our recommendations focus on a core set of actionable efforts to increase program impacts while maintaining customer satisfaction, including those related to customer recruitment, education, and retention; program implementation enhancements; device functionality and operations optimization; and data tracking improvements. Notably, we understand that Duke Energy developed this program to provide small business customers an opportunity to participate in demand response, since these customers pay a surcharge but did not have an opportunity to participate in these programs. As a result, recommendations must be considered in light of enhancing program cost-effectiveness as well as equitably serving this historically underserved population.

Recommendation: Customer Recruitment, Education, and Retention

The EWB program staff and their implementation contractors far exceeded enrollment goals in 2017. In fact, recruiters were so successful that the program experienced a backlog in the second half of 2016 where recruited customers had to wait two to three months to have their thermostat or switch installed, instead of the target of four weeks. Building on this success, we recommend that Duke Energy focus on recruiting customers that evaluation results suggest are optimal from a demand response and energy savings impact perspective.

- **Optimize customer recruitment targeting.** Evaluation results from 2016 and 2017 both suggest that the program should seek to recruit customers with specific attributes, such as customers with larger HVAC units and higher monthly usage in summer months. In terms of event participation, several unenrolled participants mentioned that they felt their business segment was not appropriate for event participation. Specifically, unenrolled participants with gyms, massage parlors, and florists report that their business segment do not tolerate large temperature changes. Additionally, a review of event participation data suggests that restaurants tend to have higher opt-out rates than other business types. When examining unenrollment by NAICs code, restaurants are unenrolling at more than double the average rate. We recommend:
  - Continuing to target customers with larger HVAC units and higher average summer consumption.
  - Conducting in-depth upfront vetting customers within specific business types that are less able to accommodate changes in temperature in their facilities to reduce Conservation Period opt-outs, unenrollment, and potentially lower impacts.
- **Enhance customer education for Conservation Period participation.** Our process research found that better participant understanding of program elements is correlated with higher participant satisfaction. Participants report relatively low understanding of cycling levels, and only a quarter of participants could correctly recall their cycling level. In addition, participants who unenrolled from Conservation Periods were less familiar with program elements than on-going participants, which may have contributed to their unenrollment. To minimize participant unenrollment and opt-outs, and increase satisfaction, we recommend:
  - Ensuring canvassers and installers fully explain cycling levels and Conservation Periods, including strategies for minimizing impacts of the events. This could include additional training for canvassers and installers, as well as adjustments to canvassers incentives, as described further below.

- Developing additional leave-behind materials or welcome email blasts for newly-enrolled program participants. These materials should describe what a customer should expect during Conservation Periods. The materials may also provide suggestions for minimizing the impact of Conservation Periods such as pre-cooling facilities or reducing the use of heat-emitting technologies during Conservation Periods.

- **Encourage customer retention strategies.** The only drop-out prevention strategy noted by participants who unenrolled from the program was the loss of the Conservation Period bill credit. Most interviewed participants who dropped out of the Conservation Periods did so due to discomfort during events. In some cases, the discomfort was exacerbated by issues with their facilities' HVAC systems and building envelopes. We recommend Duke Energy staff:
  - Consider having the program call center employ additional drop-out prevention strategies, such as providing tips for mitigating discomfort during events or helping them understand how to opt out of events.[6] We suggest informing customers about how to opt-out since opting out of some events will yield higher impacts overall than if the customer is to drop out entirely. In addition, the call center might refer customers mentioning issues with their building's HVAC system or building envelope to other Duke Energy programs. While this may not stop a customer from dropping out of the program, it would provide Duke Energy with increased energy savings through the relevant energy efficiency programs.

- **Encourage adoption of, or conversion to, higher cycling strategies.** Enrollment in the lower cycling strategies, especially the 30% strategy, is higher than expected, leading to lower than anticipated per participant impacts.
  - Test options to support converting existing customers to higher cycling strategies. We understand that Duke is already in the process of an analytics project to help identify customers that could use higher cycling strategies. These analytics could help Itron during the installation to assess if customers could increase their cycling strategy, without jeopardizing comfort. An additional option would be to promote higher cycling strategies on the customer portal; especially for customers with higher reference loads. Customers can currently change strategies after they enroll, but according to the program manager, most customers who change after enrollment change to a lower cycling strategy. It should be noted that more aggressive cycling strategy enrollment goals should be balanced with customers' comfort, as we found that higher cycling strategies are tied to more noticeable reductions in comfort, higher opt-out rates, and reduced likelihood of participating in the future.

Recommendation: Program Implementation Enhancements

The program uses a series of marketing channels, including door-to-door marketing ("canvassing"), phone recruitment, email and direct mail, website, and digital marketing. Door-to-door marketing was a successful

---

[6] Based on information from the program team, assisting customers in changing cycling levels is a retention strategy already employed by the call center.

strategy in 2017, and program enrollment increased considerably after Duke Energy engaged Threshold Marketing canvassers.

Duke Energy pays Threshold Energy a set fee for every account enrolled in the program. This fee does not vary based on the size or number of HVAC devices that a customer has, or the cycling level chosen. Perhaps as a result, the Threshold program managers describe focusing their efforts on customers where they can likely engage with an on-site decision maker (e.g., "mom and pop" businesses), and described how it was easier and more lucrative for canvassers to enroll customers with fewer HVAC units, since customers with more complex systems required more time to enroll for the same commission. Although engaging willing participants benefits marketing cost-effectiveness and increases participation, these enrollment strategies may not capture the most optimal savings opportunities from an impacts perspective. We recommend:

- **Aligning enrollment incentives with factors known to produce higher impacts to maximize cost-effectiveness.** Threshold's enrollment incentives were not aligned with Duke Energy's goals as they are paid per account regardless of characteristics that affect potential kW and kWh savings (e.g., cycling strategy, number of devices enrolled, baseline usage, or HVAC size). We recommend revisiting how Threshold is compensated by developing a tiered incentive strategy that provides greater compensation for customers with greater savings potential or interest in higher cycling levels. At the same time, customer comfort matters: higher cycling strategies are tied to more noticeable reductions in comfort, higher opt-out rates, and reduced likelihood of participating in the future. Accordingly, any tiered incentive strategy will need to balance recruitment into aggressive cycling strategies with continued support for customer comfort.

- **Considering adjustments to education or incentives to ensure installers offer participants with heat pumps winter Conservation Period participation.** Only half of participants with heat pumps recall installers offering participation in winter Conservation Periods. To increase the number of winter participants, the evaluation team recommends increasing installer education on the benefits of winter participation and on the program goals related to winter participation. The program may also consider adjusting installer incentives for enrolling winter participants.

Recommendation: Device Functionality and Operations Optimization

Our demand response impact analysis identified average percent load impacts that were routinely under the cycling strategy amount. This is consistent with expectations for a duty cycle strategy, as the average run-time of units during non-events is rarely 100%. We also found that energy efficiency savings were lower than anticipated, which may be driven by customer engagement with their set points. We recommend:

- **Incorporating an adaptive cycling strategy for Conservation Period events.** Adaptive cycling replaces the baseline run-time of 100% with an actual run-time percentage during a non-event hot day. For example, in simple 30% duty cycling where the baseline is 100%, event period run-time is limited to 70% (100%-30%). Adaptive cycling, which uses a previous measurement of run-time during hot days for the particular device (e.g., 90%) would limit event period run-time to 63% e.g., 90%* (100%-30%)). This helps to achieve percent run-time reductions closer to the cycling strategy, and it helps customers who may have under- or over- sized units. We understand that Duke Energy will be implementing this approach to cycling for the 2018 Conservation Period events.

- **Implementing strategies to optimize energy efficiency settings for thermostats.** Notably, Duke Energy implemented an "auto-EE" functionality to their customer portal in 2018. This feature assesses the building's thermodynamics and auto-adjusts the set points when the facility is closed to generate additional energy savings compared to customer setpoints. These changes could potentially increase the overall energy savings from the thermostats in future program years. We also recommend assessing set points for thermostats to understand programming behavior of installers and customers. Educational materials that help customers optimize their own comfort, while also yielding bill savings, may help customers achieve higher energy savings associated with their devices.

Recommendation: Data Tracking

- **Enhance data tracking across Duke Energy program participation databases, customer billing data, and AMI data, as well as with Itron device log data.** Throughout this evaluation, we encountered a number of data issues that limited our ability to execute the planned analyses and increased evaluation cost and time frames. For example, the original evaluation plan sought to assess net demand impacts using AMI data. However, the DEP AMI data had substantial data availability issues as well as quality issues in terms of anomalous load shapes, necessitating incorporating device log data for the impact analysis. In particular, the load shapes within the available AMI data (based on graphical review) were not consistent with expected AC load shapes, and the amount of AMI data was insufficient to fully represent the population of participants. We offer the following set of recommended data tracking enhancements:

  - Develop an identical set of unique identifiers across datasets and include Account ID and Source Account ID and Source Service Point ID in every dataset. If an identical set of unique identifiers is unavailable due to the data existing in different systems, consider developing a crosswalk that links Source Service Point ID and Service Point ID. Currently, Duke Energy program data tracks participation at the Account level, while the vendor tracks participation at the Source Service Point Level. In addition, for DEP consumption data, provide an identifier that links Meter Number to Source Service Point ID and Account Number. This can support effective identification of the meter associated with a device installation.

  - Track changes in cycling strategies across time rather than replacing the strategies with the latest enrollment status. This will allow us to correctly classify participants by cycling level for each event, even if their cycling level or status changed. For example, a participant who participated with a 30% cycling strategy in July events but then changed their cycling strategy in September would be tracked as at the latest cycling strategy. Since the tracking data currently does not reflect the original cycling strategy and when it changed, we cannot accurately analyze the impacts of a past event.

  - Differentiate between unenrollment date and deactivation/removal date in the program-tracking data. Currently, the Duke Energy program-tracking data records two dates for each measure, start date (start_dt) and end date (end_dt). The start date corresponds to the installation date in Itron's data, while and the end date can correspond to either the unenrollment date or the removal date in Itron's data. The distinction between the two end dates in the Itron data is important because unenrolled devices can still achieve energy savings while removed devices achieve neither energy nor demand response savings.

2. Program Description

2.1 Program Design

The DEC and DEP EWB program is an integrated demand response (DR) and energy efficiency (EE) program that provides small businesses with the opportunity to participate in Conservation Period events, earn bill credits, and realize additional EE benefits. The program was introduced in 2016 and offers participants either a free programmable two-way Wi-Fi Thermostat or a Load Control Switch if participants agree to participate in summer Conservation Period events. Alongside the hardware, participants who install a thermostat also have access to a web-based customer portal via their personal computer, tablet, or mobile phone that allows customers to manage their thermostats remotely, including presets, advanced control and scheduling options. Participants can select one of three levels of DR participation—30% cycling, 50% cycling, and 75% cycling—with varying levels of earned bill credits based on the selected cycling strategy. Thermostat participants who have a heat pump with electric resistance heat strips are also offered the option of participating in winter Conservation Period events and can earn additional bill credits per season.

Duke Energy designed the program primarily for its demand response benefits. Specifically, the utility wants to provide small business customers with an opportunity to participate in a DR program, since these customers had previously been paying a DR rider without having an opportunity to participate in a program. The energy efficiency savings from the program are an added benefit that is secondary to the demand response savings. The program targets small businesses with a qualifying central air conditioning system and a minimum usage of 1,000 kWh per month during the billing months of May through September.

The program was first implemented by Itron in the DEC and DEP territories in 2016. While Itron is the primary implementer in charge of installing thermostats and calling Conservation Period events, Duke Energy has contracted with two other firms--Lime Energy and Threshold Marketing--to help recruit participants.

The program uses a series of marketing channels, including door-to-door marketing, phone recruitment, email and direct mail, website, and digital marketing. Of these, the most successful channel has been door-to-door recruitment. The program initially engaged Lime Energy to recruit participants as part of their larger contract to implement Duke Energy's Small Business Energy Saver (SBES) program. Specifically, Lime Energy tried to identify potential participants from the pool of SBES program participants. Then, in June 2016, the program engaged Threshold Marketing to help with recruiting efforts. Threshold Marketing canvassers go door-to-door using lists of eligible customers to recruit participants. Representatives from both Lime Energy and Threshold Marketing confirm the eligibility of interested customers, enroll them in the program, and schedule a time for the thermostat or switch installation. As part of this process, canvassers help customers choose their cycling level. When customers learn about the program through a channel other than a canvasser, such as the website or email, these customers enroll online or via phone.

After a customer has enrolled in the program, Itron installers install the thermostat and/or switch during a scheduled installation appointment. Itron installers program the thermostat(s) based on the customer's requested schedule, ensure the thermostat is connected to the customer's Wi-Fi network, set up the customer's program web portal account, and train the customer in how to use the thermostat and portal.[7]

Summer events are called on weekdays between May and September when average temperature criteria are met and a high system peak is projected. The events are used to help Duke Energy manage system peak. According to the filings, the control period under the Summer Control option may be up to four hours each day an event is called. Interruption of cooling equipment for cycling purposes is limited to a total of no greater than 40 hours during any one summer season. Winter events can be called between November and March. For customers selecting the Winter Control option, Duke Energy can, at its discretion, interrupt service to the resistance heating elements associated with each electric heat pump unit for up to four hours each day an event is called. Resistance heating element interruptions are also limited to a total of no greater than 40 hours during any one winter season. Duke Energy decides when to call an event and Itron is responsible for implementing the event. Each time an event is scheduled, participants are notified via email. Participants who received a thermostat are also notified through a light on the thermostat and through the web portal. During the event, the devices display a message that an event is in progress. Participants can opt out of events at any time before or during the event.

Customers receive a bill credit for each enrolled HVAC unit with an installed device in each year that they participate in Conservation Period events. The summer DR credits are tied to cycling level, with credits of $50 for 30% cycling, $85 for 50% cycling, and $135 for 75% cycling. In addition, participating customers receive $25 each year they participate in winter Conservation Period events. Customers can opt out of up to two events each year and still receive their bill credit.[8]

2.2 Program Implementation

Based on program staff interviews and program data review, the evaluation team found that the 2017 program implementation was being executed smoothly. Program participation exceeded targets and the program successfully called multiple events during the summer Conservation Period, however, no winter Conservation Period events were called. Duke Energy was happy with the various vendors implementing the program and the vendors described being well-supported by Duke Energy. To illustrate program success, one of the main challenges mentioned was that Itron could not hire fast enough to support demand for the device installation after Threshold Marketing was enlisted and program enrollment increased quickly. The program staff described internal process improvements that helped address some of the early challenges identified during the program's rollout in 2016.[9] The remainder of this section outlines the highlights the most interesting elements of how the program has been implemented.

[7] These activities apply to thermostats only; they do not apply to switches.

[8] Bill credits are paid after customers enroll, so customers that opt out of more than two events are forfeiting the credit on the following year's bill cycle.

[9] These were primarily technical issues related to optimizing program implementation, such as processes for ensuring all of a participant's accounts were enrolled, associating multiple accounts with a single participant log-in, allowing canvassers to enroll participants directly, etc. The program team was able to identify and implement changes to address these challenges early in the program rollout.

Program enrollment increased considerably after Duke Energy engaged Threshold Marketing to help recruit potential participants. While Lime Energy canvassers had competing priorities with completing lighting and refrigeration measures through Duke Energy's SBES program while discussing EWB with customers, Threshold Marketing canvassers were focused solely on promoting EWB. At the end of 2017, Duke Energy reported that approximately 16% of customers approached by a canvasser agreed to participate in the program. Because of Threshold Marketing's success in recruiting customers, the program experienced a backlog in the second half of 2016, where customers had been recruited and had to wait two to three months to have their thermostat or switch installed, instead of the target of four weeks. In response, the program stopped other forms of marketing and Itron hired more installers to handle the influx of new participants.

Although participation has exceeded expectations, participant characteristics differ from what was expected (see Section 5.1, Participation Analysis). For example, Threshold Marketing has found that thermostats have been more popular than expected. As a result, canvassers typically use the benefits of the smart thermostats to sell the program, before describing the Conservation Period events and bill credits. According to the program manager, this has been a positive development, since the thermostats provide Duke Energy with energy savings in addition to the DR impacts, and because the thermostats cost less than the switches. Participants are also installing more devices per business than assumed (an average of 1.8 devices compared to 1.3[10]). At the same time, however, customers are choosing lower cycling levels and the HVAC equipment on which devices are installed is smaller than anticipated. While the higher number of devices per participant has decreased the marketing cost per device enrolled, the combined effect of lower cycling levels and smaller equipment likely reduces savings and therefore increases the program's cost per kW.

Duke Energy pays Threshold Marketing a fixed fee for every account enrolled in the program. This fee does not vary based on the size or number of HVAC devices or control equipment that a customer has, nor the cycling level chosen. Perhaps as a result, the Threshold Marketing program managers describe focusing their efforts on customers where they are most likely to engage decision makers. As a result, revising the incentive structure to provide tiered incentives based on cycling strategy may support enrollment of higher potential customers.

Once a customer has enrolled in the program, Itron installers arrive during the scheduled time window to install the device. At this point, about 20% of enrolled customers "turn down" the program, or do not go through with the program installation. At the time the evaluation team talked to program staff, there was no reliable data on how many of these customers went on to reschedule a different time to have their thermostat or switch installed versus how many declined to participate in the program. However, Itron was planning on collecting this data in the future to be able to better track customer turn downs. Their understanding was that the most common reasons that customers turned down the program (without rescheduling) were that there were issues with Wi-Fi networks or HVAC equipment not working that precluded the customer from participating. While some customers with HVAC equipment issues install the switch instead, many will fix their HVAC systems, so they can participate. Itron took multiple steps to decrease the turn down rate. Itron also made efforts to make their installations more efficient, to help address the backlog of customers waiting for their installation caused by the increase in enrollment after Threshold Marketing started canvassing. First, installers started bringing Wi-Fi signal detectors and starting installation with the furthest away thermostat, to identify Wi-Fi network issues quickly. Second, installers started bringing Wi-Fi extenders to help address Wi-Fi coverage issues. The

[10] From Duke Energy Stage 2 – Evaluation Screening for: Small Business Demand Response PowerPoint, slide 27.

Itron program managers thought that the canvassers were doing everything that they could to screen out customers that have incompatible equipment and did not think there was a problem with canvassers not fully vetting customers' eligibility.

There are no differences in how the program is implemented in the DEC and DEP service territories. However, since each canvasser and installer focuses on a geographic region, different staff implement the program in the two territories. For example, a single canvasser was responsible for approximately 30% of all new DEC participant registrations during the 2017 program year. According to program staff, this canvasser registered most or all of their new participants at the 30% cycling level, and thus, skewed all DEC participants towards a 30% cycling level. In addition, the time between enrollment and installation varied by region, based on the number of canvassers and installers available.

3. Key Research Objectives

This evaluation of the EWB program includes process and impact assessments and addresses several major research objectives:

- Determine the estimated gross demand response impacts from the program;
- Determine the estimated net energy efficiency impacts from the program;
- Explore how participating customers are interacting with the program, and how satisfied they are;
- Determine whether any modifications or improvements can be made to program design (including eligibility requirements or incentive structures), program operations, or program equipment/software to reduce customer barriers to enrollment and support increasing enrollment and event participation.

In addition to the above objectives, the evaluation plan included the following objectives, which were not addressed in this evaluation:

  - Winter demand response events: The demand analysis did not include winter events as no winter events were called in 2017.
  - Use of AMI data: For the summer demand response analysis, we used telemetry data rather than AMI data. As a result, we conducted the analysis on the population of devices with data, rather than a sample of AMI data. This change was made due to the limited availability and poor quality of the AMI data. This results in gross demand response impacts, rather than net impacts.
  - Demand response forecast models: The evaluation did not develop forecast models for DR impact prediction based on peak standard weather due to changes in evaluation priorities.

Based on discussions with DEC/DEP program staff and Duke Energy evaluation, measurement, and verification (EM&V) staff, the evaluation team developed the following process-related research questions:

- What are customers' motivations for enrolling in the program?
- To what extent do implementation staff fully and accurately explain the program to customers? Are there questions that customers have that are not being fully addressed?
- Do customers understand how to use their smart thermostat? Is program training on how to use the thermostat sufficient?
- Do customers understand how to access and interpret information in the program portal?
- Are program implementers offering the winter demand response control option to all customers with electric heat pumps?
- What barriers do customers have that prevent them from enrolling in the program? Why do customers approached by implementers Lime Energy and Threshold Marketing decide not to participate? How could Duke Energy help customers overcome these barriers?
- Are there barriers that prevent customers who enroll in the program from participating in demand response events?
- Why do customers choose to unenroll from the demand response portion of the EWB Program?
- How satisfied are participants with various program elements and the program overall?

- What were customers' experiences during Conservation Periods? Have there been any aspects of their event experience that will influence their willingness to participate in future events?

4. Overview of Evaluation Activities

To address the evaluation research objectives and questions, the evaluation team performed a range of data collection and analytical activities. Table 4-1 provides a summary of evaluation activities and associated areas of inquiry. Following the table, we provide detail on each activity's scope, sampling approach (if applicable), and timing.

Table 4-1. Overview of Evaluation Research Activities

#	Evaluation Activity	Impact	Process	Purpose of Activity
1	Program Staff Interviews		X	▪ Provide insight into program design and delivery ▪ Support process assessment
2	Materials Review	X	X	▪ Provide insight into program design and delivery ▪ Inform planning savings assumptions
3	Early Participant Interviews		X	▪ Identify topics related to participants' experience to explore further through participant survey ▪ Identify and provide early feedback on any issues associated with the program rollout
4	Participant Survey		X	▪ Assess participants' motivations and barriers to participation, experiences with program thermostats and demand responses events, and satisfaction with the program
5	Non-Participant and Un-Enrolled Participant Interviews		X	▪ Understand why customers approached about the program decline to participate ▪ Understand why previously-enrolled customers stop participating in demand response events
6	Participation Analysis	X	X	▪ Provide overall installation count by cycling strategy, jurisdiction, and other features of interest
7	Gross Demand Response Impact Analysis	X		▪ Calculate gross load impacts associated with the five summer Conservation Period events called in 2017
8	Net Energy Savings Impact Analysis	X		▪ Calculate net energy savings impacts associated with thermostats installed in 2017

4.1 Program Staff Interviews

In February and March 2017, the evaluation team completed seven interviews with program staff at Duke Energy and program implementers. In addition to the Duke Energy program manager, the evaluation team talked to program managers and supervisor from Itron (three interviews), Threshold Marketing (two interviews), and Lime Energy (one interview). The interviews explored program design and implementation, program performance, incentivized demand response event specifications, and tracking and communication processes, among other topics. To supplement these interviews, Duke Energy also provided the evaluation team with a demonstration of the program portal.

4.2 Program Materials Review

In support of the impact and process evaluations, the evaluation team reviewed program materials and data, including marketing materials, program plans, training materials, enrollment forms, past research studies. This information informed our research design, provided insight into program design and delivery, and supported the assessment of program impacts.

4.3 Customer Interviews

4.3.1 Early Participant In-Depth Interviews

In preparation for survey design, the evaluation team completed 10 in-depth interviews with early participants (who participated before October 2016).[11] The goals of these interviews were to (1) provide program staff with early feedback about the program roll out and first demand response events and (2) help identify key issues to explore through the larger participant survey effort. Respondents were offered a $25 incentive for completing the interview. The evaluation team conducted a purposive sample of 10 participants based on a review of program-tracking data and interviews with program staff. Program staff indicated interest in the customer experience differences between those customers recruited by Lime Energy versus those recruited by Threshold Marketing. To explore these differences, the evaluation team interviewed five early participants recruited by each contractor for a total of 10 interviews. The interviews were completed between April 25 and May 4, 2017.

4.3.2 Participant Survey

Sample Design and Fielding

The evaluation team fielded an online survey of program participants. As the population of participants was small (2,811 unique 2017 enrolled participants at the time of the survey data request in August 2017), the evaluation team attempted a census of all program participants with a valid email address. Survey participants were offered a $25 incentive to complete the survey. The evaluation team fielded the survey on September 13, 2017, and closed the survey after receiving 242 completes, far exceeding the target of 200 completes. The portion of DEC and DEP respondents was slightly different from the population (Table 4-2).

Table 4-2. Comparison of Participant Survey Respondents to the Program Population

Utility	Percent of Survey Respondents (n=242)	Percent of Population (N=2,811)
DEC	74%	66%
DEP	26%	34%

Note: Population reflects unique customers at the time of survey fielding.

Survey Disposition and Response Rate

The survey response rate was 16.9% for DEC and 17.6% for DEP (Table 4-3). As a census of all program participants was attempted, the evaluation team did not calculate confidence and precision.

[11] Because there was no process evaluation of the 2016 program, the 2017 evaluation included early interviews with participants to provide Duke Energy with advance feedback on any potential issues with the program rollout. These interviews included early 2016 participants to represent customers recruited by Lime Energy, and thereby gather data to assess whether there were meaningful differences between customers recruited by Lime Energy versus Threshold Marketing.

Table 4-3. Participant Survey Response Rate

Disposition	DEC	DEP	Overall
Response Rate (AAPOR RR3)	16.9%	17.6%	17.1%

To develop the sample, we first removed duplicate emails across premises and business with multiple projects. Of all the accounts in the program tracking data, about 50% represented a unique email address of a customer actively enrolled in the program and were included in the survey (1,065 DEC and 353 DEP). Table 4-4 presents the survey dispositions.

Table 4-4. Participant Survey Dispositions

Disposition	DEC	DEP
Complete	180	62
Partial Complete	11	6
Terminate Before Screening Questions	84	36
Refusal	7	2
No Response	783	247
Total	1,065	353

4.3.3 Non-Participant and Unenrolled Participant Interviews

The evaluation team conducted in-depth interviews with 10 "non-participants," defined as customers approached about the program that have decided not to participate, and 10 "unenrolled participants," defined as customers who enrolled in the program but later decided to no longer participate in Conservation Periods (Table 4-5). The evaluation team attempted a census of all unenrolled participants, as well as all non-participant customers tracked in the program database who had declined to participate in the program and did not have valid reason listed (i.e., already had smart thermostat or did not qualify). Both groups were offered a $25 incentive upon completion of the interview. Interviews were completed between July 21 and October 10, 2017.

Table 4-5. Completes and Sample Size

Group	Completes	Sample
Non-participants	10	980
Unenrolled participants	10	100

4.4 Participation Analysis

As part of our evaluation, we summarized program enrollment and demand response event participation based on program-tracking data. As part of these analyses, we reviewed the Duke Energy and Itron program participation databases to determine the total number of enrolled devices and participants, the type of devices installed, the selected cycling strategies, as well as installation dates. In addition, we reviewed thermostat and switch log data to determine device operability and opt-out rates. Notably, different analyses use different subsets of participants, outlined in greater detail in Section 5.

4.5 Gross Demand Response Impact Analysis

Opinion Dynamics conducted a gross demand response analysis to estimate event specific hourly load impacts for installed devices, by jurisdiction, device type, and cycling strategy. We conducted this analysis using device log data supplied by Itron (which provides device run-time data) in combination with program-tracking data, event data, and weather data from the National Oceanic and Atmospheric Administration's (NOAA) National Centers for Environmental Information.

To estimate impacts, we first cleaned device log data. We then developed a counterfactual for what would have occurred on a non-event day in the absence of the demand response event by identifying similar non-event days (in terms of weather, day of week, and other variables). Using these proxy non-event days, we used linear regression models to estimate changes in run-time during events. The actual run-time during the event is compared to the estimated counterfactual to establish hourly impacts. We then converted run-time impacts to load impacts by applying the full load estimate (HVAC capacity divided by SEER) from program-tracking data. We used the cleaned log data and program-tracking data to determine device operational rates and opt-out rates for each event, and applied the average per-device impacts for each event to the number of operational devices. We used the average of these values across the five events to calculate net realization rates against ex ante goals. A summary of the approach is provided in Section 5.2.

4.6 Net Energy Savings Impact Analysis

Opinion Dynamics conducted a consumption analysis and a cross-participation analysis to estimate net energy savings impacts for thermostats installed in 2017. We conducted the consumption analysis using customer billing data, program participation data and weather data. We used a linear fixed effects regression (LFER) model, which controls for all facility factors that do not vary over time using the individual constant terms in the equation. The consumption analysis used a comparison group matched on pre-period energy consumption patterns.

Our team also conducted a cross-participation analysis. The purpose of the analysis was to adjust consumption analysis results for energy savings as a result of participation in other Duke Energy non-residential programs. To do so, we identified measures installed through the Non-Residential Prescriptive and SBES Programs, and their savings, during the post-participation period. Savings reflect pro-rated net ex post impacts based on the date of installation. Once identified, we removed the difference between cross-participation savings of EWB participants relative to the comparison group. This accounts for the fact that the consumption analysis already nets out equal cross-participation savings for the comparison group and participants.

To calculate total energy savings impacts, our team applied per-device impacts to the total number of thermostats enrolled in 2017. We used this value to calculate net realization rates against ex ante goals. A summary of the approach is provided in Section 5.1.

5. Impact Evaluation

Our impact evaluation included three main research efforts: a participation analysis, a gross demand response impact analysis, and a net energy savings impact analysis. The following subsections describe our approach and the results for each of these research efforts.

5.1 Participation Analysis

As part of our evaluation, we summarized program enrollment and event participation based on program-tracking data. Notably, different analyses use different subsets of participants, as summarized in Table 5-1, and further described in the subsections below.

Table 5-1. Summary of Participation Counts for 2017 Impact Analyses

Participation Type	Description	DEC	DEP
2017 Program Enrollment	Count of all devices (switches and thermostats) installed in 2017 and not deactivated.	4,878	1,915
Demand Response	Count of all devices (switches and thermostats) installed as of the end of the 2017 summer Conservation Period events (program launch to September 30, 2017) that were eligible to participate during an event (i.e., active, enrolled devices with a known cycling strategy), were operational and could be cycled during each 2017 Conservation Period.	2,978	1,800
Energy Savings	Count of *premises with thermostats* installed in 2017, including deactivated devices.	4,490	1,719
Cumulative Program Enrollment	Count of all *devices* (switches and thermostats) installed from program initiation through December 31, 2017 and not deactivated.	5,876	2,635

5.1.1 2017 Program Enrollment

According to information provided by Duke Energy, anticipated participation in the program was 1,848 devices for DEC and 1,132 devices for DEP, for a total of 2,980 devices.

Review of the program-tracking data indicated that, during 2017, the program achieved a total enrollment of 4,878 devices in the DEC service territory (264% of goal) and 1,915 devices in the DEP service territory (169% of goal), for a total of 6,793 devices across both territories. Consistent with 2016, the program-tracking data showed that thermostats were more popular than expected. Nearly all new customers chose the thermostat (91% of installed devices) over the switch (9% of installed devices). Process analysis indicated that most customers with switches had been interested in a thermostat but had an issue with their HVAC unit not being compatible, and thus could only participate using a switch. Table 5-2 provides projected and actual program enrollment in 2017, by jurisdiction and device type.

Table 5-2. 2017 Projected and Achieved EWB Device Enrollment

Jurisdiction	Device Type	# Projected	# Achieved	% Achieved
DEC	Thermostat	1,755	4,490	256%
	Switch	92	388	420%
	Total	**1,848**	**4,878**	**264%**
DEP	Thermostat	1,076	1,719	160%
	Switch	57	196	346%
	Total	**1,132**	**1,915**	**169%**

Note: Reflects devices enrolled from January 1, 2017—December 31, 2017 excluding deactivated devices.

To develop expected savings from Conservation Period events, the program assumed 50% enrollment in the 30% cycling strategy, 30% enrollment in the 50% cycling strategy, and 20% enrollment in the 75% cycling strategy. DEP participant uptake was relatively consistent with these assumptions, but DEC participant uptake tended more heavily towards lower cycling strategies (see Table 5-3). Everything else being equal, a lower cycling strategy will generate lower DR savings. To realize expected demand response load impacts, the program may therefore need to more strongly promote the higher cycling strategies, particularly among DEC customers.

Table 5-3. 2017 Projected and Achieved Enrollment Cycling Strategy Distribution of Cycling Strategies

Jurisdiction	Projected[A]	Achieved[B]
30% Cycling Strategy		
DEC	50%	84%
DEP		53%
50% Cycling Strategy		
DEC	30%	12%
DEP		25%
75% Cycling Strategy		
DEC	20%	5%
DEP		22%

[A] Projected enrollment assumptions based on 8/18/2014 PowerPoint presentation, entitled “Small Business Demand Response – Evaluation Gate Presentation”.
[B] Device counts reflect devices installed from January 2017–December 2017 excluding deactivated devices.

Compared to 2016, DEC enrollment in 2017 shifted towards lower cycling strategies while DEP enrollment shifted towards the 75% cycling strategy (see Table 5-4).

Table 5-4. Comparison of 2016 and 2017 EWB Cycling Strategies Enrollment Distribution

Jurisdiction	2016	2017
DEC		
30%	56%	84%
50%	25%	12%
75%	19%	5%
DEP		
30%	65%	53%

Jurisdiction	2016	2017
50%	25%	25%
75%	10%	22%

We also assessed whether average size and efficiency of units changed from 2016 to 2017, reflecting an attempt by the program to target facilities with larger HVAC units. In our 2016 evaluation, we found that ex ante per-unit savings assumptions were considerably higher than ex post impacts, mostly due to an overestimate of the size (tonnage) of the controlled air conditioning units. Since equipment size is directly correlated with savings, the smaller-than-expected controlled units significantly affected realized energy efficiency and DR impacts. Our review of 2017 participation data showed that the average size of units was virtually identical in 2016 and 2017 (Table 5-5).

Table 5-5. Comparison of 2016 and 2017 EWB Average HVAC Size and Efficiency

	Average SEER Value		Average Tonnage Value		Average Tonnage/SEER Value	
Jurisdiction	2016	2017[A]	2016	2017	2016	2017
DEC	11.2	11.2	4.41	4.35	0.394	0.388
DEP	11.8	11.8	4.08	4.01	0.364	0.340

A: 2017 SEER values were based on 2016 participants, as this data was not available in the 2017 participant data.

5.1.2 Energy and Demand Impacts Participation

As noted earlier, this evaluation used different participation counts to estimate energy efficiency impacts and demand response load impacts (Table 5-6). Energy efficiency savings reflect thermostats installed in 2017 (4,490 devices in DEC service territory and 1,719 devices in DEP service territory). We report participation in 2017 Conservation Period events in terms of the average number of devices that were operational and could be cycled during each 2017 Conservation Period. Therefore, demand response load impacts from Conservation Period events reflect a device-weighted average of operational devices cycled during each 2017 Conservation Period event (2,978 devices in DEC service territory and 1,800 devices in DEP service territory).

Table 5-6. Devices Included in 2017 Energy Efficiency and Demand Response Impacts Analysis

Jurisdiction and Cycling Strategy	2017 Thermostat Installations (EE Impacts)	2017 Conservation Period Devices (DR Impacts)		
		Thermostat	Switch	Total
DEC				
30%	4,490	2,141	143	2,285
50%		406	41	447
75%		234	12	246
Jurisdiction Total		2,781	196	2,978
DEP				
30%	1,719	1,020	99	1,119
50%		413	32	445
75%		223	12	236
Jurisdiction Total		1,656	143	1,800

5.1.3 Cumulative Program Enrollment

Based on the program-tracking database, the program installed a cumulative total of 8,511 devices as of the end of 2017, associated with 4,561 unique customer premises. As with the new 2017 enrollees, customers to date have overwhelmingly opted for smart thermostats (92%) over load control switches (8%). The 30% cycling strategy is the most popular among customers, with 79% of DEC and 58% of DEP devices enrolled into that cycling level. Only 14% of DEC and 23% of DEP devices were enrolled in the 50% cycling strategy and 7% of DEC and 17% of DEP devices enrolled in the 75% cycling strategy. As of December 2017, 218 devices were deactivated (e.g., removed the device), and 343 devices were un-enrolled (e.g., customers who opted out of participating in all Conservation Period events and are listed as 0% cycling).

Table 5-7 provides the distribution of device types and cycling strategies enrolled in the program since inception (2015) through December 31, 2017. Notably, cumulative installed devices suggest that there is an increased potential for Conservation Period summer event participation in 2018, compared to 2017 summer events. Substantial enrollment after the summer 2017 Conservation Period drives this increased potential.

Table 5-7. 2015 – 2017 Enrolled EWB Devices, by Jurisdiction, Type, and Cycling Strategy

Jurisdiction and Cycling Strategy	Number of Devices			Percentage of Total Devices in Jurisdiction		
	Thermostat	Switch	Total	Thermostat	Switch	Total
DEC						
30%	4,316	300	4,616	79%	69%	79%
50%	707	96	803	13%	22%	14%
75%	397	35	432	7%	8%	7%
Multiple/Unknown	24	1	25	0%	0%	0%
Jurisdiction Total	5,444	432	5,876	100%	100%	100%
DEP						
30%	1,377	140	1,517	57%	62%	58%
50%	577	32	609	24%	14%	23%
75%	428	25	453	18%	11%	17%
Multiple/Unknown	26	30	56	1%	13%	2%
Jurisdiction Total	2,408	227	2,635	100%	100%	100%

Note: Device counts reflect all devices from 2015 through December 2017, excluding devices that were deactivated (e.g., removed).

Table 5-8 summarizes device enrollment by the various program design features, such as device type (e.g., thermostat and switch), the choice of cycling strategy, enrollment in summer and/or winter events, one or more locations participating in the program, and others. Note that enrollment is very low for both summer and winter Conservation Period events compared to summer Conservation Period events alone. This is because thermostat customers must have a heat pump and electric resistance heat strips to be eligible to participate in winter events. By participating in the winter events, the program has 100% control of the electric resistance heating elements during the Conservation Period event.

Table 5-8. 2015—2017 EWB Device Enrollment by Program Design Features

Program Design Feature	DEC Devices (n=5,876)[A]	DEP Devices (n=2,635)[A]
Device Type		
Thermostat	93%	91%
Switch	7%	9%

Program Design Feature	DEC Devices (n=5,876)[A]	DEP Devices (n=2,635)[A]
Cycling Levels		
30%	79%	58%
50%	14%	23%
75%	7%	17%
Multiple/Unknown[B]	0%	2%
Summer and Winter Participants		
Summer Only	89%	91%
Summer and Winter	9%	6%
Unknown[B]	2%	3%
Number of Locations Participating in the Program		
One	98%	96%
Two or More	2%	4%
Recruitment/Marketing Source		
Business Energy Advisor	3%	3%
Canvasser	44%	57%
Email	5%	3%
Flyer	4%	8%
Friend	2%	0%
Installer	0%	0%
Small Business Energy Saver (SBES)	1%	1%
Telemarketing	7%	8%
Web	1%	1%
Other	3%	3%
Unknown[B]	31%	15%

[A] Device counts reflect devices installed through December 2017 excluding deactivated devices.
[B] Devices enrolled September through December 2017 did not have vendor data available, so are marked as unknown.

5.2 Gross Demand Response Impact Analysis

5.2.1 Methodology

The demand response impact analysis assessed summer Conservation Period gross impacts from switches and thermostats in place and operational at the time of the 2017 summer Conservation Period events.

For demand response programs, the concept of freeridership is not applicable. This is because customers will rarely, if ever, choose to cycle their units off during a hot day without program intervention. Non-participant spillover is also not applicable because non-participants are not notified of Conservation Period events. Participant spillover is unlikely to occur because customers rarely turn off other equipment during program events. However, takeback effects, such as running fans to compensate for the cycling of the AC unit and/or increased run-time for refrigeration and/or process cooling equipment, may occur. Because we used device-level (thermostat or switch) log data to conduct this analysis, rather than facility-level data, this analysis produces gross impacts, i.e., results are **not adjusted** for takeback effects. Notably, the original evaluation plan sought to assess net demand impacts using AMI (advanced metering infrastructure) data. However, the DEP AMI data had substantial data availability issues, and both DEC and DEP had quality issues related to anomalous load shapes, necessitating the use of device log data for the impact analysis. In particular, the load shapes within the AMI data—based on graphical review—were not consistent with AC load shapes, and the amount of AMI data was insufficient to fully represent the population of participants.

Activities included:

- Cleaned and prepared data by reviewing event data, as well as program participation, weather data and logger data to identify the number of devices eligible and available to participate in summer events;
- Determined baseline load by identifying similar non-event days (in terms of weather, day of week, and other variables);
- Modeled program impacts by conducting linear fixed effects regression analysis with similar non-event days using device log data and weather data to estimate per device run-time impacts;
- Converted run-time impacts to per device load impacts by applying the full load estimate (HVAC capacity divided by SEER); and
- Identified the number of participating devices (i.e., those eligible and operational) and calculated gross event impacts by multiplying the per device full load impacts by the number of participating devices; and
- Calculated gross impacts for each event by multiplying the per device load impacts by the number of participating devices by specific categories, including device type, cycling strategy and jurisdiction. We calculated the average program-level impact as the weighted average of load impacts across events by jurisdiction, weighting by the number of participating devices.

Clean and Prepare Data

As part of the data cleaning process to prepare for modeling, we excluded devices for the following reasons:

- Enrolled after last summer 2017 Conservation Period events
- Deactivated, unenrolled, or failed prior to event period or event
- Unknown cycling strategy
- No run-time during event and non-event days (less than 1% of participating devices)
- Insufficient run-time data (e.g., run-time data had zeroes for each 15-minute interval)
- Run-time greater than 100%

In total, we had 5,398 devices (3,454 in DEC and 1,944 in DEP) in our modeling data set. Table 5-9 shows in detail the total number of devices left after each data cleaning step by jurisdiction.

Table 5-9. Run-Time Modeling Data Cleaning Steps

Jurisdiction	# Devices Left	Drop Reason
DEC	3,645	Initial Count of Devices
	3,615	Missing Run-time Data
	3,565	Missing Run-time Data on Event and Matched Comparison Days

Jurisdiction	# Devices Left	Drop Reason
	3,554	Unknown Cycling Strategy
	3,455	Devices with Insufficient Run-time Data (Run-time is Zero for All Observations)
	3,454	Time Intervals > 60 Minutes/Percent Run-time Greater than 100% in an Interval
DEP	2,031	Initial Count of Devices
	2,009	Missing Run-time Data
	1,984	Missing Run-time Data on Event and Matched Comparison Days
	1,983	Unknown Cycling Strategy
	1,944	Devices with Insufficient Run-time Data (Run-time is Zero for All Observations)
	1,944	Time Intervals > 60 Minutes/Percent Run-time Greater than 100% in an Interval

We applied the modeled impact to all devices that received an event signal and cycled their unit during an event, regardless of their inclusion in the model.

Determine Baseline Load

We used a quasi-experimental design to estimate the load impacts of the EWB program. Our selected approach used proxy weather days[12] (i.e., non-event days with similar weather to event days in May through September 2017) to help replicate baseline conditions for event days (i.e., what would the participant's load have been in the absence of the EWB program event?). To develop matches, we used propensity score matching to select four non-event days that were similar in weather profile for each of the five event days. When using propensity score matching, we first build a logistic regression model to estimate each day's probability of being an event day, or its "propensity score," based on hourly weather. We then match each day to the nearest event day in terms of propensity scores (Figure 5-1 and Figure 5-2). The blue lines in the figures represent the event days, and the gray lines represent the matched non-event days. As can be seen, average hourly temperature profiles match fairly well between event and matched comparison days. It should be noted that Events 1 and 4 had more severe thunderstorms in DEP territory, which limited the quality of relevant proxy days available for analysis. We corrected for this issue through the models.

[12] We used participant addresses to geocode the locations of all participants and found the weather station that was closest to each participant's zip code.

Figure 5-1. Average Hourly Temperatures on Event Days and Matched Non-Event Days in DEC Territory

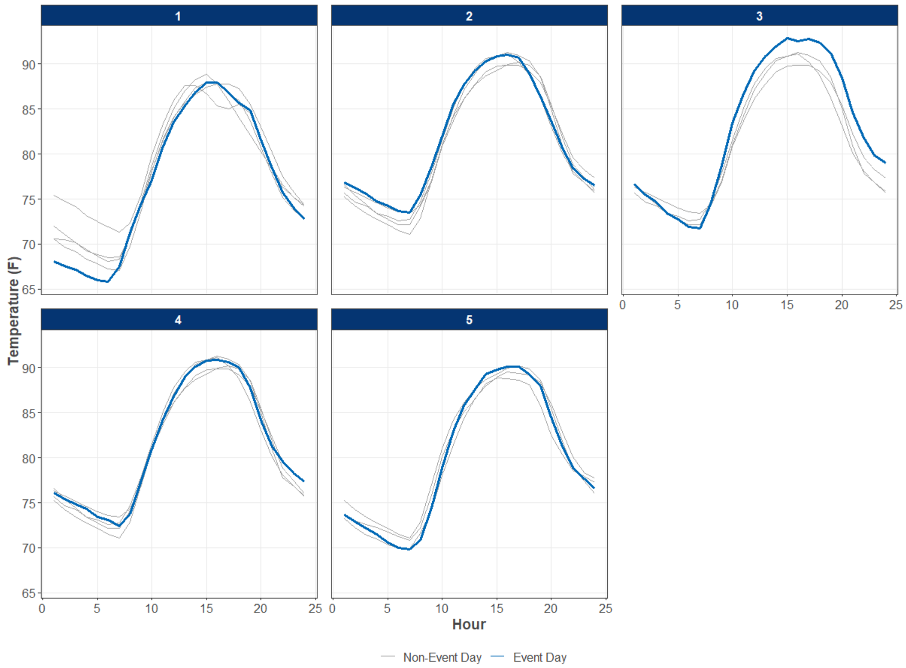
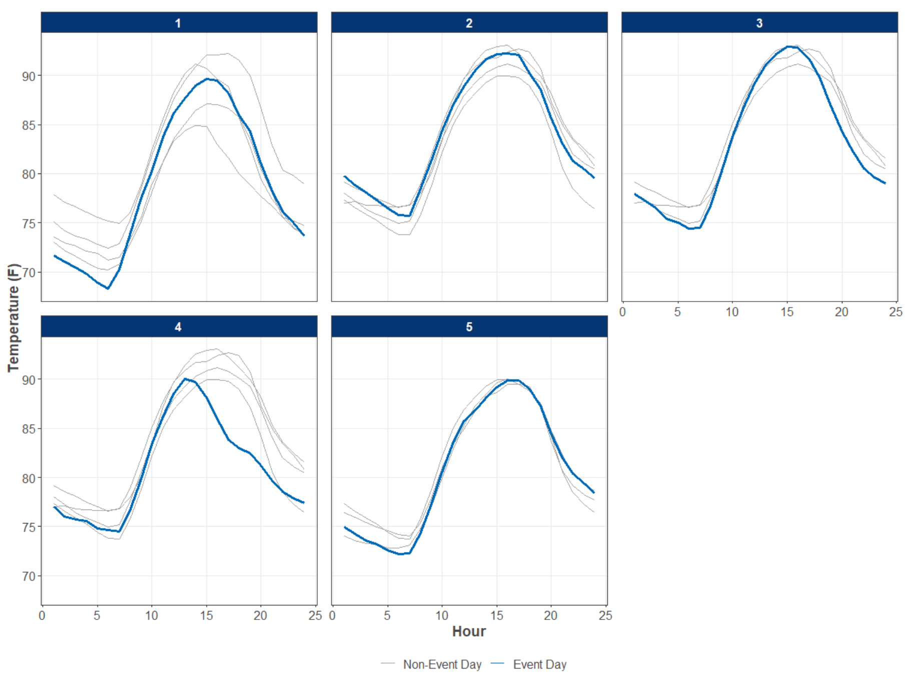


Figure 5-2. Average Hourly Temperatures on Event Days and Matched Non-Event Days in DEP Territory



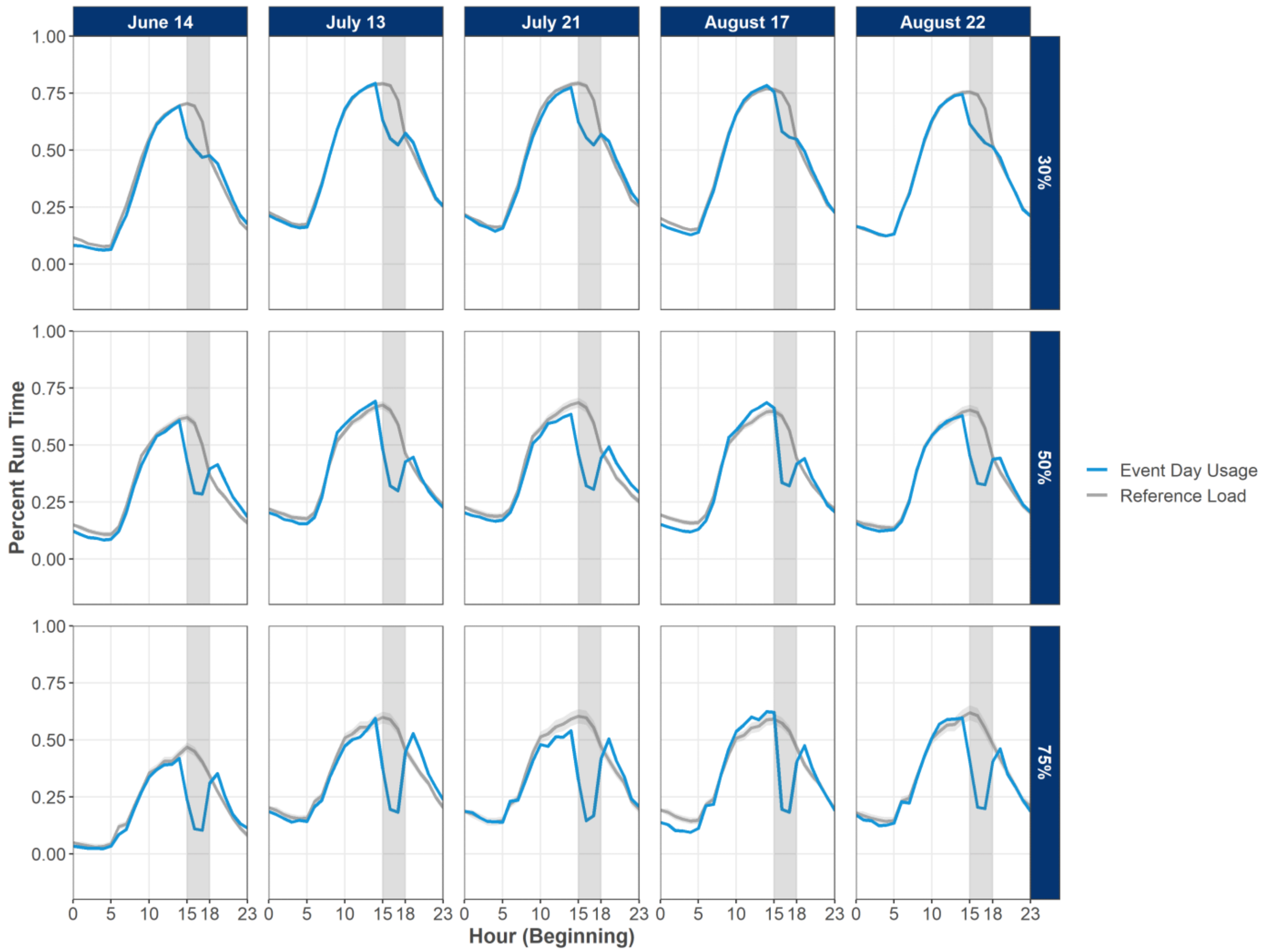
Model Program Impacts

We used a linear fixed-effects regression modeling approach for the demand response impact analysis. The model estimates the percentage of hourly run-time on a per-device level. Event impacts are the mean difference between the modeled (predicted) baseline run-time and the event run-time over the event period,[13] multiplied by mean full load demand (described below). The "fixed-effects" modeling approach allows us to control for the time-invariant device-level factors affecting demand (i.e., factors that do not change over the study period, such as type of facility or square footage) without measuring those factors explicitly in the models. All operational devices were included in the model, including those which opted out of the event. The impact estimates therefore include the effect of any participant opt-outs.

Figure 5-3 provides the actual event day hourly run-time (blue) and predicted run-time (gray) for each event for thermostats in the DEC territory. All events show clear evidence of run-time reduction during event hours. All events also show snapback (an increase in run-time following the event as temperatures are returned to their pre-event levels). The presence of snapback means that energy efficiency savings are likely minimal during the event days.

[13] The statistical regression model used to estimate the baseline hourly run-time during event periods predicts what the hourly run-time would have been during the event, if no event had been called. We then compare this baseline run-time to actual event day run-time to establish the demand savings by hour for each event. We estimated a separate model for each jurisdiction, device (thermostat and switch), cycling strategy (30%, 50%, and 75%), and event. However, because there were so few switches for the 75% cycling strategy, we combined these devices across jurisdictions.

Figure 5-3. Summer Event Day Usage and Estimated Baseline with 90% Confidence Interval (DEC Thermostats)



Convert Run-time Impacts to Demand Impacts

Converting percent run-time impacts to kW reduction involves multiplying the run-time reduction by the assumed full load demand of each device. Opinion Dynamics calculated the full load demand for each device based on Equation 5-1, which uses equipment cooling capacity and efficiency values. We used tonnage values provided in the participant data to calculate equipment cooling capacity (in Btu per hour). The participant data had this information for the majority of devices (81%). If a device did not have a tonnage value, we applied the average tonnage by device and jurisdiction. Efficiency values for the air conditioning systems were not available in the participation data. As a result, we applied the average 2016 evaluated SEER values by jurisdiction.

Equation 5-1. Per Participant Full Load kW for Air Conditioners

$$\text{Full load kW} = \frac{\text{Capacity}}{\text{SEER}}$$

Where:

Capacity = tons * 12 Btu/hour

SEER (Btu/watt-hour) = 11.2 (DEC) or 11.8 (DEP)

Calculated Event Participation and Gross Event Impacts

We first determined device participation for each event by identifying how many devices were (1) operational and (2) eligible. Operational devices are those that received an event signal and could be cycled. This excludes devices that had zero run-time during the day of the event or were in an incompatible mode (e.g., off mode). Eligible devices are defined as those that are active during an event and enrolled with a known cycling strategy. Eligible devices therefore exclude deactivated and unenrolled devices, and devices with an unknown cycling strategy. Notably, because there are five events and enrollment continued throughout the summer period, the number of eligible devices is different for each event.

We calculated gross impacts for each event by multiplying the per device load impacts by the number of participating devices by specific categories, including device type, cycling strategy and jurisdiction. We calculated the average program-level impact as the weighted average of load impacts across events by jurisdiction, weighting by the number of participating devices.

5.2.2 Results

Duke Energy called five summer Conservation Period events during the 2017 cooling season (June 14, July 13, July 21, August 17, and August 22). The temperatures were fairly similar across these events, with an average maximum event temperature of 95°. In Table 5-10, we summarize key features for these events, as well as the total number of eligible and operational devices. Notably, many devices were installed after the summer Conservation Period, and as a result are not included in the analysis because they were not eligible to participate in any events.

Table 5-10. 2017 EWB *Ex Post* Demand Response Events

Event Date	Day of Week	Start Time	End Time	Average Event Temp (F)	Max Event Temp (F)	Devices Eligible to Receive a Signal	Devices that Received a Signal and Cycled During Event	Operational Rate
June 14	Wednesday	3:00 PM	6:00 PM	89	94	4,790	4,334	90%
July 13	Thursday	3:00 PM	6:00 PM	92	96	5,133	4,658	91%
July 21	Friday	3:00 PM	6:00 PM	94	97	5,175	4,698	91%
August 17	Thursday	3:30 PM	6:00 PM	88	95	5,576	5,082	91%
August 22	Tuesday	3:00 PM	6:00 PM	89	95	5,613	5,116	91%
Average				**91**	**95**	**5,257**	**4,778**	**91%**

Note: Averages may not compute correctly due to independent rounding.

We also reviewed opt-out rates by event. Per conversations with Itron, the evaluated opt-out rates are consistent with their expectations for this program. Notably, we identified higher opt-out rates for food / liquor SIC codes, which is consistent with findings from our process survey.

Table 5-11. 2017 Summer Conservation Period Opt-Out Rates by Event and Business Type

Event	Food	Non-Food	Overall
DEC			
June 14	6%	3%	3%
July 13	10%	3%	4%
July 21	13%	4%	5%
August 17	6%	3%	4%
August 22	6%	4%	4%
Average	**8%**	**4%**	**4%**
DEP			
June 14	4%	5%	5%
July 13	13%	3%	4%
July 21	15%	6%	7%
August 17	3%	3%	3%
August 22	3%	3%	3%
Average	**8%**	**3%**	**4%**

Table 5-12 provides per device average load impacts by cycling strategy and device for DEC. As can be seen, customers who enroll in the highest cycling strategy tend to have lower reference loads, but achieve the highest load impacts. In addition, contrary to expectations based on typical customer engagement and opt-out behavior of participants with thermostats, thermostats achieved slightly greater load impacts than switches. According to program staff, this may be driven by the types of facilities that enroll with switches: program staff observed that a greater number of schools and storage facilities enrolled with switches, and these types of facilities may have lower reference load during summer event days compared to the average business.

Table 5-12. 2017 DEC *Ex Post* Average Event Demand Response Load Impacts by Cycling Strategy and Device

Device	Cycling Strategy	Per Device		% Load Impact
		Reference Load (kW)	**Load Impact (kW)**	
Thermostats	30%	3.355	0.740	22%
	50%	3.348	1.310	39%
	75%	2.471	1.371	56%
	Total	**3.280**	**0.876**	**27%**
Switches	30%	3.240	0.668	21%
	50%	2.777	0.872	31%
	75%	2.006	1.071	53%
	Total	**3.066**	**0.736**	**24%**

Table 5-13 provides per device average load impacts by cycling strategy and device for DEP. Trends in per device reference load and load impacts are similar to those for DEC: customers enrolled in the highest cycling strategy tend to have lower reference loads but achieve the highest load impacts. In DEP, thermostats also achieved greater load impacts than switches.

Table 5-13. 2017 DEP *Ex Post* Average Event Demand Response Load Impacts by Cycling Strategy and Device

Device	Cycling Strategy	Per Device		% Load Impact
		Reference Load (kW)	**Load Impact (kW)**	
Thermostats	30%	2.993	0.636	21%
	50%	2.393	0.939	39%
	75%	2.396	1.301	54%
	Total	**2.763**	**0.801**	**29%**
Switches	30%	2.925	0.550	19%
	50%	2.572	0.814	32%
	75%	2.006	1.079	54%
	Total	**2.766**	**0.655**	**24%**

Our impact analysis identified average percent load impacts that were routinely under the cycling strategy level. Overall, we found that the percent load impact from devices were lower than the duty cycle enrollment. For example, for DEP the 30% strategy achieved a load reduction of 21%, the 50% strategy a reduction of 39%, and the 75% strategy a reduction of 54%. This is consistent with expectations for a duty cycling[14] strategy, as the average run-time of units during non-events is rarely 100%. We recommend incorporating an adaptive cycling strategy for calling events. Adaptive cycling cycles the air conditioner as a percent of baseline during a hot day run-time rather than as a percent of total run-time. This helps to achieve percent run-time reductions closer to the cycling strategy, and it helps customers who may have over-sized units. Based on information from the program team, Duke Energy will implement this cycling strategy for the 2018 Conservation Period events.

Table 5-14 provides a summary of Conservation Period event impacts for DEC. Overall, DEC achieved 72% of its program-level demand response impact goal. While enrollment exceeded goals (realization rate of 129%), per unit savings for each cycling strategy fell short of expectations (realization rates of 56% for thermostats and 46% for switches). In addition, device enrollment is heavily distributed towards lower cycling strategies. The combination of lower cycling strategies and lower per device impacts drives the overall low realization rate.

Table 5-14. 2017 DEC Average Event Demand Response Load Impact Realization Rates

Device	Cycling Strategy	Participation			Gross Annual Summer Coincident kW/Unit			Gross Annual Summer Coincident Aggregate kW		
		Ex Ante[A]	Ex Post	RR	Ex Ante[A]	Ex Post	RR	Ex Ante[A]	Ex Post	RR
Thermostat	30%	1,097	2,141	195%	0.927	0.740	80%	1,017	1,585	156%
	50%	658	406	62%	1.729	1.310	76%	1,138	532	47%
	75%	439	234	53%	2.876	1.371	48%	1,263	320	25%
	TOTAL	**2,194**	**2,781**	**127%**	**1.558**	**0.876**	**56%**	**3,417**	**2,438**	**71%**

[14] A *duty cycle* is the fraction of one period in which a system is active. Thus, a 75% *duty cycle means* the unit is off 75% of the time and allowed to operate 25% of the time.

Device	Cycling Strategy	Participation			Gross Annual Summer Coincident kW/Unit			Gross Annual Summer Coincident Aggregate kW		
		Ex Ante[A]	Ex Post	RR	Ex Ante[A]	Ex Post	RR	Ex Ante[A]	Ex Post	RR
Switch	30%	58	143	247%	1.044	0.668	64%	61	96	158%
	50%	35	41	117%	1.776	0.872	49%	62	36	57%
	75%	23	12	54%	2.820	1.071	38%	65	13	20%
	TOTAL	**116**	**196**	**169%**	**1.617**	**0.736**	**46%**	**188**	**145**	**77%**
All Devices	**TOTAL**	**2,310**	**2,978**	**129%**				**3,605**	**2,582**	**72%**

[A] Ex Ante impact assumptions from Duke Energy. Source file: "DEC-DEP SBDREE Ex-Ante Savings - 05-10-18.xlsx" and "2017 Budget.xlsx".

Table 5-15 provides a summary of Conservation Period event impacts for DEP. Overall, DEP achieved 70% of its demand response impact goal. As with DEC, enrollment exceeded goals (realization rate of 127%), but per participant impacts were lower than expected for each cycling strategy (realization rates of 56% for thermostats and 47% for switches) and enrollment was heavily distributed towards lower cycling strategies. The combination of lower cycling strategies and lower per device impacts results in the lower realization rate.

Table 5-15. 2017 DEP Average Event Demand Response Load Impact Realization Rates

Device	Cycling Strategy	Participation			Gross Annual Summer Coincident kW/Unit			Gross Annual Summer Coincident Aggregate kW		
		Ex Ante[A]	Ex Post	RR	Ex Ante[A]	Ex Post	RR	Ex Ante[A]	Ex Post	RR
Thermostat	30%	672	1,020	152%	0.857	0.636	74%	576	649	113%
	50%	403	413	102%	1.600	0.939	59%	645	388	60%
	75%	269	223	83%	2.661	1.300	49%	716	290	41%
	TOTAL	**1,344**	**1,656**	**123%**	**1.441**	**0.801**	**56%**	**1,937**	**1,327**	**69%**
Switch	30%	35	99	283%	0.904	0.550	61%	32	54	172%
	50%	21	32	152%	1.537	0.814	53%	32	26	81%
	75%	14	12	89%	2.442	1.079	44%	34	13	39%
	TOTAL	**70**	**143**	**205%**	**1.402**	**0.655**	**47%**	**98**	**94**	**96%**
All Devices	**TOTAL**	**1,414**	**1,800**	**127%**				**2,035**	**1,421**	**70%**

[A] Ex Ante impact assumptions from Duke Energy. Source file: "DEC-DEP SBDREE Ex-Ante Savings - 05-10-18.xlsx" and "2017 Budget.xlsx".

When looking across both jurisdictions, enrollment exceeded goals, but was heavily distributed towards lower cycling strategies (Table 5-3). Per device load impacts were lower than anticipated across jurisdictions (56% for DEC and 55% for DEP) and cycling strategies (Table 5-14 and Table 5-15). Both utilities underachieved overall total summer coincident demand savings goals (72% for DEC and 70% for DEP); however, DEC had higher average per-event load impacts than DEP, perhaps driven by higher reference loads in the DEC jurisdiction. Conversely, DEP had a larger share of its enrollments on more aggressive cycling strategies than DEC.

Table 5-16. Summary of 2017 DEC and DEP *Ex Post* Average Event Demand Response Load Impacts

Metric	2017 Ex Ante		2017 Ex Post		Realization Rate	
	DEC	DEP	DEC	DEP	DEC	DEP
Participation (devices)	2,310	1,414	2,978	1,800	129%	127%
Per Device Weighted Average Summer Coincident Savings (kW)	1.56	1.44	0.87	0.79	56%	55%
Total Summer Coincident Demand Savings (kW)	**3,605**	**2,035**	**2,582**	**1,421**	**72%**	**70%**

5.3 Net Energy Savings Impact Analysis

5.3.1 Methodology

Opinion Dynamics conducted a series of analytical steps to estimate net energy efficiency savings attributable to thermostats installed in 2017. These steps included:

- Cleaned and prepared data, including review of program participation data to identify the number of premises with enrolled and installed thermostats in 2017;
- Modeled program impacts by conducting a consumption analysis, using a linear fixed effects regression model with a comparison group matched on pre-period energy consumption to estimate premise-level energy efficiency savings;
- Conducted a cross-participation analysis to understand the savings that EWB participants achieved from participation in other Duke Energy programs and account for them in consumption analysis at the premise-level; and
- Calculated total net energy savings by adjusting the average per-premise energy savings for cross-participation and multiplying per-premise savings by the number of premises with a thermostat enrolled in 2017. We then calculated per-device impacts by applying the average number of devices installed per-premise to calculate a realization rate against per-device ex ante goals.

Clean and Prepare Data

We excluded customer accounts from our energy efficiency impact models for the following reasons:

- Switch customers (ineligible for energy efficiency impacts);
- Extremely high (greater than 50,000 kWh/month) or low (less than 500 kWh/month) average daily consumption (10 customers were removed); and
- Inadequate billing history before or after program participation (1,017 customers were removed).

As a result of this data cleaning, we dropped 1,027 of 2,903 premises from the consumption analysis. The primary driver for the removal of these premises was insufficient post-period data, which was a limitation due to the timing of the evaluation rather than any problem inherent in the data. A review of consumption data indicated that customers excluded from the analysis had similar pre-period energy consumption as those included in the analysis. It should also be noted that we applied the estimated savings to all eligible participants, regardless of their inclusion in the model.

Model Program Impacts

Prior to conducting the consumption analysis, Opinion Dynamics created a matched comparison group. Utilizing a comparison group allows us to establish a counterfactual, i.e., the baseline energy that participants likely would have used in the absence of the program. Matched comparison groups consist of non-participants who have similar known traits to participants. We matched participants with non-participants in terms of business type (based on a combination of SIC codes) and monthly energy usage. Within business type, the five non-participants with the closest monthly energy usage to a participant were included in the comparison group.

A consumption analysis with a comparison group inherently provides net impacts. Because the comparison group represents energy use in the absence of the program, results from the consumption analysis are net results, and application of a net-to-gross ratio (NTGR) is unnecessary. Participant spillover, where the participant takes additional non-program energy-saving actions attributable to the program, is directly captured in the consumption analysis results. However, results from the consumption analysis also reflect savings from participation in other Duke Energy programs. As a result, consumption analysis results need to be adjusted for such cross-participation (see next subsection).

The consumption analysis employed a LFER model, which accounted for factors that are not expected to vary over time via the constant terms of the equation, such as square footage. This model also accounts for differences in weather and pre-program energy use between participants. To improve our estimate of what participants' usage would have been absent the program, we added dummy variables for each of the 12 months of the year.[15] Including these variables in the model helped control for monthly trends such as seasonal effects and allowed for a more accurate estimate of pre- and post-program usage. The model included weather terms as well as interaction terms between weather and the post-participation period for the treatment group to account for differences in weather patterns across years. We also included interaction terms to control for any differences in baseline usage between the treatment and comparison groups.

We included 2016 participants in the models to increase the robustness of our model results but did not apply the resulting estimated per-participant savings to 2016 participants when calculating 2017 impacts. We included 2016 participants in the model because many of the 2017 participants enrolled towards the latter half of 2017, resulting in an insufficient sample of 2017 participants with the required months of post-installation energy consumption data. We selected this approach after discussing program design and implementation with program staff, who indicated that there were few changes to implementation across the two program years, suggesting that per unit energy savings would likely be similar. In addition, we confirmed that 2016 and 2017 participants had very similar pre-participation energy usage and HVAC tonnage. A more detailed discussion of the consumption analysis methodology, including data cleaning steps, a comparison group assessment, and the final model, is provided in Volume II.

Apply Cross-Participation Analysis

The consumption analysis not only reflects EWB program savings but also savings from participation in other Duke Energy programs. As a result, the consumption analysis has the potential for overestimating energy savings (if EWB participants have higher cross-participation savings than the comparison group) or

[15] Dummy variables are binary terms for each month, with "1" signifying that the bill occurred in that month.

underestimating energy savings (if the comparison group has higher cross-participation savings than participants). We conducted a cross-participation analysis for participants and the comparison group to identify and correct for this. To do so, we identified measures that participants and the comparison group customers installed through the Non-Residential Prescriptive and SBES Programs, and their savings, during the post-participation period.[16] Savings reflect pro-rated net ex post impacts based on the date of installation. Once identified, we removed the difference between cross-participation savings of the comparison group and of the EWB participants. This accounts for the fact that the consumption analysis already nets out equal cross-participation savings for the comparison group and EWB participants.

It should be noted that program staff made implementation changes between 2016 and 2017 and discontinued the specific targeting of SBES participants for recruitment into EWB. This change improved cross-participation rates for 2017 EWB participants when compared to 2016 EWB participants.

Calculate Total Energy Savings

Energy efficiency impact estimates reflect changes in energy consumption at a premise level (i.e., billing data is at a premise level). Calculating total energy savings entails multiplying the per-premise savings by the number of thermostats installed between January 1 and December 31, 2017, including deactivated devices.[17] To calculate program realization rates relative to Duke Energy's ex ante assumptions, we converted premise-level energy efficiency savings to the thermostat level by identifying the average number of devices per premise (Table 5-17).

Table 5-17. 2017 EWB Thermostat Enrollments, Premises and Average Devices Per Premise

Jurisdiction	Number of Thermostats Installed in 2017	Number of Premises	Average Number of Devices per Premise
DEC	4,490	2,577	1.7
DEP	1,719	879	2.0
Total	**6,209**	**3,456**	**1.8**

Note: Device counts reflect all devices enrolled in January 2017-December 2017, including devices deactivated in 2017.

5.3.2 Results

Table 5-18 provides a summary of the daily and annual energy savings results by jurisdiction, before accounting for cross-participation. We identified substantial variation in energy efficiency savings between DEC and DEP, with DEC participants saving more than twice (5 kWh per day and over 3% of baseline usage) what DEP participants saved (2 kWh per day and less than 1.5% of baseline usage).

[16] We matched EWB participants to other program-tracking data by account and service point ID.

[17] The consumption analysis credits energy efficiency savings for each participant until the date of deactivation.

Table 5-18. 2017 EWB *Ex Post* Daily and Annual Energy Efficiency Savings

Jurisdiction	Daily Energy Savings Estimate (kWh/Day)			Annual Energy Savings Estimate (kWh/Year)	
	Daily Estimate	Baseline Usage	Percent Savings	Per Premise	Per Thermostat[A]
DEC	5.06	155	3.29%	1,847	1,060
DEP	2.11	145	1.44%	771	394

[A] Converted to thermostat level by applying average number of devices/premise. Results are not adjusted for cross-participation analysis findings.

We have used our knowledge of the program, participants, and similar programs to make conjectures for factors that might explain the differences in energy efficiency between jurisdictions, however, due to the nature of billing analyses results, it is not possible to determine which of these factors is causally related to the savings difference nor how to attribute the quantity of savings differences to each factor. We offer the following series of checks we conducted to identify what may be driving lower energy savings in the DEP territory versus DEC territory.

According to program staff, program design and implementation is relatively consistent across both territories, including the type of facilities targeted and enrolled in the program. Our analysis found the following differences in characteristics between DEC and DEP participants:

- DEP participants tend to have lower annual average baseline usage, compared to DEC participants.
- DEP participants have slightly lower average tonnage in terms of the HVAC units being controlled.
- DEP participants have slightly more thermostats per premise than DEC participants.
- During the cooling season (May through September), DEC participants tend to use their program-controlled air conditioning units slightly more than DEP participants (expressed as runtime percentage).

Individually, these differences between DEC and DEP participants are small and unlikely to fully account for the observed differences in savings. However, all differences directionally support lower savings for DEP participants. Table 5-19 summarizes these participant characteristics.

Table 5-19. Comparison of DEC and DEP Participant Characteristics

Characteristics	DEC	DEP
Average Daily Baseline Usage	155	145
Average AC Size (Tons)	4.35	4.01
Average Cooling Season Run-time	28.7%	27.5%
Average Number of Thermostats per Premise	1.74	1.96

Other factors, such as customer behavior may play a role, e.g., engagement with their thermostat. Survey results suggest that DEP participants may change their set points or use the web portal more frequently than DEC customers. Additionally, the energy-saving benefits of the Wi-Fi-enabled thermostat are largely a function of how customers were using their existing (baseline) thermostat. Other customer behaviors not observable in this evaluation, such as those linked to business types and thermostat set-points, may further drive savings differentials. Future research efforts should assess whether there are differences in enrollment by SIC code that are correlated with lower energy savings impacts and investigate non-event day customer set points.

The cross-participation analysis results call for removing a substantial portion of energy savings from the consumption analysis results (Table 5-20). Approximately 18% of EWB participants also participated in other Duke Energy programs in 2016 and 2017, while 7% of matched comparison group non-participants participated in other Duke Energy programs. The majority of cross-program participation was in the Non-Residential Prescriptive Program, which also contributed the largest share of savings adjustments (60% compared to 40% from SBES). These rates were consistent across jurisdictions.

Table 5-20. Thermostat-Level Cross-Participation Analysis Results

Jurisdiction	(A) Consumption Analysis Savings (kWh)	Pro-Rated Cross-Participation Savings (kWh)			(E) Adjusted Energy Savings (kWh) (A-D)
		(B) EWB Participant	(C) Matched Comparison Group	(D) Difference Between EWB Participant and Matched Comparison Group (B-C)	
DEC	1,060	937	388	549	511
DEP	394	503	128	376	18

Table 5-21 shows the per-thermostat and program-level savings for the program in each jurisdiction. DEC participants saved 2,296 MWh and DEP participants saved 31.7 MWh annually.

Table 5-21. 2017 *Ex Post* Annual EWB Energy Efficiency Savings

	Consumption Analysis Savings (kWh)	Cross Participation Deduction (kWh)	Adjusted Energy Savings (kWh)
DEC			
Thermostat Level	1,060	-549	511
Program Level	4,759,461	-2,463,014	2,296,448
DEP			
Thermostat Level	394	-376	18
Program Level	677,283	-645,546	31,737

Table 5-22 provides the energy efficiency savings realization rate for 2017. Overall, we found that the program overachieved thermostat installation goals across both jurisdictions (realization rates of 256% for DEC and 160% for DEP). However, per device energy savings were lower than expected across jurisdictions (realization rates of 80% for DEC and 3% for DEP), which was largely driven by cross-participation. The resulting overall realization rate is 204% for DEC and 5% for DEP. It should be noted that Duke Energy added an “auto-EE” functionality to their customer portal in 2018. This feature assesses the building’s thermodynamics and auto-adjusts the set points when the facility is closed to generate additional energy savings. These changes could potentially increase the overall energy efficiency savings from the thermostats in future program years.

Table 5-22. Summary of 2017 DEC and DEP *Ex Post* Energy Efficiency Impacts

Metric	2017 Ex Ante		2017 Ex Post		Realization Rate	
	DEC	DEP	DEC	DEP	DEC	DEP
Participation (thermostats)	1,755	1,076	4,490	1,719	256%	160%
Per Participant Average Annual kWh	641	562	511	18	80%	3%
Total Energy Savings (kWh)	**1,124,522**	**605,111**	**2,296,448**	**31,737**	**204%**	**5%**

Note: Averages may not compute correctly due to independent rounding.

6. Process Evaluation

6.1 Methodology

The process assessment leveraged the following data collection methods and research activities:

- Program staff interviews (n=7)
- Materials review
- Program-tracking data analysis
- Early participant interviews (n=10)
- Participant survey (n=242)
- Non-participant interviews (n=10)
- Unenrolled participant interviews (n=10)

We provide a detailed overview of these data collection method and research activities in Section 4.

6.2 Findings

This section provides detailed findings from the EWB process evaluation, starting with the experiences of participants, followed by non-participants and then unenrolled participants. Throughout this section, we include feedback from the program staff interviews to help provide context or explain results, where applicable.

6.2.1 Participant Experiences

This section details participants' experiences with the EWB program. These results draw primarily from the participant survey, with findings from the early participant interviews provided where these results can help complement the survey results. The evaluation team assessed differences in participant survey results based on jurisdiction and the and cycling level chosen by customers.[18]

This section starts by providing context about who survey respondents were, then summarizes participant satisfaction with the program. We then detail the various aspects of program participation, starting with motivations for participation and the enrollment and installation processes, followed by thermostat and portal usage and conservation period experiences.

[18] The evaluation team investigated assessing differences between participants recruited by Threshold Marketing and Lime Energy but was not able to do so as the sample frame only included six participants recruited by Lime Energy, and only one of these six participants completed the survey.

Participant Survey Respondent Firmographics

To provide early process feedback, the participant survey was fielded in September 2017. As a result, the survey sample frame included 2017 program participants enrolled at the time of the data request, in August 2017. A comparison of DEC and DEP participants showed similarities in terms of many elements of program enrollment. However, DEC participants more often chose the lowest (30%) cycling level (86% DEC vs. 56% DEP)[19] and less often installed multiple devices in their businesses (37% DEC vs. 43% DEP).[20] Because there were no other differences in how the program was implemented in each jurisdiction, these differences in participant characteristics across the two jurisdictions likely account for some of the variation in survey responses between the two groups, as survey participants closely mirror the population for both jurisdictions.

Table 6-1. Participant Enrollment Characteristics

Characteristic	DEC		DEP	
	Survey Respondents (n=180)	Population (n=2,699)	Survey Respondents (n=62)	Population (n=943)
Cycling Level				
30%	77%	86%	42%	56%
50%	15%	10%	31%	22%
75%	8%	4%	27%	22%
Enrollment in Summer and Winter Events				
Summer Only	95%	93%	95%	96%
Summer & Winter	5%	7%	5%	4%
Number of Devices Across All Locations				
One	60%	63%	45%	57%
Two or more	40%	37%	55%	43%
Device Type				
Thermostat	96%	92%	95%	90%
Switch	3%	7%	3%	10%
Both	1%	1%	2%	1%
Recruited by Lime Energy or Threshold Marketing				
Yes	84%	89%	85%	85%
No	16%	11%	15%	15%

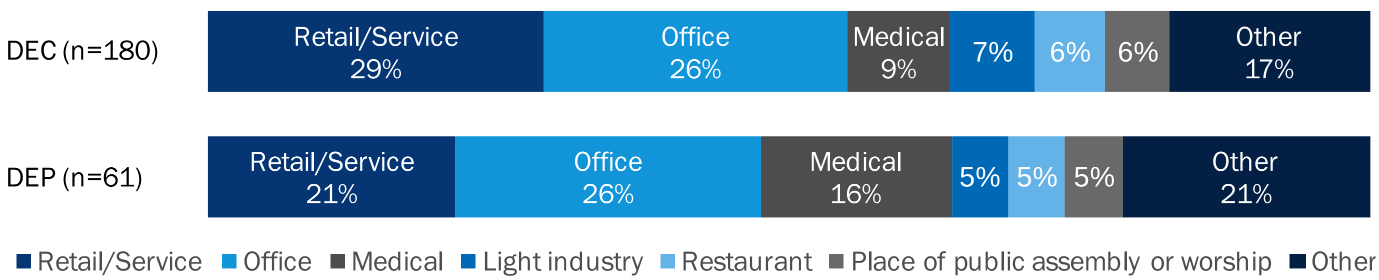
Note: The sample frame includes all 2017 participants enrolled when data was requested for the survey in August 2017, with customers who participated at multiple locations de-duped to one observation. The population data include all 2017 participants enrolled through December 2017.

[19] During conversations with program staff, the evaluation team learned that the activities of one canvasser may be responsible for most of the disparity between cycling levels in the two jurisdictions. A single canvasser for DEC was responsible for approximately 30% of all new participant registrations during the 2017 program year. The canvasser registered most or all of their new participants at the 30 percent cycling level, and thus, skewed all DEC participants towards a 30 percent cycling level.

[20] By the end of the evaluated period, DEC and DEP participants showed increasingly similar rates of multiple-device installations.

Business types of survey respondents are similar across the two jurisdictions, with most being retail/service, office, or medical businesses (see Figure 6-1).

Figure 6-1. Participant Survey Respondent Business Type

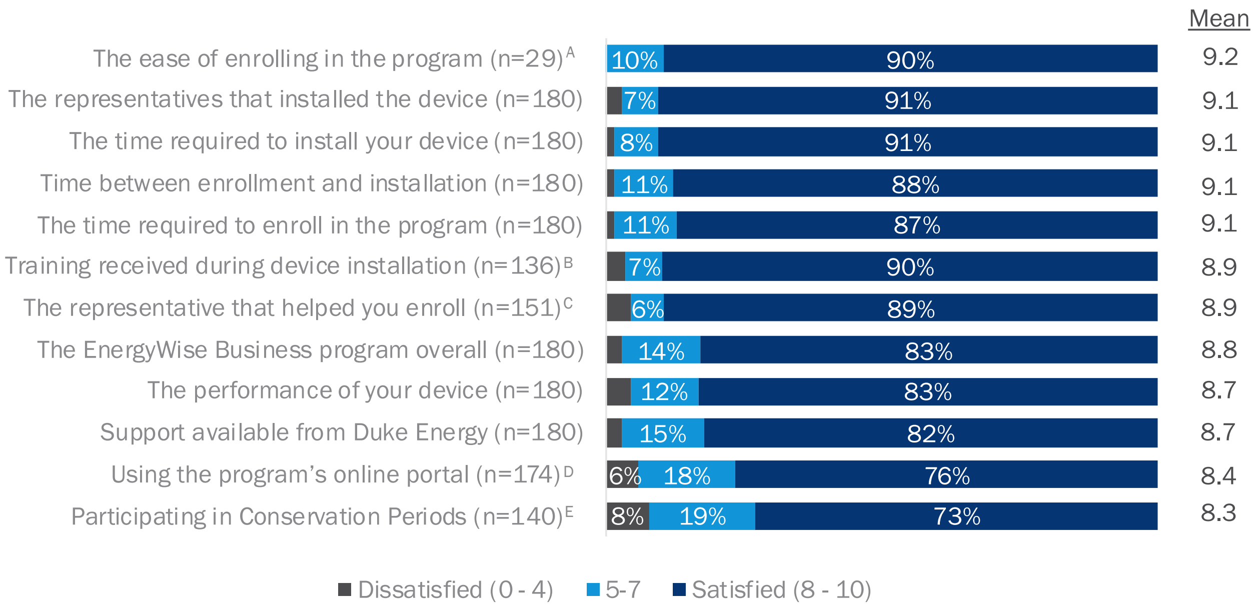


Participant Satisfaction

Overall, participants report high satisfaction with program elements. In general, participants are highly satisfied with the program enrollment and installation processes, the performance of their thermostat or switch, and the Duke Energy and implementation vendor staff. While still generally satisfied, average satisfaction is lower for the program portal and the Conservation Period events, as quantified for each jurisdiction below and detailed throughout the remainder of the participant survey results section.

DEC participants highly rate their satisfaction with their enrollment experiences, whether they enrolled on their own or through a canvasser. DEC participants highly rate their satisfaction with the ease of program enrollment when enrolling on their own (mean of 9.2, see Figure 6-2). On average, DEC participants provide the same high rating for their satisfaction with the representatives who installed the device, the time required to install the device, the time between enrollment and installation, and the time required to enroll in the program (mean of 9.1). Program data suggests that the average time between enrollment and installation is 26.1 days, and typically it takes longer in DEP territory and for switches. DEC participants report lower satisfaction with participation in Conservation Periods (mean of 8.3) and with their use of the program's online portal (mean of 8.4).

Figure 6-2. DEC Participant Satisfaction

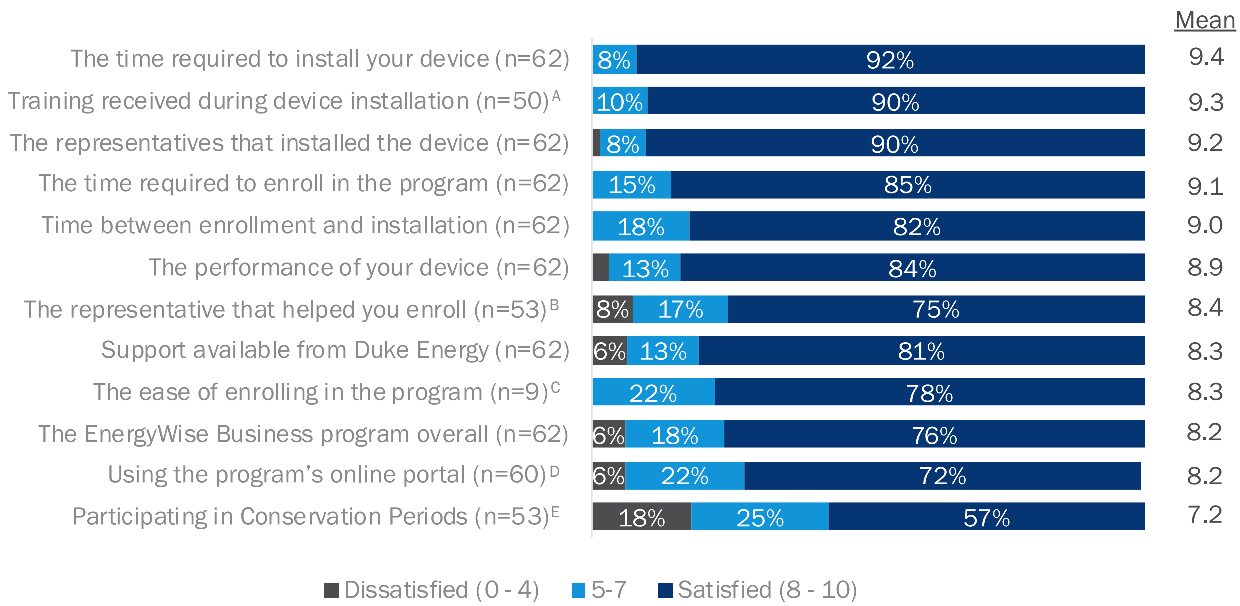


A: Only includes customers not recruited by canvassers.
B: Only includes customers present during installation.
C: Only includes customers recruited by canvassers.
D: Only includes customers receiving at least one thermostat.
E: Only includes customers recalling participation in any Conservation Period.

DEP participants most highly rate satisfaction with the time required to install their device (mean of 9.4, see Figure 6-3), the training received during installation if they were present for it (mean of 9.3), and the representative that installed their device (mean of 9.2). Like DEC participants, DEP participants report lower satisfaction with participation in Conservation Periods (mean of 7.2) and with their use of the program's online portal (mean of 8.2). Though DEP participants highly rate satisfaction with most program elements, DEP participants are significantly less satisfied with the program overall than DEC participants and report they are less likely to continue to participate in the program.[21]

[21] The evaluation team explored the relationship between cycling level differences between the two jurisdictions and their satisfaction with the program overall. Though sample sizes are too small to produce significant results, DEP customers still report lower satisfaction with the program than DEC participants after controlling for differences in cycling levels.

Figure 6-3. DEP Participant Satisfaction



A: Only includes customers present during installation.
B: Only includes customers recruited by canvassers.
C: Only includes customers not recruited by canvassers.
D: Only includes customers receiving at least one thermostat.
E: Only includes customers recalling participation in any Conservation Period.

One noteworthy finding is the high satisfaction with the time between enrollment and equipment installation for both DEC and DEP participants. After Threshold Marketing was brought on board and the program enrollment rate increased, the time between enrollment and installation increased until Itron could hire more installers. For that period, the wait between program enrollment and thermostat installation increased to two to three months, exceeding the target of four weeks. Based on the results above, this lag does not seem to have impacted participants' satisfaction with the program.[22]

Participant survey findings reflect similar sentiments from early participant interviews. Like most participants, early participants highly rate their satisfaction with the program overall (mean of 9.2) and with the Wi-Fi enabled thermostat they received from the program (mean of 9.3). During one interview, an early participant mentioned that "everybody [associated with Duke Energy] was polite and easy to get along with."

Motivations for Participation

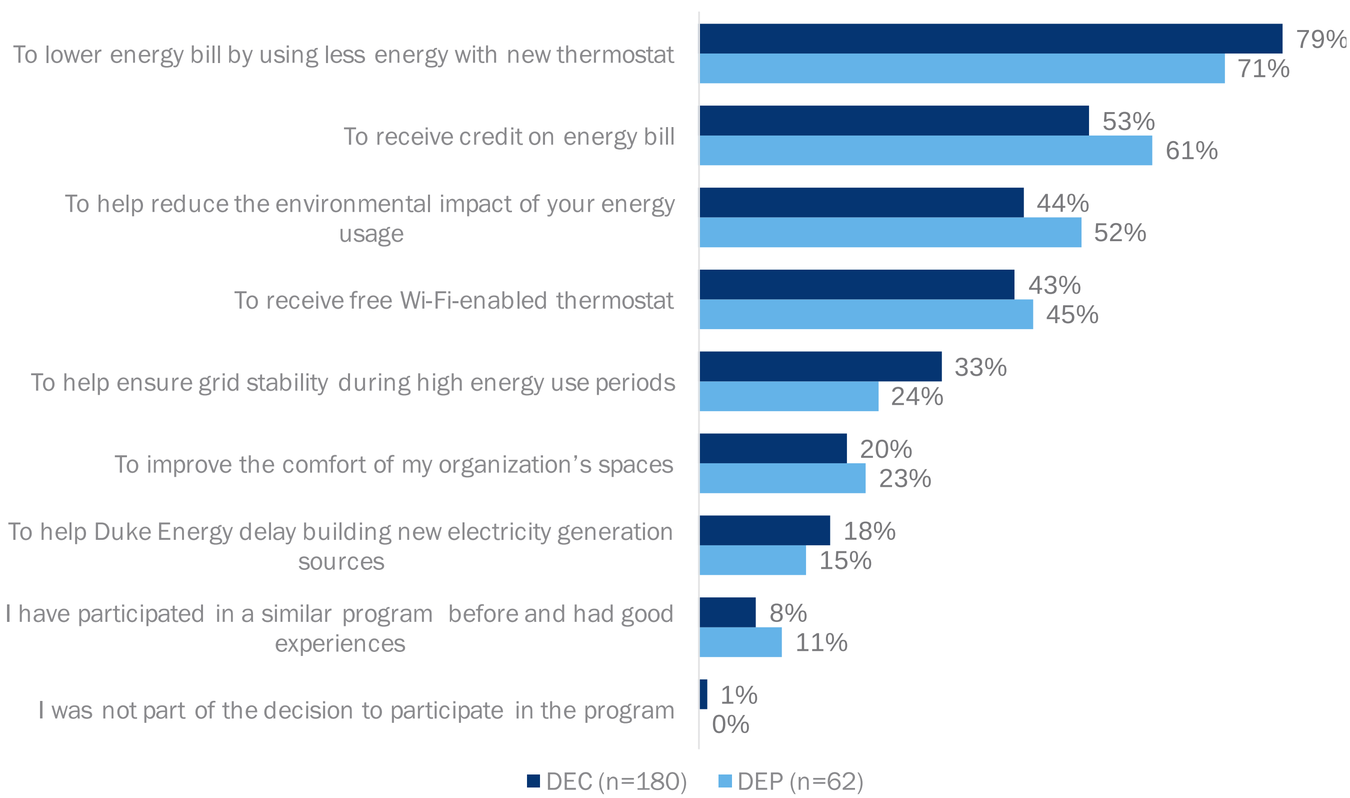
When asked about customers' reasons for participating in the program, Threshold Marketing managers reported that customers enroll for the free thermostat installation and energy savings. Their canvassers tell

[22] The evaluation team tested the correlation between the days from enrollment to installation and customer satisfaction and found no meaningful correlation.

customers they can expect five percent savings with the new thermostat and find that business owners are especially interested in the benefits of being able to remotely track and control their thermostat(s). The Threshold Marketing program managers reported typically using the energy savings and benefits of the free thermostat first to get customers interested, and then explaining the Conservation Periods second. Similarly, Duke Energy's program marketing collateral also leads with the benefits of the smart thermostat.

Survey respondents report a variety of motivations for participating in the program. Participants most commonly cite bill savings (79% for DEC and 71% for DEP, see Figure 6-4) and bill credits (53% for DEC and 61% for DEP) as a motivation for enrolling in the program, followed by environmental benefits (44% for DEC and 52% for DEP), and the free thermostat itself (43% for DEC and 45% for DEP).

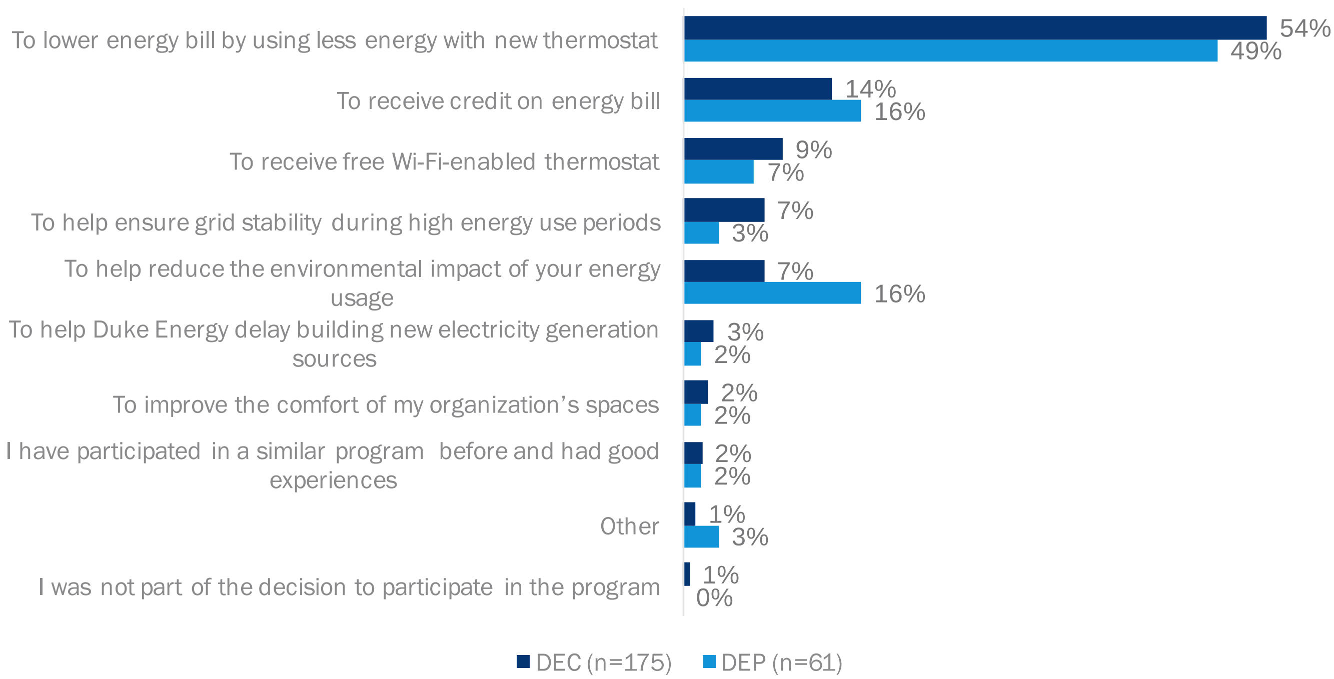
Figure 6-4. Participant Motivation for Enrollment: All Reasons



Note: Figure includes all reasons for enrolling.
This question allowed for multiple responses.

When participants were asked for the most important motivation for program participation, about half reported the most important motivation was lowering their energy bill (54% DEC, 49% DEP, see Figure 6-5), which is consistent with how the program is marketed. When comparing responses between general motivations and the primary motivation among those respondents who reported more than one motivation to participate, receiving a bill credit, reducing the environmental impact of energy usage, and receiving a free Wi-Fi-enabled thermostat appear to be secondary motivations.

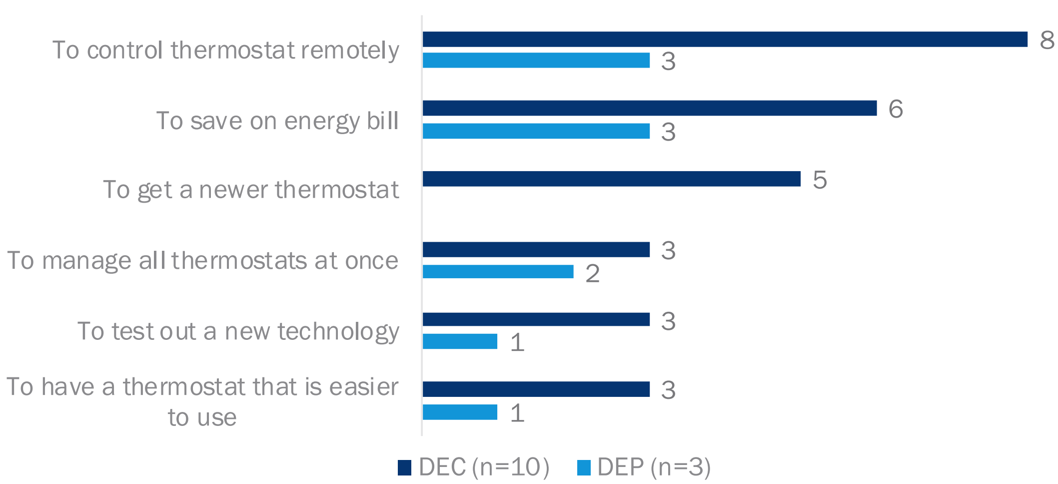
Figure 6-5. Participant Motivation for Enrollment: Primary Reason



Note: Figure includes only most important reason for enrolling.

Participants who cite receiving a free Wi-Fi-enabled thermostat as a motivation for program participation were also asked about the elements of the thermostat that were most appealing. Most cite the ability to remotely control their thermostat as an appealing element (8 of 10 DEC, 3 of 3 DEP, see Figure 6-6). Responses are similar for early program participant interviews. One early program participant interviewee additionally cites the "lockout" feature, which password protects changes to the thermostat, as the most appealing feature.

Figure 6-6. Thermostat Features Appealing to Participants



Note: Figure reports counts of participants indicating each feature was appealing, and includes all features mentioned by respondents.

Enrollment Process

Most participants were initially recruited to participate in the program by a canvasser (84% DEC, 86% DEP). Almost all participants who had been recruited by a canvasser recall the canvasser visit (97% DEC, 98% DEP) and most report that based on their conversation with the canvasser, they understood program elements very well when they enrolled.

To characterize customer understanding of specific program elements, the evaluation team first asked participants if they recalled a visit from the canvasser and then if they recalled specific pieces of information discussed by the canvasser. The responses from these two questions were then aggregated together to describe the understanding of all participants. Of the various program elements asked about in the survey, participants report having the best understanding of elements related to the thermostat, including when they could expect their device to be installed (77% DEC, 85% DEP, see Figure 6-7 and Figure 6-8) and the benefits of a Wi-Fi thermostat or switch (72% DEC, 81% DEP). Participants who did not recall discussions with the canvasser are labelled in the graph as "did not recall the discussion at all."

Participants report lower understanding with the DR components of the program, including that Duke Energy would temporarily lower HVAC usage during Conservation Periods, the bill credits for participating in Conservation Periods, and the cycling level they could choose. While about half of participants (51% DEC, 56% DEP) understood cycling levels very well, 39% of DEC and 21% of DEP participants did not remember discussing cycling levels at all. These results are consistent with how program staff described the recruitment and enrollment process: canvassers would lead with the benefits of the thermostats to interest customers and explain the Conservation Periods second. Itron program managers also mentioned that, at the time of installation, customers were not always well-informed about the program. While it was unclear if that was because customers did not recall conversations with canvassers or if canvassers were not providing all the information, Itron did find that installers sometimes had to explain the program to customers.

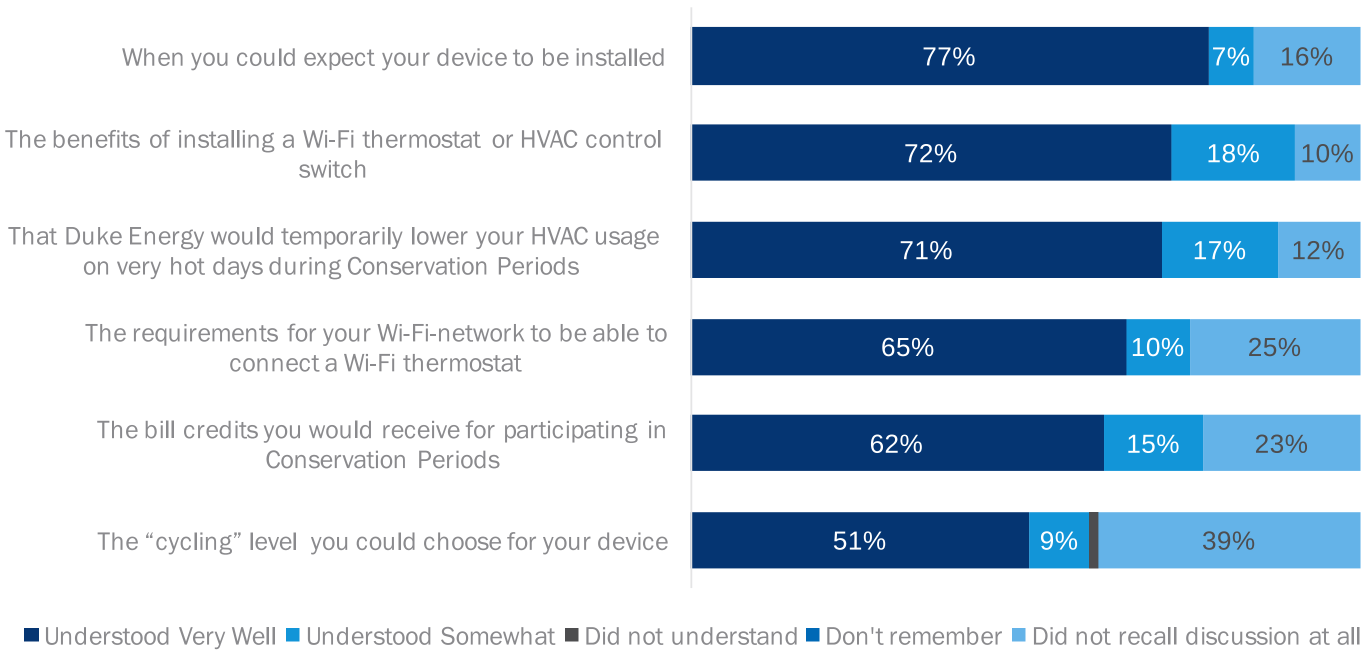
While most participants understood the Wi-Fi network requirements for the program, 25% of DEC and 13% of DEP participants do not remember discussing Wi-Fi requirements with their canvasser. Again, while it is unclear if this is related to customer recall versus what canvassers emphasized during their recruitment pitch, this finding is interesting since Wi-Fi network issues are one of the top two reasons[23] that recruited customers turn down the thermostat at installation. Threshold Marketing managers reported that canvassers do check for Wi-Fi connectivity when qualifying customers but err on the side of enrolling customers when there are doubts about their eligibility, to give the Itron installers the opportunity to make the installation happen.

More DEP participants report understanding each program element very well compared to DEC participants. The differences between the two jurisdictions are unlikely to result from differences in program design, as the programs are run virtually identically in the two jurisdictions. The differences also do not appear to result from firmographic differences between the two jurisdictions as respondents report a similar composition of business types. It is likely that the differences arise from services delivered by different implementation staff in the two jurisdictions. As the jurisdictions are serviced by different individual canvassers and different individual installers, the differences between jurisdictions may be the result of particular staff members servicing the two territories.

[23] Program staff reported that Wi-Fi issues were tied with HVAC equipment issues as the top reason for turn downs.

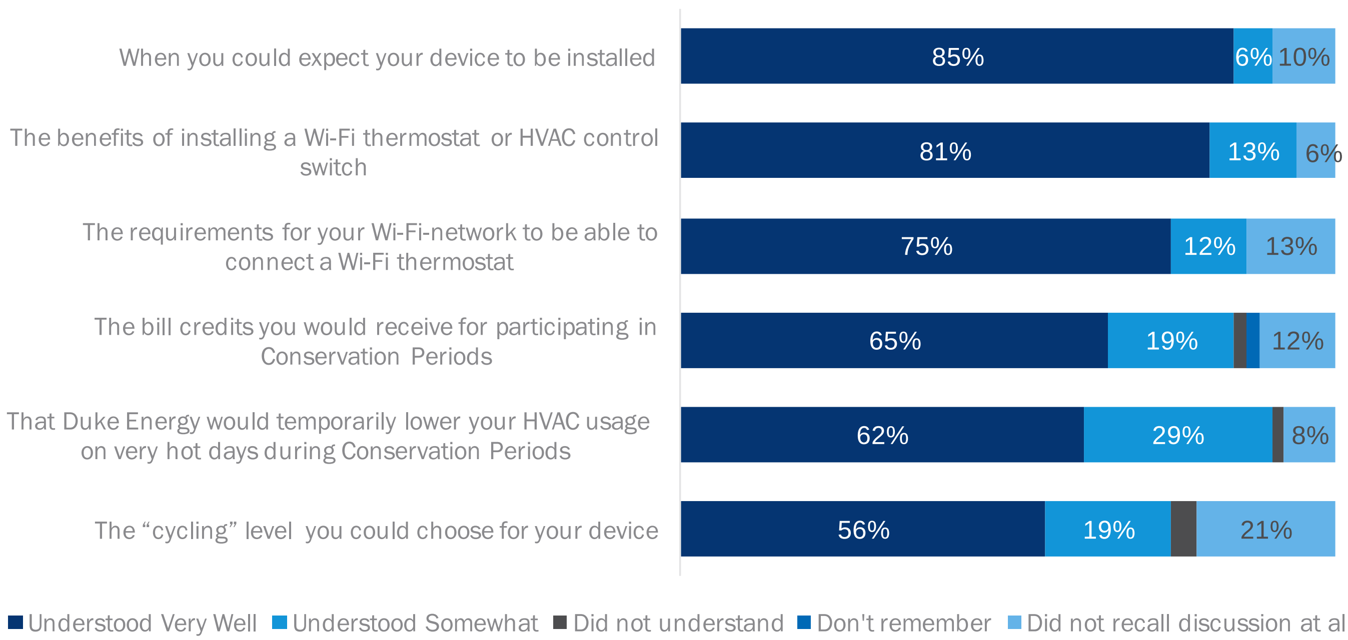
After enrolling in the program, most participants did not have any additional questions about the program (DEC 90%, DEP 82%). For those who did, questions typically related to bill credit timing and the number of demand response events Duke Energy planned to call.

Figure 6-7. Recruited Participants' Understanding of Elements: DEC (n=146)



Note: "Did not recall discussion at all" represents customers who did not recall talking about program elements with a Duke Energy representative during enrollment. "Don't remember" indicates customers who recalled talking about the element but did not remember how well they understood.

Figure 6-8. Recruited Participants' Understanding of Elements: DEP (n=52)



Note: "Did not recall discussion at all" represents customers who did not recall talking about program elements with a Duke Energy representative during enrollment. "Don't remember" indicates customers who recalled talking about the element but did not remember how well they understood.

Survey participants who were not recruited by a canvasser[24] report lower understanding of program elements before enrolling in the program than participants recruited by a canvasser. Most non-recruited participants report being unaware of the cycling level they could choose for their device (19 of 27 DEC, 6 of 9 DEP, see Figure 6-9 and Figure 6-10), when they could expect their device to be installed (18 of 29 DEC, 6 of 9 DEP), and the requirement for their Wi-Fi network to connect a Wi-Fi enabled thermostat (17 of 29 DEC, 6 of 9 DEP). The majority of DEC non-recruited participants also report being unaware that Duke Energy would call demand response events (17 of 29).

[24] The customers would have heard about the program through one of Duke Energy's other marketing channels and enrolled themselves online or by calling.

Figure 6-9. Non-Recruited Participants' Understanding of Elements: DEC (n=29)

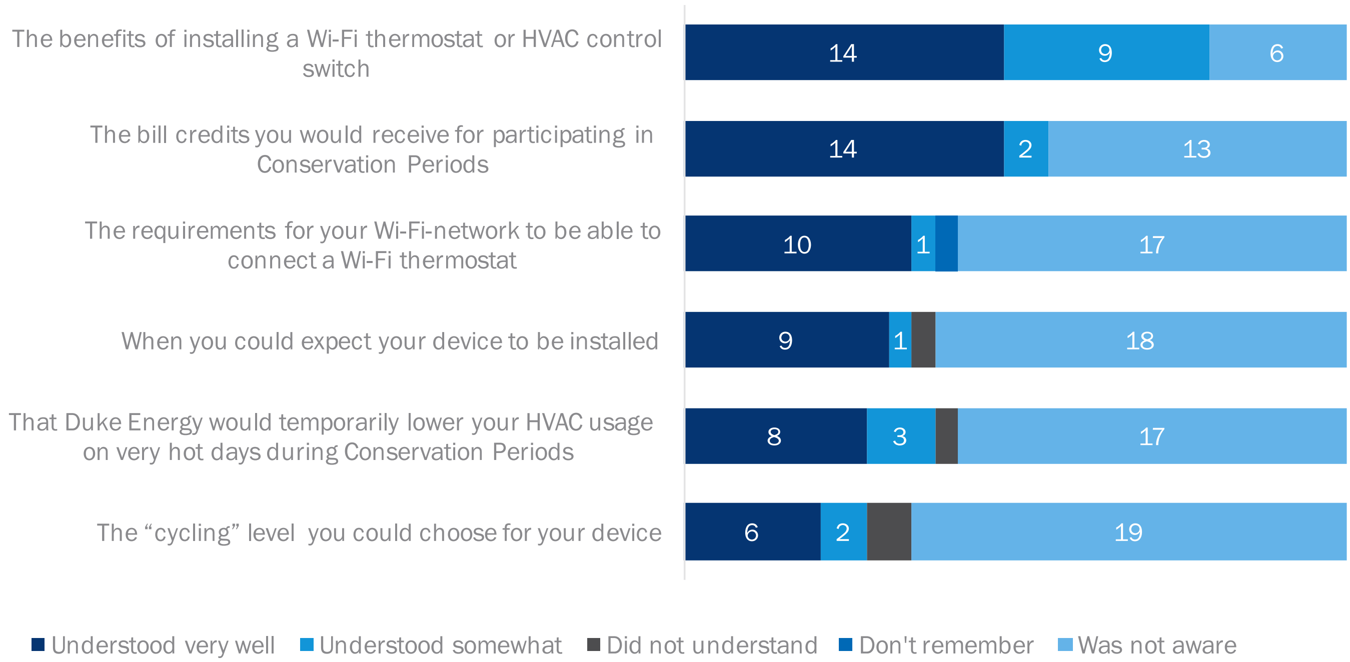
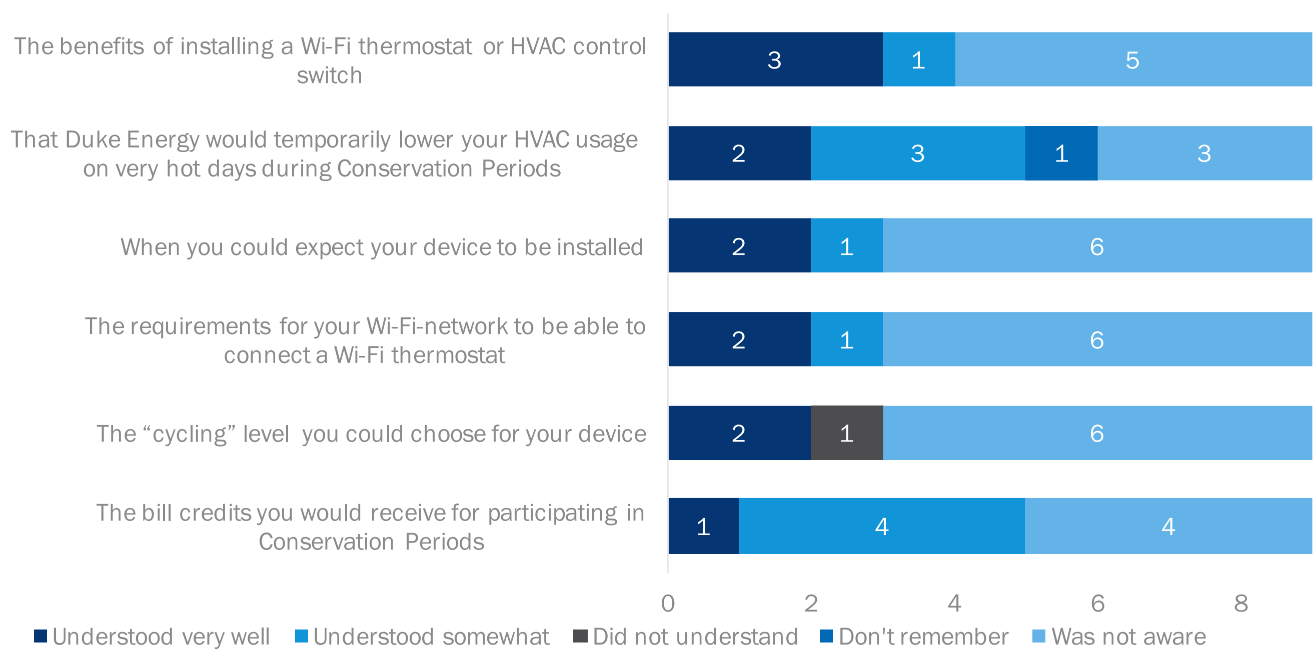


Figure 6-10. Non-Recruited Participants' Understanding of Elements: DEP (n=9)



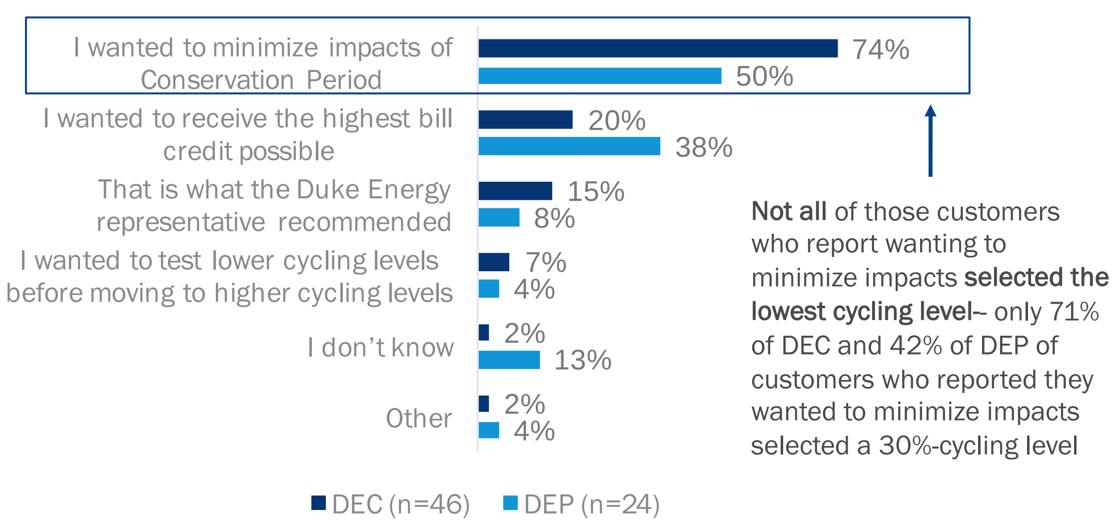
During program enrollment, customers are asked to select their cycling level. To better understand how well they understand cycling levels, participants were asked about their chosen cycling level. About half of DEC participants and almost two-thirds of DEP participants recall choosing a cycling level (52% DEC, 61% DEP, see Table 6-2). However, only about one-quarter of all participants correctly recall the cycling level they chose (22% DEC, 31% DEP). The evaluation team analyzed responses and did not find any correlation between the accuracy of cycling level recall and the cycling level the customer chose. These results further demonstrate the earlier finding that few participants understand their cycling levels; even amongst customers who remember choosing a cycling level, less than half knew what their cycling level was.

Table 6-2. Participant Recall of Cycling Levels

Recall of Cycling Level	DEC (n=180)	DEP (n=62)
Recalled correct cycling level	22%	31%
Recalled incorrect cycling level	5%	10%
Recalled choosing a level, but did not recall the level itself	25%	21%
Did not recall choosing cycling level	48%	39%

When asked their rationale for choosing their cycling level, most participants report a desire to minimize the impacts of Conservation Periods on their business (74% DEC, 50% DEP, see Figure 6-11). Surprisingly, a large portion of these participants selected a cycling level that did not align with this stated rationale. Of those who reported that they chose their cycling level to minimize the impact of Conservation Periods, only 71% (DEC) and 42% (DEP) selected the lowest (30%) cycling level. The remaining 29% of DEC and 58% of DEP participants chose a higher cycling level, meaning their selected cycling strategy would not minimize the impacts of Conversation Periods.

Figure 6-11. Participant Rationale for Choosing Cycling Level

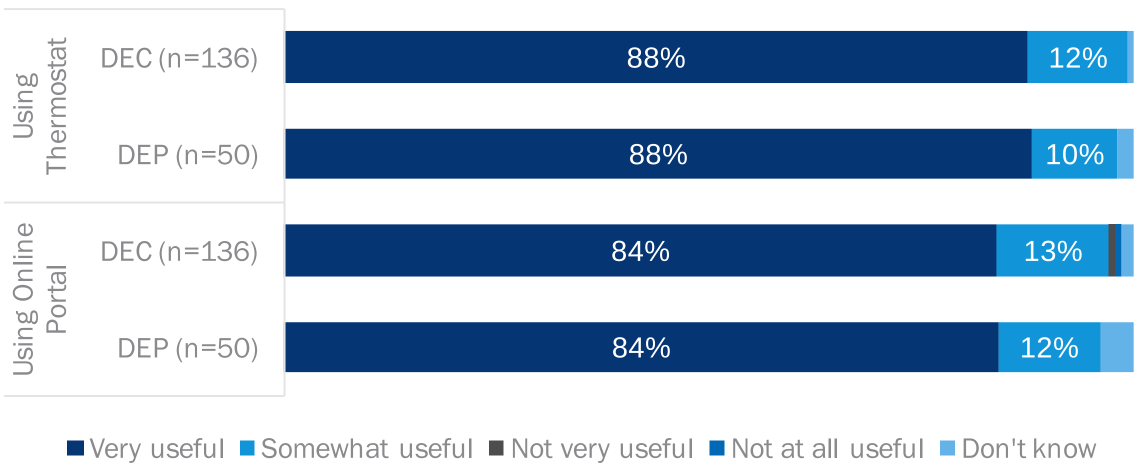


Note: Figure includes only customers who recalled their cycling level, even if recalled incorrectly.
This question allowed for multiple responses.

Installation Process

After enrolling in the program, customers schedule a time for program implementation staff to install their new equipment. During the installation, program implementation staff are tasked with conducting training regarding the thermostat itself and the online portal. Most participants in both jurisdictions report they were present during installation (82% DEC, 90% DEP). Of these, almost all recall the training administered by implementation staff (94% DEC, 93% DEP). Most participants report that both the thermostat training and portal training were very useful (88% for thermostat training and 84% for portal training, see Figure 6-12).

Figure 6-12. Participant Rating of Usefulness of Training about Using the Thermostat and the Online Portal



Note: Figure includes only customers who recalled training.

Program implementation staff are also tasked with programming new thermostats after installation. More than four-fifths of participants recall the installer programming their thermostat directly following the installation (88% DEC, 85% DEP, Table 6-3) and did not have additional questions for implementation staff. Of those whose thermostats were programmed, almost all report installers programmed their thermostat as requested (96% DEC and DEP). Of those instances where the installer did not program the thermostat, participants most often asked installers not to program the thermostat (6 of 14 DEC, 2 of 5 DEP), and only a few reported installers not offering to program their thermostats (3 of 14 DEC, 2 of 5 DEP). Very few participants have lingering questions about their thermostat (7% DEC, 6% DEP). Questions include how to set the thermostat to turn off the AC on weekends and how to switch between heating and cooling functions.

Table 6-3. Participant Recall of Representative Programming Thermostat

Representative Programmed Thermostat	DEC (n=144)	DEP (n=54)
Programmed	88%	85%
Did not program	10%	9%
Don’t know	2%	6%

Note: Table includes only those customers present at time of installation.

One process-related research question for this evaluation was to understand how well Itron installers are doing in terms of enrolling customers with heat pumps into winter demand response events. Because winter DR is only applicable to customers with specific electric heating types, Duke Energy decided not to let canvassers or customers directly sign up for winter Conservation Period events. Instead, Itron installers are tasked with confirming customers' heating systems and asking eligible customers if they would like to participate in winter Conservation Period events. To assess how well that was happening, survey respondents were first asked about their heating equipment, and then, if applicable, whether they were offered winter event participation. Of survey participants who report having heat pumps, about half (45% DEC, 50% DEP, see Table 6-4) recall being offered the opportunity for winter participation, while one-third said they were not (36% DEC, 33% DEP).

Table 6-4. Participant Recall of Winter Participation Offered by Duke Energy Canvasser

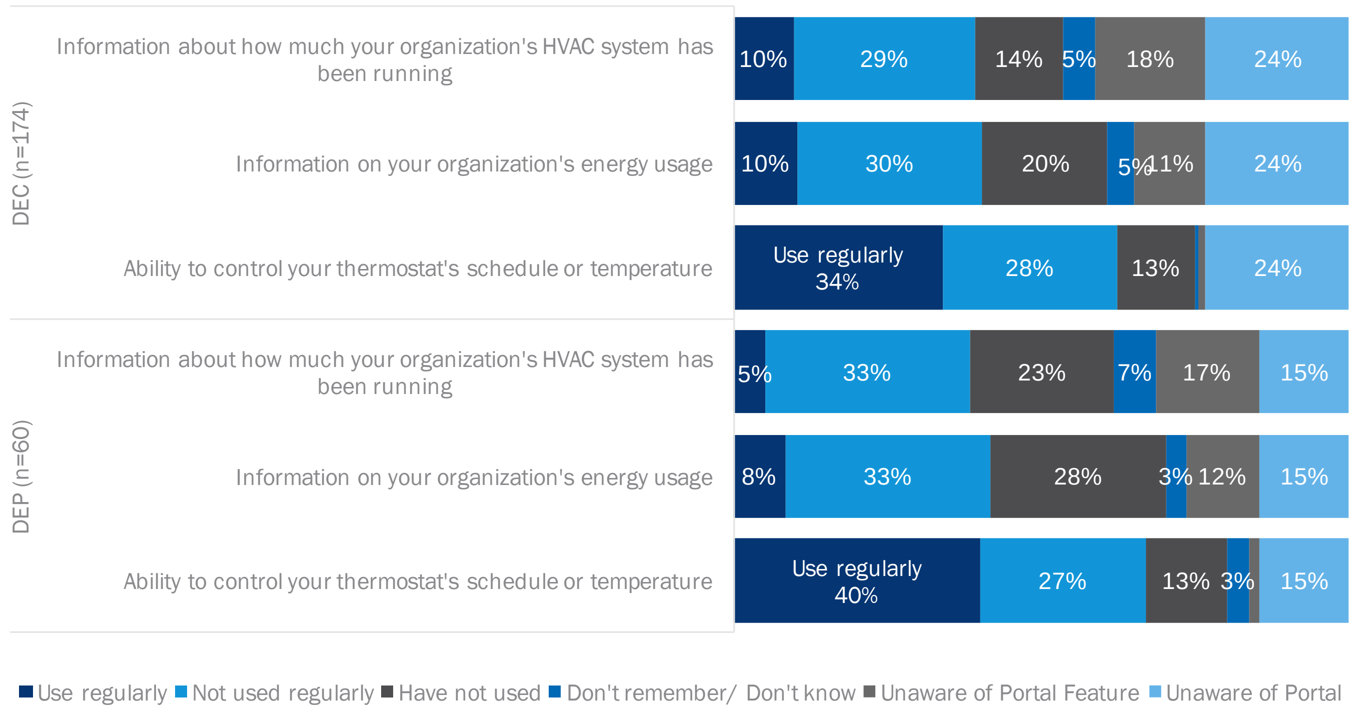
Winter Participation Offered by Duke Energy Canvasser	DEC (n=75)	DEP (n=18)
Yes	45%	50%
No	36%	33%
Don't Know	19%	17%

Note: Table includes only those customers who report having a heat pump

Portal and Thermostat Usage

Participants were also asked about their usage of the program online portal and thermostat. More than three-quarters of participants were aware of the online portal prior to completing the survey, with DEP participants reporting higher awareness (85%) than DEC participants (76%). Of those who were aware of the portal, more than one-third report using the portal to control their thermostat's temperature (34% DEC, 40% DEP, see Figure 6-13). Few report regularly viewing information about how much their HVAC system has been running (10% DEC, 5% DEP) or information on their organization's energy use (10% DEC, 8% DEP). A large portion of customers are unaware of specific portal features or unaware or the portal altogether; taken together, about one-third of DEC and DEP participants are unaware of the portal's ability to display information about how much their HVAC system has been running (42% DEC, 32% DEP) and more than one-quarter are unaware of the portal's ability to display information on their organization's energy use (35% DEC, 27% DEP).

Figure 6-13. Participant Online Portal Awareness and Usage



Participants report lower satisfaction with the portal than with any other program element with the exception of their participation in Conservation Periods. Few participants regularly use portal features, which likely drives their dissatisfaction. Though the program has a smart phone application through which participants can control their thermostats, when asked how the portal could be improved, a small percentage of participants (6%) recommend improvements such as linking the portal to a phone app. These participants may not be familiar with the program's smart phone application. Participants also mentioned portal improvements such as the ability to switch between heating and cooling on the portal (2%),[25] making the website faster (2%), and allowing control of multiple thermostats from a single page (1%).

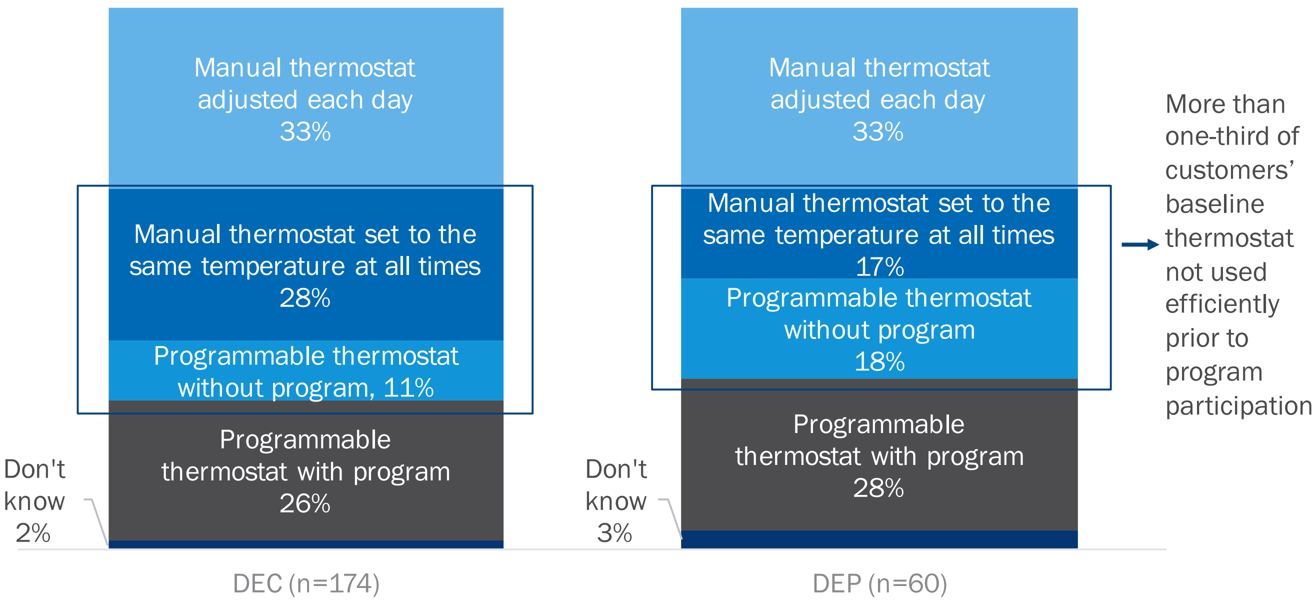
Early participants provided additional insights into the benefits of the portal. Most early participants have accessed the online portal (8 of 10) and have used the portal to control their HVAC systems over the weekend or at night (3 of 8) or to control multiple thermostats from a single page (3 of 8). One early participant who uses the portal to remotely control their AC felt the function was extremely useful, stating that "if my guys had set the air conditioning on at 70 degrees and then forgot to raise it when they went home or on a Sunday when we're closed, that was the critical thing for me." Another early participant lived far from his business and asked the interviewer to "imagine what it's like to get a call about a room being too hot and having to drive an hour to fix it." Another survey participant who controlled multiple thermostats at once commented: "[I decided to

[25] The Itron thermostat does not have the ability to automatically switch between heating and cooling.

enroll in the] program for thermostats, that it could be programmed and set to one location. 'Cause if I went out and set all 10 of them right now, just walking it, I'd have a 30 minute walk."

The energy-saving benefits of the Wi-Fi-enabled thermostat are largely a function of how customers were using their existing (baseline) thermostat. More than one-third of participants report their baseline equipment was not adjusted daily and was therefore energy inefficient (39% DEC, 35% DEP, see Figure 6-14). Conversely, a little more than one-quarter of participants report having had a programmable thermostat that was programmed with a schedule (26% DEC, 28% DEP), while one-third had been adjusting the temperature on their manual thermostat every day.

Figure 6-14. Participant Thermostat Use Before Participation



Few participants report difficulties changing the programming of their Wi-Fi-enabled thermostats. About two-thirds of participants have changed their thermostat schedule since installation (65% DEC, 68% DEP). Of those who have not changed the schedule, most have had no need to change it (77% DEC, 93% DEP). Of those who have tried to change their schedule, almost all are able to do so successfully (95% DEC and DEP). Approximately two-thirds of participants report that making changes to their thermostat was very easy (63% DEC, 59% DEP, see Table 6-5) and most of the remaining participants report it was fairly easy (36% DEC, 38% DEP).

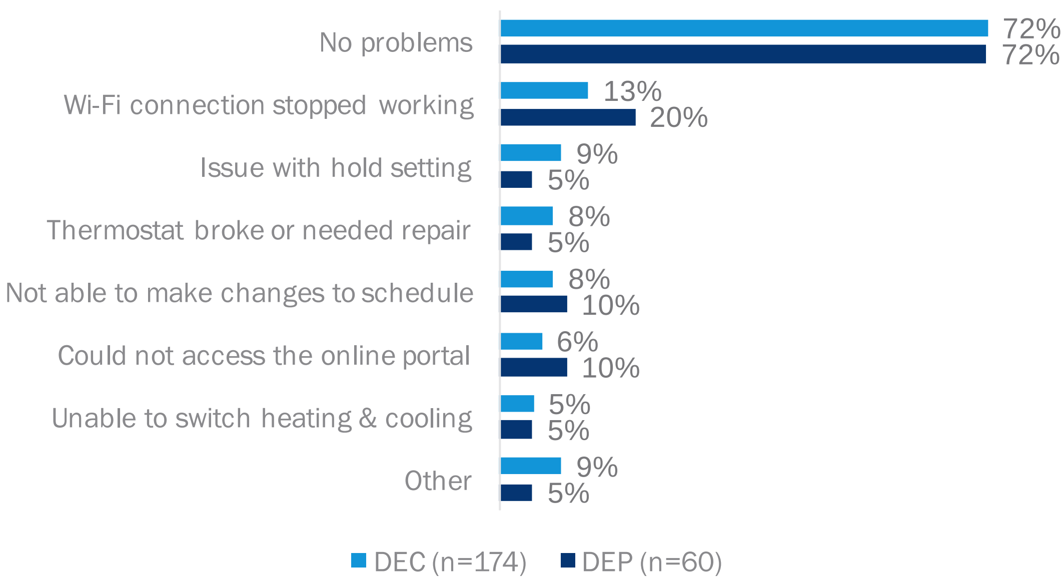
Table 6-5. Participant Thermostat Use After Participation

Difficulty of Making Changes to Thermostat	DEC (n=107)	DEP (n=39)
Very easy	63%	59%
Fairly easy	36%	38%
Somewhat difficult	2%	3%

Note: Table includes only those customers who were able to make changes to their thermostat's schedule.

Most participants have not experienced any problems with their new thermostat (72% DEC and DEP, see Figure 6-15). The most common issues reported by participants are losing the Wi-Fi connection with the thermostat (13% DEC, 20% DEP), problems with the hold setting (9% DEC, 5% DEP),[26] or that the thermostat broke or needed repairing (8% DEC, 5% DEP).

Figure 6-15. Participant Difficulty with Thermostat



Note: This question allowed for multiple responses.

Only about one-quarter of participants have contacted a program representative for any reason (19% DEC, 29% DEP). Of these, most were able to contact the appropriate support staff member (94% DEC and DEP) and most were able to resolve their issue (77% DEC, 83% DEP). Survey participants generally called about lost Wi-Fi signals (6 of 35 DEC, 6 of 18 DEP), event opt-outs (4 of 34 DEC, 1 of 18 DEP), and hold issues (3 of 35 DEC). After talking with a program representative, most were able to resolve their issue (77% DEC, 83% DEP).

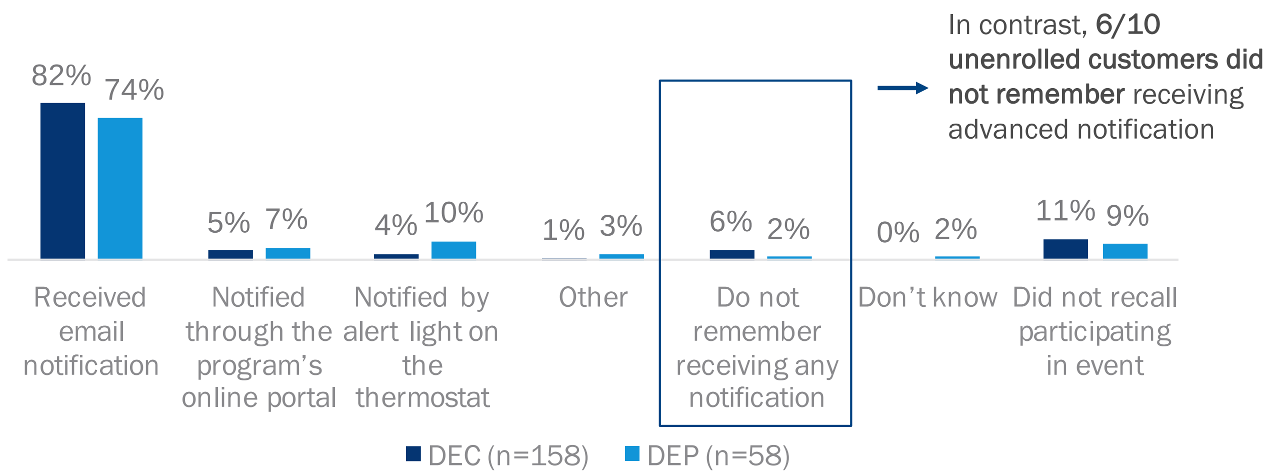
Summer Conservation Period Experiences

Nearly all participants recall participating in a summer Conservation Period event (89% DEC, 91% DEP). As noted above, participants rate their satisfaction with participation in these Conservation Periods lower than any other program element. Of those recalling Conservation Period events, almost all recall receiving some type of notification prior to the event (94% DEC, 96% DEP). Most participants recall receiving an email notification (82% DEC, 74% DEP, see Figure 6-16) and few recall notifications through the program's online portal (5% DEC, 7% DEP) or receiving a notification by the alert light on their thermostat (4% DEC, 10% DEP). Responses to the participant survey stand in contrast to responses from customers who unenrolled in the program, as described later in this section. Less than half of unenrolled customers (4 of 10) recall receiving advanced notification of a Conservation Period event.

---

[26] The hold function allows the user to override the pre-set temperature and thermostat setting.

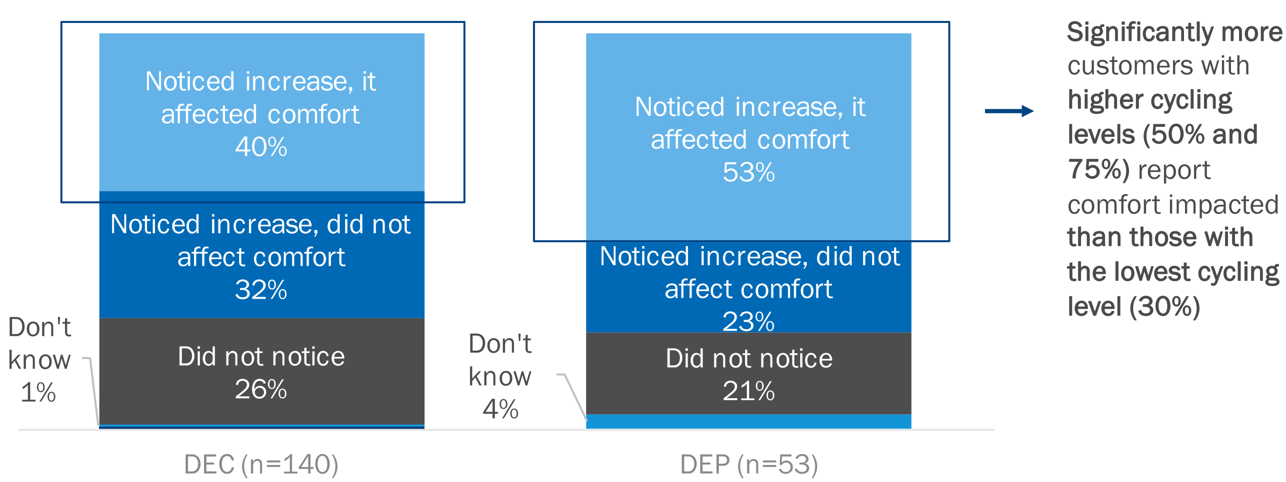
Figure 6-16. Participant Types of Advanced Notification



Note: This question allowed for multiple responses.

Participants recalling events had different perceptions of how the events affected their facilities' temperature and comfort. About one-quarter of participants (26% DEC and 21% DEP) did not notice any changes in temperature during the events (see Figure 6-17). Slightly more (32% DEC and 23% DEP) noticed temperature increases that did not impact their comfort. However, two-fifths of DEC participants and about half (53%) of DEP participants did report that temperature increases during the Conservation Periods impacted their comfort. When comparing perceived impacts of Conservation Periods to cycling levels, significantly more participants with higher cycling levels (50% or 75% cycling levels) report that their comfort was impacted by Conservation Periods than those with the lowest cycling level (30%).

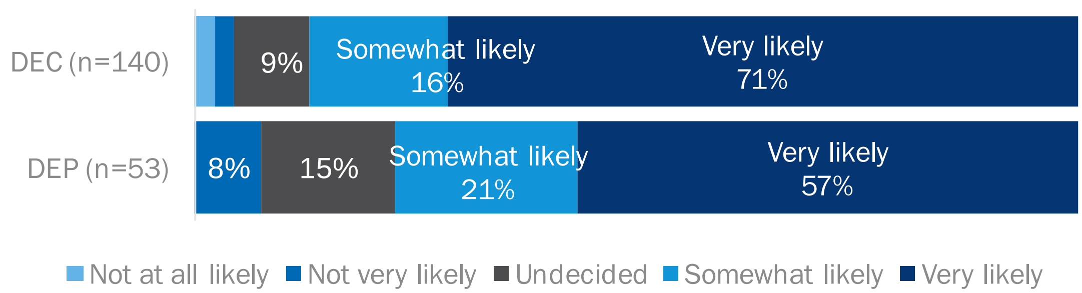
Figure 6-17. Participant Perceived Impact of Conservation Periods on Temperature and Comfort



Note: Totals may not sum to 100% due to rounding.

The majority of participants report they are very likely to continue participating in Conservation Periods in future years (71% DEC, 57% DEP, see Figure 6-18). Participants who are unlikely to participate in future years mentioned the high number of Conservation Periods[27] (2 of 6 DEC, 1 of 4 DEP) and Conservation Periods impacting business (1 of 6 DEC, 1 of 4 DEP) as the reasons why they are unlikely to participate. One survey participant reports "we noticed the temperature change and made it vastly uncomfortable for my employees and we needed to close."

Figure 6-18. Participant Likelihood of Continued Participation



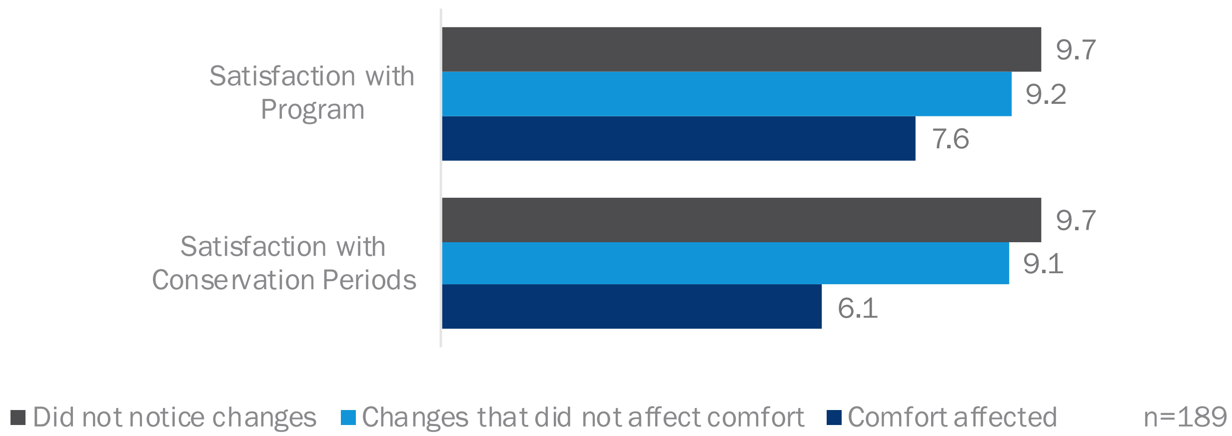
Note: Figure includes only customers who recall Conservation Periods.

To better understand the implications of discomfort during events on customers' experiences and likelihood of continuing in the program, the evaluation team explored the statistical relationships between participants' cycling level, satisfaction, and likelihood to participate in the program in the future. First, the evaluation team found that experiences during Conservation Periods are highly correlated with overall satisfaction with the program and program elements. Compared to those whose comfort was not affected, participants whose comfort was affected have significantly lower satisfaction with events (mean of 6.1 versus 9.1 and 9.7, see Figure 6-19) and the program overall (mean of 7.6 versus 9.7 and 9.2); they are also significantly less likely to participate in the future.[28]

[27] The program called five events in 2017 out of the maximum of ten events allowed through the enrollment contract.

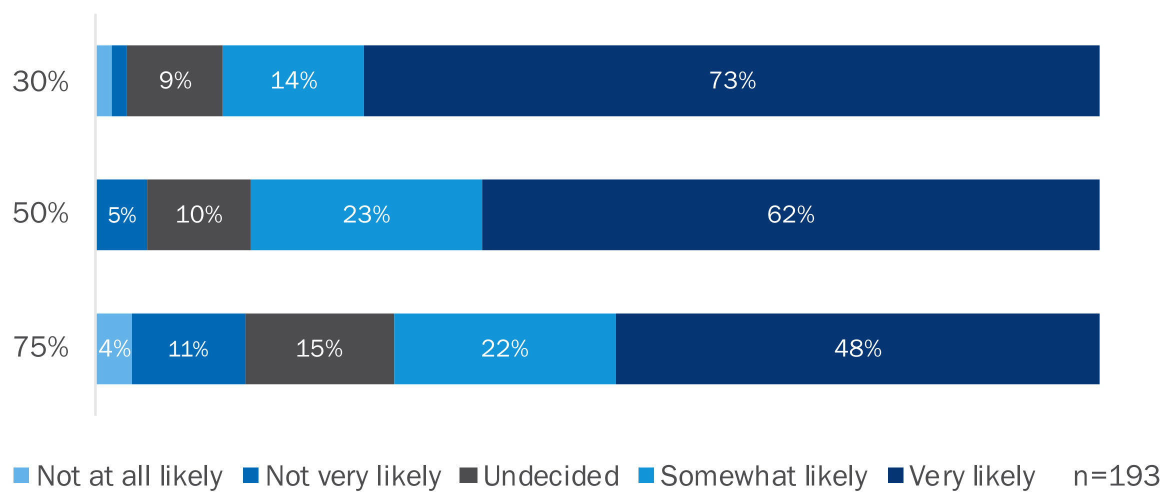
[28] Testing of statistical significance was conducted on the combined DEC and DEP results.

Figure 6-19. Mean Participant Satisfaction by Conservation Period Experience (DEC and DEP Combined)



The evaluation team also explored how this dynamic varied across cycling levels. The evaluation team found that participants with the lowest cycling level are significantly more satisfied with Conservation Periods and more often report they are very likely to participate in the program in the future (73% versus 62% and 48%, see Figure 6-20).

Figure 6-20. Participant Likelihood of Participating in Future by Cycling Level (DEC and DEP Combined)



Given the earlier finding that some customers did not understand cycling levels and Conservation Periods well when enrolling in the program, the evaluation team explored how much of the pattern between satisfaction, cycling level, and future participation was driven by customers' understanding of the program when they enrolled. Participants who understood Conservation Periods very well when enrolling are significantly more satisfied with the program and Conservation Periods than those who only somewhat understood the Conservation Periods (mean of 8.9 versus 8.3, see Figure 6-21). Those who understood cycling levels very well when enrolling are significantly more satisfied with the program than those who only somewhat understood cycling levels (mean of 8.4 versus 6.8, see Figure 6-22.

Figure 6-21. Participant Satisfaction by Understanding of Conservation Periods (DEC and DEP Combined)

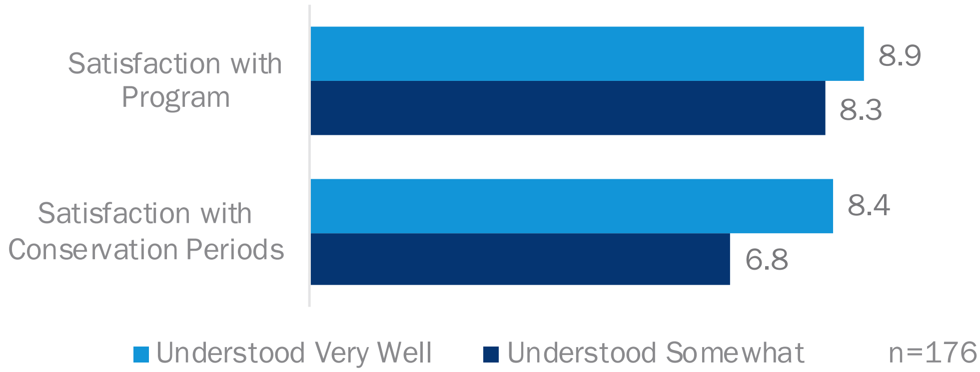
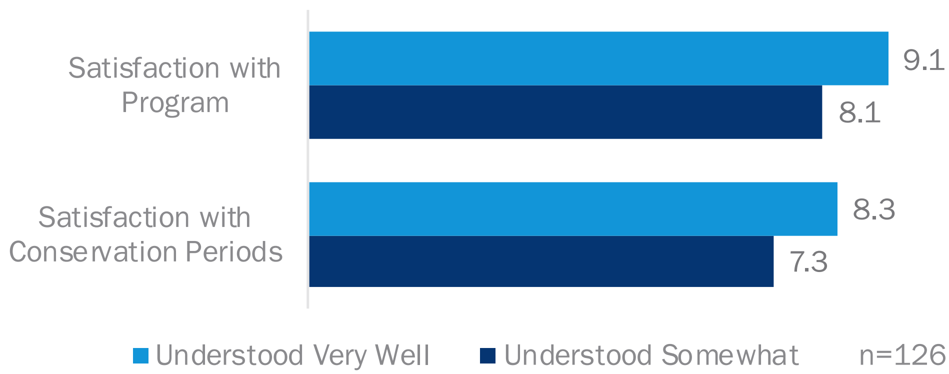


Figure 6-22. Participant Satisfaction by Understanding of Cycling Levels (DEC and DEP Combined)



The evaluation team also examined the statistical relationship between business type and participant satisfaction. The team found that restaurants have significantly lower satisfaction with the program overall (7.5) and with Conservation Periods (5.4) than other business types (8.7, 8.2).[29] These results are unsurprising as over three-quarters of restaurant participants report that Conservation Periods affected their comfort. Restaurant participants also report they are less likely to participate in the Conservation Periods in the future. In line with this customer feedback, opt-out analysis indicates that restaurants and food service establishments tended to opt out of 2017 Conservation Periods at a higher rate (5% to 14% per event) than non-food businesses (3% to 5% per event).

[29] The evaluation team did not find statistically significant differences for other common participant business types (medical, office, retail, light industry, or place of public assembly or worship). The evaluation team may have been unable to detect differences among these groups due to smaller sample sizes.

Based on program-tracking data, a small share of survey participants opted out of at least one Conservation Period (6% DEC, 15% DEP).[30] When asked, almost all of these participants recalled their request (9 of 10 DEC, 7 of 8 DEP). Some of these participants simply had a special need on the day of the event, such as a "changing daily work load [that] can cause higher need on some afternoons" or that the Conservation Period "was supposed to happen during a time when we had many clients scheduled." Others noted that Conservation Periods were impacting business functions. One participant mentioned that their "office was getting too warm to the point that productivity was lost and some employees left early." Participants who opt out of Conservation Periods are also significantly less likely to participate in the program in the future compared to those who did not opt out of an event.

6.2.2 Non-Participant Customer Experiences

The following section presents results from the non-participant customer interviews. The evaluation team conducted 10 interviews with customers who were approached about the program but decided not to participate. The interviews explored non-participant customer barriers to enrolling in the program, understanding of program elements, and understanding of Conversation Periods.

Firmographics

The evaluation team spoke with representatives from ten companies who were recruited by a canvasser but declined to participate in the program ("non-participants").[31] The evaluation team spoke with these companies' managers (6 of 10) and company owners (4 of 10). Non-participants were fairly evenly split between companies with few employees and companies with a moderate number of employees (4 companies employ fewer than 10 employees at all locations; 6 employ between 10 and 55 employees at all locations). More of the interviewed non-participants are in the retail business sector (5 of 10, Table 6-6) compared to respondents to the participant survey (29% DEC, 21% DEP).

[30] In the final year-end population, about 11% of customers across both jurisdictions opted out of at least one event.

[31] Due to the small sample size, the evaluation team did not break out results by jurisdiction.

Table 6-6. Non-Participant Firmographics

Characteristic	Count (n=10)
Business Type	
Retail	5
Restaurant	3
Construction	1
Office	1
Tenure	
Lease	6
Own	4
Thermostats	
One	7
Two or more	3

Barriers to Enrollment

Most interviewed non-participants were aware of the program (8 of 10), and for those unaware, interviewers described the main features of the program. Though most non-participants were visited by canvassers according to the program-tracking data (7 of 10), only a few recalled the visit (3 of 10). Others heard about the program through mailers (3 of 10), phone calls from Duke Energy representatives (3 of 10), and email (1 of 10).

The most common reason for non-participation was the perception that the program would negatively impact business (6 of 10, Table 6-7). Other reasons for non-participation included satisfaction with current thermostat systems (2 of 10), a lack of trust of networked devices (1 of 10), distrust of an outsider controlling the thermostat (1 of 10), and currently ineffective air conditioning equipment (1 of 10).

Table 6-7. Non-Participant Barriers to Program Enrollment

Barrier to Enrollment	Count (n=10)
Would negatively impact business	6
No need for more complicated system	2
Does not trust networked infrastructure	1
Did not like concept of outsider controlling thermostat	1
Air conditioning currently struggling to cool business	1

Note: Barriers to participation coded from customer open end responses.

Interviewed non-participants generally fall into one of two groups: those who felt their business was not a good target for the program (4 of 10), and those who felt their outdated equipment or uninsulated facility would increase the impact of the Conservation Periods (3 of 10). One non-participant who thought their business was not a good target owns a massage parlor and reported that "...people are pretty picky about being comfortable while they're getting their massage. Noise level and air quality are probably the two really important things for my type of business." Among those who felt Conservation Periods would overly impact their businesses, one non-participant thought that their facility "...heats up in here really quick. We've had a couple problems over the years with our AC, and when it stops working you know it very, very quickly."

Understanding of the Program and Events

The evaluation team also asked questions to understand whether these customers' decision not to participate was related to an incomplete understanding of the program. For non-participants who were familiar with the program (8 of 10), most understood the program when declining participation (6 of 8). Only one non-participant was not familiar with the cycling level options and one other non-participant was not familiar with the ability to opt out of events. Interviewed non-participants did not have any additional questions about the program and were not interested in learning more about the program.

Though our sample size was too small to extrapolate findings to the population, interviewed non-participants generally did not seem like good candidates for program participation or likely future participants. In other words, it did not appear that there was an opportunity to increase their participation by better explaining the program.

6.2.3 Unenrolled Participant Experiences

The following section presents results from interviews with 10 customers who enrolled in the program but later decided to no longer participate in Conservation Periods ("unenrolled participants"). These interviews explored reasons for unenrollment, reasons for initial enrollment, understanding of program elements, understanding of Conservation Periods, and experiences with the program call center.[32]

Firmographics

Interviewed unenrolled participants included company executives, such as owners (5 of 10, see Table 6-8), managers (3 of 10), and CFOs (2 of 10). Most interviewed unenrolled participants employ fewer than 10 employees (6 of 10) and the remaining companies employ between 10 and 49 employees (4 of 10). Many are retailers (5/10) and most are renting their facilities (8/10). More of the unenrolled participants are in the retail business sector (5/10, see Table 6-8) compared to respondents to the participant survey (29% DEC, 21% DEP). The evaluation team interviewed approximately the same portion of single thermostat unenrolled participants (6 of 10) as we did for the participant survey (60% DEC, 45% DEP).

[32] Due to the small sample size, the evaluation team did not break out results by jurisdiction.

Table 6-8. Unenrolled Participant Firmographics

Characteristic	Count (n=10)
Business Type	
Retail	5
Gym/exercise facility	2
Restaurant	2
Place of worship	1
Tenure	
Lease	8
Own	2
Thermostats	
One	6
Two or more	4

Reasons for Unenrollment

Almost all interviewed customers (9 of 10) chose to unenroll their thermostats because higher temperatures during Conservation Periods were impacting business. One customer noted that "it [getting over 90 degrees] was happening all the time." Another unenrolled participant stated that on "one day in particular, it was 90-some degrees outside, and within 20 minutes, my restaurant was over 95 degrees." A third reported that Conservation Periods were getting "extremely prohibitive because when that would happen, it would get up to like 85, 90 degrees in here... It was driving off customers." Based on these responses, the evaluation team expected unenrolled participants to have selected higher cycling levels, however, most had selected the lowest possible cycling level (Table 6-9).[33]

Table 6-9. Unenrolled Participant Customer Cycling Level

Cycling Level in Program Data	Count (n=10)
30%	7
50%	2
75%	1

Undersized equipment or lack of insulation may have caused higher indoor temperatures during Conservation Periods for unenrolled participants. Three unenrolled participants specifically mentioned that lack of insulation or undersized equipment made participation in Conservation Periods more difficult.[34] One customer stated that "This is an older building, but we also have a blower on the oven, and that helps reduce some of the excess heat from the oven, but when you got the sun bearing down... We got those sun bearing down on those rooftops, they're metal rooftops... It's just going to cause it to get really hot." Another customer reported that their air conditioners could not keep up with the cooling load, stating that "by 3:30, 4:00 in the afternoon, bam, there, we got to turn the air on.... I mean, I don't know if it's because of the space we have, or if it's our

[33] Only a few unenrolled participants recall the cycling level (3 of 10).

[34] Statements were collected from the customers who explicitly mentioned their facilities and equipment in the interviews.

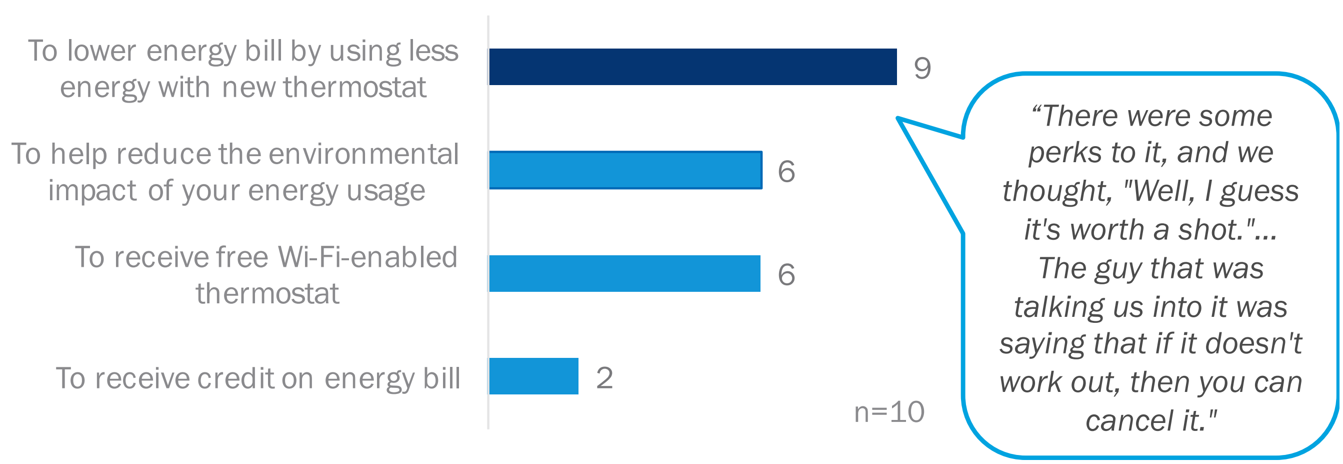
… Or if our air conditioners are just … I mean, I know they're not efficient." Another customer noted that their space was not well-suited to changes in the temperature and that "it takes about an hour to cool down our warehouse, so it's not gonna be cool out there even when our last group starts [during the Conservation Period]." These experiences could explain why 30% cycling levels produced such high temperatures for several interviewed unenrolled participants.

Eight of the ten unenrolled participants reported they would have never enrolled if they had understood the full ramifications of the program. Notably, both of the interviewed staff representing gym facilities mentioned that demand response programs were not appropriate for their business type. One gym facility staffer reported that participation in the program did not fit the national gym standard their facility subscribed to, stating that "it's even like an ACSM [American College of Sports Medicine] guideline that you do not go above 72 in those conditions." However, when compared to participant survey responses, results were mixed in terms of whether gym customers were satisfied with the program.

Reasons for Initial Enrollment

The evaluation team explored whether there are any differences in the rationale for initial program enrollment between unenrolled participants versus on-going participants, to better understand why customers unenroll from the program. Similar to ongoing participants, almost all interviewed unenrolled participants were originally motivated by lower energy bills (9 of 10, see Figure 6-23). On-going participants are more often also motivated by receiving a bill credit (53% DEC, 61% DEP) than unenrolled participants (2 of 10), and conversely, unenrolled participants are more often motivated by receiving a free Wi-Fi enabled thermostat. Thus, these unenrolled customers may have less motivation to continue DR participation, as they still continue to utilize the program Wi-Fi enabled thermostat (which was more often cited as a motivation for initial participation) and only lose out on the bill credits (which was less often cited as a motivation for initial participation). One unenrolled participant reported that implementation staff stated, "that if it doesn't work out, then you can cancel it."

Figure 6-23. Unenrolled Participant Reasons for Initial Enrollment

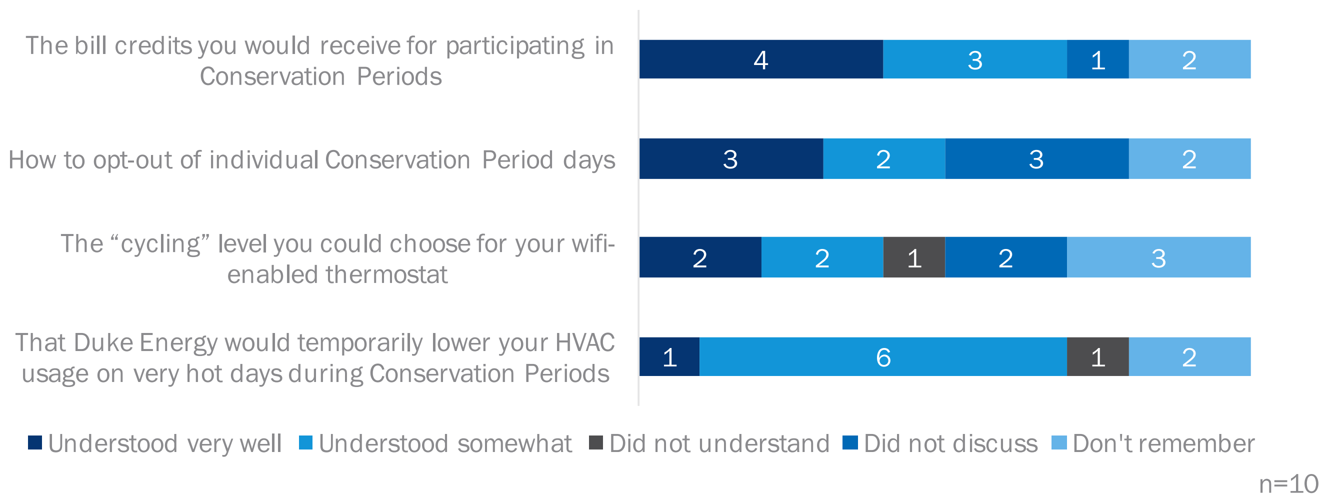


Note: This question allowed for multiple responses.

Understanding of the Program and Events

Interviewed unenrolled participants generally seemed less familiar with program elements than on-going participants, which may have contributed to their unenrollment. Fewer unenrolled participants (1 of 10, see Figure 6-24) reported understanding very well when they enrolled in the program that Duke Energy would lower HVAC usage during events, compared to ongoing participants (68%). Unenrolled thermostat customers generally had very high temperatures in their facilities and participating in any event seemed like an issue – not just an issue of them not understanding how to opt out of the occasional Conservation Periods that might pose an issue for their business. Most unenrolled participants understood in a general sense that Duke Energy would lower their HVAC usage, but many did not have a sense of the timing or the impact of that timing. The program could very well have given customers information about the program and the various elements, but customers did not recall it and did not feel they have a firm understanding.

Figure 6-24. Unenrolled Participant Understanding of Program Elements



More than half of interviewed unenrolled participants felt they had an incorrect understanding of Conservation Periods when they enrolled (6 of 10). Before experiencing Conservation Periods, one customer thought that Conservation Periods would be called at different times of the day instead of just during the peak hours. Another customer reported that information about Conservation Periods was not shared, and felt that Duke Energy staff "need to say, 'This happens every year, this is exactly how it's gonna work, it's a three-hour time period, your air condition's gonna be on for this amount of time, it's gonna be off for this amount of time' ... It's just ... And there's no documentation to explain the Conservation Period or how much that works."

Experiences with the Call Center

Unenrolled participants generally had positive experiences with the program call center, though few mentioned that call center staff had employed retention strategies when they called to unenroll. Almost all (9 of 10) unenrolled participants reported that call center staff were friendly and helpful. When customers called to unenroll, the only drop-out prevention strategy customers described being used by call center staff was discussing the loss of their Conservation Period rebate (2 of 10). The evaluation team did not ask explicitly about retention strategies for the program but asked generally about unenrolled participants' experience with the call center. One customer reported that they did not realize they would receive a rebate for participation in Conservation Periods until they called to unenroll. Another customer mentioned a drop-out prevention strategy to the call center staff, recalling that “after we opted out of the first one, I called back and said, ‘Hey can we go down to like the next lowest one?’ Which was I think 50%." Call Center staff may be employing these or other retention strategies, but the small sample of unenrolled participants the evaluation team spoke with did not mention them when asked generally about the call center staff.

7. Conclusions and Recommendations

7.1 Conclusions

Our evaluation of the 2017 EWB program found that program participants are satisfied with the program and are motivated to enroll to save money on their energy bill. Further, despite participants indicating that they understand program elements very well overall, survey results suggest that participants have a relatively low understanding of cycling levels, and only a quarter of participants could correctly recall their cycling level. Despite overachieving device installation goals, the program did not achieve its per device impact goals, and device enrollment was heavily skewed towards the lower cycling strategies. Overall, the program achieved demand impact realization rates of 72% for DEC and 70% for DEP and energy impact realization rates of 204% for DEC and 5% for DEP.

The following bullets present key findings and conclusions from our evaluation.

- Total participation exceeded expectations, but participant characteristics are different than Duke Energy's expectations. Overall, we found that customers enrolled 6,793 devices in 2017, achieving 182% of the program enrollment goal.
    - The majority of enrolled devices were in DEC territory (72%) compared to DEP (28%). Most participants selected thermostats (91%), exceeding the anticipated share (60%).
    - The majority of participants selected the 30% cycling strategy, which is the lowest strategy available: 84% of DEC participants are enrolled in the 30% cycling strategy compared to 53% of DEP participants. For DEC, enrollment shifted towards lower cycling strategies from 2016 to 2017.
    - Average size of HVAC units controlled by devices installed in 2017 remained relatively unchanged from 2016, at 4.2 tons.
- The program called five summer Conservation Period events in 2017 and achieved average per event demand savings of 2,582 kW in DEC and 1,421 kW in DEP.
    - As noted above, both utilities underachieved their goals, despite overall enrollment exceeding goals. Device enrollment was heavily distributed towards lower cycling strategies.
    - Per device load impact realization rates were lower than anticipated goals across jurisdictions (56% for DEC and 55% for DEP) and cycling strategies.
    - Operational rates and opt-out rates were consistent with Itron's expectations for the program (on average, of the eligible units, 4% to 7% opted-out and 91% cycled).
- The thermostats installed through the program in 2017 achieved energy savings of 2,296,448 kWh in DEC and 31,737 kWh in DEP.
    - Despite exceeding thermostat installation goals across both jurisdictions, per device energy efficiency savings realization rates were lower than expected in both jurisdictions.
    - Cross-participation adjustments substantially reduced energy impacts for both jurisdictions.
    - Despite similar program design and implementation, and few differences in the types of facilities enrolled, the evaluation identified substantial variation in energy efficiency savings between DEC

and DEP: consumption analysis results showed unadjusted energy savings for DEC participants more than 2.5 times those of DEP participants. While the cross-participation analysis found a smaller savings adjustment for DEP participants in absolute terms, it was much higher than for DEC participants as a percentage of unadjusted energy savings. Our analysis found that DEP participants tend to have lower annual average baseline usage and summer average baseline usage than DEC participants, as well as slightly lower average tonnage in terms of the HVAC units being controlled. Other factors, such as customer behavior, e.g., engagement with their thermostat, may play a role. Survey results suggest that DEP customers may change their set points or use the web portal more frequently than DEC customers.

- Participants are generally satisfied with the program overall (mean ratings of 8.8 for DEC and 8.2 for DEP).
  - There are small, but significant, differences in participant satisfaction across territories. DEP participants report significantly lower satisfaction with the program overall (mean 8.2) and with Conservation Periods (mean of 7.2) than DEC participants (means of 8.8 and 8.3, respectively).
  - Participants with the 30% cycling level are significantly more satisfied with Conservation Periods and more often report that they are very likely to participate in the program in the future, compared to those enrolled in higher cycling levels.
  - Restaurants have significantly lower satisfaction with the program overall (mean rating of 7.5) and with Conservation Periods (5.4) than other business types (8.7 program overall, 8.2 Conservation Periods). Restaurants and food service establishments tended to opt out of Conservation Periods at slightly higher rates than other types of businesses.
- Participants most often report being motivated to enroll in the program to lower their energy bills (79% DEC, 71% DEP).
- Most participants report understanding program elements very well, and this understanding is linked to participant satisfaction.
  - Participants who understood Conservation Periods very well when enrolling are significantly more satisfied with the program and Conservation Periods than those who only somewhat understood the Conservation Periods.
  - Participants who understood cycling levels very well when enrolling are significantly more satisfied with the program than those who only somewhat understood cycling levels.
  - Few participants correctly recall which cycling level they chose (22% DEC, 31% DEP).
- Of those participants who have tried to change their thermostat schedule, almost all are able to do so successfully (95% DEC; 95% DEP).
- Less than half of participants use the online portal to control their thermostat's schedule or temperature.
  - About one-third of DEC and DEP participants are unaware of the portal's ability to display information about how much their HVAC system has been running (42% DEC, 32% DEP) and more than one-quarter are unaware of the portal's ability to display information on their organization's energy use (35% DEC, 27% DEP).
- About half of participants with electric heat pumps recall implementers offering the winter demand response option (45% DEC, 50% DEP).

- About one half of DEP participants (53%) and two-fifths of DEC participants (40%) experienced discomfort during the Conservation Periods.
  - Participants whose comfort was affected report significantly lower satisfaction with Conservation Period events and the program overall and are less likely to participate in Conservation Periods in the future.
- Non-participants most often report not enrolling in the program because they feel their business would be negatively impacted by the Conservation Periods (6 of 10).
- Participants chose to unenroll from Conservation Periods because higher temperatures were impacting their business (9 of 10).

7.2 Recommendations

Our recommendations focus on a core set of actionable efforts to increase program impacts while maintaining customer satisfaction, including those related to customer recruitment, education, and retention; program implementation enhancements; device functionality and operations optimization; and data tracking improvements. Notably, we understand that Duke Energy developed this program to provide small business customers an opportunity to participate in demand response, since these customers pay a surcharge but did not have an opportunity to participate in these programs. As a result, recommendations must be considered in light of enhancing program cost-effectiveness as well as equitably serving this historically underserved population.

Recommendation: Customer Recruitment, Education, and Retention

The EWB program staff and their implementation contractors far exceeded enrollment goals in 2017. In fact, recruiters were so successful that the program experienced a backlog in the second half of 2016 where recruited customers had to wait two to three months to have their thermostat or switch installed, instead of the target of four weeks. Building on this success, we recommend that Duke Energy focus on recruiting customers that evaluation results suggest are optimal from a demand response and energy savings impact perspective.

- **Optimize customer recruitment targeting.** Evaluation results from 2016 and 2017 both suggest that the program should seek to recruit customers with specific attributes, such as customers with larger HVAC units and higher monthly usage in summer months. In terms of event participation, several unenrolled participants mentioned that they felt their business segment was not appropriate for event participation. Specifically, unenrolled participants with gyms, massage parlors, and florists report that their business segment do not tolerate large temperature changes. Additionally, a review of event participation data suggests that restaurants tend to have higher opt-out rates than other business types. When examining unenrollment by NAICs code, restaurants are unenrolling at more than double the average rate. We recommend:
  - Continuing to target customers with larger HVAC units and higher average summer consumption.
  - Conducting in-depth upfront vetting customers within specific business types that are less able to accommodate changes in temperature in their facilities to reduce Conservation Period opt-outs, unenrollment, and potentially lower impacts.

- **Enhance customer education for Conservation Period participation.** Our process research found that better participant understanding of program elements is correlated with higher participant satisfaction. Participants report relatively low understanding of cycling levels, and only a quarter of participants could correctly recall their cycling level. In addition, participants who unenrolled from Conservation Periods were less familiar with program elements than on-going participants, which may have contributed to their unenrollment. To minimize participant unenrollment and opt-outs, and increase satisfaction, we recommend:
  - Ensuring canvassers and installers fully explain cycling levels and Conservation Periods, including strategies for minimizing impacts of the events. This could include additional training for canvassers and installers, as well as adjustments to canvassers incentives, as described further below.
  - Developing additional leave-behind materials or welcome email blasts for newly-enrolled program participants. These materials should describe what a customer should expect during Conservation Periods. The materials may also provide suggestions for minimizing the impact of Conservation Periods such as pre-cooling facilities or reducing the use of heat-emitting technologies during Conservation Periods.
- **Encourage customer retention strategies.** The only drop-out prevention strategy noted by participants who unenrolled from the program was the loss of the Conservation Period bill credit. Most interviewed participants who dropped out of the Conservation Periods did so due to discomfort during events. In some cases, the discomfort was exacerbated by issues with their facilities' HVAC systems and building envelopes. We recommend Duke Energy staff:
  - Consider having the program call center employ additional drop-out prevention strategies, such as providing tips for mitigating discomfort during events, or helping them understand how to opt out of events. We suggest informing customers about how to opt-out since opting out of some events will yield higher impacts overall than if the customer is to drop out entirely. In addition, the call center might refer customers mentioning issues with their building's HVAC system or building envelope to other Duke Energy programs. While this may not stop a customer from dropping out of the program, it would provide Duke Energy with increased energy savings through the relevant energy efficiency programs.
- **Encourage adoption of, or conversion to, higher cycling strategies.** Enrollment in the lower cycling strategies, especially the 30% strategy, is higher than expected, leading to lower than anticipated per participant impacts.
  - Test options to support converting existing customers to higher cycling strategies. We understand that Duke is already in the process of an analytics project to help identify customers that could use higher cycling strategies. These analytics could inform Itron work with customers during the installation to assess if customers could increase their cycling strategy, without jeopardizing comfort. An additional option would be to promote higher cycling strategies on the customer portal; especially for customers with higher reference loads. Customers can currently change strategies after they enroll, but according to the program manager, most customers who change after enrollment change to a lower cycling strategy. It should be noted that more aggressive cycling strategy enrollment goals should be balanced with customers' comfort, as we found that higher cycling strategies are tied to more noticeable reductions in comfort, higher opt-out rates, and reduced likelihood of participating in the future.

Recommendation: Program Implementation Enhancements

The program uses a series of marketing channels, including door-to-door marketing ("canvassing"), phone recruitment, email and direct mail, website, and digital marketing. Door-to-door marketing was a successful strategy in 2017, and program enrollment increased considerably after Duke Energy engaged Threshold Marketing canvassers.

Duke Energy pays Threshold Marketing a set fee for every account enrolled in the program. This fee does not vary based on the size or number of HVAC devices that a customer has, or the cycling level chosen. Perhaps as a result, the Threshold Marketing program managers describe focusing their efforts on customers where they can likely engage with an on-site decision maker (e.g., "mom and pop" businesses), and described how it was easier and more lucrative for canvassers to enroll customers with fewer HVAC units, since customers with more complex systems required more time to enroll for the same commission. Although engaging willing participants benefits marketing cost-effectiveness and increases participation, these enrollment strategies may not capture the most optimal savings opportunities from an impacts perspective. We recommend:

- **Aligning enrollment incentives with factors known to produce higher impacts to maximize cost-effectiveness.** Threshold's enrollment incentives were not aligned with Duke Energy's goals as they are paid per account regardless of characteristics that affect potential kW and kWh savings (e.g., cycling strategy, number of devices enrolled, baseline usage, or HVAC size). We recommend revisiting how Threshold is compensated by developing a tiered incentive strategy that provides greater compensation for customers with greater savings potential or interest in higher cycling levels. At the same time, customer comfort matters: higher cycling strategies are tied to more noticeable reductions in comfort, higher opt-out rates, and reduced likelihood of participating in the future. Accordingly, any tiered incentive strategy will need to balance recruitment into aggressive cycling strategies with continued support for customer comfort.

- **Considering adjustments to education or incentives to ensure installers offer participants with heat pumps winter Conservation Period participation.** Only half of participants with heat pumps recall installers offering participation in winter Conservation Periods. To increase the number of winter participants, the evaluation team recommends increasing installer education on the benefits of winter participation and on the program goals related to winter participation. The program may also consider adjusting installer incentives for enrolling winter participants.

Recommendation: Device Functionality and Operations Optimization

Our demand response impact analysis identified average percent load impacts that were routinely under the cycling strategy amount. This is consistent with expectations for a duty cycle strategy, as the average run-time of units during non-events is rarely 100%. We also found that energy efficiency savings were lower than anticipated, which may be driven by customer engagement with their set points. We recommend:

- **Incorporating an adaptive cycling strategy for Conservation Period events.** Adaptive cycling replaces the baseline run-time of 100% with an actual run-time percentage during a non-event hot day. For example, in simple 30% duty cycling where the baseline is 100%, event period run-time is limited to 70% (100%-30%). Adaptive cycling, which uses a previous measurement of run-time during hot days for the particular device (e.g., 90%) would limit event period run-time to 63% e.g., 90%* (100%-30%)). This helps to achieve percent run-time reductions closer to the cycling strategy, and it helps customers who may have under- or over- sized units. We understand that Duke Energy will be implementing this approach to cycling for the 2018 Conservation Period events.

- **Implementing strategies to optimize energy efficiency settings for thermostats.** Notably, Duke Energy implemented an "auto-EE" functionality to their customer portal in 2018. This feature assesses the building's thermodynamics and auto-adjusts the set points when the facility is closed to generate additional energy savings compared to customer setpoints. These changes could potentially increase the overall energy savings from the thermostats in future program years. We also recommend assessing set points for thermostats to understand programming behavior of installers and customers. Educational materials that help customers optimize their own comfort, while also yielding bill savings, may help customers achieve higher energy savings associated with their devices.

Recommendation: Data Tracking

- **Enhance data tracking across Duke Energy program participation databases, customer billing data, and AMI data, as well as with Itron device log data.** Throughout this evaluation, we encountered a number of data issues that limited our ability to execute the planned analyses and increased evaluation cost and time frames. For example, the original evaluation plan sought to assess net demand impacts using AMI data. However, the DEP AMI data had substantial data availability issues as well as quality issues in terms of anomalous load shapes, necessitating incorporating device log data for the impact analysis. In particular, the load shapes within the available AMI data (based on graphical review) were not consistent with expected AC load shapes, and the amount of AMI data was insufficient to fully represent the population of participants. We offer the following set of recommended data tracking enhancements:

  - Develop an identical set of unique identifiers across datasets and include Account ID and Source Account ID and Source Service Point ID in every dataset. If an identical set of unique identifiers is unavailable due to the data existing in different systems, consider developing a crosswalk that links Source Service Point ID and Service Point ID. Currently, Duke Energy program data tracks participation at the Account level, while the vendor tracks participation at the Source Service Point Level. In addition, for DEP consumption data, provide an identifier that links Meter Number to Source Service Point ID and Account Number. This can support effective identification of the meter associated with a device installation.

  - Track changes in cycling strategies across time rather than replacing the strategies with the latest enrollment status. This will allow us to correctly classify participants by cycling level for each event, even if their cycling level or status changed. For example, a participant who participated with a 30% cycling strategy in July events but then changed their cycling strategy in September would be tracked as at the latest cycling strategy. Since the tracking data currently does not reflect the original cycling strategy and when it changed, we cannot accurately analyze the impacts of a past event.

  - Differentiate between unenrollment date and deactivation/removal date in the program-tracking data. Currently, the Duke Energy program-tracking data records two dates for each measure, start date (start_dt) and end date (end_dt). The start date corresponds to the installation date in Itron's data, while and the end date can correspond to either the unenrollment date or the removal date in Itron's data. The distinction between the two end dates in the Itron data is important because unenrolled devices can still achieve energy savings while removed devices achieve neither energy nor demand response savings.

8. Summary Form

Duke Energy Carolinas and Progress EnergyWise Business Program

Completed EMV Fact Sheet

Duke Energy Progress' and Carolinas' EnergyWise Business Program is a demand response program that provides small businesses with the opportunity to participate in DR events, earn incentives, and realize additional EE benefits. The program offers customers either a programmable, two-way Wi-Fi Smart Thermostat or a Load Control Switch. Customers can select one of three levels of DR participation: 30% cycling, 50% cycling, and 75% cycling, with varying levels of earned incentives based upon the selected cycling strategy. Thermostat participants with a heat pump with electric resistance heat strips are also offered the option of participating in winter DR events and can earn additional incentives per season.

Date	November 9, 2018
Region(s)	Duke Energy Carolinas & Progress
Evaluation Period	1/1/17 through 12/31/17
Annual kWh Savings	DEC: 2,296,448 DEP: 31,737
Coincident kW Impact	DEC: 2,582 DEP: 1,421
Measure Life	Not evaluated
Net-to-Gross Ratio	Not evaluated
Process Evaluation	Yes
Previous Evaluation(s)	2016

To determine program impacts, the evaluation team used a three-step process: (1) we conducted a participation analysis; (2) we assessed energy savings impacts via a consumption analysis and cross-participation analysis; and (3) we estimated ex post gross demand impacts through a regression analysis. These results were then used to calculate realization rates.

Step 1: Participation Analysis. Reviewed program-tracking data to assess program participation during the evaluation period.

- Reviewed program participation database to determine device and participant counts, types of devices installed, and cycling strategies employed, as well as installation dates.
- Reviewed thermostat and switch log data to determine device operability rates and identify opt-outs.

Step 2: Net Energy Savings Analysis. Conducted a regression analysis and cross-participation analysis to estimate energy savings impacts for thermostats installed in 2017.

- Cleaned participation and customer billing data; developed matched comparison group to assess net energy impacts. Conducted regression analysis by jurisdiction.
- Conducted cross-participation analysis to deduct any double counted savings from other Duke Energy programs.
- Applied per-device impacts to enrolled thermostats and calculated net realization rates.

Step 3: Gross Demand Response Analysis. Conducted a regression analysis to estimate event-specific load impacts across cycling strategy, jurisdiction and device type.

- Cleaned participation and device log data; developed matched proxy-weather days to assess counterfactual. Conducted regression analysis by jurisdiction.
- Calculated opt-out and operational rates for devices.
- Converted run-time to kW by applying full load capacity.
- Applied per-device impacts to operational devices and calculate net realization rates.

Page intentionally left blank

For more information, please contact:

Olivia Patterson
Vice President

510 444 5050 tel
510 444 5222 fax
opatterson@opiniondynamics.com

1 Kaiser Plaza, Suite 445
Oakland, CA 94612

Opinion Dynamics

Boston | Headquarters

617 492 1400 tel
617 497 7944 fax
800 966 1254 toll free

1000 Winter St
Waltham, MA 02451

Duke Energy Carolinas and Progress

EnergyWise Business 2017 Evaluation Report – Appendices

November 9, 2018

Contributors

EMI CONSULTING

Table of Contents

Table of Tables

Table of Figures

Page intentionally left blank

Appendix A. DSMore Table

The Excel spreadsheet containing measure-level inputs for Duke Energy Analytics is provided as a separate file. Per-measure savings values in the spreadsheet are based on the gross demand response impacts and net energy efficiency savings analysis reported above. Measure life estimates have not been updated as part of this evaluation since it was not part of the evaluation scope.

Appendix B. Detailed Net-to-Gross Methodology

Demand Response

Opinion Dynamics conducted a gross demand response analysis to estimate average event-specific hourly load impacts for installed devices across cycling strategy, device type and jurisdiction. We conducted this analysis using device log data supplied by Itron, which provides device run-time data, in combination with program tracking data, event data, and weather data from the National Oceanic and Atmospheric Administration's (NOAA) National Centers for Environmental Information. For demand response programs, the concept of free-ridership is not applicable. Customers will rarely, if ever, choose to cycle their units off during a hot day without program intervention. Non-participant spillover is also not applicable because non-participants are not notified of Conservation Period events. Participant spillover is unlikely to occur because customers rarely turn off other equipment during program events. However, takeback effects, such as running fans to compensate for the cycling of the AC unit and/or increased run time for refrigeration and/or process cooling equipment, may occur. Because we used device-level (thermostat or switch) log data to conduct this analysis, rather than facility-level data, this analysis produces gross impacts, i.e., results are not adjusted for takeback effects. Notably, the original evaluation plan sought to assess net demand impacts using AMI (advanced metering infrastructure) data. However, the AMI data had substantial data quality issues, necessitating the use of device log data for the impact analysis. As a result, the log data does not incorporate takeback effects. Notably, the load shapes within the AMI data—based on graphical review—were not consistent with AC load shapes, and the amount of AMI data was insufficient to fully represent the population of participants.

Energy Efficiency

Opinion Dynamics estimated net energy efficiency savings through a consumption analysis savings adjusted for cross-participation, with spillover corrected during the regression modeling. Specifically, the evaluation team conducted a net energy efficiency analysis via a consumption analysis that used monthly billing data with a matched comparison group. This consumption analysis yields net energy efficiency savings plus any double-counting from other programs. Impacts from free riders are already removed during the consumption analysis because the regression model adjusts for pre-program energy consumption. Participant spillover, in which the participant takes additional non-EWB program energy related actions in response to the program causing changes in their energy usage, is attributable to the program, and is included in the raw average energy impacts. To get to the full net energy efficiency savings, we removed cross-participation savings from the net ex post energy efficiency savings, as detailed in Section J.

Appendix C. Early Participant In-Depth Interview Guide

Introduction

This interview guide details the key topics and questions for the evaluation of the Energy Wise for Business Program at Duke Energy. The evaluation team will use this guide to conduct in-depth qualitative interviews with program participants. The purpose of interviews is to (1) provide program staff early feedback about the program roll-out and first demand response events, and (2) help identify key issues to explore through the larger participant survey effort.

The evaluation team will conduct these interviews by telephone to complete the interviews quickly and to be flexible to respondents' schedules. The evaluation team will record the discussion to ensure thorough documentation of each interview and will organize the results for subsequent qualitative analysis as guided by the research objectives. The interview guide first provides an overview of the evaluation research questions and interview sample, then second provides the topics and questions that will be used for the interviews.

Research Questions

Below are the evaluation questions for these early participant interviews:

- What barriers do customers have that prevent them from enrolling in the program?
- Are implementation staff able to explain the program to customers? Are there questions that customers have that are not being fully addressed?
- Do customers understand how to use their smart thermostat? Is program training on how to use the thermostat sufficient?
- Do customers understand how to access and interpret information in the program portal?
- Are there barriers that prevent customers who enroll in the program from participating in demand response events?
- What were customers' experiences during events? Have there been any aspects of their event experience that will influence their willingness to participate in future events?
- Are program implementers offering the year-round demand response option to all customers with electric heat pumps?
- How satisfied are participants with various program elements and the program overall?

Interview Sample

EMI Consulting will recruit and schedule in-depth interviews with at least 10 Energy Wise for Business Program participants. We will seek to include a range of business customer types (e.g., retail, restaurants, office, service) to ensure that we are capturing early feedback on possible variation in program experiences. We will focus on customers who have participated in a demand response event to ensure that we receive feedback on the events. We will interview five customers recruited by Lime Energy and five recruited by Threshold Marketing to try to understand differences in how each contractor marketed the program and why Threshold Marketing has been more successful.

Survey/Interview

This section of the interview guide outlines the topics and suggested language for interview questions and probes that will be used for the in-depth interviews with participating customers. Experienced EMI Consulting interviewers will address each topic during the interview but may not necessarily stick to the exact phrasing and order of the questions based on the responses and discussion flow for each interview. Topics that will be addressed in the interviews are organized into seven sections: (1) Company Overview (2) Program Awareness, (3) Installation and Training, (4) Thermostat and Online Portal Usability, (5) Demand Response Experience, (6) Program Satisfaction, and (7) Closing.

Recruiting Dialogue/Message Script

Hello, my name is [INTERVIEWER]. Thank you for taking the time today to speak with us. The purpose of the call is to discuss your experiences with the Energy Wise for Business Program. Your feedback will help us better understand the why you decided to participate in the program, highlight what is working well, and identify any areas where the program can be improved. As a thank you for your time and feedback, we will provide you a $25 incentive. The interview today should take approximately 20-minutes.

To help with my note-taking, is it ok if I record our call today?

[With permission, start the recording]

Company Overview

To provide me with valuable context for your interview, it helps to begin with an overview of the type of work your business does and your role in the company.

1. So, to start, how would you describe the type of work that your company does?
    a. How many people are employed there?
2. What is your role in the company?
    a. How long have you been in your current role?
    b. What are your primary responsibilities?
3. How many thermostats are in the building that control the heating and cooling?
    a. Do you know if you have a schedule programmed for those thermostats? Do you know what that looks like?
4. Are you responsible to managing the thermostat settings/schedule? If not, who is?
    a. Is there anyone else in your company that is interacts with the thermostats? If so, in what capacity?

Program Participation

5. First, I'd like to hear about your experience with the Duke Energy representative that first came to your business to explain the program. (Note to Interviewer: First Lime Energy, and then Threshold Marketing, go door-to-door canvassing businesses about the Energy Wise for Business Program at Duke Energy.

We'd like to understand differences in sales pitches between Lime and Threshold through these questions.).

a. What do you recall most about that visit?

   i. Do you remember how the representative explained the program?

   ii. Was the representative able to clearly explain the program benefits and details?

   iii. Was the representative able to answer any questions that you may have had?

   iv. Did the representative help you schedule an installation time through the online portal?

   v. Were there any challenges finding an installation time that worked for you?

b. [If not mentioned] Do you recall ever seeing any marketing material related to Energy Wise for Business? (Possible probes: email, online banners, newsletter, bill inserts, social media, etc.)

6. Why did your company decide to participate in the Duke program? (Note to Interviewer: First Lime Energy, and then Threshold Marketing, go door-to-door canvassing businesses about the Energy Wise for Business Program at Duke Energy. We'd like to understand differences in sales pitches between Lime and Threshold through these questions.).

   a. Was there any aspect of the representative's message that was particularly influential? If so, what and why?

   b. What factors were most important in your business' decision to participate?

      i. Probe: thermostat, remote access to energy controls, the credit for participating in DR events, helping the environment, etc.

   c. Did your company elect for the thermostat or the switch? Why?

7. Did you have any concerns about participating in the program?

   a. Were those addressed? If so, how?

Installation and Training

Next I have a few questions about the [thermostat/switch] you received:

8. How would you describe your experience with installation of the [thermostat/switch]?

   a. How long (many days) did you have to wait between when you agreed to participate in the program and when the [thermostat/switch] was actually installed?

   b. Were you present for the installation?

   c. How long did the process take?

   d. Where there any challenges installing the [thermostat/switch]?

9. Did the installation technician walk you through how to use the [thermostat/switch]?

   a. What information was covered by the technician?
   b. Did you have any questions that were not answered during the training?
      i. [If yes] Did you ever get answers to them? How?
   c. Where any educational materials left behind?
      i. [If yes] How useful where those materials?
10. Do you recall what cycling level you chose to participate at for the demand response events? (If not, provide them with their cycling level and the options.)
   a. Why did you select that level of participation?
   b. Did the representative or technician provide you with any advice on what level to choose?
11. [If electric heat pump customer] Did the installers offer the year-round demand response option to your business?

Thermostat and Online Portal Usability

Thermostat

[Ask this section if customer has thermostat]

12. Was a schedule programmed into the thermostat during the installation?
   a. Who inputted the schedule (i.e., the representative, myself with instruction)?
   b. Does your business still use the same schedule?
      i. [If no] Why not? What changes have been made?
      ii. Do you make changes directly at the device or over Wi-Fi via the online portal?
      iii. Is there anyone else in your company that makes schedule adjustments to the thermostat?
13. How would you rate your overall satisfaction with the thermostat on scale of 0 to 10 with 0 being "extremely dissatisfied" and 10 being "extremely satisfied"?
   a. What contributes most to your rating?
14. How would you rate your confidence making adjustments to the schedule on your thermostat using a 0 to 10 scale (with 0 being "not confident at all" and 10 being "completely confident)?
   a. What contributes most to your rating?
15. Do you think that the thermostat has helped your organization save energy?
   a. If so: How? (Probe to understand if they think this is based on differences in settings, ability to control remotely, auto away features, etc.?

b. If so: Why not?

Online Portal

16. Have you accessed the online portal that provides access to the thermostat settings and energy use since it was first installed?

[If yes]

a. How often would you estimate you access the portal?
b. What are the primary reasons you would access the portal?
c. How easy or difficult is the online portal to use?
d. Is the information presented in a way that is easy to understand?
e. What information on the portal do you find the most useful? Why?
f. Is there anything that you find confusing in the portal? What?

[If no]

g. Why not? Are you able to do everything you would need to do to with the thermostat without using the portal?

17. Is there anything additional that you would like to see made available on the online portal that would make is more useful?

Demand Response Experience

18. Did your company participate in any of the demand response events, where Duke used your [switch/thermostat] to control the energy use of your air conditioner for a few hours in 2016?
    a. [If yes] Do you recall how many events you participated in?
    b. [If no] Why not? Is there any particular reason your company was not able to participate in the events?
19. Do you recall how you found out about the demand response event? (Possibilities: email, online portal, thermostat notification, other participants)
    a. How far in advance was the notification?
    b. Is that a reasonable notification time frame for your company?
20. Tell me about your experiences during the demand events.
    a. Did the demand event positively or negatively impact your company in any way?
21. How likely is your company to participate in future demand response events (i.e., Not very likely, somewhat likely, very likely)? Why?

22. Do you have any suggestions that would make participating in demand events easier for or more convenient for your company?

Program Satisfaction

23. If you were to rate your overall satisfaction with your experiences participating in the program on a scale of 0 to 10 (with 0 being "extremely dissatisfied" and 10 being "extremely satisfied"), how would you rate your overall satisfaction level?

    a. What contributes most to this satisfaction?

    b. Is there anything that would make you more/less satisfied with Energy Wise?

Closing

Those are all the questions that I have for you today. Is there anything additional that you think would be valuable for us to take into consideration that I have not asked you about?

If we have any additional questions, is it okay if we email or call you?

Thanks,

[End the call, stop the recording, and save the file]

Appendix D. Non-Participant In-Depth Interview Guide

Introduction

This interview guide details the key topics and questions for the evaluation of the Energy Wise Business Program at Duke Energy. The evaluation team will use this guide to conduct in-depth qualitative interviews with non-participants, who are defined as customers approached about the program that have decided not to participate. The interviews will address their concerns, and what additional information or support would be needed for them to participate.

The evaluation team will conduct these interviews by telephone to complete the interviews quickly and to be flexible to respondents' schedules. The evaluation team will record the discussion to ensure thorough documentation of each interview and will organize the results for subsequent qualitative analysis as guided by the research objectives. The interview guide first provides an overview of the evaluation research questions and interview sample, then second provides the topics and questions that will be used for the interviews.

Research Questions

Below are the evaluation questions for these early participant interviews:

- What barriers do customers have that prevent them from enrolling in the program? Why do customers approached by implementers Lime Energy and Threshold Marketing decide not to participate? How could Duke Energy help customers overcome these barriers?
- Are implementation staff able to explain the program to customers? Are there questions that customers have that are not being fully addressed?

Interview Sample

EMI Consulting will recruit and schedule in-depth interviews with up to 20 Energy Wise Business Program non-participants. We will seek to include a range of business customer types (e.g., retail, restaurants, office, service) to ensure that we are capturing feedback on possible variation in program experiences. If the program tracking data allows, we will seek a mix of non-participants approached by both Lime Energy and Threshold Marketing.

Interview

This section of the interview guide outlines the topics and suggested language for interview questions and probes that will be used for the in-depth interviews with non-participating customers. Experienced EMI Consulting interviewers will work to identify the decision maker at each business and address each topic during the interview but may not necessarily stick to the exact phrasing and order of the questions based on the responses and discussion flow for each interview. Topics that will be addressed in the interviews are organized into seven sections: (1) Company Overview, (2) Program Awareness, (3) Decision to Participate, and (4) Closing.

Recruiting Dialogue/Message Script

Hello, my name is [INTERVIEWER]. Thank you for taking the time today to speak with us. The purpose of the call is to discuss the Energy Wise Business Program offered by Duke Energy [IF NEEDED: Through the Energy Wise Business Program, Duke Energy provides small business customers with free Wi-fi enabled thermostats or HVAC switches that allows Duke Energy to override your thermostat settings on very hot or very cold days in exchange for a bill credit.] The reason we are reaching out to you is because you were approached about the program but chose not to participate. Your feedback will help us better understand why you decided not to participate in the program, and potentially identify any areas where the program can be improved. As a thank you for your time and feedback we will provide you a $25 check, and the call will only take approximately 10-minutes.

[INTERVIEWER NOTE: If there is any concern about the legitimacy of the interview, please let customer know they can contact EM&V to confirm you are working on behalf of Duke Energy.

Regina.Harris@duke-energy.com

513-287-1218

Melinda.Goins@Duke-energy.com

704-382-3827]

To help with my note-taking, is it ok if I record our call today?

[With permission, start the recording]

Company Overview

To provide me with valuable context for your interview, it helps to begin with an overview of the type of work your business does and your role in the company.

24. So, to start, how would you describe the type of work that your company does?
    a. How many people are employed there?
25. What is your role in the company?
    a. How long have you been in your current role?
26. Do you know what type of thermostat is used to control your organization's heating and cooling? (Looking for programmable versus manual, analog versus digital)
    a. How many thermostats are in the building?
    b. Do you know if you have a schedule programmed for those thermostats? If so, can you describe what the schedule looks like?
27. Are you responsible for managing the thermostat settings/schedule? If not, who is? [Interviewer note: if customers does not manage thermostat and is not decision maker, ask if there is anyone else they could talk to]
    a. Is there anyone else in your company that interacts with the thermostats? If so, in what capacity?

28. Does your organization own or lease your facility?
    a. [If lease] Does your organization pay for its own electricity consumption?
29. Is your company part of a franchise or chain?

Program Awareness

30. First, I'd like to hear about your experience with the Duke Energy representative that first came to your business to explain the program. (Note to Interviewer: First Lime Energy, and then Threshold Marketing, go door-to-door canvassing businesses about the Energy Wise Business Program at Duke Energy. Lime Energy also offers customers direct install lighting measures, so customers might remember this visit better by describing this as an additional service described during their lighting retrofit project).
    a. What do recall most about that visit?
        i. Do you remember how the representative explained the program? [If needed, probe into whether they explained the free smart thermostat, demand response options]
        ii. Was the representative able to clearly explain the program benefits and details?
        iii. Was the representative able to answer any questions that you may have had?
    b. [If not mentioned] Do you recall ever seeing any marketing material related to Energy Wise Business? (Possible probes: email, online banners, newsletter, bill inserts, social media, etc.)

Decision to Participate

31. What aspects of the program were most appealing to your business? Explain.
32. Can you explain why your company ultimately decided not to participate in the program?
    a. What factors were most important in your business' decision?
        i. Probe: equipment compatibility (especially if couldn't get thermostat), privacy concerns, comfort concerns
    b. Is there anything about the program, that if modified, would have changed your decision not to participate?
33. Did you have any concerns about how the program was presented?
    a. If so, what were they?
    b. Did you share these concerns with Duke Energy or the representative?
        i. [If yes] How did the representative address your concerns?
34. Do you have any suggestions on how to improve the program offering?

Closing

Those are all the questions that I have for you today. Is there anything additional that you think would be valuable for us to take into consideration that I have not asked you about?

If we have any additional questions, is it okay if we email or call you?

Can you please confirm the name and address where we should send your $25 check?

Thanks,

[End the call, stop the recording, and save the file]

Appendix E. Unenrolled Thermostat In-Depth Interview Guide

Introduction

This interview guide details the key topics and questions for the evaluation of the EnergyWise Business Program for Duke Energy. The evaluation team will use this guide to conduct in-depth qualitative interviews with participants who have unenrolled their thermostats from Demand Response events, also known as "Conservation Periods." The interviews will probe for the root causes for unenrollment in the demand response component of the program. This guide is fairly exploratory, as this is the first research done with any cycling opt-out customers.

The evaluation team will conduct these interviews by telephone to complete the interviews quickly and to be flexible to respondents' schedules. The evaluation team will record the discussion to ensure thorough documentation of each interview, and will organize the results for subsequent qualitative analysis as guided by the research objectives. The interview guide first provides an overview of the evaluation research questions and interview sample, and then provides the topics and questions that will be used for the interviews.

Research Questions

The primary research question for these unenrolled thermostat participant interviews is:

- Why do customers choose to unenroll in the demand response portion of the Energy Wise Business Program?

Interview Sample

EMI Consulting will recruit and schedule in-depth interviews with up to 10 EnergyWise Business Program unenrolled thermostat participants. Due to the small sample size (approximately 135 customers), we will make a census attempt of all unenrolled thermostat participants.

Interview

This section of the interview guide outlines the topics and suggested language for interview questions and probes that will be used for the in-depth interviews with unenrolled thermostat participants. Experienced EMI Consulting interviewers will work to identify the decision maker at each business and address each topic during the interview, but may not necessarily stick to the exact phrasing and order of the questions based on the responses and discussion flow for each interview.

Recruiting Dialogue/Message Script

Hello, my name is [INTERVIEWER]. Thank you for taking the time today to speak with us. The purpose of the call is to discuss the EnergyWise Business Program offered by Duke Energy [IF NEEDED: Through the EnergyWise Business Program, Duke Energy provides small business customers with free Wi-Fi enabled thermostats or HVAC switches that allow Duke Energy to override your thermostat settings on very hot or very cold days in exchange for a bill credit.] The reason we are reaching out to you is because you received the thermostat, but chose to unenroll your thermostat from Conservation Periods. Your feedback will help us better understand why you decided to unenroll your thermostat and potentially identify any areas where the program can be improved. As a thank you for your time and feedback we will provide you a $25 check, and the call will only take approximately 15-minutes.

[INTERVIEWER NOTE: If there is any concern about the legitimacy of the interview, please let customer know they can contact EM&V to confirm you are working on behalf of Duke Energy: Melinda.Goins@Duke-energy.com / 704-382-3827]

To help with my note-taking, is it ok if I record our call today?

[With permission, start the recording]

Screening Questions

A1. Through the EnergyWise Business program, your organization received a free Wi-Fi -enabled thermostat that allows Duke Energy the ability to temporarily cycle your thermostat on very hot days, in exchange for bill credits. Are you aware that your organization was participating in this program?
1. Yes
2. No
8. I'm not sure

A2. [IF A1 = 1] Were you involved in the decision to enroll in EnergyWise Business and have a Wi-Fi -enabled thermostat installed at your organization?
1. Yes
2. No
8. I'm not sure

A3. Are you responsible for maintaining the thermostat temperature and/or schedule at your organization?
1. Yes
2. No

A4. [IF A2 <>1 AND A3 <> 1, OR IF A1 <> 1] Is there someone else at your organization who was involved in the decision to install the program wifi-enabled thermostat or who maintains the thermostat temperature and/or schedule at your organization?
1. Yes, and their email address/phone number is: [OPEN-END] [THANK AND TERMINATE SURVEY]
2. No/I'm not sure [THANK AND TERMINATE SURVEY]

Motivations for Initial Enrollment

B2. Why did you decide to become involved in the EnergyWise Business Program? [Do not read. Select all that apply]
1. To receive free Wi-Fi-enabled thermostat
2. To receive credit on energy bill
3. To lower energy bill by using less energy with new thermostat
4. To help reduce the environmental impact of your energy usage
5. To help ensure grid stability during high energy use periods
6. To improve the comfort of my organization's spaces
7. I have participated in a similar program before and had good experiences
8. To help Duke Energy delay building new electricity generation sources
0. Other [OPEN END]
10. I was not part of the decision to participate in the program
98. I do not remember or prefer not to say

B3. [IF NO. OF B2 RESPONES > 1, SHOW REASONS SELECTED FOR B2] Which of these was the most important factor in your decision to enroll in the program?

Enrollment and Installation

C1. [IF RECRUITED = YES] Our records indicate that a representative from Duke Energy visited your organization to explain the EnergyWise Business program and help you sign up. Does this sound familiar to you? [IF NEEDED: These representatives may have worked for companies called Lime Energy or Threshold Marketing

1. Yes
2. No
3. Don't remember
8. Don't know

C2. As far as you remember, did the Duke Energy representative discuss any of the following topics with you when they first described the EnergyWise Business program?

1. That Duke Energy would temporarily lower your HVAC usage on very hot days during Conservation Periods
2. The "cycling" level you could choose for your wifi-enabled thermostat
3. The bill credits you would receive for participating in Conservation Periods
4. How to opt-out of individual Conservation Period days

C3. [IF RECRUITED = YES AND C1 = YES] After the Duke Energy representative first described the EnergyWise Business program to you, how well did you feel that you understood…
[SHOW RESPONSES TO C2]
[UNDERSTOOD VERY WELL, UNDERSTOOD SOMEWHAT, DID NOT UNDERSTAND, DON'T REMEMBER]

C4. [IF RECRUITED = NO] Before enrolling in the EnergyWise Business program, had you heard about the following topics?

1. What it meant for Duke Energy to temporarily lower your HVAC usage on very hot days during Conservation Periods
2. The "cycling" level you could choose for your wifi-enabled thermostat
3. The bill credits you would receive for participating in Conservation Periods
4. How to opt-out of individual Conservation Period days

C5. [IF RECRUITED = NO] At the time you enrolled in the program, how well did you feel that you understood…
[SHOW RESPONSES TO C4]
[UNDERSTOOD VERY WELL, UNDERSTOOD SOMEWHAT, DID NOT UNDERSTAND, DON'T REMEMBER]

C6. Did you have any questions about the program that were not answered when you enrolled or was not answered by the technician during the thermostat install?

1. Yes
2. No
3. Don't remember
8. Don't know

C7. [IF C6=1] What were these questions? [OPEN ENDED RESPONSE]

C8. Do you remember choosing a "cycling" level for your wifi-enabled thermostat when you first enrolled in the program?
1. Yes
2. No
3. I don't know what cycling is
8. Don't remember

C9. [IF C8=YES] Do you remember which "cycling" level you chose at first?
1. 30% cycling
2. 50% cycling
3. 75% cycling
8. I don't know

C10. [IF C8=YES] Why did you choose that cycling level? (check all that apply)
1. I wanted to receive the highest bill credit possible
2. I wanted to minimize impacts of Conservation Periods on comfort at my organization
3. That is what the Duke Energy representative recommended
0. Other [OPEN END]
8. I don't know

Experiences Driving Unenrollment

E1. To the best of your knowledge, did your organization participate in any Conservation Periods this summer?
1. Yes
2. No
8. Don't know

E1a. [IF E1 = 1] Do you remember receiving advance notice about the Conservation Periods(s) through any of the following methods? (Select all that apply)
1. Received email notification
2. Notified through the program's online portal
3. Notified by alert light on the thermostat
4. Do not remember any receiving notification
0. Other [OPEN END]
8. Don't know

Y1. What were the primary reasons your company decided to unenroll your thermostat(s) from Conservation Periods? Were there any additional reasons you decided to unenroll? (PROBE FOR: large impact on business during DR events, lack of communication about events, malfunction of thermostat unit, difficulty using program portal, etc. If difficulty with thermostat mentioned, probe for technical malfunction vs. an expressed sense of frustration/incapacity to figure out the systems. Probe to distinguish between responses related to customer service/implementation issues versus the program not being a good fit for the customer.) [OPEN END]

Y2. [IF NEEDED] Was there a particular event that drove your company to that decision? Can you describe that event? [OPEN END]

Y3. Approximately how many Demand Response events did your company participate in before unenrolling your thermostat(s)? [OPEN END]

Y4. (REPEAT Y4 QUESTIONS FOR EACH REASON DISCUSSED IN Y1, IF APPLICABLE) Was this aspect of the program discussed with you before you participated in the program? If so, what do you recall from the discussion? [OPEN END]

Y4a. [IF Y4=YES, IF NEEDED] Looking back, did the information you receive at sign-up accurately reflect your experiences in this regard? [OPEN END]

Y4b. [IF Y4=NO, IF NEEDED] Would you have participated in the program if you had known about this aspect? [OPEN END]

Y5. Do you have any suggestions on how Duke Energy could improve the EnergyWise Business Program? [OPEN END]

Company Overview

To provide me with valuable context for your interview, it helps to get an overview of the type of work your business does and your role in the company.

X1. What is your role in the company? [OPEN END]

G1. What is the business type of the facility located at <ADDRESS>?
1. K-12 School
2. College/University
3. Grocery
4. Medical
5. Hotel/Motel
6. Light Industry
7. Heavy Industry
8. Office
9. Restaurant
10. Retail/Service
11. Government
12. Place of public assembly or worship
00. Other [OPEN END]

X3. How many thermostats does your company have? [OPEN END]

X4. Does your organization own or lease your facility?
1. Own
2. Lease

XX. If the customer leases the facility, do they maintain the HVAC system or does the building owner?

X5. [If lease] Does your organization pay for its own electricity consumption?
1. Yes
2. No

G3a. How many employees, full plus part-time, are employed at this facility? [NUMERIC OPEN END, 0 TO 2000; 9998=Don't know]

[ASK IF G3a=9998]
G3b. Do you know the approximate number of employees? Would you say it is…?
1. Less than 10
2. 10-49
3. 50-99
4. 100-249
5. 250-499
6. 500 or more

G4. What are the typical total weekly operating hours for the facility at [ADDRESS]? Operating hours are defined as any time where the facility is occupied. [OPEN-END]

Closing

Z1. Those are all the questions that I have for you today. Is there anything additional that you think would be valuable for us to take into consideration that I have not asked you about? [OPEN END]

Z2. If we have any additional questions, is it okay if we email or call you?
1. Yes
2. No

Z3. Can you please confirm the name and address where we should send your $25 check? [OPEN END]

Thanks again for your feedback!

[End the call, stop the recording, and save the file]

Appendix F. Participant Online Survey Instrument

Survey Background

This survey was fielded to gather data in support of the process evaluation of the Duke Energy EnergyWise Business program. The survey was meant to capture data on the experiences of customers who received free smart thermostats or switches and have participated in demand response events. The survey sought to understand customers' motivations and barriers to participation, experiences with program-provided thermostats and demand responses events, and satisfaction with the program. This survey was fielded in September 2017, after the summer heating season (and demand response events) will be mostly complete.

Survey Objectives

This survey is designed to collect data to answer the following research questions:

- What are customers' motivations for enrolling in the program?
- To what extent do implementation staff fully and accurately explain the program to customers? Are there questions that customers have that are not being fully addressed?
- Do customers understand how to use their smart thermostat? Is program training on how to use the thermostat sufficient?
- Do customers understand how to access and interpret information in the program portal?
- Are there barriers that prevent customers who enroll in the program from participating in demand response events?
- What were customers' experiences during events? Have there been any aspects of their event experience that will influence their willingness to participate in future events?
- Are program implementers offering the year-round demand response option to all customers with electric heat pumps?

How satisfied are participants with various program elements and the program overall?

Sample

The evaluation team developed a sampling strategy designed to achieve 200 completed surveys across a variety of customer and projects characteristics. To ensure that the survey sample is as up-to-date as possible in terms of program enrollment and demand response event participation, the evaluation team requested updated program data in August 2017 that was used to develop the survey sampling plan. Variables that may be considered when developing our sampling strategy include:

- Whether a customer installed a smart thermostat or switch
- Number of devices installed
- Cycling level chosen for demand response events
- Whether a customer opted out of any demand response events

- Whether customer has an electric heat pump or not

If a customer completes projects at multiple locations, we will randomly select one of those locations to ask survey questions about. The participant survey will take 15-20 minutes to complete, and respondents will be offered a $25 Amazon gift card for participating.

Fielding Instructions

This survey will be programmed in and fielded with Qualtrics, a web-based survey software. EMI Consulting will email the survey link to participants. Customers will be sent two follow-up reminders asking them to complete the survey, approximately one week apart.

Variables

Variable Name	Description
Device	Equals "thermostat" or "switch" or "both" based on device chosen
Device_Desc	"Wi-Fi enabled thermostat" for thermostat or "switch for your HVAC system" or "Wi-Fi enabled thermostat and switch for your HVAC system"
Cycling	Cycling level that customer has chosen
NumDevices	Number of thermostats that the customer has installed
Recruited	Equals "yes" if customer was recruited by either Lime Energy or Threshold Marketing
Event	Equals "yes" if customer has participated in a DR event
Winter	Equals "yes" if customer is enrolled in winter DR
Opt_Out	Equals "yes" if customer has opted out of a DR event
Address	Address of participant's business
Locations	Number of locations that participant has enrolled in the program

Survey

Section A: Introduction

A0. Hello and thank you for taking the time to provide your feedback on the EnergyWise Business program from Duke Energy. Through this program, you received a free [DEVICE_DESC] that allows Duke Energy to override your thermostat settings on very hot or very cold days in exchange for a bill credit.

The survey will take about 15 minutes to complete. Your responses will help Duke Energy improve the program for future participants like yourself.

As a thank-you for your time and input, you will receive a $25 gift card after completing the survey.

This survey is administered by the Energy Wise Business program evaluator, EMI Consulting. If you have questions about this survey or encounter any problems, please contact Robert Saul at rsaul@emiconsulting.com or (206) 388-0973. If you would like to verify the authenticity of this study, please contact Melinda Goins from Duke Energy at Melinda.Goins@duke-energy.com or 704-382-3827.

A1. [IF LOCATIONS>1] We understand your organization has participated in the EnergyWise Business at multiple locations. For the following questions, we'll be asking about your organization's facility at [ADDRESS].

Through the EnergyWise Business program, your organization received a free [DEVICE_DESC] that allows Duke Energy the ability to temporarily override your thermostat settings on very hot [IF WINTER=YES add "and very cold"] days, in exchange for bill credits. Are you aware that your organization is participating in this program?

1. Yes
2. No
8. I'm not sure

A2. [IF A1 = 1] Were you involved in the decision to install a [DEVICE_DESC] at your organization [IF LOCATIONS>1 add "facility at [ADDRESS]]?

1. Yes
2. No
8. I'm not sure

A3. [IF A1 = 1 AND DEVICE=THERMOSTAT OR BOTH] Are you responsible for maintaining the thermostat temperature and/or schedule at your organization?

1. Yes
2. No
8. I'm not sure

A4. [IF A2 <>1 AND A3 <> 1, OR IF A1 <> 1] Is there someone else at your organization who was involved in the decision to install the program [DEVICE_DESC] or who maintains the thermostat temperature and/or schedule at your organization?

1. Yes, and their email address is: [OPEN-END] [THANK AND TERMINATE SURVEY]
2. No/I'm not sure [THANK AND TERMINATE SURVEY]

Section B: Motivations

B2. Why did you decide to become involved in the EnergyWise Business Program? Please select all that apply. [RANDOMIZE OPTIONS 1-8]

1. To receive free Wi-Fi-enabled thermostat
2. To receive credit on energy bill
3. To lower energy bill by using less energy with new thermostat
4. To help reduce the environmental impact of your energy usage
5. To help ensure grid stability during high energy use periods
6. To improve the comfort of my organization's spaces
7. I have participated in a similar program before and had good experiences
8. To help Duke Energy delay building new electricity generation sources
0. Other: ___________________________
10. I was not part of the decision to participate in the program
98. I do not remember or prefer not to say

B3. [IF NO. OF B2 RESPONES > 1, SHOW REASONS SELECTED FOR B2] Which of these was the most important factor in your decision to enroll in the program?

[LIST RESPONSES SELECTED TO B2]

B3a. [IF B3= "To receive free Wi-Fi-enabled thermostat"] What was appealing to you about the new Wi-Fi-enabled thermostat? Please choose all that apply.

1. To be able to control thermostat remotely
2. To be able to manage all my organization's thermostats at the same time
3. To get a newer thermostat than we had
4. To have a thermostat that is easier to use
5. To test out a new technology
6. To save on energy bill
0. Other: ________________________

Section C: Enrollment and Installation

Next, we have a few questions related to your experiences with enrolling in the program.

C1. [IF RECRUITED = YES] Our records indicate that a representative from Duke Energy visited your organization to explain the EnergyWise Business program and help you sign up. Does this sound familiar to you?

1. Yes
2. No
3. Don't remember
8. Don't know

C2. [IF RECRUITED = YES AND C1 = YES] As far as you remember, did the Duke Energy representative discuss the following topics with you when they first described the EnergyWise Business program? Please select all that apply.

1. The benefits of installing a Wi-Fi thermostat or HVAC control switch
2. The requirements for your Wi-Fi-network to be able to connect a Wi-Fi thermostat
3. When you could expect your [DEVICE] to be installed
4. That Duke Energy would temporarily lower your HVAC usage on very hot [IF WINTER=YES add "and very cold"] days during Conservation Periods
5. The "cycling" level you could choose for your [DEVICE]
6. The bill credits you would receive for participating in Conservation Periods

C3. [IF RECRUITED = YES AND C1 = YES] After the Duke Energy representative first described the EnergyWise Business program to you, how well did you feel that you understood… [SHOW RESPONSES TO C2]

[UNDERSTOOD VERY WELL, UNDERSTOOD SOMEWHAT, DID NOT UNDERSTAND, DON'T REMEMBER]C4. [IF RECRUITED = NO] Before enrolling in the EnergyWise Business program, had you heard about the following topics? Please select all that apply.

1. The benefits of installing a Wi-Fi thermostat or HVAC control switch

2. The requirements for your Wi-Fi-network to be able to connect a Wi-Fi thermostat
3. When you could expect your [DEVICE] to be installed
4. What it meant for Duke Energy to temporarily lower your HVAC usage on very hot [IF WINTER=YES add “and very cold”] days during Conservation Periods
5. The “cycling” level you could choose for your [DEVICE]
6. The bill credits you would receive for participating in Conservation Periods

C5. [IF RECRUITED = NO] At the time you enrolled in the program, how well did you feel that you understood… [SHOW RESPONSES TO C4]

[UNDERSTOOD VERY WELL, UNDERSTOOD SOMEWHAT, DID NOT UNDERSTAND, DON’T REMEMBER]

C6. Did you have any questions about the program that were not answered when you enrolled?

1. Yes
2. No
3. Don’t remember
8. Don’t know

C7. [IF C6=1] What were these questions? [OPEN ENDED RESPONSE]

C8. Do you remember choosing a “cycling” level for your [DEVICE_DESC] when you first enrolled in the program?

1. Yes
2. No
3. I don’t know what cycling is
8. Don’t remember

C9. [IF C8=YES] Do you remember which “cycling” level you chose?

1. 30% cycling
2. 50% cycling
3. 75% cycling
8. I don’t know

C10. [IF C8=YES] Why did you choose that cycling level? Please check all that apply.

1. I wanted to receive the highest bill credit possible
2. I wanted to minimize impacts of Conservation Periods on comfort at my organization
3. That is what the Duke Energy representative recommended
0. Other: ____
8. I don’t know

C11. [IF WINTER=NO] Does your organization use an electric heat pump for heating the building?

1. Yes
2. No
8. Don’t know

C12. [IF C11=1] Did the program representatives explain that you could receive additional bill credits by participating in Conservation Periods where Duke Energy would temporarily lower your heat in the winter as well as the summer?

1. Yes
2. No
8. Don't know

Next, we'd like to ask a few questions about the day that Duke Energy representatives installed your [DEVICE_DESC].

C13. Were you present when the Duke Energy representatives came to install your [DEVICE_DESC]?

1. Yes
2. No [SKIP TO C19]
8. Don't know [SKIP TO C19]

C14. [IF C13=1 AND DEVICE= "THERMOSTAT" OR "BOTH"] Do you remember if the Duke Energy representatives who installed your thermostat provided any training or guidance about how to use the new thermostat?

1. Yes
2. No
8. Don't remember

C15. [IF C14 = YES] How useful was that training in terms of…

a. Using the program's online portal (the app or website that Duke Energy provides for managing your thermostat)
b. Using your thermostat

[VERY USEFUL, SOMEWHAT USEFUL, NOT VERY USEFUL, NOT AT ALL USEFUL, DON'T KNOW]

C16. [IF C13=1 AND DEVICE= "THERMOSTAT" OR "BOTH"] Did the Duke Energy representatives help you program an operating schedule in your new thermostat?

1. Yes
2. No
8. I don't know

C16a. [IF C16=1] Did the Duke Energy representatives correctly program an operating schedule in your new thermostat to your specifications?

1. Yes
2. No, please explain: [OPEN END]
8. I don't know

C16b. [IF C16=2] Why didn't the Duke Energy representatives program an operating schedule into your new thermostat?

1. I asked them not to program a schedule
2. They did not offer to program a schedule
3. Someone else from my organization would know this

0. Other: [OPEN END]
8. Don't remember

C17. [IF C13=1 AND DEVICE= "THERMOSTAT" OR "BOTH"] Did you have any additional questions about how your thermostat works that were not answered?

1. Yes
2. No
3. Don't remember
8. Don't know

C18. [IF C17=1] What were these questions? [OPEN ENDED RESPONSE]

C19. [IF AND DEVICE= "THERMOSTAT" OR "BOTH"] Before today, were you aware of Duke Energy's online portal (the app or website that Duke Energy provides for managing your thermostat)?

1. Yes
2. No
8. Don't remember/Don't know

C19a. [IF C19=1 AND DEVICE= "THERMOSTAT" OR "BOTH"] Before today, were you aware of the following features of Duke Energy's online portal? [RANDOMIZE LIST]

a. Information on your organization's energy usage
b. Information about how much your organization's HVAC system has been running
c. Ability to control your thermostat's schedule or temperature

[SHOW RESPONSE OPTIONS AS COLUMNS IN MATRIX]

1. Yes
2. No
8. Don't remember/Don't know

C20. [FOR C19.A-C19.C=YES] Have you used the following features of Duke Energy's online portal?

a. Information on your organization's energy usage
b. Information about how much your organization's HVAC system has been running
c. Ability to control your thermostat's schedule or temperature

[SHOW RESPONSE OPTIONS AS COLUMNS IN MATRIX]

1. Have not used
2. Have accessed but do not use regularly
3. Use regularly
8. Don't remember/Don't know

C21. [Do you have any thoughts about how Duke Energy could make the online portal more useful or easier to use? [OPEN ENDED RESPONSE]

Section D: Thermostat Usage

D1. [IF DEVICE= "THERMOSTAT" OR "BOTH"] Before receiving your new thermostat, do you know how your air conditioning was controlled? Choose the response that best applies:

1. We had a manual thermostat that was set to the same temperature at all times
2. We had a manual thermostat that we turned up and down throughout the day
3. We had a programmable thermostat that was set to the same temperature at all times
4. We had a programmable thermostat that was programmed to cool to different temperatures at different times of day
8. Don't know or prefer not to answer

D1s. [IF DEVICE= "SWITCH"] Do you know how your air conditioning is currently controlled? Choose the response that best applies:

1. We have a manual thermostat that is set to the same temperature at all times
2. We have a manual thermostat that we turn up and down throughout the day
3. We have a programmable thermostat that is set to the same temperature at all times
4. We have a programmable thermostat that is programmed to cool to different temperatures at different times of day
8. Don't know or prefer not to answer

D2. [IF DEVICE= "THERMOSTAT" OR "BOTH"] Have you tried to change the programmed operating schedule on your thermostat since it was installed?

1. Yes
2. No
3. I have not but someone else at my organization has
8. Don't know

D2a. [IF D2=No] Why have not tried to change your thermostat's operating schedule?

1. Have had no need to change the schedule
2. Do not know how to change the schedule
0. Other: ________________________________
8. Don't know

D3. [IF D2=Yes] Have you been able to make the changes to your thermostat's operating schedule that you wanted to make?

1. Yes
2. No
8. Don't know

D4. [IF D3=Yes] How easy or difficult was it to make these changes to your thermostat?

[SHOW VERY DIFFICULT, SOMEWHAT DIFFICULT, FAIRLY EASY, VERY EASY, DON'T KNOW]

D5. [IF D3=No] Please describe the problems that you've had:

____

D6. [IF DEVICE= "THERMOSTAT" OR "BOTH" AND D2=YES] Did you make these changes on the thermostat device itself or through the online portal (the app or website that Duke Energy provides for managing your thermostat)?

1. Thermostat only
2. Primarily thermostat, but have tried the portal
3. Both thermostat and portal
4. Primarily portal, but have tried thermostat
5. Portal only
8. Don't know

D6a. [IF D6=2,3,4,5] How do you typically access the program portal?

1. Desktop or laptop computer
2. Tablet
3. Smart phone
8. Don't know

D7. [IF DEVICE= "THERMOSTAT" OR "BOTH"] Are you the only person who would change the thermostat for your organization, or are there others who could change the schedule or temperature that the thermostat is set to? Select all that apply.

1. Only me
2. There are others who could adjust the temperature temporarily
3. There are others who could adjust the programmed schedule
8. Don't know

D8. [IF DEVICE= "THERMOSTAT" OR "BOTH"] Have you had any difficulties using your new thermostat? Please select all that apply.

1. Wi-Fi connection stopped working
2. Not being able to make desired changes to the programmed schedule
3. Could not access the online portal provided for controlling the thermostat
0. Other: ______________________
4. No problems

D9. Have you tried to contact Duke Energy or EnergyWise Business Call Center for support [IF DEVICE= "THERMOSTAT" OR "BOTH" DISPLAY "related to your new thermostat or"] about the EnergyWise Business program in general?

1. Yes
2. No
8. Don't know

D10. [IF D9=YES] What did you contact Duke Energy about? [OPEN-END]

D11. [IF D9 = 1] Were you able to reach someone who could address your questions or issues?

1. Yes
2. No
8. Don't know

D12. [IF D9 = 1] Were you able to resolve the issue or concern that you contacted Duke Energy about?

1. Yes
2. No
8. Don't know

D13. [IF D12 <> 1] Please briefly describe how you are getting around this issue and whether there is anything Duke Energy could do to resolve your issue. [OPEN-END]

Section E: Demand Response Events

[ASK QUSETIONS E1 – E7 IF EVENT = YES]

E1. As part of your involvement with the Duke EnergyWise Business program, your organization agreed to participate in at least one Conservation Period where Duke Energy temporarily lowers your HVAC usage on very hot [IF WINTER=YES DISPLAY "and very cold"] days. To the best of your knowledge, did your organization participated in any Conservation Periods this summer?

1. Yes
2. No
8. Don't know

E1a. [IF E1 = 1] Do you remember receiving advance notice about the Conservation Periods(s) through any of the following methods? Select all that apply.

1. Received email notification
2. [IF DEVICE= "THERMOSTAT" OR "BOTH"] Notified through the program's online portal
3. [IF DEVICE= "THERMOSTAT" OR "BOTH"] Notified by alert light on the thermostat
3. Do not remember any receiving notification
0. Other: ______________________
8. Don't know

E2. [IF E1 = 1] Please choose the option that best describes your experience during the Conservation Period:

1. We did not notice any changes in our facility's temperature
2. We noticed that the temperature in our facility increased but it did not affect our comfort
3. We noticed that the temperature in our facility increased and it affected our comfort
0. Other: ______________________________________
8. Don't know

E3. [IF E1 = 1] Based on your experience with Conservation Periods(s) this summer, how likely are you to continue participating in Conservation Periods to earn bill credits in future years?

[VERY LIKELY, SOMEWHAT LIKELY, UNDECIDED, SOMEWHAT UNLIKELY, VERY UNLIKELY]

E4. [IF E3= SOMEWHAT UNLIKELY OR VERY UNLIKELY] Why do you think you won't continue to participate in future Conservation Periods? [OPEN-END]

E5. [IF CYCLING<75 AND E3<> VERY UNLIKELY] Would you consider choosing a higher cycling level, meaning that Duke Energy could lower your HVAC usage for more time during a Conservation Period, in exchange for a higher bill credit?

1. Yes
2. No
8. Don't know

E6. [IF OPT_OUT=YES] To the best of your knowledge, did your organization decide to override any of Duke Energy's Conservation Periods this summer?

1. Yes
2. No
8. Don't know

E7. [IF E6 = 1] Please briefly describe why your organization decided to override the Conservation Period. [OPEN-END]

Section F: Satisfaction

F1. Please rate your satisfaction with the following aspects of the EnergyWise Business Program:

[RANDOMIZE a-j; SHOW 0 to 10, WHERE 0 IS "EXTREMELY DISSATISFIED" AND 10 IS "EXTREMELY SATISFIED", N/A]

a. [IF RECRUITED = YES] The Duke Energy representative that first explained the program to you and helped you enroll
b. [IF RECRUITED = NO] The ease of the process for enrolling in the program
c. The time required to enroll in the program
d. The amount of time between when you first enrolled in the program and when your [DEVICE] was installed
e. The Duke Energy representatives that came and installed your [DEVICE_DESC] for you
f. The time required to install your [DEVICE_DESC]
g. [IF C14 = 1] The training you received as part of your [DEVICE] installation
h. [IF DEVICE= "THERMOSTAT" OR "BOTH"] Using the program's online portal
i. [IF E1 = 1] Participating in Conservation Periods
j. The performance of your [DEVICE]
k. Support available from Duke Energy

F2. [IF MIN(F1)<5] What could Duke Energy do to improve your satisfaction with…

[SHOW F1x WHERE F1x<5]

F3. Please rate your satisfaction with the EnergyWise Business program overall:

[SHOW 0 to 10, WHERE 0 IS "EXTREMELY DISSATISFIED" AND 10 IS "EXTREMELY SATISFIED", N/A]

F4. [IF F3<5] What could Duke Energy staff do to improve your satisfaction with the EnergyWise Business program overall?

Section G: Facility Characteristics

You are almost done! I just have a few general questions about your organization.

G1. What is the business type of the facility located at <ADDRESS>?

1. K-12 School
2. College/University
3. Grocery
4. Medical
5. Hotel/Motel
6. Light Industry
7. Heavy Industry
8. Office
9. Restaurant
10. Retail/Service
11. Government
12. Place of public assembly or worship

00. Other, specify

[ALLOW PARTICIPANT TO SKIP QUESTION]

G2. Which of the following best describes the ownership of this facility?

1. My company owns and occupies this facility
2. My company owns this facility but it is rented to someone else
3. My company rents this facility

[ALLOW PARTICIPANT TO SKIP QUESTION]

G3a. How many employees, full plus part-time, are employed at this facility? [NUMERIC OPEN END, 0 TO 2000; 9998=Don't know]

[ASK IF G3a=9998]

G3b. Do you know the approximate number of employees? Would you say it is…?

1. Less than 10
2. 10-49
3. 50-99
4. 100-249
5. 250-499
6. 500 or more

[ALLOW PARTICIPANT TO SKIP QUESTION]

G4. What are the typical total weekly operating hours for the facility at [ADDRESS]? Operating hours are defined as any time where the facility is occupied. [OPEN-END]

G4. Is there anything else you'd like to mention about your experience with the EnergyWise Business that we have not asked about? [RECORD OPEN-END; ALLOW PARTICIPANT TO SKIP QUESTION]

Section H: Closing

Thank you for taking the time to complete the survey. As a small token of our appreciation for your time, we would like to provide you with a $25 Amazon gift card. Can you confirm the e-mail address we should send the gift card to?

Appendix G. Participant Online Survey Cross-Tabulations

A1. [IF LOCATIONS>1] We understand your organization has participated in the EnergyWise Business at multiple locations. For the following questions, we'll be asking about your organization's facility at [ADDRESS].

Through the EnergyWise Business program, your organization received a free [DEVICE_DESC] that allows Duke Energy the ability to temporarily override your thermostat settings on very hot [IF WINTER=YES add "and very cold"] days, in exchange for bill credits. Are you aware that your organization is participating in this program?

			utility		
			DEC	DEP	Total
a1	Yes	Count	180	62	242
		% within utility	100.0%	100.0%	100.0%
Total		Count	180	62	242
		% within utility	100.0%	100.0%	100.0%

A2. [IF A1 = 1] Were you involved in the decision to install a [DEVICE_DESC] at your organization [IF LOCATIONS>1 add "facility at [ADDRESS]]?

			utility		
			DEC	DEP	Total
a2	Yes	Count	153	53	206
		% within utility	98.7%	98.1%	98.6%
	No	Count	1	1	2
		% within utility	0.6%	1.9%	1.0%
	I'm not sure	Count	1	0	1
		% within utility	0.6%	0.0%	0.5%
Total		Count	155	54	209
		% within utility	100.0%	100.0%	100.0%

A3. [IF A1 = 1 AND DEVICE=THERMOSTAT OR BOTH] Are you responsible for maintaining the thermostat temperature and/or schedule at your organization?

			utility		
			DEC	DEP	Total
a3	Yes	Count	164	55	219
		% within utility	94.3%	91.7%	93.6%
	No	Count	10	5	15
		% within utility	5.7%	8.3%	6.4%
Total		Count	174	60	234
		% within utility	100.0%	100.0%	100.0%

A4. [IF A2 <>1 AND A3 <> 1, OR IF A1 <> 1] Is there someone else at your organization who was involved in the decision to install the program [DEVICE_DESC] or who maintains the thermostat temperature and/or schedule at your organization?

[No customers received this question].

B2. Why did you decide to become involved in the EnergyWise Business Program? Please select all that apply. [RANDOMIZE OPTIONS 1-8]

			utility		
			DEC	DEP	Total
b2	To lower energy bill by using less energy with new thermostat	Count	142	44	186
		% within utility	79.3%	71.0%	
		% of Total			77.2%
	To receive credit on energy bill	Count	95	38	133
		% within utility	53.1%	61.3%	
		% of Total			55.2%
	To help reduce the environmental impact of your energy usage	Count	79	32	111
		% within utility	44.1%	51.6%	
		% of Total			46.1%
	To receive free Wi-Fi-enabled thermostat	Count	77	28	105
		% within utility	43.0%	45.2%	
		% of Total			43.6%
	To help ensure grid stability during high energy use periods	Count	59	15	74
		% within utility	33.0%	24.2%	
		% of Total			30.7%
	To improve the comfort of my organization's spaces	Count	36	14	50
		% within utility	20.1%	22.6%	
		% of Total			20.7%
	I have participated in a similar program before and had good experiences	Count	14	7	21
		% within utility	7.8%	11.3%	
		% of Total			8.7%
	I was not part of the decision to participate in the program	Count	1	1	2
		% within utility	0.6%	1.6%	
		% of Total			0.8%
	Other	Count	2	1	3
		% within utility	1.1%	1.6%	
		% of Total			1.2%
	I do not remember or prefer not to say	Count	2	0	2
		% within utility	1.1%	0.0%	
		% of Total			0.8%
Total		Count	179	62	241
		% of Total	100.0%	100.0%	100.0%

B3. [IF NO. OF B2 RESPONES > 1, SHOW REASONS SELECTED FOR B2] Which of these was the most important factor in your decision to enroll in the program?

			utility		
			DEC	DEP	Total
b3	To lower energy bill by using less energy with new thermostat	Count	62	23	85
		% within utility	53.0%	50.0%	52.1%
	To receive credit on energy bill	Count	20	6	26
		% within utility	17.1%	13.0%	16.0%
	To help reduce the environmental impact of your energy usage	Count	7	9	16
		% within utility	6.0%	19.6%	9.8%
	To receive free Wi-Fi-enabled thermostat	Count	10	3	13
		% within utility	8.5%	6.5%	8.0%
	To help ensure grid stability during high energy use periods	Count	9	1	10
		% within utility	7.7%	2.2%	6.1%
	To help Duke Energy delay building new electricity generation sources	Count	4	1	5
		% within utility	3.4%	2.2%	3.1%
	To improve the comfort of my organization's spaces	Count	3	1	4
		% within utility	2.6%	2.2%	2.5%
	I have participated in a similar program before and had good experiences	Count	2	2	4
		% within utility	1.7%	4.3%	2.5%
Total		Count	117	46	163
		% within utility	100.0%	100.0%	100.0%

B3a. [IF B3="To receive free Wi-Fi-enabled thermostat"] What was appealing to you about the new Wi-Fi-enabled thermostat? Please choose all that apply.

			utility		
			DEC	DEP	Total
b3a	To be able to control thermostat remotely	Count	8	3	11
		% within utility	80.0%	100.0%	
		% of Total			84.6%
	To save on energy bill	Count	6	3	9
		% within utility	60.0%	100.0%	
		% of Total			69.2%
	To get a newer thermostat than we had	Count	5	0	5
		% within utility	50.0%	0.0%	
		% of Total			38.5%
	To be able to manage all my organization's thermostats at the same time	Count	3	2	5
		% within utility	30.0%	66.7%	
		% of Total			38.5%
	To have a thermostat that is easier to use	Count	3	1	4
		% within utility	30.0%	33.3%	
		% of Total			30.8%
	To test out a new technology	Count	3	1	4
		% within utility	30.0%	33.3%	
		% of Total			30.8%
Total		Count	10	3	13
		% of Total	100.0%	100.0%	100.0%

C1. [IF RECRUITED = YES] Our records indicate that a representative from Duke Energy visited your organization to explain the EnergyWise Business program and help you sign up. Does this sound familiar to you?

			utility		
			DEC	DEP	Total
c1	Yes	Count	146	52	198
		% within utility	96.7%	98.1%	97.1%
	No	Count	3	0	3
		% within utility	2.0%	0.0%	1.5%
	Don't remember	Count	2	1	3
		% within utility	1.3%	1.9%	1.5%
Total		Count	151	53	204
		% within utility	100.0%	100.0%	100.0%

C2. [IF RECRUITED = YES AND C1 = YES] As far as you remember, did the Duke Energy representative discuss the following topics with you when they first described the EnergyWise Business program? Please select all that apply.

			utility DEC	DEP	Total
c2	The benefits of installing a Wi-Fi thermostat or HVAC control switch	Count	132	49	181
		% within utility	90.4%	94.2%	
		% of Total			91.4%
	That Duke Energy would temporarily lower your HVAC usage on very hot [IF WINTER=YES add “and very cold”] days during Conservation Periods	Count	128	48	176
		% within utility	87.7%	92.3%	
		% of Total			88.9%
	When you could expect your [DEVICE] to be installed	Count	123	47	170
		% within utility	84.2%	90.4%	
		% of Total			85.9%
	The bill credits you would receive for participating in Conservation Periods	Count	112	46	158
		% within utility	76.7%	88.5%	
		% of Total			79.8%
	The requirements for your Wi-Fi-network to be able to connect a Wi-Fi thermostat	Count	109	45	154
		% within utility	74.7%	86.5%	
		% of Total			77.8%
	The “cycling” level you could choose for your [DEVICE]	Count	89	41	130
		% within utility	61.0%	78.8%	
		% of Total			65.7%
Total		Count	146	52	198
		% of Total	100.0%	100.0%	100.0%

C3_1. [IF RECRUITED = YES AND C1 = YES] After the Duke Energy representative first described the EnergyWise Business program to you, how well did you feel that you understood… The benefits of installing a Wi-Fi thermostat or HVAC control switch.

			utility DEC	DEP	Total
c3_1	Understood Very Well	Count	105	42	147
		% within utility	79.5%	85.7%	81.2%
	Understood Somewhat	Count	27	7	34
		% within utility	20.5%	14.3%	18.8%
Total		Count	132	49	181
		% within utility	100.0%	100.0%	100.0%

C3_2. [IF RECRUITED = YES AND C1 = YES] After the Duke Energy representative first described the EnergyWise Business program to you, how well did you feel that you understood… The requirements for your Wi-Fi-network to be able to connect a Wi-Fi thermostat.

			utility DEC	DEP	Total
c3_2	Understood Very Well	Count	95	39	134
		% within utility	87.2%	86.7%	87.0%
	Understood Somewhat	Count	14	6	20
		% within utility	12.8%	13.3%	13.0%
Total		Count	109	45	154
		% within utility	100.0%	100.0%	100.0%

C3_3. [IF RECRUITED = YES AND C1 = YES] After the Duke Energy representative first described the EnergyWise Business program to you, how well did you feel that you understood… When you could expect your [DEVICE] to be installed.

			utility DEC	DEP	Total
c3_3	Understood Very Well	Count	113	44	157
		% within utility	91.9%	93.6%	92.4%
	Understood Somewhat	Count	10	3	13
		% within utility	8.1%	6.4%	7.6%
Total		Count	123	47	170
		% within utility	100.0%	100.0%	100.0%

C3_4. [IF RECRUITED = YES AND C1 = YES] After the Duke Energy representative first described the EnergyWise Business program to you, how well did you feel that you understood… That Duke Energy would temporarily lower your HVAC usage on very hot [IF WINTER=YES add "and very cold"] days during Conservation Periods.

			utility DEC	DEP	Total
c3_4	Understood Very Well	Count	103	32	135
		% within utility	80.5%	66.7%	76.7%
	Understood Somewhat	Count	25	15	40
		% within utility	19.5%	31.3%	22.7%
	Did not understand	Count	0	1	1
		% within utility	0.0%	2.1%	0.6%
Total		Count	128	48	176
		% within utility	100.0%	100.0%	100.0%

C3_5. [IF RECRUITED = YES AND C1 = YES] After the Duke Energy representative first described the EnergyWise Business program to you, how well did you feel that you understood… The "cycling" level you could choose for your [DEVICE].

			utility DEC	DEP	Total
c3_5	Understood Very Well	Count	74	29	103
		% within utility	83.1%	70.7%	79.2%
	Understood Somewhat	Count	13	10	23
		% within utility	14.6%	24.4%	17.7%
	Did not understand	Count	2	2	4
		% within utility	2.2%	4.9%	3.1%
Total		Count	89	41	130
		% within utility	100.0%	100.0%	100.0%

C3_6. [IF RECRUITED = YES AND C1 = YES] After the Duke Energy representative first described the EnergyWise Business program to you, how well did you feel that you understood… The bill credits you would receive for participating in Conservation Periods.

			utility DEC	DEP	Total
c3_6	Understood Very Well	Count	90	34	124
		% within utility	80.4%	73.9%	78.5%
	Understood Somewhat	Count	22	10	32
		% within utility	19.6%	21.7%	20.3%
	Don't remember	Count	0	1	1
		% within utility	0.0%	2.2%	0.6%
	Did not understand	Count	0	1	1
		% within utility	0.0%	2.2%	0.6%
Total		Count	112	46	158
		% within utility	100.0%	100.0%	100.0%

C4. [IF RECRUITED = NO] Before enrolling in the EnergyWise Business program, had you heard about the following topics? Please select all that apply.

			utility DEC	DEP	Total
c4	The benefits of installing a Wi-Fi thermostat or HVAC control switch	Count	23	4	27
		% within utility	79.3%	44.4%	
		% of Total			71.1%
	The bill credits you would receive for participating in Conservation Periods	Count	16	5	21
		% within utility	55.2%	55.6%	
		% of Total			55.3%
	What it meant for Duke Energy to temporarily lower your HVAC usage on very hot [IF WINTER=YES add “and very cold”] days during Conservation Periods	Count	12	6	18
		% within utility	41.4%	66.7%	
		% of Total			47.4%
	The requirements for your Wi-Fi-network to be able to connect a Wi-Fi thermostat	Count	12	3	15
		% within utility	41.4%	33.3%	
		% of Total			39.5%
	When you could expect your [DEVICE] to be installed	Count	11	3	14
		% within utility	37.9%	33.3%	
		% of Total			36.8%
	The “cycling” level you could choose for your [DEVICE]	Count	10	3	13
		% within utility	34.5%	33.3%	
		% of Total			34.2%
Total		Count	29	9	38
		% of Total	100.0%	100.0%	100.0%

C5_1. [IF RECRUITED = NO] At the time you enrolled in the program, how well did you feel that you understood... The benefits of installing a Wi-Fi thermostat or HVAC control switch.

			utility		
			DEC	DEP	Total
c5_1	Understood very well	Count	14	3	17
		% within utility	60.9%	75.0%	63.0%
	Understood somewhat	Count	9	1	10
		% within utility	39.1%	25.0%	37.0%
Total		Count	23	4	27
		% within utility	100.0%	100.0%	100.0%

C5_2. [IF RECRUITED = NO] At the time you enrolled in the program, how well did you feel that you understood... The requirements for your Wi-Fi-network to be able to connect a Wi-Fi thermostat.

			utility		
			DEC	DEP	Total
c5_2	Understood very well	Count	10	2	12
		% within utility	83.3%	66.7%	80.0%
	Understood somewhat	Count	1	1	2
		% within utility	8.3%	33.3%	13.3%
	Don't remember	Count	1	0	1
		% within utility	8.3%	0.0%	6.7%
Total		Count	12	3	15
		% within utility	100.0%	100.0%	100.0%

C5_3. [IF RECRUITED = NO] At the time you enrolled in the program, how well did you feel that you understood... When you could expect your [DEVICE] to be installed.

			utility		
			DEC	DEP	Total
c5_3	Understood very well	Count	9	2	11
		% within utility	81.8%	66.7%	78.6%
	Understood somewhat	Count	1	1	2
		% within utility	9.1%	33.3%	14.3%
	Did not understand	Count	1	0	1
		% within utility	9.1%	0.0%	7.1%
Total		Count	11	3	14
		% within utility	100.0%	100.0%	100.0%

C5_4. [IF RECRUITED = NO] At the time you enrolled in the program, how well did you feel that you understood... What it meant for Duke Energy to temporarily lower your HVAC usage on very hot [IF WINTER=YES add "and very cold"] days during Conservation Periods.

			utility		
			DEC	DEP	Total
c5_4	Understood very well	Count	8	2	10
		% within utility	66.7%	33.3%	55.6%
	Understood somewhat	Count	3	3	6
		% within utility	25.0%	50.0%	33.3%
	Don't remember	Count	0	1	1
		% within utility	0.0%	16.7%	5.6%
	Did not understand	Count	1	0	1
		% within utility	8.3%	0.0%	5.6%
Total		Count	12	6	18
		% within utility	100.0%	100.0%	100.0%

C5_5. [IF RECRUITED = NO] At the time you enrolled in the program, how well did you feel that you understood... The "cycling" level you could choose for your [DEVICE].

			utility		
			DEC	DEP	Total
c5_5	Understood very well	Count	6	2	8
		% within utility	60.0%	66.7%	61.5%
	Understood somewhat	Count	2	0	2
		% within utility	20.0%	0.0%	15.4%
	Did not understand	Count	2	1	3
		% within utility	20.0%	33.3%	23.1%
Total		Count	10	3	13
		% within utility	100.0%	100.0%	100.0%

C5_6. [IF RECRUITED = NO] At the time you enrolled in the program, how well did you feel that you understood... The bill credits you would receive for participating in Conservation Periods.

			utility		
			DEC	DEP	Total
c5_6	Understood very well	Count	14	1	15
		% within utility	87.5%	20.0%	71.4%
	Understood somewhat	Count	2	4	6
		% within utility	12.5%	80.0%	28.6%
Total		Count	16	5	21
		% within utility	100.0%	100.0%	100.0%

C6. Did you have any questions about the program that were not answered when you enrolled?

			utility DEC	DEP	Total
c6	Yes	Count	10	3	13
		% within utility	5.6%	4.8%	5.4%
	No	Count	162	51	213
		% within utility	90.0%	82.3%	88.0%
	Don't remember	Count	5	5	10
		% within utility	2.8%	8.1%	4.1%
	Don't know	Count	3	3	6
		% within utility	1.7%	4.8%	2.5%
Total		Count	180	62	242
		% within utility	100.0%	100.0%	100.0%

C8. Do you remember choosing a “cycling” level for your [DEVICE_DESC] when you first enrolled in the program?

			utility DEC	DEP	Total
c8	Yes	Count	94	38	132
		% within utility	52.2%	61.3%	54.5%
	No	Count	41	10	51
		% within utility	22.8%	16.1%	21.1%
	I don’t know what cycling Is	Count	19	4	23
		% within utility	10.6%	6.5%	9.5%
	Don't remember	Count	26	10	36
		% within utility	14.4%	16.1%	14.9%
Total		Count	180	62	242
		% within utility	100.0%	100.0%	100.0%

C9. [IF C8=YES] Do you remember which “cycling” level you chose?

			utility DEC	DEP	Total
c9	75% cycling	Count	9	8	17
		% within utility	9.6%	21.1%	12.9%
	50% cycling	Count	13	6	19
		% within utility	13.8%	15.8%	14.4%
	30% cycling	Count	27	11	38
		% within utility	28.7%	28.9%	28.8%
	I don't know	Count	45	13	58
		% within utility	47.9%	34.2%	43.9%
Total		Count	94	38	132
		% within utility	100.0%	100.0%	100.0%

C10. [IF C8=YES] Why did you choose that cycling level? Please check all that apply.

			utility DEC	DEP	Total
c10	I wanted to receive the highest bill credit possible	Count	9	9	18
		% within utility	42.9%	56.3%	
		% of Total			48.6%
	That is what the Duke Energy representative recommended	Count	7	2	9
		% within utility	33.3%	12.5%	
		% of Total			24.3%
	I wanted to test lower cycling levels before moving to higher cycling levels	Count	3	1	4
		% within utility	14.3%	6.3%	
		% of Total			10.8%
	I wanted to minimize impacts of Conservation Periods on comfort at my organization	Count	1	0	1
		% within utility	4.8%	0.0%	
		% of Total			2.7%
	Other	Count	1	1	2
		% within utility	4.8%	6.3%	
		% of Total			5.4%
	Don’t know	Count	1	3	4
		% within utility	4.8%	18.8%	
		% of Total			10.8%
Total		Count	21	16	37
		% of Total	100.0%	100.0%	100.0%

C11. [IF WINTER=NO] Does your organization use an electric heat pump for heating the building?

			utility DEC	DEP	Total
c11	Yes	Count	75	18	93
		% within utility	43.9%	30.0%	40.3%
	No	Count	59	20	79
		% within utility	34.5%	33.3%	34.2%
	Don't know	Count	37	22	59
		% within utility	21.6%	36.7%	25.5%
Total		Count	171	60	231
		% within utility	100.0%	100.0%	100.0%

C12. [IF C11=1] Did the program representatives explain that you could receive additional bill credits by participating in Conservation Periods where Duke Energy would temporarily lower your heat in the winter as well as the summer?

			utility DEC	DEP	Total
c12	Yes	Count	34	9	43
		% within utility	45.3%	50.0%	46.2%
	No	Count	27	6	33
		% within utility	36.0%	33.3%	35.5%
	Don't Know	Count	14	3	17
		% within utility	18.7%	16.7%	18.3%
Total		Count	75	18	93
		% within utility	100.0%	100.0%	100.0%

C13. Were you present when the Duke Energy representatives came to install your [DEVICE_DESC]?

			utility DEC	DEP	Total
c13	Yes	Count	148	56	204
		% within utility	82.2%	90.3%	84.3%
	No	Count	31	6	37
		% within utility	17.2%	9.7%	15.3%
	Don't know	Count	1	0	1
		% within utility	0.6%	0.0%	0.4%
Total		Count	180	62	242
		% within utility	100.0%	100.0%	100.0%

C14. [IF C13=1 AND DEVICE= “THERMOSTAT” OR “BOTH”] Do you remember if the Duke Energy representatives who installed your thermostat provided any training or guidance about how to use the new thermostat?

			utility DEC	DEP	Total
c14	Yes	Count	136	50	186
		% within utility	94.4%	92.6%	93.9%
	No	Count	6	3	9
		% within utility	4.2%	5.6%	4.5%
	Don't remember	Count	2	1	3
		% within utility	1.4%	1.9%	1.5%
Total		Count	144	54	198
		% within utility	100.0%	100.0%	100.0%

C15. [IF C14 = YES] How useful was that training in terms of… Using the program's online portal (the app or website that Duke Energy provides for managing your thermostat).

			utility DEC	DEP	Total
c15_c15a	Very useful	Count	114	42	156
		% within utility	83.8%	84.0%	83.9%
	Somewhat useful	Count	18	6	24
		% within utility	13.2%	12.0%	12.9%
	Not very useful	Count	1	0	1
		% within utility	0.7%	0.0%	0.5%
	Not at all useful	Count	1	0	1
		% within utility	0.7%	0.0%	0.5%
	Don't know	Count	2	2	4
		% within utility	1.5%	4.0%	2.2%
Total		Count	136	50	186
		% within utility	100.0%	100.0%	100.0%

C15. [IF C14 = YES] How useful was that training in terms of… Using your thermostat.

			utility DEC	DEP	Total
c15_c15b	Very useful	Count	119	44	163
		% within utility	87.5%	88.0%	87.6%
	Somewhat useful	Count	16	5	21
		% within utility	11.8%	10.0%	11.3%
	Don't know	Count	1	1	2
		% within utility	0.7%	2.0%	1.1%
Total		Count	136	50	186
		% within utility	100.0%	100.0%	100.0%

C16. [IF C13=1 AND DEVICE= "THERMOSTAT" OR "BOTH"] Did the Duke Energy representatives help you program an operating schedule in your new thermostat?

			utility DEC	DEP	Total
c16	Yes	Count	127	45	172
		% within utility	88.2%	83.3%	86.9%
	No	Count	14	6	20
		% within utility	9.7%	11.1%	10.1%
	I don't know	Count	3	3	6
		% within utility	2.1%	5.6%	3.0%
Total		Count	144	54	198
		% within utility	100.0%	100.0%	100.0%

C16a. [IF C16=1] Did the Duke Energy representatives correctly program an operating schedule in your new thermostat to your specifications?

			utility DEC	DEP	Total
c16a	Yes	Count	122	43	165
		% within utility	96.1%	95.6%	95.9%
	No, please explain:	Count	3	1	4
		% within utility	2.4%	2.2%	2.3%
	I don't know	Count	2	1	3
		% within utility	1.6%	2.2%	1.7%
Total		Count	127	45	172
		% within utility	100.0%	100.0%	100.0%

C16b. [IF C16=2] Why didn't the Duke Energy representatives program an operating schedule into your new thermostat?

			utility DEC	DEP	Total
c16b	They did not offer to program a schedule	Count	3	2	5
		% within utility	21.4%	40.0%	26.3%
	I asked them not to program a schedule	Count	6	2	8
		% within utility	42.9%	40.0%	42.1%
	Other	Count	1	0	1
		% within utility	7.1%	0.0%	5.3%
	Don't remember	Count	4	1	5
		% within utility	28.6%	20.0%	26.3%
Total		Count	14	5	19
		% within utility	100.0%	100.0%	100.0%

C17. [IF C13=1 AND DEVICE= "THERMOSTAT" OR "BOTH"] Did you have any additional questions about how your thermostat works that were not answered?

			utility DEC	DEP	Total
c17	Yes	Count	10	3	13
		% within utility	6.9%	5.6%	6.6%
	No	Count	132	49	181
		% within utility	91.7%	90.7%	91.4%
	Don't remember	Count	1	1	2
		% within utility	0.7%	1.9%	1.0%
	Don't know	Count	1	1	2
		% within utility	0.7%	1.9%	1.0%
Total		Count	144	54	198
		% within utility	100.0%	100.0%	100.0%

C19. [IF AND DEVICE= "THERMOSTAT" OR "BOTH"] Before today, were you aware of Duke Energy's online portal (the app or website that Duke Energy provides for managing your thermostat)?

			utility		
			DEC	DEP	Total
c19	Yes	Count	133	51	184
		% within utility	76.4%	85.0%	78.6%
	No	Count	38	8	46
		% within utility	21.8%	13.3%	19.7%
	Don't remember/Don't know	Count	3	1	4
		% within utility	1.7%	1.7%	1.7%
Total		Count	174	60	234
		% within utility	100.0%	100.0%	100.0%

C19a_a. [IF C19=1 AND DEVICE= "THERMOSTAT" OR "BOTH"] Before today, were you aware of the following features of Duke Energy's online portal? Information on your organization's energy usage.

			utility		
			DEC	DEP	Total
c19a_a	Yes	Count	106	42	148
		% within utility	79.7%	82.4%	80.4%
	No	Count	20	7	27
		% within utility	15.0%	13.7%	14.7%
	Don't remember/Don't know	Count	7	2	9
		% within utility	5.3%	3.9%	4.9%
Total		Count	133	51	184
		% within utility	100.0%	100.0%	100.0%

C19a_b. [IF C19=1 AND DEVICE= "THERMOSTAT" OR "BOTH"] Before today, were you aware of the following features of Duke Energy's online portal? Information about how much your organization's HVAC system has been running.

			utility		
			DEC	DEP	Total
c19a_b	Yes	Count	93	37	130
		% within utility	69.9%	72.5%	70.7%
	No	Count	31	10	41
		% within utility	23.3%	19.6%	22.3%
	Don't remember/Don't know	Count	9	4	13
		% within utility	6.8%	7.8%	7.1%
Total		Count	133	51	184
		% within utility	100.0%	100.0%	100.0%

C19a_c. [IF C19=1 AND DEVICE= "THERMOSTAT" OR "BOTH"] Before today, were you aware of the following features of Duke Energy's online portal? Ability to control your thermostat's schedule or temperature.

			utility DEC	DEP	Total
c19a_c	Yes	Count	130	49	179
		% within utility	97.7%	96.1%	97.3%
	No	Count	2	1	3
		% within utility	1.5%	2.0%	1.6%
	Don't remember/Don't know	Count	1	1	2
		% within utility	0.8%	2.0%	1.1%
Total		Count	133	51	184
		% within utility	100.0%	100.0%	100.0%

C20a. [FOR C19.A-C19.C=YES] Have you used the following features of Duke Energy's online portal? Information on your organization's energy usage.

			utility DEC	DEP	Total
c20_c20a	Use regularly	Count	18	5	23
		% within utility	17.0%	11.9%	15.5%
	Have accessed but do not use regularly	Count	52	20	72
		% within utility	49.1%	47.6%	48.6%
	Have not used	Count	35	17	52
		% within utility	33.0%	40.5%	35.1%
	Don't remember/ Don't know	Count	1	0	1
		% within utility	0.9%	0.0%	0.7%
Total		Count	106	42	148
		% within utility	100.0%	100.0%	100.0%

C20b. [FOR C19.A-C19.C=YES] Have you used the following features of Duke Energy's online portal? Information about how much your organization's HVAC system has been running.

			utility DEC	DEP	Total
c20_c20b	Use regularly	Count	17	3	20
		% within utility	18.3%	8.1%	15.4%
	Have accessed but do not use regularly	Count	51	20	71
		% within utility	54.8%	54.1%	54.6%
	Have not used	Count	25	14	39
		% within utility	26.9%	37.8%	30.0%
Total		Count	93	37	130
		% within utility	100.0%	100.0%	100.0%

C20c. [FOR C19.A-C19.C=YES] Have you used the following features of Duke Energy's online portal? Ability to control your thermostat's schedule or temperature.

			utility DEC	DEP	Total
c20_c20c	Use regularly	Count	59	24	83
		% within utility	45.4%	49.0%	46.4%
	Have accessed but do not use regularly	Count	49	16	65
		% within utility	37.7%	32.7%	36.3%
	Have not used	Count	22	8	30
		% within utility	16.9%	16.3%	16.8%
	Don't remember/ Don't know	Count	0	1	1
		% within utility	0.0%	2.0%	0.6%
Total		Count	130	49	179
		% within utility	100.0%	100.0%	100.0%

D1. [IF DEVICE= "THERMOSTAT" OR "BOTH"] Before receiving your new thermostat, do you know how your air conditioning was controlled? Choose the response that best applies:

			utility DEC	DEP	Total
d1	We had a manual thermostat that we turned up and down throughout the day	Count	58	20	78
		% within utility	33.3%	33.3%	33.3%
	We had a programmable thermostat that was programmed to cool to different temperatures at different times of day	Count	45	17	62
		% within utility	25.9%	28.3%	26.5%
	We had a manual thermostat that was set to the same temperature at all times	Count	49	10	59
		% within utility	28.2%	16.7%	25.2%
	We had a programmable thermostat that was set to the same temperature at all times	Count	19	11	30
		% within utility	10.9%	18.3%	12.8%
	Don't know or prefer not to answer	Count	3	2	5
		% within utility	1.7%	3.3%	2.1%
Total		Count	174	60	234
		% within utility	100.0%	100.0%	100.0%

D1s. [IF DEVICE= “SWITCH”] Do you know how your air conditioning is currently controlled? Choose the response that best applies:

			utility DEC	DEP	Total
d1s	We have a manual thermostat that we turn up and down throughout the day	Count	2	1	3
		% within utility	33.3%	50.0%	37.5%
	We have a programmable thermostat that is programmed to cool to different temperatures at different times of day	Count	2	0	2
		% within utility	33.3%	0.0%	25.0%
	We had a programmable thermostat that was set to the same temperature at all times	Count	1	1	2
		% within utility	16.7%	50.0%	25.0%
	Don’t know or prefer not to answer	Count	1	0	1
		% within utility	16.7%	0.0%	12.5%
Total		Count	6	2	8
		% within utility	100.0%	100.0%	100.0%

D2. [IF DEVICE=“THERMOSTAT” OR “BOTH”] Have you tried to change the programmed operating schedule on your thermostat since it was installed?

			utility DEC	DEP	Total
d2	Yes	Count	113	41	154
		% within utility	64.9%	68.3%	65.8%
	No	Count	53	15	68
		% within utility	30.5%	25.0%	29.1%
	I have not but someone else at my organization has	Count	6	3	9
		% within utility	3.4%	5.0%	3.8%
	Don't know	Count	2	1	3
		% within utility	1.1%	1.7%	1.3%
Total		Count	174	60	234
		% within utility	100.0%	100.0%	100.0%

D2a. [IF D2=No] Why have not tried to change your thermostat's operating schedule?

			utility DEC	DEP	Total
d2a	Have had no need to change the schedule	Count	41	14	55
		% within utility	77.4%	93.3%	80.9%
	Do not know how to change the schedule	Count	8	1	9
		% within utility	15.1%	6.7%	13.2%
	Other	Count	2	0	2
		% within utility	3.8%	0.0%	2.9%
	Don't know	Count	2	0	2
		% within utility	3.8%	0.0%	2.9%
Total		Count	53	15	68
		% within utility	100.0%	100.0%	100.0%

D3. [IF D2=Yes] Have you been able to make the changes to your thermostat's operating schedule that you wanted to make?

			utility DEC	DEP	Total
d3	Yes	Count	107	39	146
		% within utility	94.7%	95.1%	94.8%
	No	Count	5	2	7
		% within utility	4.4%	4.9%	4.5%
	Don't know	Count	1	0	1
		% within utility	0.9%	0.0%	0.6%
Total		Count	113	41	154
		% within utility	100.0%	100.0%	100.0%

D4. [IF D3=Yes] How easy or difficult was it to make these changes to your thermostat?

			utility DEC	DEP	Total
d4	Very easy	Count	67	23	90
		% within utility	62.6%	59.0%	61.6%
	Fairly Easy	Count	38	15	53
		% within utility	35.5%	38.5%	36.3%
	Somewhat difficult	Count	2	1	3
		% within utility	1.9%	2.6%	2.1%
Total		Count	107	39	146
		% within utility	100.0%	100.0%	100.0%

D6. [IF DEVICE= "THERMOSTAT" OR "BOTH" AND D2=YES] Did you make these changes on the thermostat device itself or through the online portal (the app or website that Duke Energy provides for managing your thermostat)?

			utility DEC	DEP	Total
d6	Thermostat only	Count	8	3	11
		% within utility	7.1%	7.3%	7.1%
	Primarily thermostat, but have tried the portal	Count	7	2	9
		% within utility	6.2%	4.9%	5.8%
	Both thermostat and portal	Count	45	12	57
		% within utility	39.8%	29.3%	37.0%
	Primarily portal, but have tried thermostat	Count	22	12	34
		% within utility	19.5%	29.3%	22.1%
	Portal only	Count	31	11	42
		% within utility	27.4%	26.8%	27.3%
	Don't know	Count	0	1	1
		% within utility	0.0%	2.4%	0.6%
Total		Count	113	41	154
		% within utility	100.0%	100.0%	100.0%

D6a. [IF D6=2,3,4,5] How do you typically access the program portal?

			utility DEC	DEP	Total
d6a	Desktop or laptop computer	Count	65	24	89
		% within utility	61.9%	64.9%	62.7%
	Smart phone	Count	37	12	49
		% within utility	35.2%	32.4%	34.5%
	Tablet	Count	3	1	4
		% within utility	2.9%	2.7%	2.8%
Total		Count	105	37	142
		% within utility	100.0%	100.0%	100.0%

D7. [IF DEVICE= "THERMOSTAT" OR "BOTH"] Are you the only person who would change the thermostat for your organization, or are there others who could change the schedule or temperature that the thermostat is set to? Select all that apply.

			utility DEC	DEP	Total
d7	Only me	Count	83	28	111
		% within utility	47.7%	46.7%	
		% of Total			47.4%
	There are others who could adjust the temperature temporarily	Count	80	22	102
		% within utility	46.0%	36.7%	
		% of Total			43.6%
	There are others who could adjust the programmed schedule	Count	28	12	40
		% within utility	16.1%	20.0%	
		% of Total			17.1%
	Don't know	Count	1	0	1
		% within utility	0.6%	0.0%	
		% of Total			0.4%
Total		Count	174	60	234
		% of Total	100.0%	100.0%	100.0%

D8. [IF DEVICE= "THERMOSTAT" OR "BOTH"] Have you had any difficulties using your new thermostat? Please select all that apply.

			utility DEC	DEP	Total
d8	No problems	Count	125	43	168
		% within utility	71.8%	71.7%	
		% of Total			71.8%
	Wi-Fi connection stopped working	Count	23	12	35
		% within utility	13.2%	20.0%	
		% of Total			15.0%
	Not being able to make desired changes to the programmed schedule	Count	14	6	20
		% within utility	8.0%	10.0%	
		% of Total			8.5%
	Had issue with hold setting	Count	16	3	19
		% within utility	9.2%	5.0%	
		% of Total			8.1%
	Could not access the online portal provided for controlling the thermostat	Count	11	6	17
		% within utility	6.3%	10.0%	
		% of Total			7.3%
	Thermostat broke or needed repair	Count	14	3	17
		% within utility	8.0%	5.0%	
		% of Total			7.3%
	Thermostat unable to switch between heating and cooling	Count	9	3	12
		% within utility	5.2%	5.0%	
		% of Total			5.1%
	Other	Count	16	3	19
		% within utility	9.2%	5.0%	
		% of Total			8.1%
Total		Count	174	60	234
		% of Total	100.0%	100.0%	100.0%

D9. Have you tried to contact Duke Energy or EnergyWise Business Call Center for support [IF DEVICE= “THERMOSTAT” OR “BOTH” DISPLAY “related to your new thermostat or”] about the EnergyWise Business program in general?

			utility DEC	DEP	Total
d9	Yes	Count	35	18	53
		% within utility	19.4%	29.0%	21.9%
	No	Count	143	44	187
		% within utility	79.4%	71.0%	77.3%
	Don't know	Count	2	0	2
		% within utility	1.1%	0.0%	0.8%
Total		Count	180	62	242
		% within utility	100.0%	100.0%	100.0%

D11. [IF D9 = 1] Were you able to reach someone who could address your questions or issues?

			utility DEC	DEP	Total
d11	Yes	Count	33	17	50
		% within utility	94.3%	94.4%	94.3%
	No	Count	2	1	3
		% within utility	5.7%	5.6%	5.7%
Total		Count	35	18	53
		% within utility	100.0%	100.0%	100.0%

D12. [IF D9 = 1] Were you able to resolve the issue or concern that you contacted Duke Energy about?

			utility DEC	DEP	Total
d12	Yes	Count	27	15	42
		% within utility	77.1%	83.3%	79.2%
	No	Count	6	3	9
		% within utility	17.1%	16.7%	17.0%
	Don't know	Count	2	0	2
		% within utility	5.7%	0.0%	3.8%
Total		Count	35	18	53
		% within utility	100.0%	100.0%	100.0%

E1. As part of your involvement with the Duke EnergyWise Business program, your organization agreed to participate in at least one Conservation Period where Duke Energy temporarily lowers your HVAC usage on very hot [IF WINTER=YES DISPLAY "and very cold"] days. To the best of your knowledge, did your organization participated in any Conservation Periods this summer?

			utility DEC	DEP	Total
e1	Yes	Count	140	53	193
		% within utility	88.6%	91.4%	89.4%
	No	Count	4	3	7
		% within utility	2.5%	5.2%	3.2%
	Don't know	Count	14	2	16
		% within utility	8.9%	3.4%	7.4%
Total		Count	158	58	216
		% within utility	100.0%	100.0%	100.0%

E1a. [IF E1 = 1] Do you remember receiving advance notice about the Conservation Periods(s) through any of the following methods? Select all that apply.

			utility DEC	DEP	Total
e1a	Received email notification	Count	129	43	172
		% within utility	92.1%	81.1%	
		% of Total			89.1%
	Notified through the program's online portal	Count	8	4	12
		% within utility	5.7%	7.5%	
		% of Total			6.2%
	Notified by alert light on the thermostat	Count	6	6	12
		% within utility	4.3%	11.3%	
		% of Total			6.2%
	Other	Count	0	1	1
		% within utility	0.0%	1.9%	
		% of Total			0.5%
	Do not remember any receiving notification	Count	9	1	10
		% within utility	6.4%	1.9%	
		% of Total			5.2%
	Don't know	Count	2	2	4
		% within utility	1.4%	3.8%	
		% of Total			2.1%
Total		Count	140	53	193
		% of Total	100.0%	100.0%	100.0%

E2. [IF E1 = 1] Please choose the option that best describes your experience during the Conservation Period:

			utility DEC	DEP	Total
e2	We noticed that the temperature in our facility increased but it did not affect our comfort	Count	45	12	57
		% within utility	32.1%	22.6%	29.5%
	We noticed that the temperature in our facility increased and it affected our comfort	Count	56	28	84
		% within utility	40.0%	52.8%	43.5%
	We did not notice any changes in our facility's temperature	Count	37	11	48
		% within utility	26.4%	20.8%	24.9%
	Other	Count	1	0	1
		% within utility	0.7%	0.0%	0.5%
	Don't know	Count	1	2	3
		% within utility	0.7%	3.8%	1.6%
Total		Count	140	53	193
		% within utility	100.0%	100.0%	100.0%

E3. [IF E1 = 1] Based on your experience with Conservation Periods(s) this summer, how likely are you to continue participating in Conservation Periods to earn bill credits in future years?

			utility DEC	DEP	Total
e3	Very likely	Count	100	30	130
		% within utility	71.4%	56.6%	67.4%
	Somewhat likely	Count	22	11	33
		% within utility	15.7%	20.8%	17.1%
	Undecided	Count	12	8	20
		% within utility	8.6%	15.1%	10.4%
	Not very likely	Count	3	4	7
		% within utility	2.1%	7.5%	3.6%
	Not at all likely	Count	3	0	3
		% within utility	2.1%	0.0%	1.6%
Total		Count	140	53	193
		% within utility	100.0%	100.0%	100.0%

E5. [IF CYCLING<75 AND E3<> VERY UNLIKELY] Would you consider choosing a higher cycling level, meaning that Duke Energy could lower your HVAC usage for more time during a Conservation Period, in exchange for a higher bill credit?

[No customers received this question].

E6. [IF OPT_OUT=YES] To the best of your knowledge, did your organization decide to override any of Duke Energy's Conservation Periods this summer?

			utility		
			DEC	DEP	Total
e6	Yes	Count	9	7	16
		% within utility	90.0%	87.5%	88.9%
	No	Count	1	1	2
		% within utility	10.0%	12.5%	11.1%
Total		Count	10	8	18
		% within utility	100.0%	100.0%	100.0%

F1a. Please rate your satisfaction with the following aspects of the EnergyWise Business Program: [IF RECRUITED = YES] The Duke Energy representative that first explained the program to you and helped you enroll

			utility		
			DEC	DEP	Total
f1_f1a	10- Extremely satisfied	Count	84	29	113
		% within utility	55.6%	54.7%	55.4%
	9	Count	29	7	36
		% within utility	19.2%	13.2%	17.6%
	8	Count	22	4	26
		% within utility	14.6%	7.5%	12.7%
	7	Count	4	4	8
		% within utility	2.6%	7.5%	3.9%
	6	Count	1	2	3
		% within utility	0.7%	3.8%	1.5%
	5	Count	4	3	7
		% within utility	2.6%	5.7%	3.4%
	3	Count	2	2	4
		% within utility	1.3%	3.8%	2.0%
	2	Count	1	0	1
		% within utility	0.7%	0.0%	0.5%
	1	Count	1	1	2
		% within utility	0.7%	1.9%	1.0%
	0- Extremely dissatisfied	Count	3	1	4
		% within utility	2.0%	1.9%	2.0%
Total		Count	151	53	204
		% within utility	100.0%	100.0%	100.0%

F1b. Please rate your satisfaction with the following aspects of the EnergyWise Business Program: [IF RECRUITED = NO] The ease of the process for enrolling in the program.

			utility DEC	DEP	Total
f1_f1b	10- Extremely satisfied	Count	17	1	18
		% within utility	58.6%	11.1%	47.4%
	9	Count	5	3	8
		% within utility	17.2%	33.3%	21.1%
	8	Count	4	3	7
		% within utility	13.8%	33.3%	18.4%
	7	Count	3	2	5
		% within utility	10.3%	22.2%	13.2%
Total		Count	29	9	38
		% within utility	100.0%	100.0%	100.0%

F1c. Please rate your satisfaction with the following aspects of the EnergyWise Business Program: The time required to enroll in the program.

			utility DEC	DEP	Total
f1_f1c	10- Extremely satisfied	Count	101	34	135
		% within utility	56.1%	54.8%	55.8%
	9	Count	38	11	49
		% within utility	21.1%	17.7%	20.2%
	8	Count	18	8	26
		% within utility	10.0%	12.9%	10.7%
	7	Count	13	6	19
		% within utility	7.2%	9.7%	7.9%
	6	Count	4	2	6
		% within utility	2.2%	3.2%	2.5%
	5	Count	3	1	4
		% within utility	1.7%	1.6%	1.7%
	4	Count	1	0	1
		% within utility	0.6%	0.0%	0.4%
	1	Count	1	0	1
		% within utility	0.6%	0.0%	0.4%
	0- Extremely dissatisfied	Count	1	0	1
		% within utility	0.6%	0.0%	0.4%
Total		Count	180	62	242
		% within utility	100.0%	100.0%	100.0%

F1d. Please rate your satisfaction with the following aspects of the EnergyWise Business Program: The amount of time between when you first enrolled in the program and when your [DEVICE] was installed.

			utility		
			DEC	DEP	Total
f1_f1d	10- Extremely satisfied	Count	104	35	139
		% within utility	57.8%	56.5%	57.4%
	9	Count	37	9	46
		% within utility	20.6%	14.5%	19.0%
	8	Count	17	7	24
		% within utility	9.4%	11.3%	9.9%
	7	Count	12	6	18
		% within utility	6.7%	9.7%	7.4%
	6	Count	4	4	8
		% within utility	2.2%	6.5%	3.3%
	5	Count	3	1	4
		% within utility	1.7%	1.6%	1.7%
	2	Count	1	0	1
		% within utility	0.6%	0.0%	0.4%
	1	Count	1	0	1
		% within utility	0.6%	0.0%	0.4%
	0- Extremely dissatisfied	Count	1	0	1
		% within utility	0.6%	0.0%	0.4%
Total		Count	180	62	242
		% within utility	100.0%	100.0%	100.0%

F1e. Please rate your satisfaction with the following aspects of the EnergyWise Business Program: The Duke Energy representatives that came and installed your [DEVICE_DESC] for you.

			utility		
			DEC	DEP	Total
f1_f1e	10- Extremely satisfied	Count	109	40	149
		% within utility	60.6%	64.5%	61.6%
	9	Count	36	9	45
		% within utility	20.0%	14.5%	18.6%
	8	Count	18	7	25
		% within utility	10.0%	11.3%	10.3%
	7	Count	9	3	12
		% within utility	5.0%	4.8%	5.0%
	6	Count	1	0	1
		% within utility	0.6%	0.0%	0.4%
	5	Count	2	2	4
		% within utility	1.1%	3.2%	1.7%
	3	Count	2	0	2
		% within utility	1.1%	0.0%	0.8%
	1	Count	2	1	3
		% within utility	1.1%	1.6%	1.2%
	0- Extremely dissatisfied	Count	1	0	1
		% within utility	0.6%	0.0%	0.4%
Total		Count	180	62	242
		% within utility	100.0%	100.0%	100.0%

F1f. Please rate your satisfaction with the following aspects of the EnergyWise Business Program: The time required to install your [DEVICE_DESC].

			utility DEC	DEP	Total
f1_f1f	10- Extremely satisfied	Count	105	38	143
		% within utility	58.3%	61.3%	59.1%
	9	Count	40	15	55
		% within utility	22.2%	24.2%	22.7%
	8	Count	18	4	22
		% within utility	10.0%	6.5%	9.1%
	7	Count	6	5	11
		% within utility	3.3%	8.1%	4.5%
	6	Count	3	0	3
		% within utility	1.7%	0.0%	1.2%
	5	Count	5	0	5
		% within utility	2.8%	0.0%	2.1%
	3	Count	1	0	1
		% within utility	0.6%	0.0%	0.4%
	1	Count	1	0	1
		% within utility	0.6%	0.0%	0.4%
	0- Extremely dissatisfied	Count	1	0	1
		% within utility	0.6%	0.0%	0.4%
Total		Count	180	62	242
		% within utility	100.0%	100.0%	100.0%

F1g. Please rate your satisfaction with the following aspects of the EnergyWise Business Program: [IF C14 = 1] The training you received as part of your [DEVICE] installation.

			utility		
			DEC	DEP	Total
f1_f1g	10- Extremely satisfied	Count	69	31	100
		% within utility	50.7%	62.0%	53.8%
	9	Count	33	11	44
		% within utility	24.3%	22.0%	23.7%
	8	Count	20	3	23
		% within utility	14.7%	6.0%	12.4%
	7	Count	7	3	10
		% within utility	5.1%	6.0%	5.4%
	6	Count	1	1	2
		% within utility	0.7%	2.0%	1.1%
	5	Count	1	1	2
		% within utility	0.7%	2.0%	1.1%
	4	Count	1	0	1
		% within utility	0.7%	0.0%	0.5%
	3	Count	1	0	1
		% within utility	0.7%	0.0%	0.5%
	2	Count	1	0	1
		% within utility	0.7%	0.0%	0.5%
	1	Count	1	0	1
		% within utility	0.7%	0.0%	0.5%
	0- Extremely dissatisfied	Count	1	0	1
		% within utility	0.7%	0.0%	0.5%
Total		Count	136	50	186
		% within utility	100.0%	100.0%	100.0%

F1h. Please rate your satisfaction with the following aspects of the EnergyWise Business Program: [IF DEVICE= “THERMOSTAT” OR “BOTH”] Using the program’s online portal.

			utility DEC	DEP	Total
f1_f1h	10- Extremely satisfied	Count	73	26	99
		% within utility	42.0%	43.3%	42.3%
	9	Count	34	7	41
		% within utility	19.5%	11.7%	17.5%
	8	Count	26	10	36
		% within utility	14.9%	16.7%	15.4%
	7	Count	12	9	21
		% within utility	6.9%	15.0%	9.0%
	6	Count	6	0	6
		% within utility	3.4%	0.0%	2.6%
	5	Count	13	4	17
		% within utility	7.5%	6.7%	7.3%
	4	Count	3	0	3
		% within utility	1.7%	0.0%	1.3%
	3	Count	3	1	4
		% within utility	1.7%	1.7%	1.7%
	2	Count	2	0	2
		% within utility	1.1%	0.0%	0.9%
	1	Count	1	1	2
		% within utility	0.6%	1.7%	0.9%
	0- Extremely dissatisfied	Count	1	2	3
		% within utility	0.6%	3.3%	1.3%
Total		Count	174	60	234
		% within utility	100.0%	100.0%	100.0%

F1i. Please rate your satisfaction with the following aspects of the EnergyWise Business Program: [IF E1 = 1] Participating in Conservation Periods.

			utility DEC	DEP	Total
f1_f1i	10- Extremely satisfied	Count	69	15	84
		% within utility	49.3%	28.3%	43.5%
	9	Count	20	8	28
		% within utility	14.3%	15.1%	14.5%
	8	Count	13	7	20
		% within utility	9.3%	13.2%	10.4%
	7	Count	9	7	16
		% within utility	6.4%	13.2%	8.3%
	6	Count	8	2	10
		% within utility	5.7%	3.8%	5.2%
	5	Count	10	4	14
		% within utility	7.1%	7.5%	7.3%
	4	Count	3	2	5
		% within utility	2.1%	3.8%	2.6%
	3	Count	2	2	4
		% within utility	1.4%	3.8%	2.1%
	2	Count	1	3	4
		% within utility	0.7%	5.7%	2.1%
	1	Count	2	1	3
		% within utility	1.4%	1.9%	1.6%
	0- Extremely dissatisfied	Count	3	2	5
		% within utility	2.1%	3.8%	2.6%
Total		Count	140	53	193
		% within utility	100.0%	100.0%	100.0%

F1j. Please rate your satisfaction with the following aspects of the EnergyWise Business Program: The performance of your [DEVICE].

			utility DEC	DEP	Total
f1_f1j	10- Extremely satisfied	Count	94	35	129
		% within utility	52.2%	56.5%	53.3%
	9	Count	32	11	43
		% within utility	17.8%	17.7%	17.8%
	8	Count	24	6	30
		% within utility	13.3%	9.7%	12.4%
	7	Count	10	4	14
		% within utility	5.6%	6.5%	5.8%
	6	Count	5	2	7
		% within utility	2.8%	3.2%	2.9%
	5	Count	7	2	9
		% within utility	3.9%	3.2%	3.7%
	4	Count	3	0	3
		% within utility	1.7%	0.0%	1.2%
	2	Count	2	1	3
		% within utility	1.1%	1.6%	1.2%
	1	Count	1	0	1
		% within utility	0.6%	0.0%	0.4%
	0- Extremely dissatisfied	Count	2	1	3
		% within utility	1.1%	1.6%	1.2%
Total		Count	180	62	242
		% within utility	100.0%	100.0%	100.0%

F1k. Please rate your satisfaction with the following aspects of the EnergyWise Business Program: Support available from Duke Energy.

			utility		
			DEC	DEP	Total
f1_f1k	10- Extremely satisfied	Count	90	27	117
		% within utility	50.0%	43.5%	48.3%
	9	Count	30	13	43
		% within utility	16.7%	21.0%	17.8%
	8	Count	28	10	38
		% within utility	15.6%	16.1%	15.7%
	7	Count	8	2	10
		% within utility	4.4%	3.2%	4.1%
	6	Count	6	2	8
		% within utility	3.3%	3.2%	3.3%
	5	Count	13	4	17
		% within utility	7.2%	6.5%	7.0%
	3	Count	2	1	3
		% within utility	1.1%	1.6%	1.2%
	1	Count	2	1	3
		% within utility	1.1%	1.6%	1.2%
	0- Extremely dissatisfied	Count	1	2	3
		% within utility	0.6%	3.2%	1.2%
Total		Count	180	62	242
		% within utility	100.0%	100.0%	100.0%

F3. Please rate your satisfaction with the EnergyWise Business program overall:

			utility DEC	DEP	Total
f3	10- Extremely satisfied	Count	79	21	100
		% within utility	43.9%	33.9%	41.3%
	9	Count	46	12	58
		% within utility	25.6%	19.4%	24.0%
	8	Count	25	14	39
		% within utility	13.9%	22.6%	16.1%
	7	Count	17	6	23
		% within utility	9.4%	9.7%	9.5%
	6	Count	4	2	6
		% within utility	2.2%	3.2%	2.5%
	5	Count	4	3	7
		% within utility	2.2%	4.8%	2.9%
	4	Count	1	0	1
		% within utility	0.6%	0.0%	0.4%
	3	Count	0	3	3
		% within utility	0.0%	4.8%	1.2%
	2	Count	3	1	4
		% within utility	1.7%	1.6%	1.7%
	1- Extremely dissatisfied	Count	1	0	1
		% within utility	0.6%	0.0%	0.4%
Total		Count	180	62	242
		% within utility	100.0%	100.0%	100.0%

G1. What is the business type of the facility located at <ADDRESS>?

			utility DEC	DEP	Total
g1	Retail/Service	Count	52	13	65
		% within utility	28.9%	21.3%	27.0%
	Office	Count	47	16	63
		% within utility	26.1%	26.2%	26.1%
	Medical	Count	16	10	26
		% within utility	8.9%	16.4%	10.8%
	Light Industry	Count	13	3	16
		% within utility	7.2%	4.9%	6.6%
	Restaurant	Count	11	3	14
		% within utility	6.1%	4.9%	5.8%
	Place of public assembly or worship	Count	10	3	13
		% within utility	5.6%	4.9%	5.4%
	Gym, excercise, or sports facility	Count	4	2	6
		% within utility	2.2%	3.3%	2.5%
	Warehouse or Distribution Center	Count	4	1	5
		% within utility	2.2%	1.6%	2.1%
	Hair Salon	Count	3	0	3
		% within utility	1.7%	0.0%	1.2%
	Grocery	Count	3	0	3
		% within utility	1.7%	0.0%	1.2%
	Preschool	Count	0	2	2
		% within utility	0.0%	3.3%	0.8%
	Government	Count	2	0	2
		% within utility	1.1%	0.0%	0.8%
	Heavy Industry	Count	1	0	1
		% within utility	0.6%	0.0%	0.4%
	Construction	Count	1	0	1
		% within utility	0.6%	0.0%	0.4%
	College/University	Count	0	1	1
		% within utility	0.0%	1.6%	0.4%
	Auto Repair	Count	1	0	1
		% within utility	0.6%	0.0%	0.4%
	Other, specify	Count	12	7	19
		% within utility	6.7%	11.5%	7.9%
Total		Count	180	61	241
		% within utility	100.0%	100.0%	100.0%

G2. Which of the following best describes the ownership of this facility?

			utility DEC	DEP	Total
g2	My company rents this facility	Count	109	43	152
		% within utility	60.9%	69.4%	63.1%
	My company owns and occupies this facility	Count	61	18	79
		% within utility	34.1%	29.0%	32.8%
	My company owns this facility but it is rented by someone else	Count	9	1	10
		% within utility	5.0%	1.6%	4.1%
Total		Count	179	62	241
		% within utility	100.0%	100.0%	100.0%

G3a. How many employees, full plus part-time, are employed at this facility?

			utility DEC	DEP	Total
g3a	Less than 10	Count	126	46	172
		% within utility	70.0%	74.2%	71.1%
	10 or more	Count	53	16	69
		% within utility	29.4%	25.8%	28.5%
Total		Count	179	62	241
		% within utility	100.0%	100.0%	100.0%

Appendix H. Impact Calculation Tables

Impact Analysis

The Excel spreadsheet containing the gross demand response impact and net energy efficiency savings impact analysis is provided as a separate file.

Appendix I. Impact Calculation Methods: Ex Post Demand Response Model Specifications

Opinion Dynamics estimated ex post demand response results for each of the five events called by Duke Energy during the 2017 event period. The analysis assessed summer Conservation Period gross impacts from switches and thermostats. Activities included:

- Cleaned and prepared data by reviewing event data, as well as program participation, weather data and logger data to identify the number of devices eligible and available to participate in summer events;
- Determined baseline load by identifying similar non-event days (in terms of weather, day of week, and other variables);
- Modeled program impacts by conducting linear fixed effects regression analysis with similar non-event days using device log data and weather data to estimate per device run-time impacts;
- Converted run-time impacts to per device load impacts by applying the full load estimate (HVAC capacity divided by SEER); and
- Identified the number of participating devices (i.e., those eligible and operational) and calculated gross event impacts by multiplying the per device full load impacts by the number of participating devices; and
- Calculated gross impacts for each event by multiplying the per device load impacts by the number of participating devices by specific categories, including device type, cycling strategy and jurisdiction. We calculated the average program-level impact as the weighted average of load impacts across events by jurisdiction, weighting by the number of participating devices.

The following sections provide additional details related to these activities otherwise not reported in the evaluation report.

Clean and Prepare Data

Opinion Dynamics used three sources of data to support the DR impact analysis. We incorporated participant data that reflected the type of device installed, installation date, and cycling strategy. We also incorporated device log data that provided 15-minute run-time for each device installed throughout the summer event season. Finally, we incorporated weather data.

The logs for thermostats and switches associated with AC or heat pumps contain data recorded at 15-minute intervals. During each of those intervals, the logs records the run-time of the AC or heat pump unit, device type, cycling strategy, cycling season (summer or year-round), device set point, device control status, device recorded temperature, and cumulative runtimes for both cooling and heating. The 15-minute interval also includes several identifiers to help us match the device to a participant including account ID, source account ID, premise (source service point ID) and utility suffixes. The demand response impact analysis uses the unit's run-time as the dependent (or primary) variable.

Clean Participant Data

To conduct the analysis, we included only those customers who had a device installed and were active for any of the events during the Summer Conservation Season. To determine that we have the correct participants associated with the right devices, we conducted a series of data cleaning and verification steps. In addition, because customers can enroll, install devices, unenroll, and deactivate devices across time, we verified which devices were active, which devices were not installed, and which devices dropped out of the program at any given time. This way, we were able to most accurately model what happened at any given event and were able to attribute the impacts to the active eligible devices.

To build the analysis file, we developed a participant database that was both longitudinal and cross-sectional. Given the various files and different dates when they were collected, different files may have inconsistent information (e.g., marked as unenrolled in one file, but a 0% cycling strategy in another file). Below is a list of steps we took to clean the customer data:

- Include participants enrolled during the summer Conservation Period in DEC and DEP territory. More specifically, over 2,000 devices were enrolled and installed after the summer Conservation Period and because they were unable to participate in the demand response events are excluded from the analysis. We also removed DEI and DEO participants.
- Verify the number of devices per participant using log and control events data.
- Use installation, unenrollment, and deactivation dates to determine which devices could have participated (receiving a signal) for each event.

Clean Device Log Data

Below are the steps for which we removed participants, devices, and/or logs from the modeling data set:

- Devices that deactivated/unenrolled before first event
- Devices with unknown cycling strategy, or are in the logger data file, but not included in the participant file
- Logs associated with devices that failed, deactivated/de-enrolled, or not active for a particular event
- Devices with zero run time during event and non-event days
- Devices with insufficient run time data (i.e., run time is zero for all observations)
- Logs with time intervals greater than 60 minutes
- Logs with percent run time greater than 100% run time

Table I-1 shows the counts of all devices that were available for the DR analysis. These numbers are higher than the demand response event participation counts because not all devices were available for all events; there were some devices that were failures for some but not all events and some devices that were enrolled or dropped out of the program any time during the 2017 event season.

Table I-1. DR Drops Table

Drop Reason	DEC	DEP
Initial Count of Devices	3,645	2,031
Missing Runtime Data	30	22
Missing Run Time Data on Event and Matched Comparison Days	50	25
Unknown Cycling Strategy	11	1

Drop Reason	DEC	DEP
Devices with Insufficient Run Time Data (Run Time is Zero for All Observations)	99	39
Time Intervals > 60 Minutes	1	0
Remaining Devices	**3,454**	**1,944**

Import and Clean Weather Data

We downloaded weather data from the National Oceanic and Atmospheric Administration's (NOAA) National Centers for Environmental Information. We used participant addresses to geocode the locations of all participants and found the weather station that was closest to each participant's zip code.

Select Proxy Weather Days

We used a quasi-experimental design to estimate the load impacts of the EWB program. Our selected approach used proxy weather days (i.e., non-event days with similar weather to event days in May through September 2017) to help replicate baseline conditions for event days (i.e., what would the participant's load have been in the absence of the EWB program event?). To develop matches, we used propensity score matching to select four non-event days that are similar in weather profile to the five event days. When using propensity score matching, we first built a logistic regression model to estimate each unit's probability of being treated, or its "propensity score," based on characteristics of interest. We then matched each treatment unit to the nearest comparison units in terms of propensity scores.

Because there was limited enrollment in the 75% cycling strategy, we combined our model for each territory for this cycling strategy. Because we combined switches in the 75% cycling strategy across jurisdictions, we selected matched weather days based on weather data in the DEC territory. We then selected these non-event days for each event for the DEP territory. This was done to ensure that both jurisdictions had the same non-event days matched to each comparison day.

Model Program Impacts

Develop Model Specifications

We used a linear fixed-effects regression modeling approach for the demand response impact analysis. The model estimates the percentage of hourly runtime on a per-device level for each event. Modeled event impacts are the mean difference between the baseline runtime and the event runtime over the event period. In other words, the observed event load was subtracted from the reference load during the event hours to obtain the gross demand reduction for the events.

The "fixed-effects" modeling approach controls for "time-invariant" device-level factors affecting demand (i.e., factors that do not change over the study period, such as type of home or square footage) without measuring those factors explicitly in the models. These factors are contained in a facility-specific intercept, or the constant term in the regression equation. Weather is generally the most important predictor of energy consumption. Cooling degree hours (CDH) with base 65 is included in the model as the primary weather variable. The model also includes the hour of the day, as time of day is highly predictive of usage. Terms for morning load, early afternoon load, and night load further correct for differences between the event day and non-event days used as comparison days for the model. All operational devices were included in the model, including those who opted out of the event. The impact estimates therefore include the effect of any participant opt-outs.

We fit separate regressions for each of the four events, using the same model specification. The model specification is as follows:

Equation I-1. Ex Post Regression Model

$$kw_{it} = \alpha_0 + \alpha_i + \beta_{event} \cdot Event + \sum_{h=1}^{23} \beta_{hour\ h} \cdot Hour_h + \sum_{h=1}^{23} \beta_{event\ hour\ h} \cdot Event \cdot Hour_h + \beta_{CDH} \cdot CDH_t + \sum_{h=1}^{23} \beta_{cdh_t\ event} \cdot CDH_t \cdot Event + \beta_{mornload} \cdot Morning\ Load_i + \beta_{earlyafternoonload} \cdot Early\ Afternoon\ Load_i + \sum_{h=1}^{23} \beta_{nightload} \cdot Night\ Load_i + \varepsilon_{it}$$

Where:

α_0 = Overall intercept

α_i = Participant specific intercept

ε_{it} = Error term

Event = Indicator variable for event day

Hour = Set of 23 indicator variables for hours of the day

Event by Hour = The interaction of event day by hour of the day

CDH = Base 65 cooling degree hours

Event by CDH = The interaction of event day by CDH

Morning load = The mean load for the participant for the hours of midnight through 6am for the day

Early afternoon load = The mean load for the participant for the hours of 10am through 1pm for the day

Night load = The mean load for the participant for the hours of 8pm to midnight for the day

In addition to the model selected, we tested other variables and interactions for possible inclusion in the model specification. These included:

- CDH2 – Cooling degree hours squared
- CDH by Hour – The interaction of CDH by hour of the day
- Event by CDH by Hour – The interaction of event day by CDH by hour of the day
- Dew point by Hour – The interaction of dew point by hour of the day
- Heat index by Hour – the interaction of heat index by hour of the day

These terms were not included in the final model specification, as the variables and interactions already in the model were effective at correcting for differences in the actual usage and the modeled usage for non-event hours that serve as comparison. It is very important that the final model correctly replicate load during non-event hours, so the counterfactual reference (predicted) load during the event is reliable.

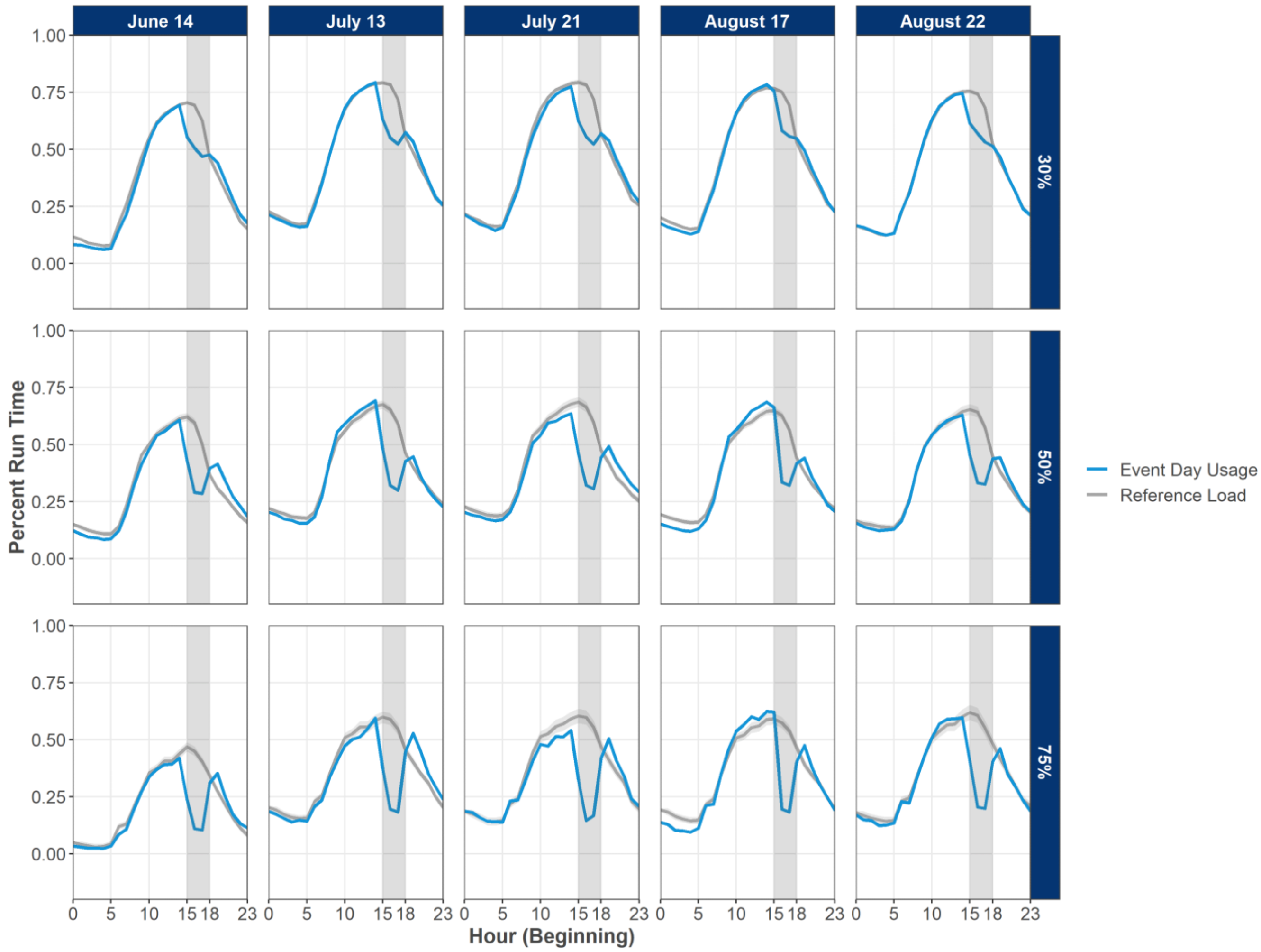
Assess Model Specifications and Validate Model

As is standard practice for impact analysis, we tested many models. We selected the final models based on fit with actual run-time, especially during the hours leading up to the event. We judged the ultimately selected model fit primarily on replication of actual usage during non-event hours, especially the hours before the event, so there is a high level of confidence in the reference points during event hours.

We developed a statistical regression model for each event to estimate a reference (or predicted) hourly demand for each event day if no event had been called. In order to assess whether the models could accurately predict non-event load, the team used each model to predict load for an actual non-event day and compared the predicted load to the actual load. Figure I-1 through Figure I-4 through show the results of the comparison for each of the summer events, respectively.

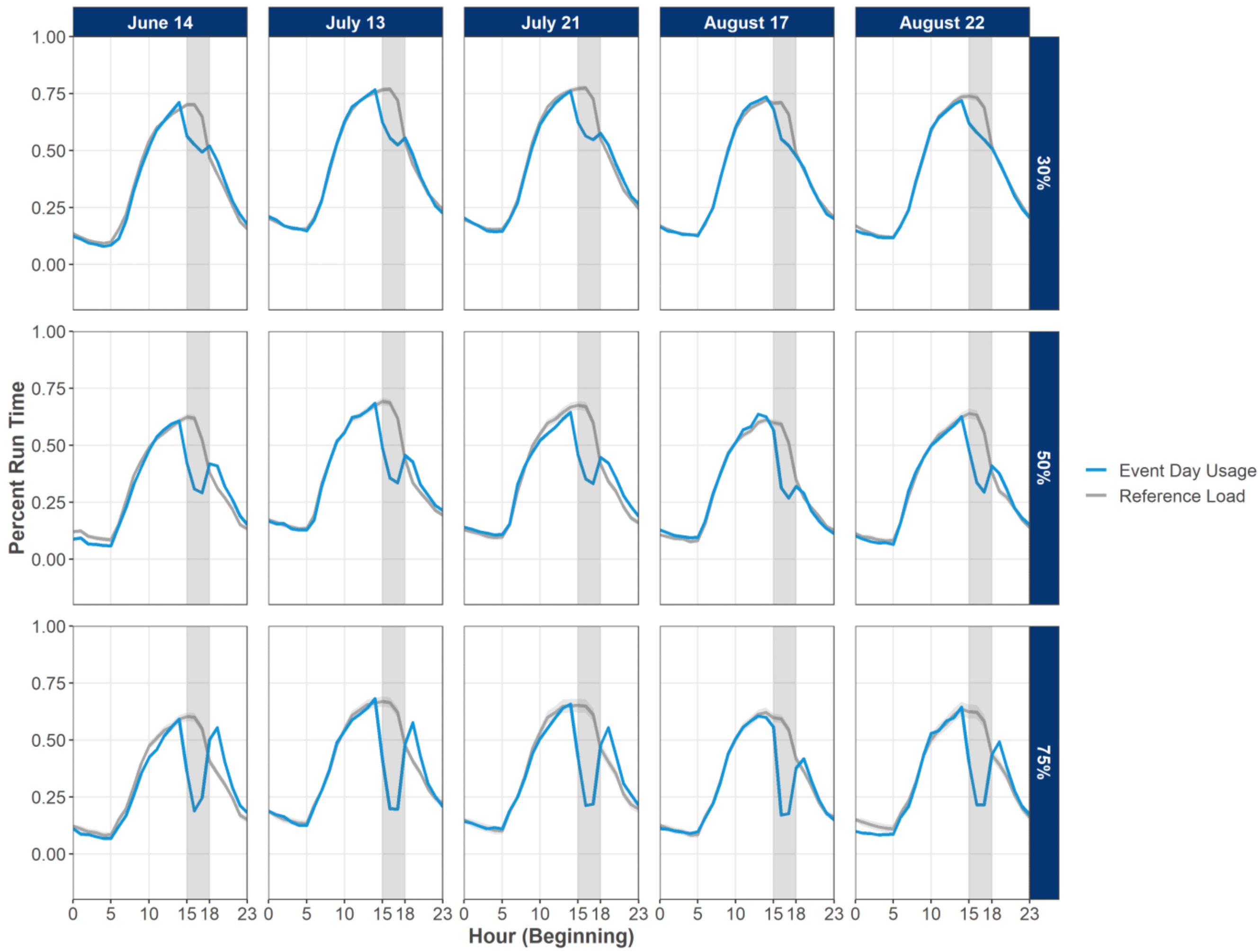
The number of devices in each model differs across devices and cycling strategies. When there are fewer devices in the models, it creates more uncertainty. This is shown in the figures below, especially for Figure I-2 and Figure I-4. These figures are for the switches, which had fewer devices within the models compared to thermostats. As shown these figures, the error bounds are large, creating greater uncertainty for the impact values. Also, because the switches on the 75% cycling strategy were combined across jurisdictions in the regression models, the plots in Figure I-2 and Figure I-4 are the same for the 75% cycling strategy.

Figure I-1. Actual Versus Baseline Usage on Non-Event Days by Event and Cycling Strategy, DEC Thermostats



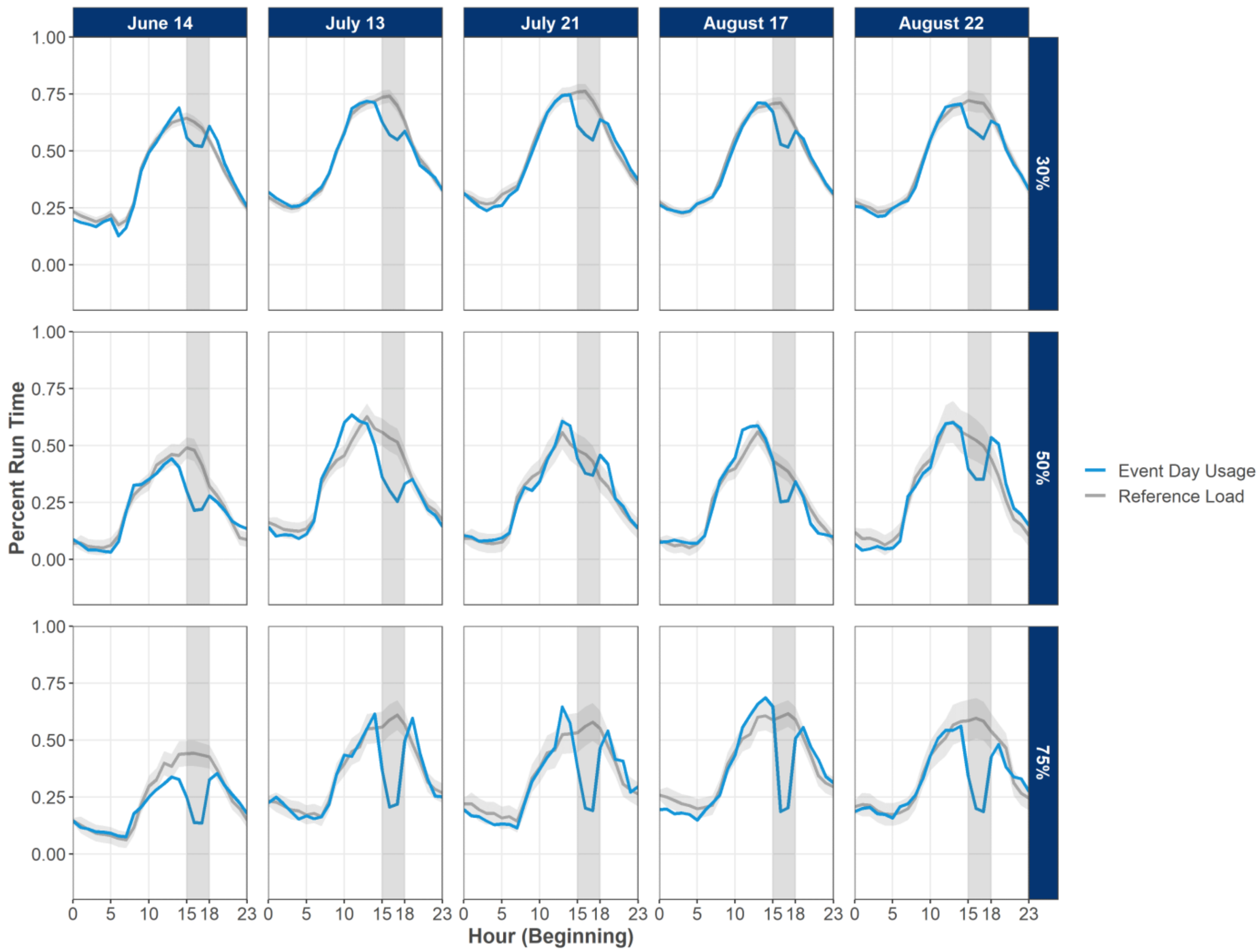
Note: Figure displays Duke Energy's five summer Conservation Period events during the 2017 cooling season (June 14, July 13, July 21, August 17, and August 22).

Figure I-2. Actual Versus Baseline Usage on Non-Event Days by Event and Cycling Strategy, DEC Switches



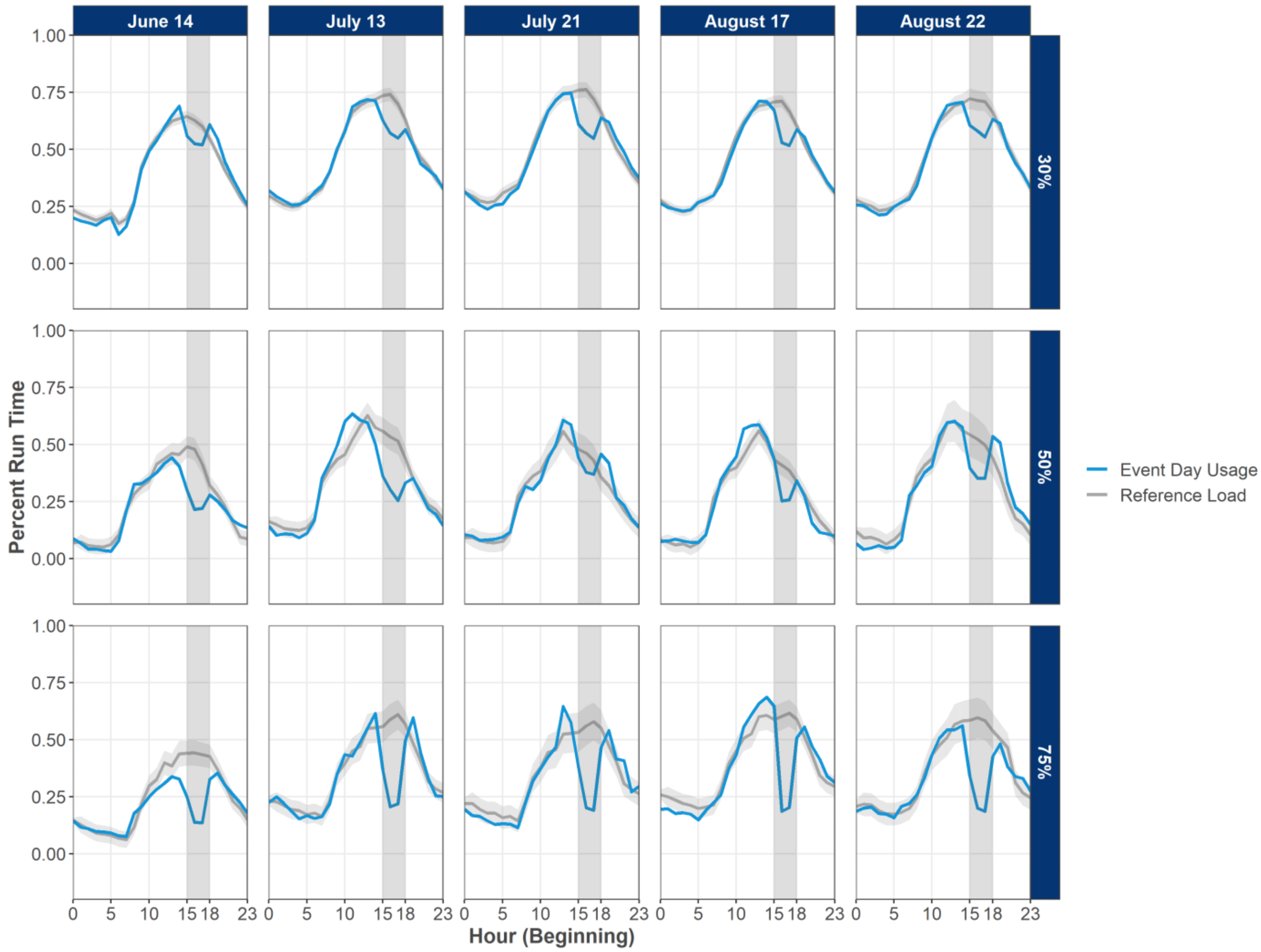
Note: Figure displays Duke Energy's five summer Conservation Period events during the 2017 cooling season (June 14, July 13, July 21, August 17, and August 22).

Figure I-3. Actual Versus Baseline Usage on Non-Event Days by Event and Cycling Strategy, DEP Thermostats



Note: Figure displays Duke Energy's five summer Conservation Period events during the 2017 cooling season (June 14, July 13, July 21, August 17, and August 22).

Figure I-4. Actual and Baseline Usage on Non-Event Days by Event and Cycling Strategy, DEP Switches



Note: Figure displays Duke Energy's five summer Conservation Period events during the 2017 cooling season (June 14, July 13, July 21, August 17, and August 22).

Impacts by State

Table I-2 provides the average ex post gross demand impacts by state and device type.

Table I-2. Ex Post Gross Demand Impacts by State

State	Device	Per Device		% Load Impact	Average Number of Devices that were Cycled*	Aggregate	
		Reference Load (kW)	Load Impact (kW)			Reference Load (kW)	Load Impact (kW)
North Carolina	Thermostat	3.0323	0.8308	27%	3,965	12,023	3,294
	Switch	2.9466	0.6976	24%	312	921	218
	Overall	**3.026**	**0.821**	**27%**	**4,277**	**12,944**	**3,512**
South Carolina	Thermostat	3.5301	1.0133	29%	473	1,669	479
	Switch	2.8640	0.7283	25%	27	78	20
	Overall	**3.494**	**0.998**	**29%**	**500**	**1,748**	**499**
Total		**3.075**	**0.840**		**4,778**	**14,691**	**4,011**

A Average number of devices eligible to participate on event day that were cycled (e.g., participated or opted-out) in an event.

Hourly Impacts by Jurisdiction, Device and Event

The tables below provide the impact values for each event and event hour across jurisdiction, device, and cycling strategy. There are some hourly impact values that are negative, but these are all during the first event hour of the fourth event, which was one of the thunderstorm event days.

Table I-3. Average Hourly Ex Post DR kW Savings by Cycling Strategy, Event, Event Hour (DEC Thermostats)

Cycling Strategy	Event	Hour Beginning	Reference Load (kW)	Event Day Load (kW)	Load Impact (kW)	% Load Impact	Standard Error	Upper Bound (90%)	Lower Bound (90%)
30%	1	15	3.235	2.544	0.691	21%	0.025	3.277	3.194
		16	3.182	2.321	0.860	27%	0.025	3.222	3.141
		17	2.874	2.147	0.726	25%	0.024	2.913	2.834
	2	15	3.623	2.882	0.741	20%	0.030	3.672	3.574
		16	3.584	2.525	1.059	30%	0.030	3.633	3.535
		17	3.286	2.392	0.894	27%	0.029	3.333	3.239
	3	15	3.625	2.839	0.786	22%	0.037	3.686	3.565
		16	3.572	2.535	1.037	29%	0.036	3.632	3.512
		17	3.287	2.389	0.899	27%	0.035	3.345	3.229
	4	15	3.503	3.451	0.052	1%	0.028	3.548	3.457
		16	3.432	2.660	0.772	23%	0.027	3.477	3.388
		17	3.164	2.542	0.622	20%	0.027	3.209	3.120
	5	15	3.431	2.795	0.637	19%	0.035	3.488	3.374
		16	3.378	2.590	0.787	23%	0.034	3.434	3.322
		17	3.103	2.421	0.683	22%	0.034	3.159	3.048
50%	1	15	2.883	1.998	0.886	31%	0.056	2.975	2.791
		16	2.771	1.350	1.421	51%	0.056	2.862	2.679
		17	2.318	1.329	0.989	43%	0.052	2.404	2.233
	2	15	3.730	2.651	1.079	29%	0.190	4.043	3.417
		16	3.609	1.775	1.834	51%	0.189	3.920	3.297
		17	3.271	1.656	1.615	49%	0.186	3.577	2.966
	3	15	3.787	2.538	1.248	33%	0.233	4.170	3.404
		16	3.670	1.773	1.897	52%	0.233	4.052	3.287
		17	3.295	1.685	1.610	49%	0.227	3.668	2.923
	4	15	3.571	3.651	-0.081	-2%	0.169	3.848	3.293
		16	3.451	1.847	1.603	46%	0.165	3.723	3.179
		17	3.113	1.769	1.345	43%	0.163	3.381	2.845
	5	15	3.603	2.511	1.091	30%	0.235	3.989	3.216
		16	3.542	1.831	1.712	48%	0.230	3.921	3.164
		17	3.167	1.797	1.370	43%	0.225	3.538	2.797
75%	1	15	2.035	1.032	1.003	49%	0.058	2.130	1.939

Cycling Strategy	Event	Hour Beginning	Reference Load (kW)	Event Day Load (kW)	Load Impact (kW)	% Load Impact	Standard Error	Upper Bound (90%)	Lower Bound (90%)
		16	1.955	0.480	1.475	75%	0.056	2.047	1.863
		17	1.751	0.448	1.302	74%	0.053	1.838	1.664
	2	15	2.657	1.650	1.006	38%	0.074	2.778	2.535
		16	2.618	0.867	1.751	67%	0.074	2.741	2.496
		17	2.425	0.810	1.615	67%	0.071	2.542	2.308
	3	15	2.666	1.424	1.242	47%	0.091	2.815	2.516
		16	2.638	0.642	1.996	76%	0.091	2.788	2.488
		17	2.447	0.740	1.707	70%	0.089	2.593	2.301
	4	15	2.654	2.786	-0.132	-5%	0.073	2.773	2.535
		16	2.583	0.876	1.707	66%	0.071	2.700	2.466
		17	2.419	0.823	1.596	66%	0.070	2.535	2.304
	5	15	2.785	1.839	0.946	34%	0.097	2.945	2.625
		16	2.731	0.922	1.809	66%	0.096	2.889	2.573
		17	2.481	0.895	1.586	64%	0.093	2.633	2.328

Table I-4. Average Hourly Ex Post DR kW Savings by Cycling Strategy, Event, Event Hour (DEC Switches)

Cycling Strategy	Event	Hour Beginning	Reference Load (kW)	Event Day Load (kW)	Load Impact (kW)	% Load Impact	Standard Error	Upper Bound (90%)	Lower Bound (90%)
30%	1	15	3.084	2.583	0.501	16%	0.075	3.207	2.960
		16	3.053	2.373	0.680	22%	0.075	3.177	2.930
		17	2.947	2.321	0.626	21%	0.072	3.065	2.829
	2	15	3.553	2.952	0.601	17%	0.080	3.685	3.421
		16	3.528	2.635	0.894	25%	0.079	3.658	3.399
		17	3.296	2.496	0.800	24%	0.076	3.421	3.170
	3	15	3.567	2.940	0.626	18%	0.093	3.720	3.413
		16	3.588	2.693	0.895	25%	0.093	3.741	3.436
		17	3.378	2.685	0.693	21%	0.091	3.527	3.229
	4	15	3.162	3.099	0.063	2%	0.072	3.280	3.043
		16	3.195	2.297	0.897	28%	0.071	3.312	3.078
		17	2.993	2.193	0.800	27%	0.069	3.107	2.879
	5	15	3.200	2.645	0.555	17%	0.096	3.359	3.042
		16	3.104	2.366	0.738	24%	0.095	3.260	2.947
		17	2.955	2.292	0.663	22%	0.093	3.108	2.801
50%	1	15	2.875	2.354	0.521	18%	0.150	3.122	2.628
		16	2.782	2.001	0.781	28%	0.151	3.030	2.534
		17	2.427	1.798	0.629	26%	0.142	2.660	2.193
	2	15	3.156	2.324	0.832	26%	0.178	3.448	2.863
		16	2.931	1.732	1.199	41%	0.174	3.217	2.644
		17	2.567	1.729	0.838	33%	0.171	2.848	2.287
	3	15	2.999	2.268	0.730	24%	0.206	3.337	2.660
		16	2.745	1.789	0.956	35%	0.205	3.081	2.408
		17	2.424	1.667	0.757	31%	0.200	2.754	2.095
	4	15	3.065	2.728	0.336	11%	0.166	3.338	2.792
		16	2.883	1.531	1.352	47%	0.165	3.154	2.611
		17	2.586	1.442	1.144	44%	0.160	2.849	2.324
	5	15	2.955	2.135	0.819	28%	0.220	3.316	2.593
		16	2.806	1.565	1.241	44%	0.218	3.166	2.447
		17	2.495	1.487	1.008	40%	0.211	2.841	2.148
75%	1	15	1.698	0.955	0.743	44%	0.135	1.921	1.476

Cycling Strategy	Event	Hour Beginning	Reference Load (kW)	Event Day Load (kW)	Load Impact (kW)	% Load Impact	Standard Error	Upper Bound (90%)	Lower Bound (90%)
		16	1.703	0.530	1.173	69%	0.137	1.929	1.477
		17	1.672	0.524	1.148	69%	0.130	1.887	1.458
	2	15	2.158	1.433	0.725	34%	0.168	2.434	1.882
		16	2.278	0.797	1.481	65%	0.167	2.553	2.003
		17	2.363	0.849	1.514	64%	0.160	2.626	2.099
	3	15	2.071	1.477	0.594	29%	0.213	2.421	1.721
		16	2.175	0.787	1.389	64%	0.211	2.523	1.828
		17	2.253	0.741	1.512	67%	0.205	2.590	1.916
	4	15	1.933	2.126	-0.193	-10%	0.136	2.157	1.708
		16	1.980	0.609	1.371	69%	0.135	2.202	1.759
		17	2.026	0.666	1.360	67%	0.132	2.243	1.809
	5	15	1.923	1.123	0.800	42%	0.208	2.265	1.581
		16	1.959	0.657	1.302	66%	0.200	2.289	1.629
		17	1.919	0.609	1.310	68%	0.192	2.234	1.604

Table I-5. Average Hourly Ex Post DR kW Savings by Cycling Strategy, Event, Event Hour (DEP Thermostats)

Cycling Strategy	Event	Hour Beginning	Reference Load (kW)	Event Day Load (kW)	Load Impact (kW)	% Load Impact	Standard Error	Upper Bound (90%)	Lower Bound (90%)
30%	1	15	2.930	2.355	0.575	20%	0.025	2.971	2.889
		16	2.930	2.198	0.731	25%	0.025	2.971	2.888
		17	2.709	2.059	0.651	24%	0.024	2.748	2.671
	2	15	3.191	2.595	0.596	19%	0.031	3.241	3.141
		16	3.201	2.312	0.889	28%	0.030	3.250	3.152
		17	3.000	2.183	0.817	27%	0.029	3.048	2.952
	3	15	3.213	2.602	0.610	19%	0.036	3.271	3.154
		16	3.228	2.349	0.879	27%	0.035	3.286	3.170
		17	3.023	2.284	0.739	24%	0.034	3.079	2.966
	4	15	2.916	2.812	0.104	4%	0.027	2.960	2.872
		16	2.928	2.265	0.663	23%	0.026	2.971	2.885
		17	2.706	2.144	0.562	21%	0.025	2.748	2.665
	5	15	3.044	2.554	0.491	16%	0.045	3.118	2.971
		16	3.017	2.386	0.631	21%	0.043	3.088	2.945
		17	2.843	2.259	0.583	21%	0.041	2.910	2.776
50%	1	15	2.477	1.677	0.800	32%	0.036	2.536	2.419
		16	2.462	1.228	1.234	50%	0.037	2.522	2.401
		17	2.079	1.159	0.920	44%	0.034	2.134	2.023
	2	15	2.678	1.894	0.784	29%	0.040	2.744	2.612
		16	2.660	1.380	1.281	48%	0.040	2.726	2.594
		17	2.391	1.300	1.091	46%	0.039	2.456	2.327
	3	15	2.618	1.782	0.835	32%	0.050	2.700	2.535
		16	2.602	1.370	1.232	47%	0.049	2.682	2.522
		17	2.322	1.288	1.034	45%	0.047	2.400	2.244
	4	15	2.306	2.184	0.122	5%	0.034	2.361	2.250
		16	2.284	1.205	1.079	47%	0.033	2.338	2.229
		17	1.966	1.035	0.931	47%	0.031	2.017	1.914
	5	15	2.458	1.845	0.613	25%	0.053	2.546	2.371
		16	2.432	1.294	1.139	47%	0.051	2.517	2.348
		17	2.147	1.133	1.014	47%	0.048	2.226	2.068
75%	1	15	2.383	1.418	0.966	41%	0.047	2.461	2.306

Cycling Strategy	Event	Hour Beginning	Reference Load (kW)	Event Day Load (kW)	Load Impact (kW)	% Load Impact	Standard Error	Upper Bound (90%)	Lower Bound (90%)
		16	2.377	0.751	1.625	68%	0.049	2.457	2.296
		17	2.176	0.974	1.202	55%	0.045	2.250	2.102
	2	15	2.630	1.629	1.001	38%	0.057	2.724	2.536
		16	2.616	0.781	1.835	70%	0.056	2.709	2.523
		17	2.446	0.774	1.672	68%	0.056	2.538	2.354
	3	15	2.554	1.662	0.892	35%	0.075	2.678	2.431
		16	2.546	0.836	1.710	67%	0.074	2.667	2.425
		17	2.396	0.856	1.540	64%	0.071	2.514	2.279
	4	15	2.323	2.162	0.161	7%	0.046	2.399	2.247
		16	2.303	0.664	1.639	71%	0.046	2.378	2.228
		17	2.117	0.688	1.430	68%	0.044	2.190	2.044
	5	15	2.428	1.552	0.876	36%	0.079	2.557	2.298
		16	2.420	0.838	1.582	65%	0.075	2.544	2.296
		17	2.259	0.839	1.420	63%	0.070	2.375	2.144

Table I-6. Average Hourly Ex Post DR kW Savings by Cycling Strategy, Event, Event Hour (DEP Switches)

Cycling Strategy	Event	Hour Beginning	Reference Load (kW)	Event Day Load (kW)	Load Impact (kW)	% Load Impact	Standard Error	Upper Bound (90%)	Lower Bound (90%)
30%	1	15	2.716	2.354	0.362	13%	0.067	2.826	2.607
		16	2.645	2.210	0.435	16%	0.067	2.755	2.534
		17	2.533	2.193	0.340	13%	0.063	2.636	2.429
	2	15	3.118	2.657	0.461	15%	0.082	3.253	2.983
		16	3.138	2.418	0.719	23%	0.080	3.269	3.006
		17	2.960	2.327	0.633	21%	0.078	3.088	2.832
	3	15	3.201	2.571	0.630	20%	0.095	3.356	3.045
		16	3.214	2.409	0.805	25%	0.092	3.366	3.062
		17	3.037	2.314	0.723	24%	0.090	3.186	2.889
	4	15	2.908	2.766	0.142	5%	0.072	3.027	2.790
		16	2.924	2.179	0.745	25%	0.070	3.040	2.808
		17	2.738	2.123	0.615	22%	0.067	2.849	2.628
	5	15	2.943	2.473	0.471	16%	0.121	3.142	2.744
		16	2.911	2.366	0.545	19%	0.120	3.109	2.713
		17	2.894	2.263	0.631	22%	0.112	3.079	2.710
50%	1	15	2.641	1.617	1.024	39%	0.163	2.910	2.373
		16	2.587	1.159	1.428	55%	0.174	2.873	2.301
		17	2.231	1.185	1.045	47%	0.155	2.486	1.975
	2	15	3.011	1.952	1.059	35%	0.214	3.363	2.659
		16	2.878	1.632	1.246	43%	0.209	3.222	2.534
		17	2.778	1.368	1.410	51%	0.208	3.121	2.435
	3	15	2.588	2.382	0.206	8%	0.255	3.007	2.169
		16	2.491	2.041	0.450	18%	0.248	2.899	2.082
		17	2.329	1.992	0.337	14%	0.241	2.726	1.932
	4	15	2.330	2.357	-0.027	-1%	0.165	2.601	2.059
		16	2.205	1.363	0.842	38%	0.163	2.473	1.937
		17	2.081	1.385	0.697	33%	0.158	2.341	1.822
	5	15	2.929	2.140	0.789	27%	0.346	3.498	2.361
		16	2.821	1.899	0.922	33%	0.326	3.358	2.284
		17	2.685	1.899	0.786	29%	0.302	3.181	2.188
75%	1	15	1.698	0.955	0.743	44%	0.135	1.921	1.476

Cycling Strategy	Event	Hour Beginning	Reference Load (kW)	Event Day Load (kW)	Load Impact (kW)	% Load Impact	Standard Error	Upper Bound (90%)	Lower Bound (90%)
		16	1.703	0.530	1.173	69%	0.137	1.929	1.477
		17	1.672	0.524	1.148	69%	0.130	1.887	1.458
	2	15	2.158	1.433	0.725	34%	0.168	2.434	1.882
		16	2.278	0.797	1.481	65%	0.167	2.553	2.003
		17	2.363	0.849	1.514	64%	0.160	2.626	2.099
	3	15	2.071	1.477	0.594	29%	0.213	2.421	1.721
		16	2.175	0.787	1.389	64%	0.211	2.523	1.828
		17	2.253	0.741	1.512	67%	0.205	2.590	1.916
	4	15	1.933	2.126	-0.193	-10%	0.136	2.157	1.708
		16	1.980	0.609	1.371	69%	0.135	2.202	1.759
		17	2.026	0.666	1.360	67%	0.132	2.243	1.809
	5	15	1.923	1.123	0.800	42%	0.208	2.265	1.581
		16	1.959	0.657	1.302	66%	0.200	2.289	1.629
		17	1.919	0.609	1.310	68%	0.192	2.234	1.604

Appendix J. Impact Calculation Methods: Ex Post Net Energy Savings Consumption Analysis Modeling

Opinion Dynamics conducted a series of analytical steps to estimate net energy efficiency savings attributable to thermostats installed in 2017. These steps included:

- Cleaned and prepared data, including review of program participation data to identify the number of premises with enrolled and installed thermostats in 2017;
- Modeled program impacts by conducting a consumption analysis, using a linear fixed effects regression model with a comparison group matched on pre-period energy consumption to estimate premise-level energy efficiency savings;
- Conducted a cross-participation analysis to understand the savings that EWB participants achieved from participation in other Duke Energy programs and account for them in consumption analysis at the premise-level; and
- Calculated total net energy savings by adjusting the average per-premise energy savings for cross-participation and multiplying per-premise savings by the number of premises with a thermostat enrolled in 2017. We then calculated per-device impacts by applying the average number of devices installed per-premise to calculate a realization rate against per-device ex ante goals.

The following sections provide additional details related to these activities otherwise not reported in the evaluation report.

Clean and Prepare Data

This section summarizes how we cleaned and prepared the 2017 program participant databases and participant and non-participant billing data for the consumption analysis.

Clean Program-Tracking Data

As a first step in preparing the necessary data we reviewed the program-tracking data to identify two key pieces of information; the date of participation in the program, and the customer's physical location. Program-tracking data must be able to be merged with the monthly billing data. In this case, as with many others, we merged the two sources of data by each customer's unique account ID, in this case the service point.

- **Installation date:** The date of participation determines the program year for each account.
- **Location:** We used the address and zip code of each customer to incorporate regional weather data in a later step.

Clean Participant and Comparison Group Billing Data

The participant billing data used in the consumption analysis come from monthly billing data from January 2015 through March 2018, obtained directly from Duke Energy. To develop the final dataset used for statistical analysis, we used a multi-step approach to combine and clean the data. We describe each billing data-cleaning step below.

- **Clean individual billing periods:** After adjusting billing periods based on flags in the data indicating "estimated" or "adjusted" meter reads, we removed billing periods with a duration of 0 days or missing information. Upon further conversations with Duke Energy, these reflect outdoor lighting bills. Usage records for these billing periods recorded either 0 kWh or positive kWh; many were the first meter read in the available billing history or a "turn-on" read. Nearly all accounts had typical billing periods of around 30 days. Additionally, we:
  - Determined average daily consumption (ADC) for each observation (based on usage and number of billing days in the period)
- **Combine participant data with billing records:** We merged usage data with the customer-specific (service point) data, including measure installation dates. We then assigned pre- and post-treatment billing periods based on those dates. We assigned billing periods before the thermostat installation date to the pre-participation period, all bills following the installation date as the post-participation period, and the bill where installation occurs to a "dead-band" period that was not included in the analysis.

After individual billing records were cleaned and all data were combined, we removed accounts that did not meet certain criteria. We used the following criteria to ensure that all accounts in the final analysis file had sufficient data to allow for robust analysis.

- **Extremely high or low average daily consumption:** We removed customers with entire pre- or post-participation periods having very high or very low usage. This is to ensure that participants spent equivalent amounts of time in their facilities in the months before and after program participation. We dropped households with average consumption at or below 500 kWh/month on average (across their billing history in both the pre- and post-participation periods). We also dropped customers with extremely high usage (over 50,000 kWh/month). These facilities with odd usage patterns are likely to be the result of factors that cannot easily be controlled for and could bias the results.
- **Inadequate billing history before or after program participation:** Thermostats associated with the program may be expected to generate energy savings throughout the year. To be able to assess changes in consumption due to program participation, we included participants with a billing history covering, at a minimum, 9 months of billing data before the first day of program participation. We also require that summer 2017 months be present in the post-period as that represents the summer cooling season when we expect to efficient set points on the thermostats to produce higher energy savings. Requiring that a longer period be available for analysis results in large losses of analyzable participants. To mitigate this issue, we chose to include 2016 participants in the analysis as a proxy for 2017 participants that were ineligible for modeling because of limited post-period data.

Table J- shows how many accounts were removed from the analysis overall for each reason. As noted above, we included 2016 participants in our analysis. As a result, participant counts in Table J- reflect 2016 and 2017 EWB participants. Given insufficient post-period data, these counts also exclude customers who enrolled after August 2017.

Table J-1. Accounts Removed from Analysis

Drop Reason	Control Group		Treatment Group	
	2016-2017 Customer Count	Percent Remaining	2016-2017 Customer Count	Percent Remaining
Initial	10,810	100.0%	2,903	100.0%
No Participation Date in Data	10,810	100.0%	2,903	100.0%
Post Period Does Not Include All Event Months	8,018	74.2%	2,063	71.1%
Too few pre-period bills (less than 12)	7,366	68.1%	1,886	65.0%
Low overall average usage (under 500kWh/month)	7,361	68.1%	1,884	64.9%
High overall average usage (over 50,000kWh/month)	7,318	67.7%	1,876	64.6%

Table J-2 shows the breakdown of participants in the treatment and comparison groups in our final model.

Table J-2. 2016-2017 Customer Accounts Included in Final Consumption Analysis Model

Type	Treatment Group	Comparison Group	Total
DEC	1,174	4,463	5,637
DEP	684	2,793	3,477
Total Accounts	**1,858**	**7,256**	**9,114**

Append Weather Data

To include weather patterns in our model, we used daily weather data from numerous weather stations across the DEP and DEC territory, utilizing the site closest to each account's geographic location. By using multiple sites, we increase the accuracy of the weather data being applied to each account. We obtained these data from the National Oceanic and Atmospheric Administration's (NOAA) National Climatic Data Center.

The daily data are based on hourly average temperature readings from each day. We calculated CDD and HDD for each day (in the analysis and historical periods) based on average daily temperature using the same formula used in weather forecasting.[1] We merged daily weather data into the billing dataset so that each billing period captures the HDD and CDD for each day within that billing period (including start and end dates[2]). For

[1] A "degree-day" is a unit of measure for recording how hot or how cold it has been over a 24-hour period. The number of degree-days applied to any particular day of the week is determined by calculating the mean temperature for the day and then comparing the mean temperature to a base value of 65 (HDD) and 75 (CDD) degrees F. (The "mean" temperature is calculated by adding together the high for the day and the low for the day, and then dividing the result by 2.) If the mean temperature for the day is 5 degrees higher than 75, then there have been 5 cooling degree-days. On the other hand, if the weather has been cool, and the mean temperature is, say, 55 degrees, then there have been 10 heating degree-days (65 minus 55). http://www.srh.noaa.gov/ffc/?n=degdays.

[2] Daily weather data are merged based on the given dates of the billing period. Assigning weather this way provides a more accurate representation of the weather experienced during the billing period than does using weather for the calendar month of the bill.

analysis purposes, we then calculated average daily HDD and average daily CDD, based on the number of days within each billing period.

Develop and Assess Comparison Group

Prior to conducting the consumption analysis, Opinion Dynamics created a matched comparison group of non-participants from the DEC and DEP jurisdictions. The matching was done on two levels: business type and energy use. Business type is based on 2-digit SIC codes and their descriptions Table J-3. Within each business type we selected up to five non-participants per participant, based on those with the most similar energy usage over time. A chart of the final matched comparison group energy use as compared to the treatment group is shown in Figure J-1.

Table J-3. SIC Codes to Business-Type

Business Description	2-Digit SIC	Business Type
Food and kindred products	20	Food/Liquor
Tobacco products	21	Food/Liquor
Retail-food stores	54	Food/Liquor
Food services--restaurants, theaters, caterers	58	Food/Liquor
Services-health services	80	Health Care - Med Office
Hotels, rooming houses, camps & other lodging places	70	Hotel
Textile mill products	22	Industrial
Apparel & other finished prods of fabrics & similar matl	23	Industrial
Lumber & wood products (no furniture)	24	Industrial
Household good mfg--not appliances or electronics	25	Industrial
Papers & allied products	26	Industrial
Mfg Products with Rubber or Plastic	30	Industrial
Leather & leather products	31	Industrial
Mfg Products with Glass, Clay, Cement, or Ceramics--nonmetallic minerals	32	Industrial
Mfg/processing metal & metal products	33	Industrial
Mfg metal products	34	Industrial
Mfg Large Machinery, Tool & Die Work, Computer and Peripheral Equip	35	Industrial
Electronic & other electrical equipment (no computer equip)	36	Industrial
Vehicle mfg	37	Industrial
Mfg measurement & control instruments	38	Industrial
Mfg Smaller Metal & Wood Products--jewelry, office supplies, caskets	39	Industrial
Water transportation	44	Industrial
Residential construction	15	Office
Heavy construction other than bldg const – contractors	16	Office
Construction - special trade contractors	17	Office
Local & suburban transit & interurban hwy passenger trans	41	Office

Business Description	2-Digit SIC	Business Type
Delivery, collection, & storage services, including warehousing	42	Office
Specialized construction activities-demolition & site prep	43	Office
Air transportation services	45	Office
Transportation services	47	Office
Telecommunications services, cable, broadcasting	48	Office
Electric, gas & sanitary services	49	Office
Banking & credit unions	60	Office
Consumer lending--credit cards, real estate, loan brokers	61	Office
Security & commodity brokers, dealers, exchanges & services	62	Office
Insurance companies, pension funds	63	Office
Insurance agencies & brokerages	64	Office
Real estate	65	Office
Offices of Bank and Other Holding Cos, Grant-Making Foundations	67	Office
Professional, scientific, & technical services-except computer design	69	Office
Services-personal services	72	Office
Services-advertising, media reps, collection agencies, credit bureaus, pest control, janitorial, rental, temp, etc	73	Office
Law offices	81	Office
Services-educational services	82	Office
Services-social services	83	Office
Services-membership organizations	86	Office
Services-engineering, accounting, research, management	87	Office
Services-services, nec	89	Office
Other government support	91	Office
Government-protection services (police, fire, correctional inst)	92	Office
Retail-building materials, hardware, garden supply	52	Retail
Department & discount stores	53	Retail
Retail-auto dealers & gasoline stations	55	Retail
Retail-apparel & accessory stores	56	Retail
Retail-home furniture, furnishings & equipment stores	57	Retail
Retail-miscellaneous retail	59	Retail
Wholesale-durable goods	50	Warehouse
Wholesalers, consumer products, food, drugs, office supplies, non-durable	51	Warehouse
Printing & publishing	27	Misc.
Services-automotive repair, services & parking	75	Misc.
Services-miscellaneous repair services	76	Misc.
Movie & Video Production, Post-production Services, Distribution, Theaters	78	Misc.
Services-amusement & recreation services	79	Misc.

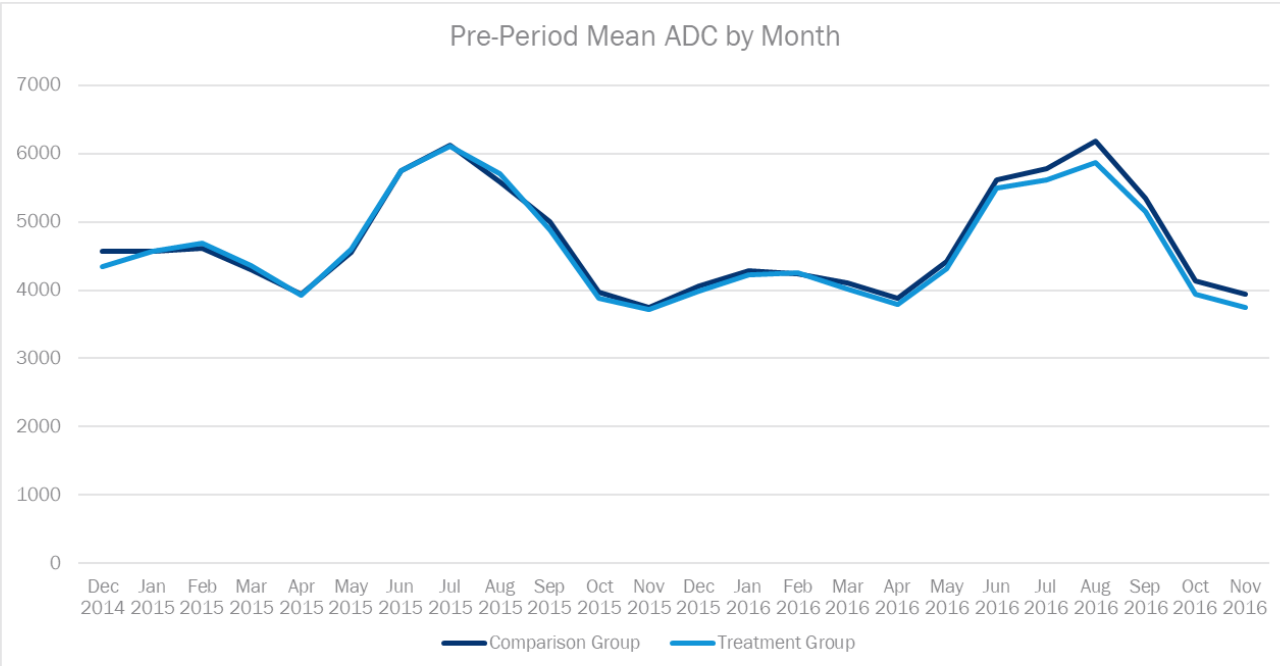
Business Description	2-Digit SIC	Business Type
Museums, historical sites, zoos & botanical gardens	84	Misc.
Non-operating establishments	99	Misc.
Agricultural production-crops	1	NA
Agricultural prod-livestock & animal specialties	2	NA
Agricultural services	7	NA

The use of a comparison group is integral to our consumption analysis methods and is used to develop a counterfactual representative of the energy used by participants in the absence of the program. Based on the information at our disposal, we analyzed pre-program energy consumption to determine that treatment participants were equivalent to the comparison participants and could be used as a valid comparison group. Similarity in ADC before engaging with the program might be a general proxy for behavioral similarities. As such, the evaluation team compared the baseline monthly ADC of participants in each group.

Opinion Dynamics examined the average daily electricity consumption for months during each participant's pre-participation period, and an analogous period for non-participants to compare energy consumption patterns. As shown in Figure J-1, pre-participation energy usage for the comparison group is very similar to that used by the participant group. We used a normalized Euclidian matching approach. After matching, each non-participant is assigned the program "start date" of their matched participant so that we can examine between-group differences in energy usage during the program post-period. By matching in this way, we minimize pre-existing differences between participants and non-participants, thereby ensuring that any between-group differences in savings we see can be attributed to the program.

Overall, the energy use patterns for treatment and comparison groups follow the same trends but with the comparison group having very slightly higher usage towards the end of the pre-period. Terms controlling for calendar months in the final model should control for the small difference in pre-period usage seen here.

Figure J-1. Comparison of Average Baseline Monthly kWh Consumption between Treatment and Comparison Customers



Our final dataset used in the consumption analysis consists of all data for all viable customers in the treatment and comparison groups that survived the cleaning process. We start with a dataset of clean and unique participants from the program, including the date of participation, and their location. We combine this with the cleaned dataset of monthly bills, which brings in the customers' usage (in kWh) over time. Into this combined dataset, we add HDD and CDD for each customer based on the nearest weather station. Customers who do not meet the criteria necessary for accurate modeling are dropped.

Based on the equivalency check, we concluded that the treatment and comparison groups were sufficiently comparable for analyzing the impacts of the program.

Model Program Impacts

Develop Model Specifications

To estimate savings, Opinion Dynamics utilized a LFER model that incorporates weather and monthly changes in energy usage, as well as interaction terms that show the effect of these factors in the post-period. The model allows all facility factors that do not vary over time to be absorbed by the individual constant terms in the equation. This method controls for factors that may vary between customers, but that do not change over time. Our method utilizes a comparison group to construct a counterfactual scenario (what participants would have done during the post-program period absent the program) for the treatment group in the post-program period. In the process of determining the appropriate model for the analysis, we tested a multitude of possibilities, all of which utilized the comparison group.

Our testing revealed that the model in Equation J-1 to have the best overall fit. The model takes into account changes in weather (HDD and CDD) for each bill and includes an interaction term of weather and the post-period to account for any changes in weather specific to the post period. The model also utilizes dummy variables for each of the 12 months to control for seasonal changes to energy use.

Interactions with monthly dummies are also included to account for differences that occur in the post-participation period. These additional interactions control for non-program changes that occur during the post-participation period, which could otherwise under- or over-value the effect of program participation.

The final model was run separately for DEC and DEP jurisdictions. This was done because of the differences seen in pre-period ADC (about 6% different) and difference in equipment tonnage (about 3%) between the two jurisdictions. In addition to running jurisdiction-specific models we also chose to include 2016 participants in the model to bolster the robustness of the results, which benefitted from additional customers in the analysis as well as better coverage of the seasons. We found the 2016 and 2017 participants were very similar in terms of per-period energy use and equipment tonnage, and therefore are comfortable using 2016 participants as a proxy for 2017 participants that were ineligible for modeling because of limited post-period data. Notably, our calculation of total savings excludes 2016 participants. Our final model is represented in Equation J-1.

Equation J-1. Energy Savings Model Specification

$$ADC_{it} = B_h + B_1 Post_{it} + B_2 HDD_{it} + B_3 CDD_{it} + B_4 Post \cdot HDD_{it} + B_5 Post \cdot CDD_{it} + B_t Month + B_{t1} Month \cdot Post + \varepsilon_{it}$$

Where:

ADC_{it} = Average daily consumption (in kWh) for the billing period

$Post$ = Indicator for treatment group in post-participation period (coded "0" if treatment group in pre-participation period or comparison group in all periods, coded "1" in post-participation period for treatment group)

HDD = Average daily heating degree days from NOAA

CDD = Average daily cooling degree days from NOAA

$Month$ = Month indicator

B_h= Average facility-specific constant

B_1= Main program effect (change in ADC associated with being a participant in the post-program period)

B_2= Increment in ADC associated with one-unit increase in HDD

B_3= Increment in ADC associated with one-unit increase in CDD

B_4= Increment in ADC associated with each increment increase of HDD for participants in the post-program period (the additional program effect due to HDD)

B_5= Increment in ADC associated with each increment increase of CDD for participants in the post-program period (the additional program effect due to CDD)

B_t= Coefficients for each month

B_{t1}= Coefficients for each month in the post-participation period

ε_{it} = Error term

Test Model Specification and Validate Model

In the development of our final model, we aimed to explain as much variation in the dependent variable as possible. The most direct measure of this is the overall R-squared, which gives an estimate of how much variability in post-participation period usage is explained by the variables included in the model. An R-squared of 1.0 indicates that a model explains 100% of the variance in the dependent variable, and an R-squared of 0.5 would explain 50%. In addition to R-squared, we also compared the model Akaike Information Criterion (AIC) values for each model we tested. The AIC provides a measure of relative quality between models; a lower value indicates a better fit to the data. In most models, we found relatively high R-Squared values, with the model chosen yielding R-Squared values that tell us the models explained around 90% of the variation in energy usage. We chose the model which had both a high R-Squared and Low AIC relative to others tested.

Estimate Net Savings

The regression model results presented in Impact Calculation Methods: Ex Post Net Energy Savings Consumption Analysis Modeling shows a reduction in electricity use after customers participate in the EWB program, controlling for weather, time, and the facility characteristics (reflected in the constant term).

Table J-4. Final Models

Variable	DEP	DEC
Post (EnergyWise Business program participation)	-15.46**	-0.251
CDD	0.134***	0.213***
HDD	0.0338***	0.0392***
Post-participation period CDD	0.0554	-0.0151
Post-participation period HDD	0.0181**	-0.00478
Constant	108.0***	113.7***
Observations	128,075	210,630
R-squared	0.892	0.907
Monthly effects included	YES	YES
Post-participation period interacted with months included	YES	YES

* p<0.1, ** p<0.05, *** p<0.01.

Due to the weather and monthly interaction terms in the model, it is necessary to calculate the full treatment effect (Treatment) by combining the average value of the main effect coefficient with the coefficient for each interaction term. The coefficient for "Post" seen in the regression output represents the average reduction of daily consumption during the post-treatment period by participants, compared to the comparison group, but doesn't include program effects associated with higher or lower temperatures experienced during the post period. Adding in the weather-specific program effects, as shown in Equation J-2 results in total program-related savings.

Equation J-2. Model Specification

$$\Delta ADC = B_1 Post + AvgPostHDD_t \cdot (B_2 Post \cdot HDD) + AvgPostCDD_t \cdot (B_3 Post \cdot CDD) + B_t Month_t$$

Where:

ΔADC = Change in Average Daily Consumption

$AvgPostHDD_t$ = Average number of HDD during month t of the post period

$AvgPostCDD_t$= Average number of CDD during month t of the post period

Table J-5. Estimate of Daily Program Savings

EnergyWise Business Program Estimate	Estimate	Standard Error	T	P>|t|	95% Confidence Interval	
					Lower	Upper
DEC	-5.0600	1.5720	-3.22	0.0010	-8.1	-2.0
DEP	-2.1110	1.1260	-1.87	0.0610	-4.3	0.1

The value of the EWB program estimate seen in Table J- represents 5 kWh and 2 kWh reduction in ADC for DEC and DEP respectively associated with moving from pre-treatment to post-treatment and compared to comparison group usage over that period. These savings estimates are extrapolated to the overall net program savings for DEP and DEC EWB program participants. As a way to better compare impacts across jurisdictions, we provide savings as a percentage of the baseline usage (Table J-). We calculate the modeled baseline usage using a similar equation to Equation J-2 but include coefficients from variables that are not associated with the treatment effect. Doing this shows the energy that customers would have used on average if they did not participate, i.e., the counterfactual. To estimate the percent savings from participants' baseline energy consumption, we divide the coefficient EWB, representing the change in daily usage, by the mean baseline ADC to arrive at the percentage of savings.

Table J-6. Estimated Savings from Consumption Analysis Compared to Baseline Usage

	Modeled Baseline Usage (kWh)	Standard Error	95% Confidence Interval		Savings (kWh)	Savings (%)
DEC Daily Savings[A]	154.9	0.1280	154.7	155.1	5.1	3.3%
DEP Daily Savings[A]	145.4	0.1140	145.2	145.6	2.1	1.4%

A: Savings estimates are the inverse of the coefficient for the EWB program shown in Table J-5.

To best represent the kWh savings for participants in North and South Carolina we apply the percentage savings from our jurisdiction specific models to average baseline usage and multiply the territory-specific annual per-home savings by the total number of thermostats in each territory, as shown in Table J-7.

Table J-7. Annual Savings from Consumption Analysis by State

State	Premises Enrolled in 2017	Annual Modeled Baseline Usage (kWh)	Savings (%)	Annual Energy Savings (kWh)	
				Per-Facility Savings	2017 EWB Program Savings
North Carolina	2,923	152.5	2.81%	1,573	4,598,265
South Carolina	485	152.5	2.81%	1,573	762,969
Miscellaneous	48	152.5	2.81%	1,573	75,510
Total	3,456	n/a	n/a	n/a	5,436,744

Note: To calculate state level results, we apply weighted average of modeled results.

Complete Model Results

DEP Specific Model

Linear regression, absorbing indicators

Number of obs	128,075
F(27, 3489)	80.46
Prob > F	0
R-squared	0.892
Adj R-squared	0.8889
Root MSE	65.2327

adc	Coef.	Robust Std. Err.	t	P>t	[95% Conf. Interval]	
post	-15.4553	7.414014	-2.08	0.037	-29.9916	-0.91909
hdd	0.033844	0.002979	11.36	0	0.028003	0.039685
cdd	0.134434	0.018574	7.24	0	0.098018	0.170851
posthdd	0.018089	0.00909	1.99	0.047	0.000267	0.035911
postcdd	0.055429	0.049801	1.11	0.266	-0.04221	0.153072
month#post						
January	0.969176	1.57464	0.62	0.538	-2.11813	4.056484
February	-1.82573	3.640752	-0.5	0.616	-8.96395	5.312489
March	2.512337	3.106803	0.81	0.419	-3.579	8.603672
April	21.10697	6.350244	3.32	0.001	8.656398	33.55754
May	10.70435	6.957071	1.54	0.124	-2.93599	24.34469
June	8.40112	8.07495	1.04	0.298	-7.43098	24.23322
July	3.711309	9.281979	0.4	0.689	-14.4874	21.90997
August	2.874474	8.380395	0.34	0.732	-13.5565	19.30545
September	10.37161	7.536285	1.38	0.169	-4.40437	25.14758
October	11.83014	5.8989	2.01	0.045	0.264494	23.39578
November	0.963615	2.863785	0.34	0.737	-4.65125	6.578478
December	0	(omitted)				
month						
January	9.004273	0.591155	15.23	0	7.845229	10.16332
February	10.48435	0.680951	15.4	0	9.149247	11.81945
March	4.934721	0.886707	5.57	0	3.196205	6.673238
April	9.000273	1.372915	6.56	0	6.308476	11.69207
May	25.48755	2.036048	12.52	0	21.49558	29.47951
June	39.95551	2.89728	13.79	0	34.27497	45.63604
July	55.35251	3.698548	14.97	0	48.10097	62.60404
August	51.84335	3.060916	16.94	0	45.84198	57.84472
September	38.88539	2.047995	18.99	0	34.87	42.90078
October	15.31778	1.368654	11.19	0	12.63433	18.00122
November	-1.61763	0.748219	-2.16	0.031	-3.08462	-0.15064
December	0	(omitted)				
Constant	108.0303	1.946486	55.5	0	104.2139	111.8467
Service Point ID	Absorbed				(3490 categories)	

DEC Specific Model

Linear regression, absorbing indicators						
					Number of obs	210,630
					F(27, 5678)	128.2
					Prob > F	0
					R-squared	0.9066
					Adj R-squared	0.904
					Root MSE	63.7236

adc	Coef.	Robust Std. Err.	t	P>t	[95% Conf. Interval]	
post	-0.25105	5.116232	-0.05	0.961	-10.2808	9.77872
hdd	0.039227	0.002211	17.74	0	0.034893	0.043561
cdd	0.21312	0.013206	16.14	0	0.187232	0.239008
posthdd	-0.00478	0.005846	-0.82	0.414	-0.01624	0.006684
postcdd	-0.0151	0.036013	-0.42	0.675	-0.0857	0.055501
month#post						
January	-0.23738	1.298134	-0.18	0.855	-2.78222	2.307458
February	-6.26397	2.74249	-2.28	0.022	-11.6403	-0.88764
March	-7.17425	2.655515	-2.7	0.007	-12.3801	-1.96843
April	-1.20338	4.690594	-0.26	0.798	-10.3987	7.991978
May	-2.49602	5.012676	-0.5	0.619	-12.3228	7.330738
June	-1.56496	5.705751	-0.27	0.784	-12.7504	9.620489
July	-2.15882	6.785293	-0.32	0.75	-15.4606	11.14295
August	-4.5233	6.237558	-0.73	0.468	-16.7513	7.704693
September	-5.43537	5.322368	-1.02	0.307	-15.8692	4.998505
October	1.288234	4.400767	0.29	0.77	-7.33895	9.915417
November	-4.32873	2.472579	-1.75	0.08	-9.17592	0.518473
December	0	(omitted)				
month						
January	5.975516	0.474308	12.6	0	5.04569	6.905342
February	9.978805	0.610775	16.34	0	8.781452	11.17616
March	6.208884	0.690616	8.99	0	4.855014	7.562754
April	9.759207	1.027143	9.5	0	7.745614	11.7728
May	24.93359	1.305792	19.09	0	22.37374	27.49345
June	36.6113	2.065026	17.73	0	32.56306	40.65953
July	46.13661	2.398289	19.24	0	41.43505	50.83817
August	46.96587	2.100697	22.36	0	42.8477	51.08404
September	36.70726	1.491287	24.61	0	33.78377	39.63075
October	16.70192	1.040537	16.05	0	14.66207	18.74177
November	-0.30662	0.618046	-0.5	0.62	-1.51823	0.904983
December	0	(omitted)				
Constant	113.7349	1.410406	80.64	0	110.97	116.4999
Service Point ID	Absorbed				(5679 categories)	

Cross Participation Analysis

The consumption analysis not only reflects EWB program savings but also savings from participation in other Duke Energy programs. As a result, the consumption analysis has the potential for overestimating energy savings (if EWB participants have higher cross-participation savings than the comparison group) or underestimating energy savings (if the comparison group has higher cross-participation savings than participants). We conducted a cross-participation analysis for participants and the comparison group to identify and correct for this. To do so, we identified measures that participants and the comparison group customers installed through the Non-Residential Prescriptive and SBES Programs, and their savings, during the post-participation period.[3] Savings reflect pro-rated net ex post impacts based on the date of installation. Once identified, we removed the difference between cross-participation savings of the comparison group and of the EWB participants. This accounts for the fact that the consumption analysis already nets out equal cross-participation savings for the comparison group and EWB participants.

To ensure that our cross-participation results are directly applicable to the energy savings from the billing analysis, we use the same base population of EnergyWise Business participants and the matched comparison group customers as those used in the modeling effort. Similar to the billing analysis, these matched comparison group customers serve as the non-participant comparison group for the cross-participation analysis. To facilitate the analysis, we prepared a master participant dataset that combined the program-tracking data for the program participants and those used as the matched comparison group of non-participants. The program tracking data ranges from January 1, 2017 through January 31, 2018 for the Non-Residential Prescriptive and Small Business Energy Saver programs.

With the master business program participant dataset, the EnergyWise Business participants and control customers in mind, we generated several key statistics that will allow us to estimate the cross-participation savings:

- Number of customers that participated in other Duke Energy programs.
- Whether these customers participate before or after their participation in EnergyWise Business. (For the control group, this will be before or after the post period)
- The duration of time that the measure is installed before the end of the program year.
- Measures that these customers installed and the net energy savings that were claimed because of the installation.

To make the final calculation to obtain the final overlap in energy savings, we calculate the per EnergyWise Business participant and non-participant savings and take the difference between them. This treatment minus control calculation makes certain that only the participation as the direct result the EnergyWise Business program is counted towards the cross-participation savings overlap. The control group serves as a counterfactual for what would have likely occurred with the EnergyWise Business participants had they not

[3] We matched EWB participants to other program-tracking data by account and service point ID.

participated in the EnergyWise Business program. This difference in per customer savings becomes the adjustment we will apply to the billing analysis impacts.

Page intentionally left blank

For more information, please contact:

Olivia Patterson
Vice President

510 444 5050 tel
510 444 5222 fax
opatterson@opiniondynamics.com

1 Kaiser Plaza, Suite 445
Oakland, CA 94612

Docket No. E-7, Sub 1192

Reimagine tomorrow.

Smart $aver® Non-Residential Custom Program Years 2016-2017 Evaluation Report

Submitted to Duke Energy Carolinas
in partnership with Tetra Tech

November 29, 2018

Principal Authors:
Patrick Burns, Senior Vice President
Nathanael Benton, Senior Consultant
Carrie Koenig, Dan Belknap, Tetra Tech

Contents

List of Figures

List of Tables

Equations

1 Executive Summary

1.1 Program Summary

Duke Energy's Non-Residential Smart $aver® Custom Incentive Program (NR Custom) offers financial assistance to qualifying commercial, industrial and institutional customers in the Duke Energy Carolinas (DEC) and Duke Energy Progress (DEP) service territories to enhance their ability to adopt and install cost-effective electrical energy efficiency projects.

The program is designed to meet the needs of non-residential customers with electrical energy saving projects involving more complicated or alternative technologies, or those measures not covered by the non-residential Smart $aver Prescriptive Program. The intent of the program is to encourage the implementation of energy efficiency projects that would not otherwise be completed without the companies' technical or financial assistance.

1.2 Evaluation Objectives and High Level Findings

This report presents the results and findings of evaluation activities for DEC's and DEP's NR Custom program conducted by the evaluation team, collectively Nexant Inc. and our subcontracting partner, Tetra Tech, for the period of January 2016 through December 2017.

1.2.1 Impact Evaluation

The overarching goals for the NR Custom impact evaluation were to:

- Quantify accurate and supportable energy impacts (kWh) and summer and winter demand (kW) savings for energy efficient measures and equipment implemented in participants' facilities.
- Assess the rate of free riders from customer and contractor perspective.
- Determine spillover effects
- Consider and verify measure installation vintage aligned with measure baseline definitions, i.e. early replacement, burnout on failure, etc.

Evaluation activities included in-depth reviews and on-site verification of a representative sample of projects, in-person or phone interviews with program participants, deploying metering equipment, collecting building automation system/energy management system (BAS/EMS) data, and engineering analyses to estimate gross and net savings for all implemented measures attributed to the NR Custom Program.

1.2.2 Process Evaluation Objectives

Process evaluations are designed to support continuous program improvement by identifying successful program elements that can be expanded upon as well as underperforming/inefficient processes that could be holding back program performance. The process evaluation for the NR Custom Program sought to:

- Assess how participant characteristics compare to segments targeted for the program
- Assess the sources of customer engagement and most effective marketing source
- Assess influence the program has on customers' decisions to install energy efficient (EE) measures
- Assess whether sufficient documentation and information are provided to customers
- Assess persistence of program engagement with participants
- Assess satisfaction with the program and its components including suggestions for program changes

To meet these objectives, the evaluation team conducted interviews with key program staff, reviewed program documentation, and utilized telephone surveys to ask program participants and trade allies about their experiences with the program.

1.2.3 High Level Findings

1.2.3.1 Gross Impact Evaluation Key Findings – DEC

The impact evaluation results indicate that program internal processes for project review, savings estimation, and installation verification are producing quality estimates of project impacts. For DEC energy realization rates exceed 100% for three of the four strata (Lighting - Large, Lighting - Small, and Non-lighting - Large). The realization rate for the Non-lighting - Small strata was better than 96%. Realization rates for Summer and Winter demand were also above 100% at the program level. Findings from the gross impact evaluation of DEC projects are summarized in Table 1-1, Table 1-2, and Table 1-3.

Table 1-1 DEC Program Reported and Verified Gross Energy Impacts for Projects Completed January 2016 – December 2017

Measure Category	Strata	Gross Reported Energy Savings (kWh)	Gross Verified Energy Savings (kWh)	RR (%)
Lighting	Large (>1,000 MWh)	35,491,559	37,792,452	106.5%
	Small (<1,000 MWh)	34,500,751	37,552,406	108.8%
Non-lighting	Large (>2,000 MWh)	21,661,701	23,301,600	107.6%
	Small (<2,000 MWh)	22,645,465	21,862,911	96.5%
Total		**114,299,476**	**120,509,369**	**105.4%**

Table 1-2 DEC Program Reported and Verified Gross Summer Demand Impacts for Projects Completed January 2016 – December 2017

Measure Category	Strata	Gross Reported Summer Demand Savings (kW)	Gross Verified Summer Demand Savings (kW)	RR (%)
Lighting	Large (>1,000 MWh)	4,854	5,636	116.1%
	Small (<1,000 MWh)	6,151	6,758	109.9%
Non-lighting	Large (>2,000 MWh)	2,107	3,369	159.9%
	Small (<2,000 MWh)	3,276	3,237	98.8%
Total		**16,389**	**19,000**	**115.9%**

Table 1-3 DEC Program Reported and Verified Gross Winter Demand Impacts for Projects Completed January 2016 – December 2017

Measure Category	Strata	Gross Reported Winter Demand Savings (kW)	Gross Verified Winter Demand Savings (kW)	RR (%)
Lighting	Large (>1,000 MWh)	4,398	5,031	114.4%
	Small (<1,000 MWh)	5,218	5,996	114.9%
Non-lighting	Large (>2,000 MWh)	2,559	5,372	209.9%
	Small (<2,000 MWh)	2,933	2,316	79.0%
Total		**15,108**	**18,715**	**123.9%**

1.2.3.2 Gross Impact Evaluation Key Findings – DEP

The impact evaluation results indicate that program internal processes for project review, savings estimation, and installation verification are producing quality estimates of project impacts. For DEP, energy realization rates exceed 100% for three of the four strata (Lighting - Large, Non-lighting - Large, and Non-lighting - Small). The realization rate for the Lighting - Small strata was better than 97%. Realization rates for Summer and Winter demand were 99.5% and 122.7%, respectively. Findings from the gross impact evaluation of DEP projects are summarized in Table 1-4, Table 1-5, and Table 1-6.

Table 1-4 DEP Program Reported and Verified Gross Energy Impacts for Projects Completed January 2016 – December 2017

Measure Category	Strata	Gross Reported Energy Savings (kWh)	Gross Verified Energy Savings (kWh)	RR (%)
Lighting	Large (>250 MWh)	3,289,490	3,662,303	111.3%
	Small (<250 MWh)	3,204,111	3,119,250	97.4%
Non-lighting	Large (>500 MWh)	5,979,116	6,075,769	101.6%
	Small (<500 MWh)	3,667,824	4,202,872	114.6%
Total		**16,140,541**	**17,060,194**	**105.7%**

Table 1-5 DEP Program Reported and Verified Gross Summer Demand Impacts for Projects Completed January 2016 – December 2017

Measure Category	Strata	Gross Reported Summer Demand Savings (kW)	Gross Verified Summer Demand Savings (kW)	RR (%)
Lighting	Large (>250 MWh)	475	519	109.4%
	Small (<250 MWh)	518	450	86.8%
Non-lighting	Large (>500 MWh)	531	519	97.7%
	Small (<500 MWh)	386	413	106.9%
Total		**1,910**	**1,901**	**99.5%**

Table 1-6 DEP Program Reported and Verified Gross Winter Demand Impacts for Projects Completed January 2016 – December 2017

Measure Category	Strata	Gross Reported Winter Demand Savings (kW)	Gross Verified Winter Demand Savings (kW)	RR (%)
Lighting	Large (>250 MWh)	499	667	133.8%
	Small (<250 MWh)	379	532	140.3%
Non-lighting	Large (>500 MWh)	632	622	98.5%
	Small (<500 MWh)	512	659	128.5%
Total		**2,022**	**2,480**	**122.7%**

1.2.3.3 Net Impact Evaluation Key Findings

The results of the net impact evaluation show that the gross energy savings are largely attributable to the program's activities. Customers did not report implementing efficient projects outside of the program, which suggests that the program is effective at getting customers to participate when they are considering efficiency projects. A large portion of the free-ridership stemmed from customers who reported they planned to complete the same project prior to learning about the program, and would have paid the additional incentive amount to complete the efficiency project. A small number of customers also rated all aspects of the program as having no influence on their project decisions.

Findings from the net impact evaluation are summarized in Table 1-7. While the table presents territory-specific findings for DEP, these results are based on a small number of survey responses and therefore have a higher statistical precision (±16%) than industry standard.[1] The evaluation team recommends using the Combined net-to-gross results for reporting DEP net impacts, which has the same precision as DEC-specific results at ±4.5%. Because the DEC results do fall within ±10% on their own, the evaluation team recommends using the DEC-specific results for reporting DEC net impacts.

Table 1-7 Net-to-Gross Evaluation Results

Net-to-Gross Component	DEC	DEP	Combined
Net of Free-ridership	78.9%	70.8%	78.5%
Program-influenced Spillover	0.4%	0.0%	0.4%
Net-to-Gross	**79.2% ***	**70.8%**	**78.8%**

* Note: Sum of Net of Free-ridership and program-influenced spillover equals 79.2% due to rounding.

1.2.3.4 Process Evaluation Key Findings

Overall, the program is operating as intended, and customers and trade allies are satisfied with their experiences with the program as well as with Duke Energy. Contractors play a key role in the program by making customers aware of the program offerings, and contractors have utilized the program to encourage customers to purchase high efficiency equipment. Contractors felt the program was influential in getting customers to move forward with projects where they would not have otherwise. Participants provided similar feedback, stating they have appreciated the support they received from trade allies and Duke Energy. Numerous customers mentioned they have previously participated in the program, speaking to their satisfaction and the ease of participation.

Additional high-level findings include the following:

- The primary source of participants' program awareness is their contractor.

[1] A common industry standard for evaluation is ±10% precision at the 90% confidence level, meaning if the research were repeated with the same sample size, the result would fall within ±10% of the estimate 90% of the time.

- Satisfaction with the program overall and its components is high among participants and trade allies.
- The contractor assistance was the most valuable program component as rated by participant respondents.
- The program-provided calculators were used by participant and contractor respondents with contractors indicating that the calculators were useful[2].
- Contractors value the program and use the incentives to encourage customers to purchase high efficiency equipment.
- Program application and processes are geared to lighting projects, leading to some confusion.
- The tracking database was occasionally missing phone numbers and email addresses for participants requiring follow-up data requests

2 Participant respondents were not asked to rate the usefulness of the calculators (only contractors were).

1.3 Evaluation Conclusions and Recommendations

Based on evaluation activities and findings, the evaluation team concluded the following and provides several recommendations for program improvement.

1.3.1 Impact

Conclusion 1: The evaluation team's analysis resulted in a 105.4% realization rate (energy) for the DEC NR Custom Program and 105.7% for the DEP NR Custom Program. The strong realization rates indicate that Duke Energy's internal processes for project review, savings estimation, and installation verification are working to produce high quality estimates of project impacts. Reported energy and demand savings could be increased by incorporating interactive factors into ex-ante impact estimates for lighting measures.

Recommendation 1: The evaluation team recommends that Duke continue to operate this program with the current level of rigor. For interior lighting projects, Duke should consider developing and applying deemed interactive factors to quantify the interactive effects between lighting retrofits and their associated HVAC systems.

Conclusion 2: Assumptions used in ex ante energy savings estimates are well-documented, but there are opportunities for improvement on new construction lighting projects and some non-lighting projects.

Recommendation 2: The evaluation team recommends that any adjustments made to baseline assumptions on new construction projects be well-documented within the incentive calculation spreadsheet developed by the program. This will provide better transparency when deviations from a lighting power density approach are used in ex-ante energy savings estimates.

Conclusion 3: The NR Custom Program uses T12 baseline fixture wattages in ex-ante energy savings estimates for applicable linear fluorescent to LED tube retrofit measures. This practice is defensible given the availability of high color rendering index (CRI) replacement lamps; however, peer Demand Side Management (DSM) programs no longer credit energy or demand savings beyond a T8 baseline.

Recommendation 3: It is recommended that the Duke NR Custom Program consider using a T8 equivalent when developing ex-ante energy and demand savings estimates for T12 to LED tube retrofit measures.

1.3.2 Process

Conclusion 1: The program is operating as intended and has resulted in high satisfaction across participant and contractor respondents. The most common source of program awareness for customers was their contractor, which is consistent with how the program is marketed.

Technical assistance from the contractor was the highest rated aspect of the program, which highlights the contractors' technical competence and the significant role contractors play in the program. Many customer respondents also commented on how their contractors are knowledgeable which made the entire process easy.

Recommendation 1: Continue program outreach efforts and continue to engage contractors in the program and keep them informed of the program and any future changes to increase awareness among customers and encourage the installation of program-qualifying equipment.

Conclusion 2: As part of the application process, an appropriate worksheet or calculator must be submitted. Duke Energy provides access to two types of calculators: Classic Custom and Custom-to-go. Over two-thirds of contractors and one-third of participant respondents indicated they have used Duke's tools to calculate savings. Contractors who used Duke Energy's provided tools rated their usefulness high. That said, contractors who install non-lighting equipment were more likely to use their own calculators or rated the usefulness of Duke's calculators low.

Recommendation 2a: Continue to keep the Custom-to-Go and Classic Custom calculators updated and available to customers and contractors who need a tool to estimate savings.
Recommendation 2b: Consider reviewing the calculators for non-lighting equipment to ensure they perform as expected and do not require lighting-specific information.

Conclusion 3: Almost all customer and contractor respondents found the time to review applications acceptable.

Program participants were generally satisfied with the review process. Most contractors were also satisfied with the process. However, five contractors felt the preapproval process could be improved. Specifically, three indicated that the non-lighting preapproval process can take significantly longer than lighting preapproval. As different technologies come into the market, it will be important to ensure customers are getting feedback in a timely manner.

Recommendation 3: Monitor the time it takes to review applications for preapproval to ensure the time does not exceed six weeks.

Conclusion 4: Most participant respondents reported high satisfaction with the application process, although five respondents indicated the program could benefit from simplifying the application. A few contractors also recommended the application is geared towards lighting projects, leading to some confusion in what information is needed.

Recommendation 4: Streamline the application paperwork to minimize customer burden and collect only the information relevant to specific equipment types.

2 Introduction and Program Description

2.1 Program Description

Duke Energy's Non-Residential Smart $aver® Custom Incentives program (NR Custom) offers financial assistance to qualifying commercial, industrial and institutional customers (that have not opted-out) in the Duke Energy Carolinas (DEC) and Duke Energy Progress (DEP) service territories to enhance their ability to adopt and install cost-effective electrical energy efficiency projects.

The program is designed to meet the needs of each Company's non-residential customers with electrical energy saving projects involving more complicated or alternative technologies, or those measures not covered by the non-residential Smart $aver Prescriptive Program. The intent of the program is to encourage the implementation of energy efficiency projects that would not otherwise be completed without the company's technical or financial assistance. The program requires pre-approval prior to the project implementation. Proposed energy efficiency measures may be eligible for customer incentives if they clearly reduce electrical consumption and/or demand.

The two approaches for applying for incentives for this program are Classic Custom and Custom-to-Go. The difference between the two approaches focuses on the method by which energy savings are calculated. The documents required as part of the application process vary slightly.

The custom application forms are located on the company's website under the Smart $aver® Incentives (Business and Large Business tabs). The application forms are offered in Word (doc) and Adobe (pdf) format with the designated worksheet in Excel format for projects saving more than 700,000 kWh annually. Customers can utilize provided calculation tools (Custom-to-Go) for energy management system (EMS) projects savings less than 700,000 kWh annually or request worksheets in another format if preferred. Customers or their vendors submit the forms with supporting documentation. Forms are designed for multiple projects and multiple locations. Custom incentive application (doc or pdf) is submitted with one or more of the following worksheets:

- Classic Custom approach (> 700,000 kWh or no applicable Custom-to-Go calculator)
  - Lighting worksheet (Excel)
  - Variable Speed Drive (VFD) worksheet (Excel)
  - Compressed Air worksheet (Excel)
  - Energy Management System (EMS) worksheet (Excel)
  - General worksheet (Excel), to be used for projects not addressed by or not easily submitted using one of the other worksheets

- Custom-to-Go Calculators (< 700,000 kWh and applicable Custom-to-Go calculator)
  - Energy Management Systems
  - Process VFDs
  - Compressed Air

The Companies contract with Alternative Energy Systems Consulting (AESC) to perform technical review of applications. The Weidt Group is an energy modeling and outreach consultant that provides energy consulting services and whole-building energy modeling to facilitate and guide the process designing energy efficiency measures into new buildings and major renovations. All other analysis is performed internally at Duke Energy, including DSMore runs for every custom measure that is recorded by the program.

2.1.1 Participation Summary – DEC

Table 2-1 summarizes program participation and reported energy savings for the full evaluation period of January 2016 through December 2017 for the DEC service territory. There were a total of 334 projects completed during the evaluation period. For the purposes of this report a project is defined as a unique enrollment ID. These 334 projects collectively accounted for a total of 944 unique database line items. Database line items typically represent single-measure projects or an individual measure implemented as part of a multi-measure project. There are also a few instances where a line item in the tracking database represents a unique project site where a common scope of work was completed as part of a larger portfolio of sites (i.e. Adams Outdoor Advertising). Table 2-2 outlines the reported summer and winter demand (kW) for the evaluation period for the DEC service territory.

Table 2-1 DEC NR Custom Program Participation and Energy Summary

Category & Strata		Database Line Items		Enrollment IDs		Reported Savings	
		Custom-To-Go	Classic	Custom-To-Go	Classic	Custom-To-Go Gross MWh	Classic Custom Gross MWh
Lighting	Large (>1,000 MWh)	-	206	-	18	-	35,492
	Small (<1,000 MWh)	336	311	144	117	16,471	18,030
Non-lighting	Large (>2,000 MWh)	-	5	-	5	-	21,662
	Small (<2,000 MWh)	9	77	8	42	1,881	20,764
Total		**345**	**599**	**152**	**182**	**18,352**	**95,947**
Grand Total		**944**		**334**		**114,299**	

Table 2-2 DEC NR Custom Program Demand Savings Summary

Category & Strata		Enrollment IDs		Summer Demand		Winter Demand	
		Custom-To-Go	Classic	Custom-To-Go Gross Summer kW	Classic Custom Gross Summer kW	Custom-To-Go Gross Winter kW	Classic Custom Gross Winter kW
Lighting	Large (>1,000 MWh)	-	18	-	4,854	-	4,398
	Small (<1,000 MWh)	144	117	3,062	3,089	2,401	2,818
Non-lighting	Large (>2,000 MWh)	-	5	-	2,107	-	2,559
	Small (<2,000 MWh)	8	42	110	3,167	138	2,795
Total		**152**	**182**	**3,172**	**13,217**	**2,539**	**12,569**
Grand Total		**334**		**16,389**		**15,109**	

Figure 2-1, Figure 2-2, and Figure 2-3 summarize the distribution of reported energy (kWh) and demand (kW) savings at the program level by technology category for the DEC service territory.

Figure 2-1 Distribution of Reported Energy Savings from NR Custom DEC Program Projects by Technology

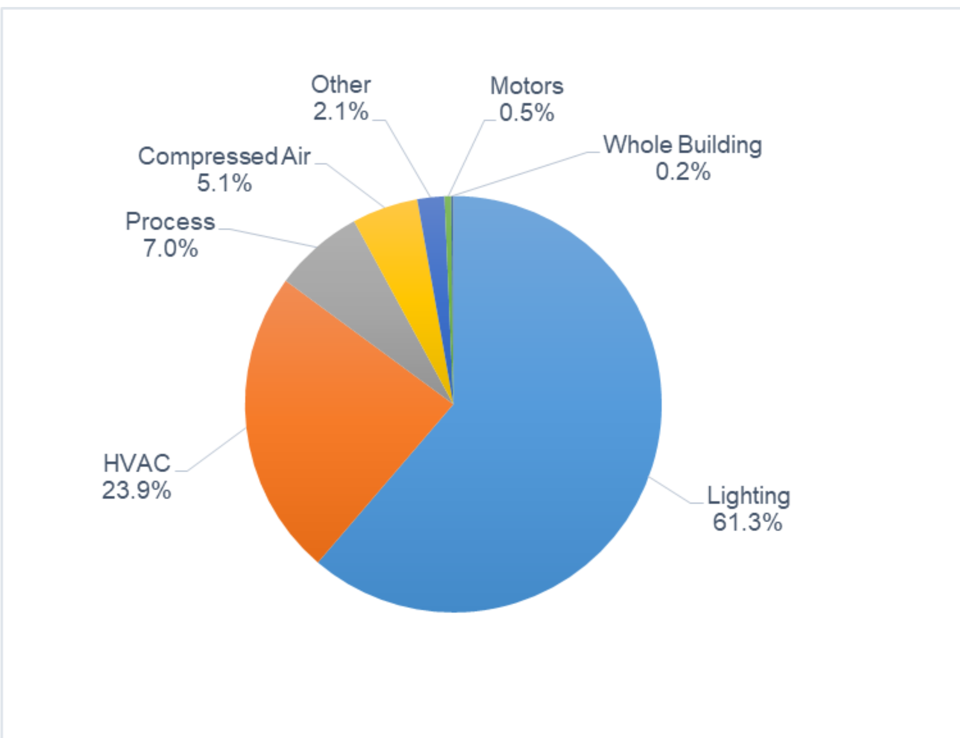


Figure 2-2 Distribution of Reported Summer Demand Savings from DEC NR Custom Projects by Technology

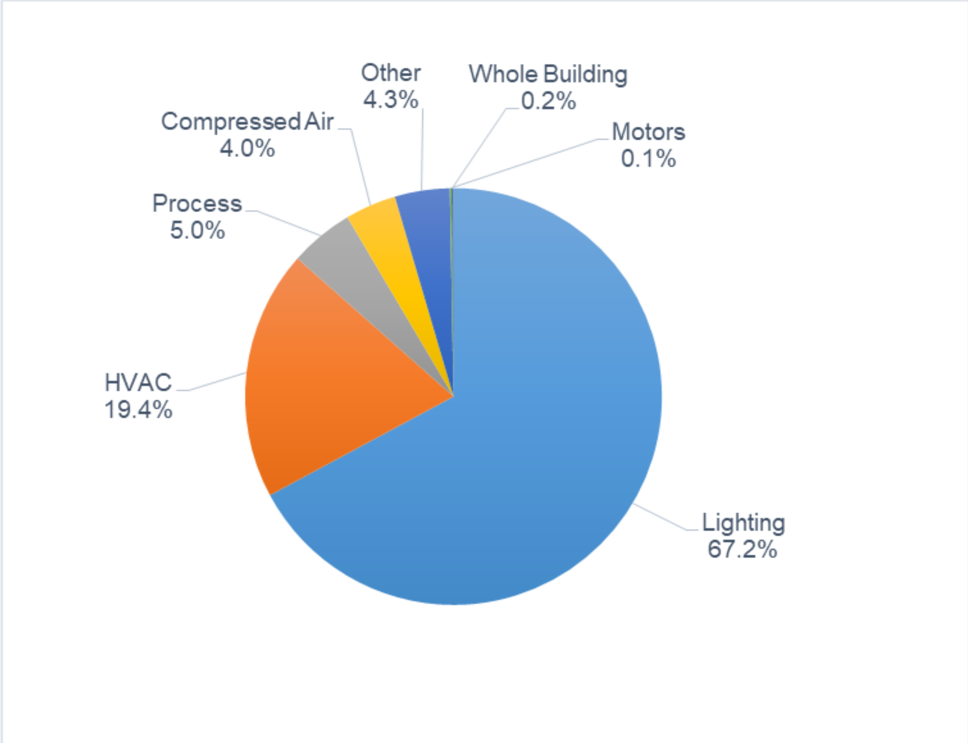
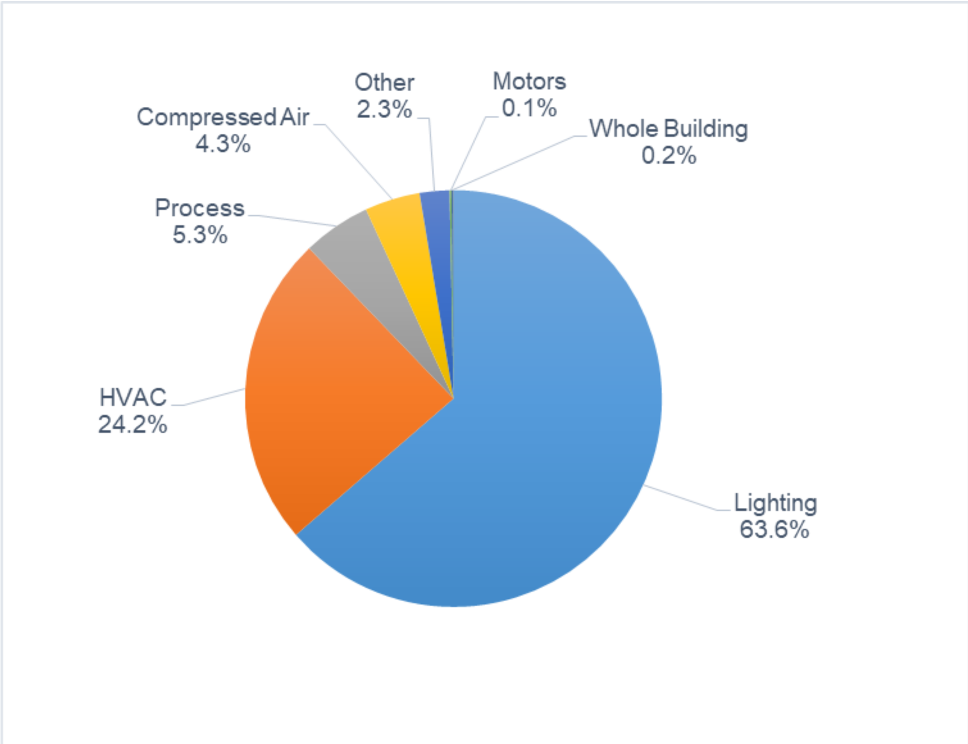


Figure 2-3 Distribution of Reported Winter Demand Savings (kW) from DEC NR Custom Projects by Technology



2.1.2 Participation Summary – DEP

Table 2-3 summarizes program participation and reported energy savings for the full evaluation period of January 2016 through December 2017. There were a total of 117 projects completed during the evaluation period. These 117 projects collectively accounted for a total of 276 unique database line items. Table 2-4 outlines the reported summer and winter demand (kW) for the evaluation period for the DEP service territory.

Table 2-3 DEP NR Custom Program Participation and Energy Summary

Category & Strata		Database Line Items		Enrollment IDs		Reported Savings	
		Custom-To-Go	Classic	Custom-To-Go	Classic	Custom-To-Go Gross MWh	Classic Custom Gross MWh
Lighting	Large (>250 MWh)	15	55	3	6	835	2,454
	Small (<250 MWh)	83	65	51	31	2,071	1,124
Non-lighting	Large (>500 MWh)	3	7	1	4	541	5,438
	Small (<500 MWh)	5	43	5	16	781	2,896
Total		**106**	**170**	**60**	**57**	**4,228**	**11,912**
Grand Total		**276**		**117**		**16,140**	

Table 2-4 DEP NR Custom Program Demand Savings Summary

Category & Strata		Enrollment IDs		Reported Summer Demand (kW) Savings		Reported Winter Demand (kW) Savings	
		Custom-To-Go	Classic	Custom-To-Go	Classic	Custom-To-Go	Classic
Lighting	Large (>250 MWh)	3	6	237	237	237	262
	Small (<250 MWh)	51	31	350	166	236	143
Non-lighting	Large (>500 MWh)	1	4	41	490	71	561
	Small (<500 MWh)	5	16	94	294	38	475
Total		**60**	**57**	**722**	**1,188**	**581**	**1,441**
Grand Total		**117**		**1,910**		**2,022**	

Figure 2-4, Figure 2-5, and Figure 2-6 summarize the distribution of reported energy (kWh) and demand (kW) savings at the program level by technology category for the DEP service territory.

Figure 2-4 Distribution of Reported Energy Savings from DEP NR Custom Program Projects by Technology

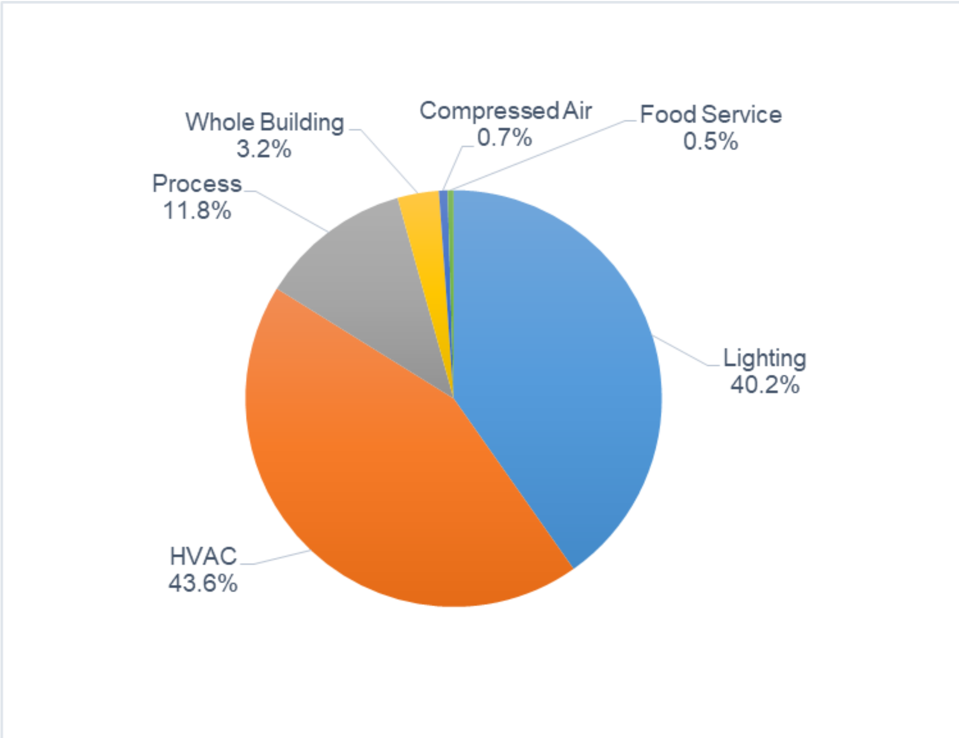


Figure 2-5 Distribution of Reported Summer Demand Savings from DEP NR Custom Projects by Technology

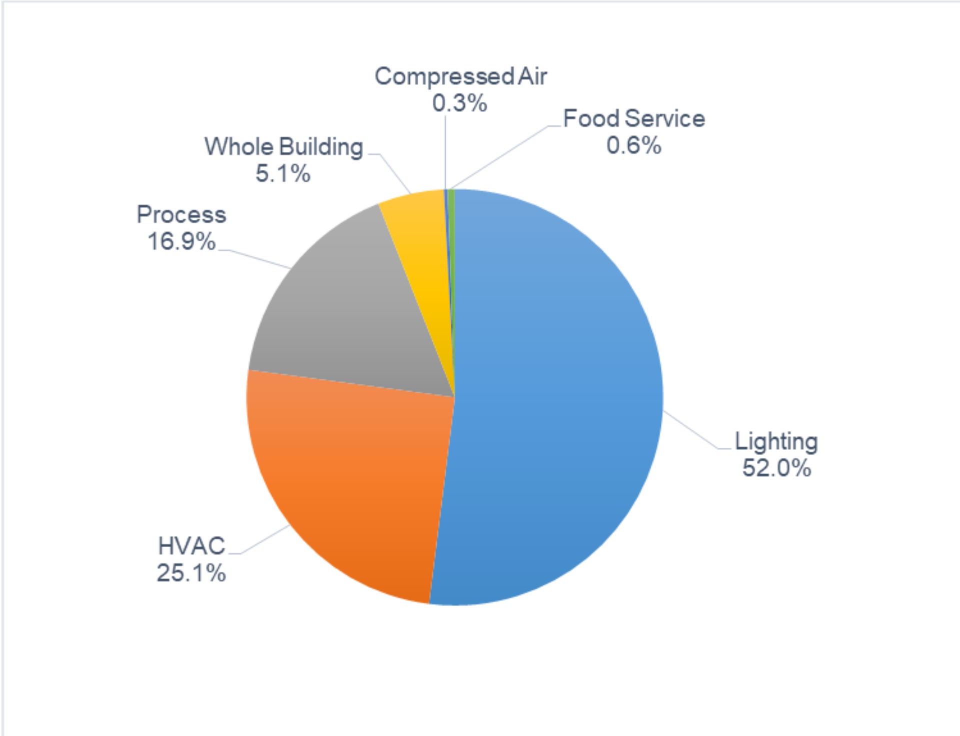
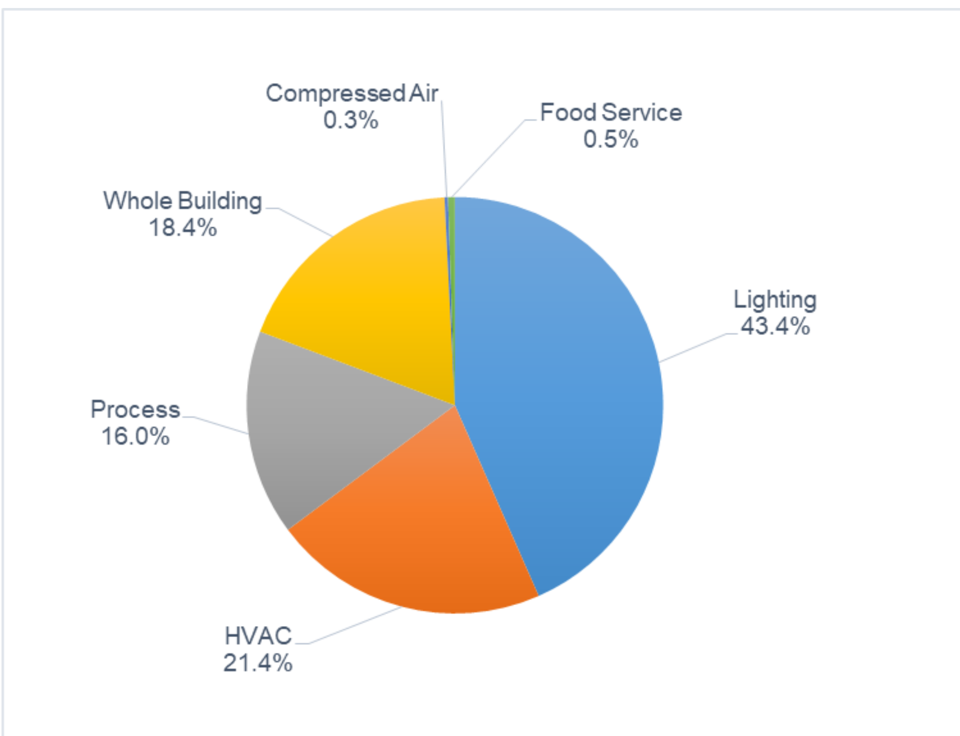


Figure 2-6 Distribution of Reported Winter Demand Savings (kW) from DEP NR Custom Projects by Technology



3 Key Research Objectives

3.1 Gross Impact

The impact evaluation processes followed standard industry protocols and definitions, where applicable, and include the Department of Energy Uniform Methods Protocol[3], 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 measures and equipment being implemented in customer facilities attributed to the NR Custom Program in the DEC service territory, the DEP service territory, and for both territories combined
- Assess the rate of free riders from customer and contractor perspectives and determine spillover effects; and,
- Consider and verify measure installation vintage aligns with measure baseline definitions, i.e. early replacement, burnout on failure, new construction etc.

3.2 Net Impact

The goal of the net impact evaluation was to estimate the overall energy impacts that are attributable to the program. This estimate comprises two components: free-ridership and spillover.

Free-ridership is the estimate of what proportion of the program's savings would have happened in the absence of the program. Free-ridership takes into account the customers' plans prior to engaging the program and the various influences the program can have on the customer such as incentives and other interactions with the program staff, contractors, and marketing materials.

Spillover estimates additional energy savings for efficiency projects that were completed without receiving a program incentive, but were influenced by the program in some other way.

Net program results are calculated through a net-to-gross ratio, as follows:

$$\text{Net-to-gross} = (1 - \text{Free-ridership \%}) + \text{Spillover \%}$$

$$\text{Net Savings} = \text{Net-to-gross (\%)} * \text{Gross Verified Savings}$$

A single NTG value was determined jointly for the DEC and DEP jurisdictions.

[3] The DOE's Uniform Methods Project for Determining Energy Efficiency Program Savings can be found at http://www1.eere.energy.gov/office_eere/de_ump.html.

3.3 Process

The evaluation team collected data from a variety of sources to address the researchable questions identified at the beginning of the study. Because the program is delivered the same in both DEC and DEP territories, the process evaluation reports on the overall program. Table 3-1 contains the list of research objectives and the data sources used to investigate each one.

Table 3-1 Process Evaluation Research Questions and Activities

Preliminary Research Questions	Document Review	Interviews with Key Contacts	Participant Survey	Trade Ally Survey
How is the program promoted? How important are account representatives? Are contractors or vendors identifying potential projects?	✓	✓	✓	✓
Understand participant experience. What steps are involved in identifying and scoping projects and obtaining pre-approval? What issues emerge during the process? How are these addressed?		✓	✓	✓
Why do potential projects drop out? Are there opportunities to make the process simpler or more streamlined while maintaining robust quality control (QC)?		✓		✓
Is the uptake of custom vs. custom-to-go projects as expected? How do the projects and/or the customer experience differ between the two participation paths?	✓	✓	✓	✓
What is the customer's decision-making process regarding energy efficiency upgrades or equipment? How influential were various aspects of the program in their decision? How influential was the contractor they worked with?	✓		✓	✓

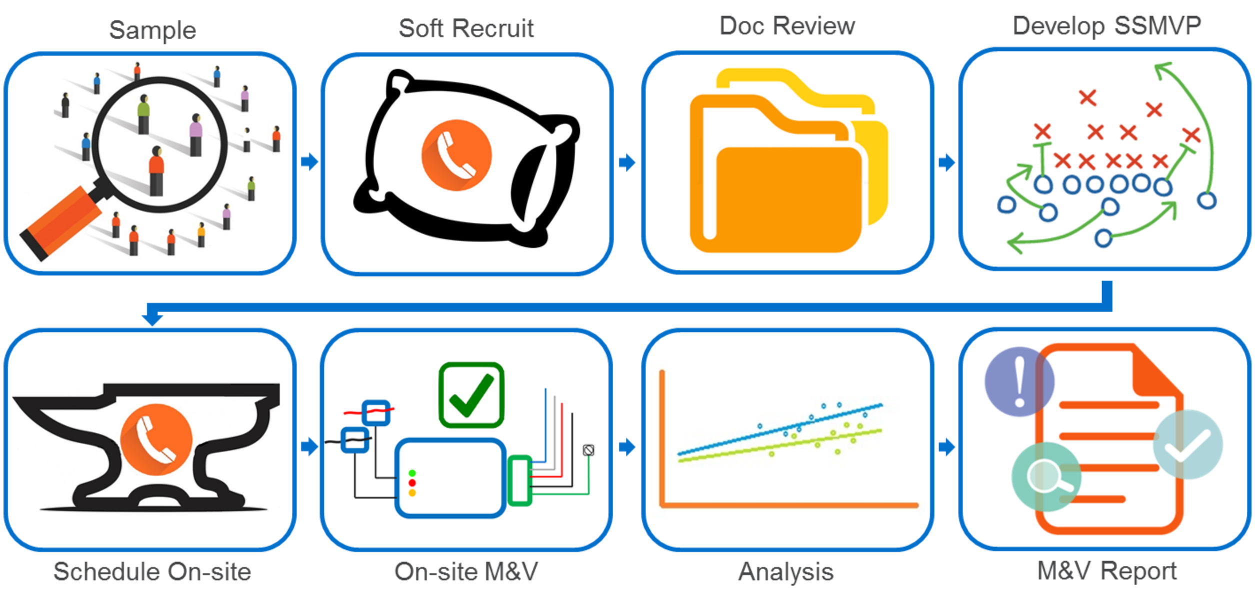
4 Impact Evaluation

4.1 Approach

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 the evaluation, measurement, and verification (EM&V) activities, and to meet the goals for this evaluation, include on-site inspections and measurements, utility billing analysis, telephone surveys, documentation review, best practice review, and interviews with implementation staff, trade allies, program participants, and general business customers.

The evaluation team's impact analysis focused on the energy and demand savings attributable to the NR Custom Program for the period of January 2016 through December 2017. A variety of techniques were used to develop independent assessments of gross and net energy savings for each sampled project. All sampled custom projects received both a desk review and on-site verification. Figure 4-1 provides a high-level process flow diagram of all impact evaluation activities and brief summary of each step in the process is provided below.

Figure 4-1 Process Flow Diagram of Impact Evaluation Activities



The evaluation team verified energy and demand savings attributable to the program by conducting the following impact evaluation activities:

- **Sample:** Conduct review of NR Custom Program participant database on a quarterly basis, identify all new projects, and draw representative sample of projects for on-site M&V.
- **Soft Recruit:** Attempt to reach all sampled participants by phone or email, prior to conducting an in-depth review of project documentation or developing a site specific

measurement and verification plan (SSMVP), to inform participants of the ongoing evaluation and request permission to conduct an on-site inspection. Nothing would be formally scheduled during this call.

- **Document (Doc) Review:** Request, receive, and review all project documentation available for those sites successfully recruited.
- **Develop SSMVP:** Develop document providing general overview of the project, reported benefits and costs, proposed level of rigor, M&V equipment, and key data to be gathered in the field.
- **Schedule On-site:** Schedule on-site inspection with participant after Duke team provides comments and approves SSMVP. The purpose of the Duke team reviews were to verify that all measures were included in the plan, reported energy and demand savings were accurate, and proposed M&V approaches were appropriate.
- **On-site M&V:** Verify measure implementation, deploy metering equipment, interview key project personnel, and obtain trend data from existing BAS/EMS systems.
- **Analysis:** Estimate gross verified energy and demand savings for sampled measures and projects using data collected from on-site measurement and verification.
- **M&V Report:** Compare gross-verified energy and demand savings to program-reported values to determine project-level realization rates and summarize findings for each sampled site in M&V report.
- **Gross Verified Savings:** Summarize project-level results to stratum-level for determining program-level realization rates and verified gross energy and demand savings.
- **Net Verified Savings:** Apply attribution survey data to estimate net-to-gross ratios and net-verified savings at the program level.

4.2 Database Review

The program participation database informed many of the evaluation activities including sample design, project-level savings review, and estimating program-level gross verified energy and demand savings. Starting in 2016 participation database extracts were requested and received quarterly in real time with the program implementation. Data included customer contact, measures, and savings information. A random sample of projects was then drawn from the population of new projects and the the evaluation team would receive site contact information and sufficient project details so as to initiate preliminary “soft-recruiting” efforts.

Once a participant was successfully recruited into the evaluation, the impact team requested detailed project documentation for each project and conducted an in-depth review of all information. While reviewing project documentation, the evaluation team would verify whether parameters such as reported energy and demand savings, energy conservation measure (ECM) quantities, and measure descriptions matched those indicated in the tracking database. Any identified discrepancies between the two sources were then identified in the SSMVP and later resolved based on feedback provided by the Duke program team.

At the conclusion of the project, the evaluation team requested a full database extract for the entire evaluation period (January 2016 through December 2017) for comparison to the compiled database maintained by the evaluation team throughout the course of the evaluation for reconciliation. There were a number of inconsistencies in the database revealed through the reconciliation. Common inconsistencies included:

- Lighting projects where ECM Quantity was indicated as "1" in the tracking database for non one-for-one retrofit measures or measures involving multiple post installation fixture types, but a common baseline fixture type. The actual quantity was usually determined from project documents or the "Measure Name" field within the tracking database itself.
- Inaccurate phone numbers or phone numbers listed as 999-9999, as a generic default. This issue was generally resolved through follow-up information requests.
- No email address for site contact. Also generally resolved through follow-up information requests if participant could not be reached by phone.

The inconsistencies identified do not have a direct impact on overall program performance, but it is recommended that these issues be addressed by the Duke Team internally so as to improve the overall evaluability of the program and eliminate lost effort chasing and correcting them.

4.3 Sampling and Estimation

The gross and net verified energy and demand savings estimates presented in this report from the Duke Energy Smart $aver Non-residential Custom Program 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 business. 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. By limiting resource-intensive data collection and analysis to a random sample of all projects, more attention can be devoted to each project surveyed.

For the NR Custom impact evaluation 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. The evaluation team used a ratio estimation technique for this evaluation. This technique assumes that the ratio of the sum of the verified savings estimates to the sum of the reported savings estimates within the sample is representative of the program as a whole. This ratio is referred to as the realization rate, or ratio estimator, and is calculated in .

Equation 1.

Equation 1: Realization Rate

$$Realization\ Rate = \frac{\sum_i^n Verified\ Savings}{\sum_i^n Reported\ Savings}$$

Where *n* is the number of projects in the evaluation sample. The realization rate is then applied to the claimed savings of each project in the population to calculate gross verified savings.

Stratification

The evaluation team used sample stratification with ratio estimation techniques for the NR Custom Program in both the DEC and DEP service territories. Stratification is a departure from simple random sampling (SRS), 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 took great care to ensure that each sampling unit within the population belonged to one (and only one) stratum. In a stratified sample design, the probability of selection is different between strata and this difference must be accounted for when calculating results. The inverse of the selection probability is referred to as the *case weight* and is used in estimation of impacts when stratified random samples are utilized. Consider the following simplified example in Table 4-1 based on a fictional program with two measures; LED lighting and variable frequency drives (VFDs).

Table 4-1 Case Weights Example

Measure	Population Size	Sample Size	Case Weight
LED lamps	15,000	30	500
VFDs	6,000	30	200

Because LED lighting measures are sampled at a higher rate (1-in-200) than VFDs (1-in-500), each sample point carries less weight in the program results than an individual VFD sample point. In general, the evaluation team designed samples so that low case weights were reserved for large and complex measures such as the L-Large and NL-Large strata.

The evaluation team felt that stratification was advantageous and utilized it in the sample design for a variety of reasons:

- 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 and smaller total sample sizes.
- It enabled the evaluation team to ensure that a minimum number of units within a particular stratum were verified.

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 an error ratio for programs that use ratio estimation.

When ratio estimation is utilized, standard deviations will vary for each project in the population. The error ratio is an expression of this variability and is analogous to the coefficient of variation, $C_{v,}$ for simple random sampling.

Equation 2 provides the formula for estimating error ratio.

Equation 2: Error Ratio

$$Error\ Ratio = \frac{\sum_{i=1}^{N} \sigma_i}{\sum_{i=1}^{N} \mu_i}$$

Equation 3 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 *Error Ratio* term is in the numerator, so required sample size will increase as the level of variability increases.

Equation 3: Required Sample Size

$$n_0 = \left(\frac{z * Error\ Ratio}{D}\right)^2$$

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)*

D = *Desired relative precision*

The sample size formula shown in Equation 3 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, (such as the Duke Energy Indiana NR Custom participant population) 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 3 by the FPC formula shown in Equation 4 will produce the required sample size for a finite population.

Equation 4: 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 5.

Equation 5: 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 6 shows the formula used to calculate the margin of error for a parameter estimate.

Equation 6: Error Bound of the Savings Estimate

$$Error\ Bound = se * (z - statistic)$$

Where:

se = *The standard error of the population parameter of interest (proportion of 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 uncertainty in evaluation findings. The confidence levels and precision values presented in this report are at the 90% confidence level. 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 7:

Equation 7: 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 programs 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 programs with exactly the same reported savings and sampling error in absolute terms, will have very different relative precision values, as shown in Table 4-2.

Table 4-2 Relative Precision Example

Program	Reported kWh	Realization Rate	Error Bound (kWh)	Verified kWh	Relative Precision (90%)
Program #1	4,000,000	0.5	400,000	2,000,000	± 20%
Program #2	4,000,000	1.0	400,000	4,000,000	± 10%

In many cases a 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 8 to estimate the error bound for the program as a whole from the stratum-level error bounds.

Equation 8: Combining Error Bounds across Strata

$$Error\ Bound_{Program} = \sqrt{Error\ Bound^2_{Stratum1} + Error\ Bound^2_{Stratum2} + Error\ Bound^2_{Stratum3}}$$

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.

4.4 Targeted and Achieved Sampling

4.4.1 DEC Sampling

Table 4-3 presents the final achieved sample size for the DEC service territory based on data collection activity (verification and M&V) and the program delivery stream method (Classic versus Custom-to-Go). Impact sample sizes targeted a 90/10 confidence precision based on the expected participation counts for the evaluation period. Samples were selected on an on-going basis across the evaluation period (January 2016 - December 2017) to help ensure proper representation of measure types and program approaches as the program progressed.

Table 4-3 DEC NR Custom Sampling Plan Custom-to-Go vs. Custom Classic - Achieved

Utility	Data Collection Activity	Custom to Go	Classic	Total
Duke Energy Carolinas	Share of Participation	24%	76%	100%
	Site Visits – On-site Measurement	10	28	38
	Site Visits – On-site Verification	4	17	21
	Total	**14**	**45**	**59**

The evaluation team stratified the participant population by technology category (lighting vs. non-lighting) and relative magnitude of savings (kWh) to ensure that the evaluated sample represented the population make-up of the total program-level savings and in order to achieve higher statistical precision by reducing the variability within the sample. Our stratification approach and achieved sample sizes are summarized in Table 4-4.

Table 4-4 DEC NR Custom Stratified Sampling - Achieved

Strata	Population	Pop Reported Savings (kWh)	Achieved Sample Size
L-Large (>1,000 MWh)	18	35,491,559	5
L-Small (<1,000 MWh)	261	34,500,751	27
NL-Large (>2,000 MWh)	5	21,661,701	2
NL-Small (<2,000 MWh)	50	22,645,465	25
Total	**334**	**114,299,476**	**59**

The evaluation team used a savings threshold of 1,000 MWh as the threshold for large Lighting (L) projects and 2,000 mWh for large Non-Lighting (NL) projects. The thresholds were chosen based upon an analysis of the distribution of participant savings.

4.4.2 DEP Sampling

Table 4-5 presents the final achieved sample size for the DEP service territory. The evaluation team stratified the DEP participant population by technology category (lighting vs. non-lighting) and relative magnitude of savings (kWh). The evaluation team used a savings threshold of 250 MWh for large Lighting (L) projects and 500 MWh for large Non-Lighting (NL) projects. Our stratification approach and achieved sample sizes are summarized in Table 4-6.

Table 4-5 DEP NR Custom Sampling Plan Custom-to-Go vs. Custom Classic - Achieved

Utility	Data Collection Activity	Custom to Go	Classic	Total
Duke Energy Progress	Share of Participation	44%	56%	100%
	Site Visits – On-site Measurement	11	8	19
	Site Visits – On-site Verification	9	5	14
	Total	**20**	**13**	**33**

Table 4-6 DEP NR Custom Stratified Sampling - Achieved

Strata	Population	Pop Reported Savings (kWh)	Achieved Sample Size
L-Large (>250 MWh)	9	3,289,490	4
L-Small (<250 MWh)	82	3,195,020	19
NL-Large (>500 MWh)	5	5,979,116	3
NL-Small (<500 MWh)	21	3,676,915	7
Total	**117**	**16,140,541**	**33**

4.5 Data Collection

As outlined in prior sections, the gross impact evaluation process began with a thorough review of project documentation. This information was provided upon formal request. Documents commonly provided by the program team include:

- Smart $aver Incentive Calculation workbooks
- DSMore Summary workbooks
- Custom Incentive Application Forms
- Contractor Proposals
- Detailed project narratives
- Product specifications and invoices
- Customer utility data (billing history)
- Incentive payment request forms
- Email correspondence between members of the program management team and participants
- Other documents commonly provided on lighting project include:
  - Smart $aver Custom Incentive Program Lighting Calculators
  - Specification sheets for retrofit lighting systems
- Other documents commonly provided for non-lighting projects include:
  - Customer submitted energy and demand savings calculations
  - Detailed reports developed by third-party engineering consultants
  - Building energy simulation model output files

After reviewing all program-supplied project documentation the evaluation team engineer assigned to each project then developed a site-specific measurement and verification plan (SSMVP) for each unique premise. These were developed in order to create a standardized, rigorous process for the verification of project claims while on-site. Each SSMVP was specifically tailored to verify the equipment that was installed and measures that were implemented per the provided project documentation. The SSMVP also identified baseline assumptions for verification with on-site personnel in order to validate ex-ante, forecasted savings estimates.

Each SSMVP also identified the specific parameters to be gathered in the field for each measure. These plans followed guidelines set forth in multiple Department of Energy Uniform Methods Project (DOE UMP) protocols including:

- Chapter 2: Commercial and Industrial Lighting Evaluation Protocol
- Chapter 14: Chiller Evaluation Protocol
- Chapter 18: Variable Frequency Drive Evaluation Protocol

- Chapter 19: HVAC Controls (DDC/EMS/BAS) Evaluation Protocol
- Chapter 22: Compressed Air Evaluation Protocol
- Chapter 8: Whole-Building Retrofit with Consumption Data Analysis Evaluation Protocol

The plans also identify a preferred and one or two alternate analysis approaches (level of rigor) along with the critical data to be gathered for each. Regardless of the method ultimately selected for the savings analysis, field engineers were instructed to gather the data necessary for all methods identified in the SSMVP. Table 4-7 provides a few examples of the data points typically gathered for several of the more commonly-encountered energy conservation measures (ECMs).

Once completed each SSMVP was then submitted to the Duke EM&V Team for review and approval. Upon approval from Duke an on-site inspection was then scheduled with the participant.

4.5.1 On-site Verification Activities

During on-site verification, field engineers would verify that measures were appropriately implemented in accordance with the SSMVP developed for the site. Field engineers would also deploy metering equipment for short-term monitoring of parameters such as lighting hours of use, energy consumption (amps or kW), and loads. They also requested copies of equipment specifications and sequences of operation, as appropriate. Any available historic trend data (when available) was also obtained from existing HVAC control and central plant sequencing control systems.

Table 4-7 Key Data Points Gathered for Commonly Encountered ECMs

Measure Name	Baseline or Retrofit
Interior Lighting Retrofits	Quantity of existing fixtures Fixture type of existing fixtures Quantity of retrofit fixtures Fixture type of retrofit fixtures Existing fixture controls, if any New fixture controls, if any Typical schedule and hours of operation Space temperature Type of heating and cooling equipment/specifications
HVAC Control/EMS	Determine baseline setpoints and schedules through customer interviews Determine post-retrofit setpoints and schedules through central BAS Obtain any available trend data Verify occupancy and equipment schedules Gather nameplate information from primary heating and cooling systems
Variable Speed Drive on Pump	Determine baseline method of pump control Determine conditions that dictate the speed of the VSD Determine whether loads modulate or are fairly constant If loads modulate, determine load profile (% load bins) Nameplate information from pump Nameplate information from VSD Gather any available trend data Deploy metering equipment capable of measuring true polyphase RMS power Perform spot power measurements (kW) of pump while running under normal operating conditions
VSD Air Compressor	Determine baseline method of control Gather information on baseline air compressor system (kW/CFM, hp, CFM output, system type, etc.) Determine how loads vary daily, weekly, seasonally, annually for VSD compressor Nameplate information from new air compressor Gather any operational parameters displayed on control panels Gather any available trend data from central controls system Determine whether compressor serves central plant with multiple compressors or is stand-alone. If part of multi-compressor plant determine role and sequences of operation (primary, secondary, trim, etc.) Deploy metering equipment capable of measure true polyphase RMS power

4.6 Level of Rigor

A variety of analysis approaches were utilized for the impact evaluation. The approach applied was decided based upon the methods used by the participant, trade ally, or program in generating the ex-ante[4] savings estimates, the availability of information, and the extent of interactive effects. An overview of each analysis approach applied is provided in Sections 4.6.1 through 4.6.3.

4.6.1 Basic Rigor: Simple Engineer Model (SEM) with On-Site Measurement

Consistent with IPMVP Option A (Partially Measured Retrofit Isolation), this approach was used for the majority of lighting, custom process, and compressed air measures. This method uses engineering calculations, along with site measurements of a limited number of important parameters, to verify the savings resulting from specific measures. This was the most prevalent level of rigor applied for this evaluation.

An overview of the key inputs and algorithms used to develop energy and demand savings estimates for lighting measures and compressed air measures is provided in Section 4.6.1.1 and 4.6.1.2.

4.6.1.1 Lighting Measures

Equation 9 and Equation 10 were used to calculate energy and demand savings for all lighting retrofit measures.

Equation 9: Lighting Demand Savings

$$\Delta kW = (Qty_{BASE} \times Watts_{BASE} - Qty_{EE} \times Watts_{EE}) / 1000 \times WHF_d$$

Equation 10: Lighting Annual Energy Savings

$$\Delta kWh/yr = (Qty_{BASE} \times Watts_{BASE} - Qty_{EE} \times Watts_{EE}) / 1000 \times HoursWk \times Weeks \times WHF_e$$

Where:

Qty_{BASE}	=	*Quantity of baseline fixtures*
$Watts_{BASE}$	=	*Watts of baseline fixture (based on the specified existing fixture type) (Watts)*
Qty_{EE}	=	*Quantity of energy efficient fixtures*
$Watts_{EE}$	=	*Watts of energy efficient fixture (based on the specified installed fixture type) (Watts)*
HoursWk	=	*Weekly hours of equipment operation (hrs/week)*
Weeks	=	*Weeks per year of equipment operation (weeks/year)*

[4] The term “ex ante” represents the forecasted energy and demand savings rather than the actual results.

WHF_d	=	*Waste heat factor for demand to account for cooling savings from efficient lighting**
WHF_e	=	*Waste heat factor for energy to account for cooling savings from efficient lighting**
1000	=	*Conversion: 1000 Watts per kW*

Fixture Wattages

The pre-existing fixture wattages were quoted from industry standards and commercial literature for the applicable type of fixtures.

The installed light fixture wattages were taken from the manufacturer's cut sheets.

Hours of Use

Nexant verified hours of use assumptions by deploying lighting loggers. The lighting operating hours may exceed the facility's posted hours of business.

4.6.1.2 Compressed Air Measures

Energy use reduction for all compressor projects can be calculated by the difference between the energy consumed in the baseline operation minus the energy consumed in the post-retrofit operation. Generally, information is required for compressor capacity in both the baseline and post-retrofit scenarios. Appropriate adjustments are made to ensure the flow profile is equivalent between pre- and post-retrofit conditions unless demand improvements have been made that result in a change in the flow profile. Compressor power at full load can be calculated using Equation 11 and Equation 12.

Equation 11: Compressor Power at Full Load (No VSD)

$$\text{Full Load } kW_{rated} = \frac{(\text{Compressor hp}) \times LF_{rated} \times (0.746\ kW/hp)}{(\eta_{motor})}$$

Equation 12: Compressor Power at Full Load (w/ VSD)

$$\text{Full Load } kW_{rated} = \frac{(\text{Comp hp}) \times LF_{rated} \times (0.746\ kW/hp)}{(\eta_{motor}) \times (\eta_{VSD})}$$

Where:

Comp hp	=	*compressor horsepower, nominal rating of the prime mover (motor)*
0.746	=	*horsepower to kW conversion factor*
η_{moto}	=	*motor efficiency (%)*
η_{VSD}	=	*variable-speed drive efficiency (%)*
LF_{rated}	=	*load factor of compressor at full load (typically 1.0 to 1.2)*

The above methods for determining the instantaneous demand of an air compressor at a given load is then repeated for many bins of hour-CFM operation. This is commonly referred to as a CFM demand profile. A demand profile is developed to provide accurate estimates of annual energy consumption. A demand profile typically consists of a CFM-bin hour table summarizing hours of usage under all common loading conditions throughout a given year.

The annual CFM profile is used to determine base case and proposed case energy use. For both, compressor electricity demand for each CFM-bin is determined from actual metering data, spot power measurements, historical trend data or CFM-to-kW lookup tables.

The difference in energy consumption between an air compressor operating in idling mode and being physically shut down can be significant depending on the base case and post-retrofit case methods of system control. For example, a rotary screw compressor with inlet valve modulation (w/ blowdown) controls will draw 26% of full-load power (kW) when operating in idling mode; whereas a VSD-controlled system (w/stopping) has zero load for the same bin-hours. Table 4-8 shows the average percent power versus percent capacity for rotary screw compressors with various control methods[5].

Table 4-8 Average Percent Power versus Percent Capacity for Rotary Screw Compressors with Various Control Methods

	% Power							
% Capacity	On/Off Control	Load/Unload (1 gal/CFM)	Load/Unload (10 gal/CFM)	Inlet Valve Modulation (w/o Blowdown)	Inlet Valve Modulation (w/ Blowdown)	Variable Displacement	VSD w/Unloading	VSD w/Stopping
0%	0%	27%	27%	71%	26%	25%	12%	0%
10%	10%	32%	35%	74%	40%	34%	20%	12%
20%	20%	63%	42%	76%	54%	44%	28%	24%
30%	30%	74%	52%	79%	62%	52%	36%	33%
40%	40%	81%	60%	82%	82%	61%	45%	41%
50%	50%	87%	68%	86%	86%	63%	53%	53%
60%	60%	92%	76%	88%	88%	69%	60%	60%
70%	70%	95%	83%	92%	92%	77%	71%	71%
80%	80%	98%	89%	94%	94%	85%	80%	80%
90%	90%	100%	96%	97%	97%	91%	89%	89%
100%	100%	100%	100%	100%	100%	100%	100%	100%

[5] Source: Department of Energy Uniform Methods Project: Chapter 22: Compressed Air Evaluation Protocol

The energy consumption for each CFM-bin is determined from the product of the average compressor demand and the number of hours in each bin (Equation 13). The sum of the kWh bin values gives the annual consumption (Equation 14).

Equation 13: Energy Consumption of CFM-bin

$$\Delta kWh_{bin1} = (Base\ kW_{operating\_bin1} - Post\ kW_{operating\_bin1}) \times CFM\text{-}bin\ 1\ Hours$$

$$\Delta kWh_{binN} = (Base\ kW_{operating\_binN} - Post\ kW_{operating\_binN}) \times CFM\text{-}bin\ N\ Hours$$

Where:

$Base\ kW_{operating\_bin1}$ = *baseline demand at part-load associated with CFM-bin 1*

$Post\ kW_{operating\_bin1}$ = *post demand at part-load associated with CFM-bin 1*

$Base\ kW_{operating\_binN}$ = *baseline demand at part-load associated with CFM-bin N*

$Post\ kW_{operating\_binN}$ = *post demand at part-load associated with CFM-bin N*

Equation 14: Total Energy Consumption of All CFM-bins

$$Total\ Energy\ Reduction\ (kWh/yr) = \sum_{o\text{-}n} [\ \Delta kWh_{bin1} + \Delta kWh_{bin2} + \ldots + \Delta kWh_{binN}\ ]$$

Where:

ΔkWh_{bin1} = *energy reduction for CFM-bin 1*

ΔkWh_{binN} = *energy reduction for CFM-bin N*

4.6.2 Basic Rigor: Simple Engineer Model (SEM) with On-Site Verification Only

This approach is very similar to SEM with On-site Measurement, but without direct measurement of key parameters. This approach was generally applied to measures that are not conducive to direct measurement such as outdoor lighting or building envelope improvements. This approach was also used in instances where process equipment could not be de-energized for the purposes of deploying metering equipment. The algorithms and inputs described in Section 4.6.1 are still applicable to this approach.

4.6.3 Enhanced Rigor: Billing Analysis with On-Site Verification Only

Consistent with IPMVP Option C (Whole Building), this approach was used for projects involving multiple HVAC control measures with interactive effects, when final ex ante building simulation models could not be obtained from the trade ally. It was also used for large industrial custom process measures involving equipment that could not be de-energized to accommodate installation of data logging equipment. This approach was only applied on projects where the reported gross energy savings exceeded 10% of annual energy consumption. This approach entailed a pre- and post-retrofit comparison of weather-normalized whole facility energy consumption. This approach adhered to guidelines set forth in the Department of Energy Uniform Methods Project Protocols for HVAC Controls (Chapter 19) and Whole-Building Retrofit with Consumption Data Analysis Evaluation Protocol (Chapter 8).

Our general approach consisted of the following:

1. Fit a premise-level degree-day regression model separately for the pre- and post-periods.

2. For each period (pre- and post-) use the coefficients of the fitted model with normal year degree days to calculate weather-normalized annual consumption (NAC) for that period.

3. Calculate the difference between the pre- and post-period NAC for the site.

This approach was used for four of the Custom Incentive Participant projects. Outlined below is the step-by-step process for this analysis:

Step 1. Fit the Regression Model: The degree-day regression for the site and year (pre or post) are modeled as:

Equation 15: Average Consumption per Day

$$E_m = \mu + \beta_H H_m + \beta_C C_m + \varepsilon_m$$

Where:

E_m	=	*Average consumption per day during interval m*
H_m	=	*Specifically, $H_m(T_H)$, average daily heating degree days at the base temperature (T_H) during meter read interval m, based on daily average temperatures on those dates*
C_m	=	*Specifically, $C_m(T_C)$, average daily cooling degree days at the base temperature (T_C) during meter read interval m, based on daily average temperatures on those dates*
μ	=	*Average daily baseload consumption estimated by the regression*
β_H, β_C	=	*Heating and cooling coefficients estimated by the regression*
ε_m	=	*Regression residual*

Step 2. Applying the Model: To calculate NAC for the pre- and post-installation periods for the given site and timeframe, combine the estimated coefficients μ, β_H, and β_C with the annual normal-year or typical meteorological year (TMY) degree days H_0 and C_0 calculated at the site-specific degree-day base, T_H and T_C. The example shown below puts all premises and periods on an annual and normalized basis.

Equation 16: Weather-Normalized Annual Consumption

$$NAC = \mu * 365.25 + \beta_H H_0 + \beta_C C_0$$

Step 3. Calculate the Change in NAC: The difference between pre- and post-program NAC values (ΔNAC) represents the change in consumption under normal weather conditions.

4.6.4 Peak Period Definition

Demand savings were evaluated based on the definition of the peak period provided by Duke Energy, as summarized Table 4-9.

Table 4-9 Definition of Peak Demand Periods

	Summer	Winter
Month	July	January
Hour	4pm – 5pm	7am – 8am

4.7 Measurement & Verification Reports

Once a savings analysis was complete all findings from on-site verification and each project-level savings analysis was summarized in a standalone Measurement and Verification Report. Each report contained the full contents of the original SSMVP (Sections 1 through 3) prepared in advance of the on-site inspection as well as a new section (Section 4) summarizing all site visit findings, the chosen approach for quantifying energy savings, the verified energy and demand savings, and commentary on reasons for differences between the reported and verified savings values. Each individual M&V Report was then submitted to the Duke EM&V Team for review, comment, and approval. The 94 individual M&V Reports developed as part of this evaluation were provided under separate cover.

4.8 Impact Evaluation Analysis and Findings

4.8.1 High Level Findings

4.8.1.1 Continue with Current Work

Based upon the results of the gross impact evaluation it is evident that the level of rigor being applied to each project as it goes through the application process of the NR Custom Program is resulting in accurate estimates of energy and demand savings in both service territories. The practice of subjecting each project to a thorough engineering review by AESC followed by a high-level review by the program team seems to be providing a level of quality control that minimizes calculation errors or instances of over-claimed energy or demand savings. In fact, the evaluated energy and demand realization rates indicate that the program is conservative when developing savings estimates. The strata-level realization rates also indicate that an appropriate level of rigor is being applied to every project regardless of its size (magnitude of energy /demand savings) or measure category (lighting vs. non-lighting).

4.8.1.2 Interactive Energy Changes for Lighting Retrofits

How energy-efficiency projects change the energy use of other equipment, not associated directly with the projects themselves, should be a consideration in estimating the energy efficiency program benefits. These interactive energy changes can be challenging to quantify, but should be accounted for whenever possible.

Interactive energy changes come in a number of forms and affect different fuel types. A measure that directly saves electricity may cause another building system to consume less energy. Alternatively, a measure that directly saves electricity could cause another building system to consume more energy. Sometimes, a single project can have both positive and negative interactive effects on other systems. For example, upgrading to energy efficient lighting reduces the electricity that a participant uses on lighting; the associated reduction in waste heat reduces the burden on the cooling system in the summer – but increases the burden on the heating system in the winter.

Lighting projects produce relatively predictable interactive energy changes enabling the development of stipulated factors through building energy simulation modeling. For this evaluation building energy simulation models were developed for 18 facility types using DOE-2 based modeling software and Database of Energy Efficiency Resources (DEER) building prototypes. Five sets of models was developed for the DEC and DEP service territories using TMY3 weather data from Raleigh-Durham, Charlotte, Asheville, Greensboro and Greenville. Table 4-10 presents the interactive factors developed by the evaluation team for each building type and weather station.

Table 4-10 Interactive Factors by Facility Type and Weather Station

Building Type	Asheville, NC	Greensboro, NC	Greenville, SC	Raleigh-Durham, NC	Charlotte, NC
Assembly	104.4%	107.6%	108.6%	108.7%	109.0%
Bio Tech Manufacturing	107.1%	112.2%	113.7%	114.0%	114.4%
Community College	104.1%	107.1%	108.0%	108.2%	108.4%
Hospital	106.0%	110.3%	111.6%	111.8%	112.2%
Hotel	105.5%	109.4%	110.5%	110.8%	111.1%
Light Industrial Manufacturing	100.1%	100.1%	100.1%	100.1%	100.1%
Motel	114.4%	124.6%	127.7%	128.3%	129.1%
Nursing Home	113.2%	122.7%	125.6%	126.2%	126.9%
Office Large	103.1%	105.3%	106.0%	106.1%	106.3%
Office Small	101.4%	102.5%	102.8%	102.8%	102.9%
Primary School	100.6%	101.1%	101.2%	101.3%	101.3%
Restaurant Fast Food	101.7%	102.9%	103.2%	103.3%	103.4%
Restaurant Sit Down	98.4%	97.2%	96.9%	96.8%	96.7%
Retail Large	102.2%	103.8%	104.2%	104.3%	104.5%
Retail Small	100.4%	100.7%	100.8%	100.8%	100.8%
Secondary School	101.1%	101.8%	102.1%	102.1%	102.2%
University	108.2%	114.0%	115.8%	116.1%	116.6%
Warehouse Conditioned	105.7%	109.7%	111.0%	111.2%	111.5%

Interactive effects were estimated for each facility type by simulating a reduction in annual lighting end use energy consumption of approximately 4%. This value was chosen based upon

Nexant's experience with evaluating other custom and prescriptive lighting programs across the country.

Table 4-11 provides an overview of the verified energy savings attributed to interior lighting measures within conditioned spaces and the relative contribution to savings by interactive effects estimated by the evaluation team. Total savings attributable to interactive effects within the evaluated sample is estimated to be approximately 724,277 kWh or 4.6% of total verified energy savings (15,678,725 kWh) for all lighting projects. Interactive effects account for approximately 6.0% of verified energy savings for projects with space cooling.

Table 4-11 Verified Energy Savings (kWh) and Relative Contribution of Interactive Effect Savings by Facility Type from Evaluated Sample for Facilities with Space Cooling

Building Type	Verified Energy Savings (kWh)	Interactive Effects Savings (kWh)	% Savings Attributable to Interactive Effects
Warehouse	7,330,480	662,018	9.03%
Light Industria/Manufacturing	3,727,968	3,458	0.09%
University	517,321	52,058	0.80%
Retail	371,303	2,971	10.06%
Office	44,378	1,049	2.36%
Primary School	32,236	413	1.28%
Assembly	22,484	1,973	8.78%
Healthcare	5,598	335	5.99%
Total	**12,051,767**	**724,277**	**6.01%**

4.8.2 Gross Impacts - DEC

Table 4-12, Table 4-13, and Table 4-14 summarize gross impact results for energy (kWh), Summer demand (kW), and Winter demand (kW) for the DEC service territory. Detailed results for each sampled project are provided in the standalone M&V Reports.

Table 4-12 DEC Gross Verified Energy Savings (kWh) by Stratum

Stratum	Population (N)	Sample Count (n)	Gross Reported Energy Savings (kWh)	Gross Verified Energy Savings (kWh)	Realization Rate (%)	Relative Precision @ 90% Confidence
L-Large (>1,000 MWh)	18	5	35,491,559	37,792,452	106.5%	4.4%
L-Small (<1,000 MWh)	261	27	34,500,751	37,552,406	108.8%	30.7%
NL-Large (>2,000 MWh)	5	2	21,661,701	23,301,600	107.6%	9.2%
NL-Small (<2,000 MWh)	50	25	22,645,465	21,862,911	96.5%	38.0%
Total	**334**	**59**	**114,299,476**	**120,509,368**	**105.4%**	**12.0%**

Table 4-13 DEC Gross Verified Summer Demand Savings (kW) by Stratum

Stratum	Population (N)	Sample Count (n)	Gross Reported Summer Demand Savings (kW)	Gross Verified Summer Demand Savings (kWh)	Realization Rate (%)	Relative Precision @ 90% Confidence
L-Large (>1,000 MWh)	18	5	4,854	5,636	116.1%	4.8%
L-Small (<1,000 MWh)	261	27	6,151	6,758	109.9%	29.8%
NL-Large (>2,000 MWh)	5	2	2,107	3,369	159.9%	38.5%
NL-Small (<2,000 MWh)	50	25	3,276	3,237	98.8%	76.6%
Total	**334**	**59**	**16,389**	**19,000**	**115.9%**	**18.2%**

Table 4-14 DEC Gross Verified Winter Demand Savings (kW) by Stratum

Stratum	Population (N)	Sample Count (n)	Gross Reported Winter Demand Savings (kW)	Gross Verified Winter Demand Savings (kW)	Realization Rate (%)	Relative Precision @ 90% Confidence
L-Large (>1,000 MWh)	18	5	4,398	5,031	114.4%	6.5%
L-Small (<1,000 MWh)	261	27	5,218	5,996	114.9%	33.8%
NL-Large (>2,000 MWh)	5	2	2,559	5,372	209.9%	9.2%
NL-Small (<2,000 MWh)	50	25	2,933	2,316	79.0%	126.9%
Total	**334**	**59**	**15,109**	**18,716**	**123.9%**	**19.3%**

4.8.2.1 Custom-to-Go vs. Custom Classic - DEC

Custom-to-Go realization rates were higher primarily based upon the fact that the majority of savings come from lighting measures. Lighting measures represent 89.7% of total Custom-to-Go project reported energy savings, whereas for Classic Custom projects lighting measures account for only 55.8% of gross reported energy savings. Figure 4-2 shows the distribution of reported energy savings for classic custom projects broken down by technology category. Figure 4-3 shows the distribution of reported energy savings for Custom-to-Go projects.

Figure 4-2 Distribution of Reported Energy Savings for DEC Classic Custom Projects by Technology Category

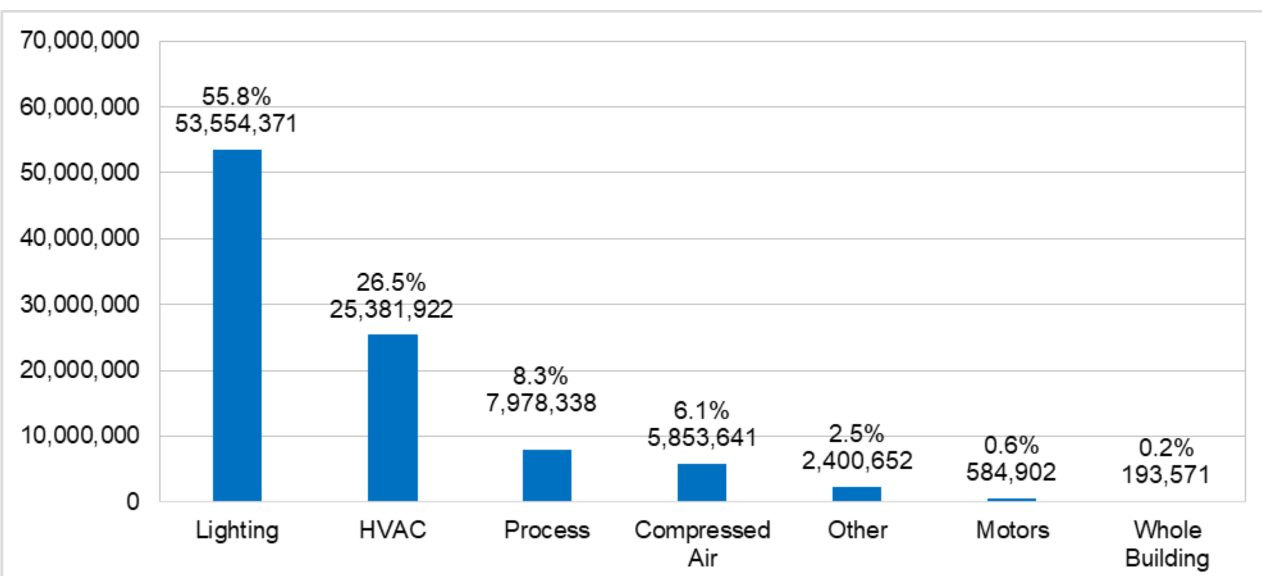


Figure 4-3 Distribution of Reported Energy Savings for DEC Custom-to-Go Projects by Technology Category

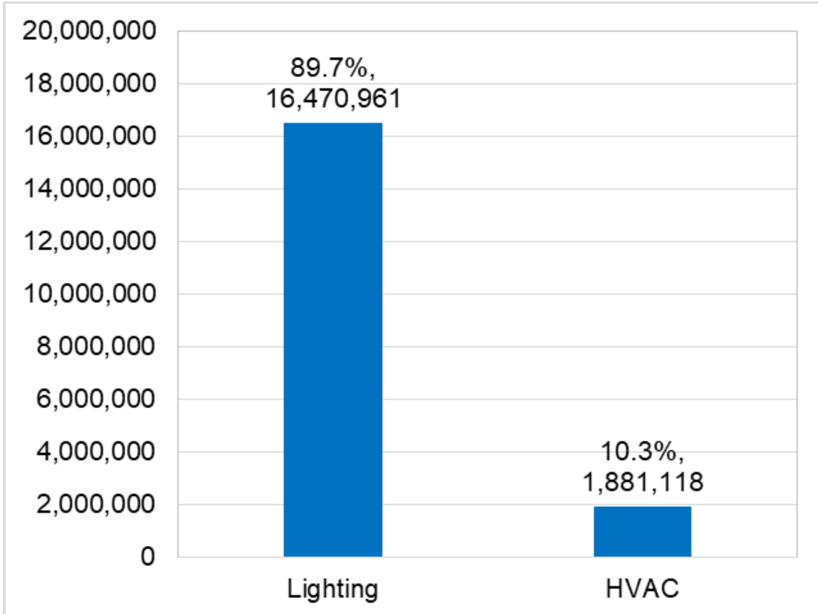


Table 4-15 shows the reported and verified energy (kWh) savings stratified by technology category (lighting vs. non-lighting) and participation track (Custom Classic vs. Custom-to-Go) for the evaluated sample.

Table 4-15 Comparison of Strata-Level Realization Rates - Classic vs. Custom-to-Go - DEC

Track	Measure Category	Sample	Sample Reported (kWh)	Sample Verified (kWh)	Realization Rate (%)
Classic	Lighting	21	10,890,605	11,648,353	107.0%
	Non-lighting	24	21,982,540	22,212,501	101.0%
	Total	**45**	**32,873,146**	**33,860,855**	**103.0%**
Custom-to-Go	Lighting	11	805,776	901,186	111.8%
	Non-lighting	3	834,272	820,142	98.3%
	Total	**14**	**1,640,048**	**1,721,328**	**105.0%**

4.8.3 Gross Impacts - DEP

Table 4-16, Table 4-17, and Table 4-18 summarize gross impact results for energy (kWh), Summer demand (kW), and Winter demand (kW) for the DEP service territory. Detailed results for each sampled project are provided in the standalone M&V Reports.

Table 4-16 DEP Gross Verified Energy Savings (kWh) by Stratum

Stratum	Population (N)	Sample Count (n)	Gross Reported Energy Savings (kWh)	Gross Verified Energy Savings (kWh)	Realization Rate (%)	Relative Precision @ 90% Confidence
L-Large (>250 MWh)	9	4	3,289,490	3,662,303	111.3%	6.6%
L-Small (<250 MWh)	82	19	3,195,020	3,110,400	97.4%	41.0%
NL-Large (>500 MWh)	5	3	5,979,116	6,075,769	101.6%	0.9%
NL-Small (<500 MWh)	21	7	3,676,915	4,213,289	114.6%	20.6%
Total	**117**	**33**	**16,140,541**	**17,061,762**	**105.7%**	**9.2%**

Table 4-17 DEP Gross Verified Summer Demand Savings (kW) by Stratum

Stratum	Population (N)	Sample Count (n)	Gross Reported Summer Demand Savings (kW)	Gross Verified Summer Demand Savings (kWh)	Realization Rate (%)	Relative Precision @ 90% Confidence
L-Large (>250 MWh)	9	4	475	519	109.4%	11.4%
L-Small (<250 MWh)	82	19	516	448	86.8%	143.0%
NL-Large (>500 MWh)	5	3	531	519	97.7%	0.7%
NL-Small (<500 MWh)	21	7	388	415	106.9%	55.7%
Total	**117**	**33**	**1,910**	**1,901**	**99.5%**	**36.1%**

Table 4-18 DEP Gross Verified Winter Demand Savings (kW) by Stratum

Stratum	Population (N)	Sample Count (n)	Gross Reported Winter Demand Savings (kW)	Gross Verified Winter Demand Savings (kW)	Realization Rate (%)	Relative Precision @ 90% Confidence
L-Large (>250 MWh)	9	4	499	667	133.8%	27.7%
L-Small (<250 MWh)	82	19	379	532	140.3%	227.8%
NL-Large (>500 MWh)	5	3	632	622	98.5%	1.8%
NL-Small (<500 MWh)	21	7	512	659	128.5%	17.2%
Total	**117**	**33**	**2,022**	**2,480**	**122.7%**	**49.6%**

4.8.3.1 Custom-to-Go vs. Custom Classic - DEP

Custom-to-Go realization rates were higher primarily based upon the fact that the majority of savings come from lighting measures. Lighting measures represent 68.7% of total Custom-to-Go project reported energy savings, whereas for Classic Custom projects lighting measures account for only 30.1% of gross reported energy savings. Figure 4-4 shows the distribution of reported energy savings for classic custom projects broken down by technology category. Figure 4-5 shows the distribution of reported energy savings for Custom-to-Go projects.

Figure 4-4 Distribution of Reported Energy Savings for DEP Classic Custom Projects by Technology Category

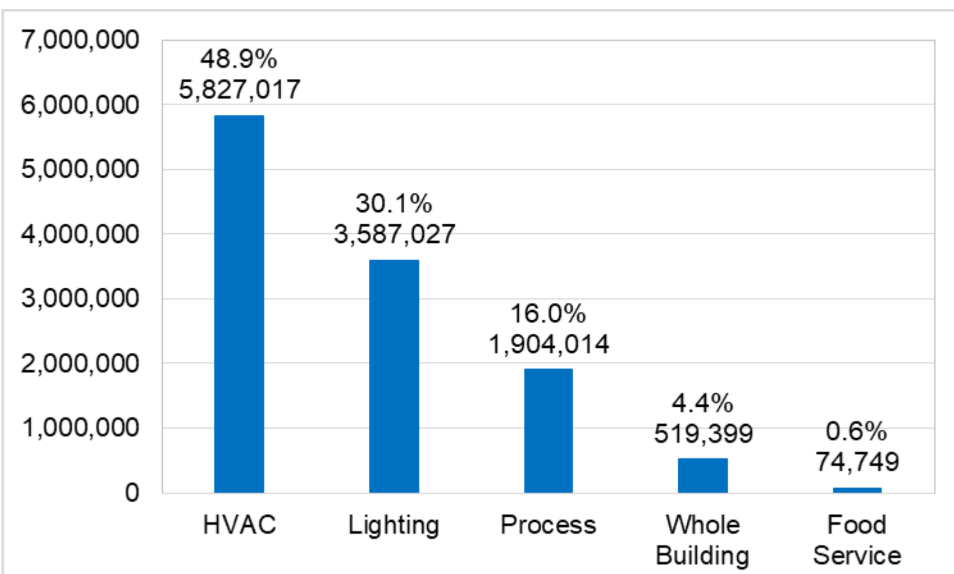


Figure 4-5 Distribution of Reported Energy Savings for DEP Custom-to-Go Projects by Technology Category

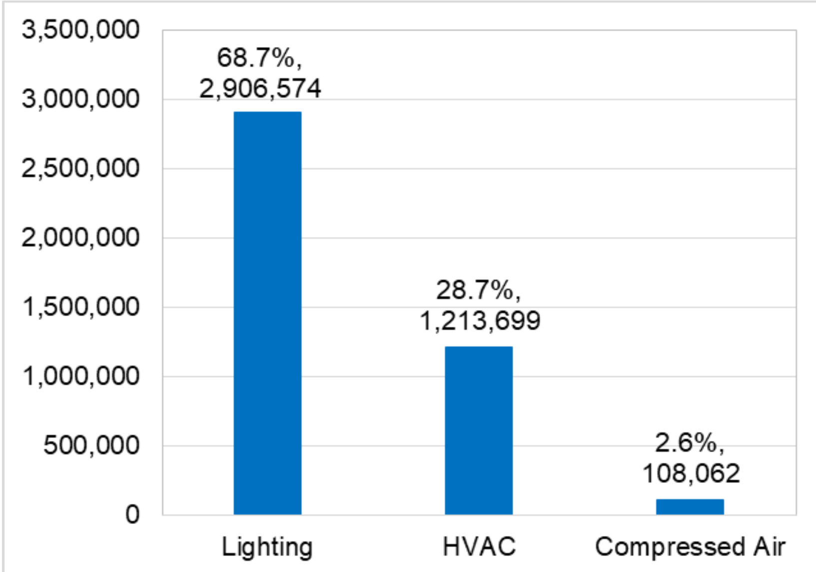


Table 4-19 shows the reported and verified energy (kWh) savings stratified by technology category (lighting vs. non-lighting) and participation track (Custom Classic vs. Custom-to-Go) for the evaluated sample.

Table 4-19 Comparison of Strata-Level Realization Rates - Classic vs. Custom-to-Go - DEP

Track	Measure Category	Sample	Sample Reported (kWh)	Sample Verified (kWh)	Realization Rate (%)
Classic	Lighting	7	948,608	958,886	101.1%
	Non-lighting	6	2,993,031	3,090,401	103.3%
	Total	**13**	**3,941,639**	**4,049,287**	**102.7%**
Custom-to-Go	Lighting	16	1,373,216	1,477,834	107.6%
	Non-lighting	4	909,075	979,924	107.8%
	Total	**20**	**2,282,292**	**2,457,759**	**107.7%**

4.8.3.2 Baseline Assumptions for Linear Fluorescent T12 Fixture Retrofits

Starting in 2017, the evaluation team agreed to ask participants and trade allies about the continued use of linear fluorescent T12 lamps. The evaluation team sought to understand how claimed energy savings for linear fluorescent to LED retrofit measures would be estimated with a T8 baseline as opposed to a T12 baseline, even if the pre-existing fixture was a T12. Additionally, the research sought to understand how high Color Rending Index (CRI) T12s are still readily available in the marketplace enabling participants to continue using T12 lighting systems. This research was completed in a cross-cutting manner for NR Custom evaluations for multiple Duke jurisdictions including Indiana, Ohio, North Carolina, and South Carolina.

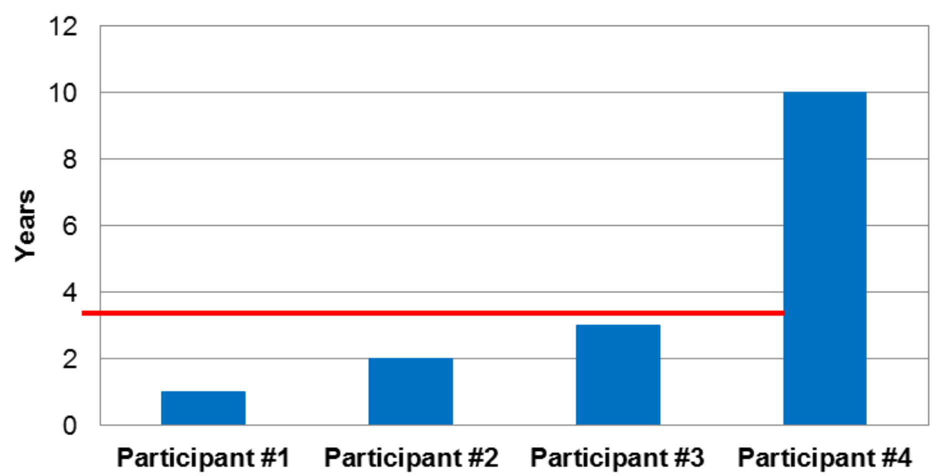
In an effort to gain direct insights on this issue from participants and trade allies, the evaluation team developed a battery of survey questions for each program participant and incorporated them into the survey instruments developed for this evaluation. The set of survey questions developed for participants was only fielded by those who implemented lighting retrofits involving linear fluorescent T12s, which was very limited (total of four across all jurisdictions being evaluated and only one from DEI). The questions asked and a summary of the responses received are summarized below.

Participant Surveys

Sampled participants with projects involving T12 retrofits (4) were asked:

- **Question #1:** *"Would you have continued using linear fluorescent T12 fixtures if you had not received a financial incentive to upgrade to LED?"*
  - Two respondents said *"Yes"*
  - Two respondents said *"No"*
- **Question #2:** *"Were you previously purchasing high Color Rendering Index (CRI) T12 replacement lamps as a means of postponing full fixture replacements?"*
  - Two respondents said *"Yes"*
  - Two respondents said *"No"*
- **Question #3:** "How long could replacement lamps have allowed you to continue to use T12 fixtures?" (Responses in Figure 4-6)

Figure 4-6 How Long Participant Could Have Continued Using T12 Fixtures

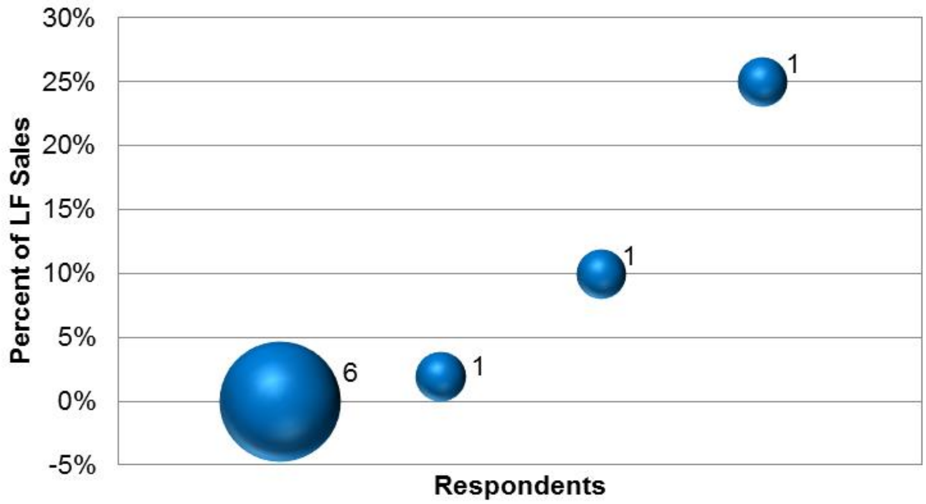


Trade Ally Surveys

Trade allies were asked the following questions regarding historic 2017 sales and forecasted 2018 sales for linear fluorescent T12 lamps and fixtures:

- **Trade Ally Question #1: "**Of your linear fluorescent lighting system sales in 2017, what percent were T12s?" (Responses in Figure 4-7)

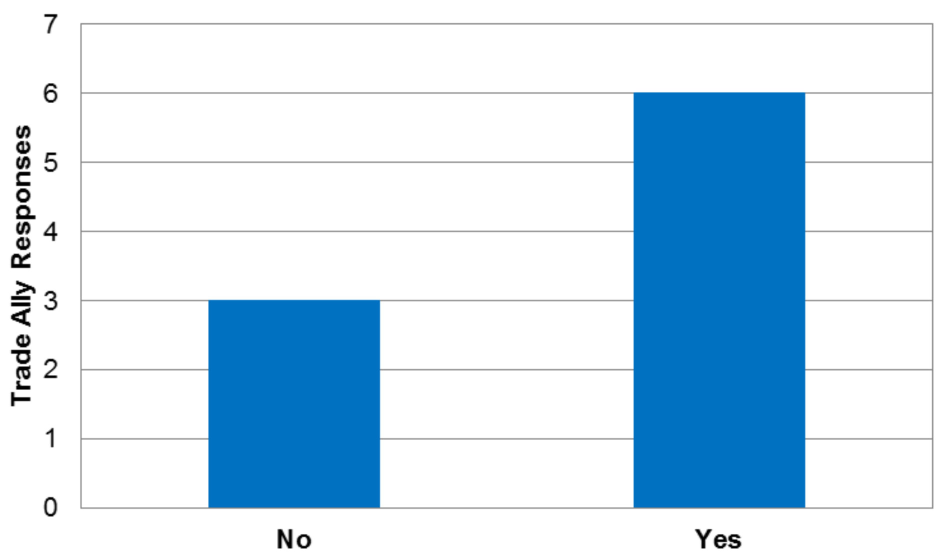
Figure 4-7 Percentage of 2017 Linear Fluorescent Lighting Sales that were T12 According to Surveyed Trade Allies



Trade ally responses to Question #1 suggest that the majority of the market has already shifted away from linear fluorescent T12s. Six of the nine trade allies surveyed reported that 0% of 2017 linear fluorescent sales were of the T12 variety.

- **Trade Ally Question #2:** "Are you still stocking and selling linear fluorescent T12 lighting systems and replacement lamps?" (Responses in Figure 4-8)

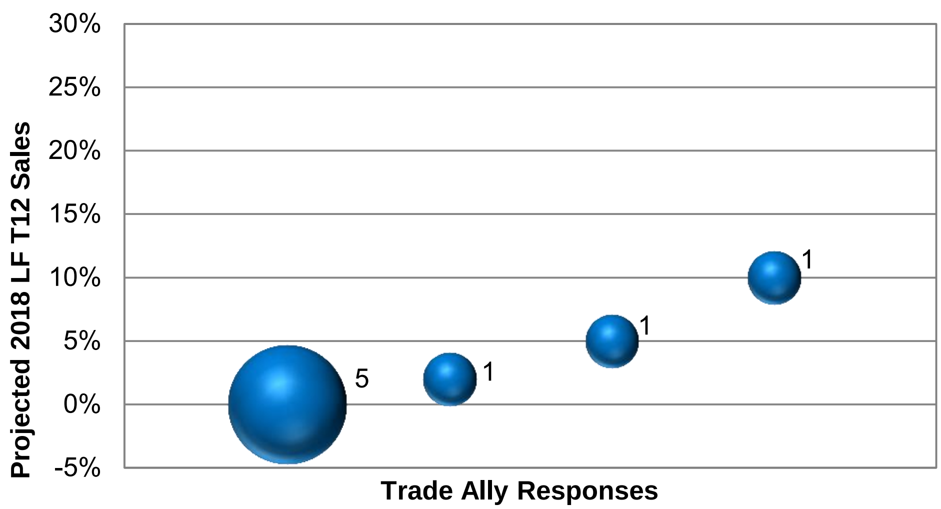
Figure 4-8 Are Trade Allies Still Stocking Linear Fluorescent T12 Replacement Lamps



Responses to Trade Ally Question #2 were also mixed. Six of the surveyed trade allies reported that they are still stocking linear fluorescent T12 lamps; however, only three of the trade allies surveyed reported to have sold T12s in 2017. This indicates that T12 lamps are being stocked, but not sold.

- **Trade Ally Question #3**: "Thinking of your 2018 sales of linear fluorescent lighting system sales, what percent will be T12s?" (Responses in Figure 4-9)

Figure 4-9 Estimated Percentage of 2018 Linear Fluorescent Lamps Sales That Will Be T12



Responses to Trade Ally Question #3 suggest that linear fluorescent T12 sales are expected to decline even further in 2018. Five of the nine trade allies surveyed indicated that 0% of 2018 linear fluorescent sales would be T12s.

In addition to asking participants and trade allies about linear fluorescent T12 lamps and fixtures, the evaluation team also quantified the difference in verified energy savings for all T12 measures sampled. For this analysis the evaluation team calculated the measure level savings using two scenarios. The first approach used a T12 baseline which is consistent with what the program uses in ex-ante energy savings estimates. The second approach used a reduced baseline fixture wattage consistent with a linear fluorescent T8 equivalent. The results of this analysis are summarized in Figure 4-10.

Figure 4-10 Comparison of Verified Energy Savings (kWh) and Realization Rates when Using T12 vs. T8 Baseline for Linear Fluorescent Retrofits

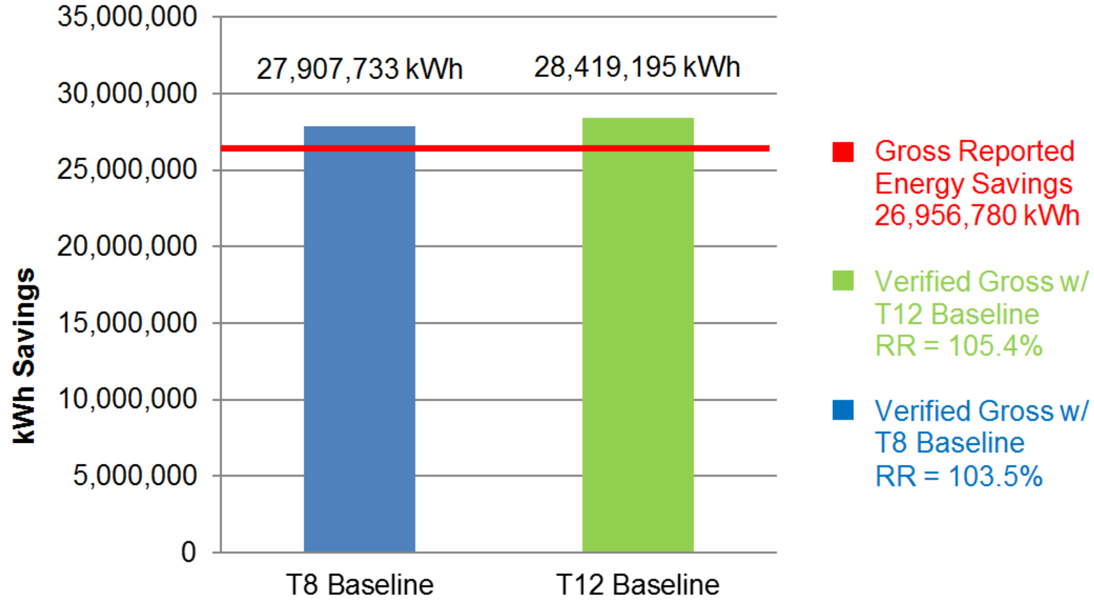


Figure 4-10 indicated that the overall impact on verified energy savings at the program level is very small regardless of whether a T12 or a T8 baseline is used for linear fluorescent fixture retrofits. Verified energy savings would reduce by approximately 511,462 kWh or 1.8%. Due to the relative minimal impact and in keeping with current industry standards, it is recommended that the NR Custom Program adopt a T8 baseline standard.

5 Net-to-Gross

5.1 Methodology

The evaluation team based the net-to-gross evaluation on customer self-report surveys, as described in the Uniform Methods Project, Chapter 23: Estimating Net Savings: Common Practices.[6] The survey was designed based on established methodologies outlined in the Pennsylvania Evaluation Framework.[7]

Net-to-gross analysis for this program involved two calculations: free-ridership and spillover. The results of these calculations are combined to produce the program-level net-to-gross ratio as follows:

Equation 17: Net-to-Gross Equation

$$NTG_p = \left(1 - FR_p\right) + SO_p$$

Where:

NTG_p	=	*program-level net-to-gross ratio*
FR_p	=	*program-level free-ridership ratio*
SO_p	=	*program-level spillover ratio.*

The program net verified energy savings are calculated by multiplying the program net-to-gross ratio by the gross verified energy savings resulting from the impact evaluation activities as described in Section 4.

Equation 18: Net Verified Energy Savings

$$kWh_{nv} = kWh_{gv} \times NTG_p$$

The calculations of the program-level free-ridership and spillover ratios are detailed in the following sections.

5.1.1 Free-Ridership

The evaluation calculated free-ridership for each survey respondent based on their answers to a series of questions. These questions collected information on the customers' *intention* prior to interacting with the program and the *influence* of the program on changing those intentions.

Survey respondents were asked how the project would have changed if the incentive were not available. Responses were scored on a scale from 0 to 50 as shown in Table 5-1. If the respondent indicated they would do a smaller or less efficient project, they are prompted to categorize it as a small, moderate, or large reduction in scope. If the respondent answered they

---

[6] https://energy.gov/sites/prod/files/2015/02/f19/UMPChapter23-estimating-net-savings_0.pdf, Section 3.2.

[7] http://www.puc.state.pa.us/Electric/pdf/Act129/SWE_PhaseIII-Evaluation_Framework082516.pdf, Appendix B.

would have done exactly the same project without the program, they are asked if they would have paid the additional amount they received in incentives to complete the project.

Table 5-1 Net-to-Gross Intention Score Methodology

Response	Intention Score
Done nothing	0
Canceled or postponed the project	0
Done a smaller or less efficient project	Small = 37.5 Moderate = 25 Large = 12.5 Don't know = 25
Done exactly the same project	Would have paid = 50 Would not have paid = 25 Don't know = 37.5

To recognize the direct points of influence that the program has on customers' decisions, the survey asked respondents to rate the influence of several program aspects (where 10 is extremely influential and 0 is not at all influential). The highest rating for each customer was scored, again on a scale of 0 to 50. The rationale is that if any aspect of the program is highly influential on a customer's decision, then the program overall was equally influential (see Table 5-2).

Table 5-2 Net-to-Gross Influence Score Methodology

Program Aspect	Max Rating → Influence Score
Incentive provided by Duke Energy	0-1 → 50 2 → 43.75 3 → 37.5 4 → 31.25 5 → 25 6 → 18.75 7 → 12.5 8 → 6.25 9-10 → 0
Interactions with Duke Energy	
Duke Energy marketing materials	
Previous experience with Duke Energy programs	
Contractor or vendor recommendation	

The intention and influence scores are added together to produce each respondent's free-ridership ratio using Equation 19.

Equation 19: Respondent Free-ridership Ratio

$$FR_i = \frac{Intention + Influence}{100}$$

The ratio is multiplied by that respondent's verified gross savings to result in free rider savings, or savings that would have occurred without the program. The program free-ridership ratio is the sum of free rider savings divided by the sum of verified gross savings as shown in Equation 20.

Equation 20: Program Free-ridership Ratio

$$FR_p = \frac{\sum (FR_i \times kWh_{gv})}{\sum kWh_{gv}}$$

5.1.2 Spillover

Spillover is an estimate of savings resulting from the installation of energy efficient projects that were completed without a program incentive but that still were influenced by the program. There are two components to arriving at these program-attributable savings.

First, the survey collects information on the type of energy-efficiency equipment that was installed but for which an incentive was not received. This is used to estimate energy savings through the application of established calculation methodologies, often a technical reference manual.

Second, the survey asks the respondent to rate the influence of the program on their decision to implement the project despite not receiving an incentive. That score is used to prorate the total project savings, recognizing that the program may not have been the only influence in the completion of the project. The result of this calculation is program-attributable spillover, shown in Equation 21:

Equation 21: Program-Attributable Spillover

$$kWh_{aso} = kWh_{gso} \times Influence$$

Where:

kWh_{aso} = *program-attributable spillover savings*

kWh_{gso} = *gross spillover savings*

Influence is the value based on the respondent's rating of the program influence, as shown in Table 5-3.

.

Table 5-3 Participant Spillover Program Influence Values

Reported SmartSaver Program 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	1.0
Don't know / Refused	Sector-level measure average

This number is divided by the total verified gross energy savings for the program to produce a program spillover ratio (Equation 22):

Equation 22: Program Spillover Ratio

$$Program\ SO\ Ratio = \frac{\sum kWh_{aso}}{kWh_{gv}}$$

5.2 Net-to-Gross Analysis and Findings

The evaluation team conducted net-to-gross interviews with 61 customers who completed projects at 75 different locations in the DEP and DEC territories. Most customers (51 of 75 projects) reported they would have put off the project, canceled it entirely, or reduced the scope or efficiency of the project. The remaining customers said they planned to do the same project prior to learning about the Smart $aver Custom Program, and all of those customers said they would have paid the cost of the upgrade if the incentive were not available. The full distribution of responses is shown in Table 5-4.

Table 5-4 What Would You Have Done Had You Not Received an Incentive?

Response	DEC	DEP
Canceled or postponed the project	29	9
Done a smaller or less efficient project	11 Large reduction (1) Moderate reduction (6) Small reduction (4)	2 Large reduction (0) Moderate reduction (2) Small reduction (0)
Done exactly the same project	21 Would have paid (21) Would not have paid (0)	3 Would have paid (3) Would not have paid (0)

When asked to rate the influence of the program on their decision to complete the energy-efficiency project, nearly all respondents rated at least one program aspect a 7 or higher on a 0 to 10 scale, where 0 means "not at all influential" and 10 means "extremely influential." The program incentive and contractors' recommendations were the program aspects most commonly given a high rating. Customers who had previously participated a Duke Energy program rated that experience as particularly influential.

The resulting free-ridership, spillover, and net-to-gross ratios are shown in Table 5-5 below. These results indicate that the program is extremely effective in encouraging customers to complete projects they would not otherwise do.

Table 5-5 Net-to-Gross Evaluation Results

Measurement	DEC	DEP	Combined[8]
Net of Free-ridership	78.9%	70.8%	78.5%
Program-influenced Spillover	0.4%	0.0%	0.4%
Net-to-Gross	**79.2%**	**70.8%**	**78.8%**

The evaluation team notes that the DEP results are based on a small number of completed interviews. While the DEC results are estimated to be accurate ±4.5% with 90% confidence, the DEP results have a much wider confidence interval of ±16%. The combined results have a confidence interval of ±4.5%. This reflects that the DEP result is only based on 14 observations and there is notable variation in the individual responses. Because the evaluation team did not originally plan to produce a precise result for each territory individually, we did not stratify our survey sample or target a certain level of response from each territory. We recommend that Duke Energy should use the combined result for DEP since we believe it is more reflective of program operations.

The overall result of 78.8 percent net-to-gross reflects that the program was a primary influence in customers' energy savings actions. The evaluation team offers some observations on the

[8] The combined results are weighted using the same kWh-based weights used for DEC and DEP results, since this accounts for individual project sizes as well as the relative size of the programs across the two jurisdictions.

drivers of the free-ridership that does exist, though many of these observations are qualitative since they are based on a small number of observations.

- Controls (BAS), HVAC Units, LEDs, and Compressors had higher than average free-ridership, while Chillers, Manufacturing Equipment, and Occupancy Sensors were lower than average. The result of 25% free-ridership for LEDs is the only result with a sufficient number of responses (60) to be a meaningful result, the other measures range from one to eight responses.
- Responses to the second wave of the survey resulted in much higher net-to-gross (94%, n=18) than those from the first wave (76%, n=57).
- There were no full free-riders, or customers with 100% freeridership scores, in the DEC territory, but there were several in the DEP territory.

6 Process Evaluation

6.1 Summary of Data Collection Activities

Process evaluation activities are designed to support continuous program improvement by identifying successful program elements that can be expanded or built upon, as well as underperforming or inefficient program processes that could be holding back program performance or participation. Because the program is delivered the same between the two territories, we report combined activites and results for DEC and DEP together for the process evaluation. The data collection activities for the process evaluation of the NR Custom Program included a database review, and interviews with key contacts involved in program operations, participating customers, and contractors who assisted customers with projects.

The evaluation team developed data collection instruments designed to explore the research questions identified. Table 6-1 summarizes the process evaluation data collection activities.

Table 6-1 Summary of Process Evaluation Data Collection Activities

Target Group	Completes
Staff	2 In-depth interviews
Participants	81 Telephone survey (65 unique participants)[9]
Contractors	24 In-depth interviews

6.1.1 Program Staff Interviews and Database Review

Two interviews were conducted in June 2016 with Duke Energy's NR Custom program staff so that the evaluation team had a good understanding of the program and to get background information on program design and implementation practices. The program staff provided valuable feedback on intended operations, processes of the program's stated (and unstated) goals and objectives, perceived barriers to program up-take, and modifications to any program components based on the previous program cycle as well as the rationale for those modifications. The information the team gathered assisted in the design of the interview guides and surveys for customers and contractors.

In addition to the program staff interviews, the evaluation team reviewed the program tracking database to ensure necessary data and information was being collected to track program progress.

6.1.2 Contractor Interviews and Surveys

Custom programs include a variety of types of contractors and projects that require preapproval. For these programs to be successful, contractors must be able to access and use calculation

[9] 65 DEC participant projects (52 unique survey respondents); 16 DEP participant projects (13 unique survey respondents)

tools, navigate preapproval processes, and communicate the steps involved to project representatives. Contractors are important market actors, especially in large custom programs, and a good understanding of their experience with program processes, preapprovals, customer decision making, and persistent barriers to additional projects is crucial to the success of custom programs.

The evaluation team selected implementation contractors associated with customer projects from the tracking database provided by Duke Energy. Discussion topics in the interviews included program awareness among customers, program guidelines and processes, interactions with customers, and suggestions for improving the program. Interviews were completed with 24 of 59 program contractors who participated in the program. The interviews were completed in February and March 2018 and the average interview length was 26 minutes. The average number of telephone attempts for cases that were not completed was 4.5. Table 6-2 outlines the contractor response rate for the evaluation.

Table 6-2 Contractor Response Rate

Disposition	Contractor Count
Starting Sample	**59**
Does not recall participating	1
No knowledgeable respondent	5
Refusal	4
Bad phone number	1
Attempted but not completed	24
Completes	**24**
Response Rate (Complete/Starting Sample)	**40.6%**

6.1.3 Participant Surveys

Collecting survey data from program participants provides data suitable for quantitative analyses of participant characteristics and satisfaction with key aspects of the program. The evaluation team conducted a telephone survey with program participants, defined by customers who received a rebate through Duke Energy's NR Custom program between January 2016 and December 2017. Surveys were conducted with program participants in two waves; the first wave was in October 2017 and the second wave was in March 2018. Surveys focused on customers' experience with the program, sources of awareness, decisions to install equipment, barriers to participation, satisfaction with various aspects of the program, and any program improvement suggestions. Surveys were completed for 81 of the 118 projects completed through the program (52 DEC and 13 DEP unique respondents).

Table 6-3 outlines the participant response rate of the evaluation.

Table 6-3 Participant Response Rate

Disposition	DEC	DEP	Overall
Starting Sample	**89**	**29**	**118**
Does not recall participating	2	0	2
Refusal	4	5	5
Incompletes (partial surveys)	0	1	1
Wrong number	2	0	2
Not completed	16	11	27
Completes	**65**	**16**	**81**
Response Rate (Complete/Starting Sample)	**73.0%**	**55.2%**	**68.6%**

Wave 1 calling started October 5, 2017 and ended October 26, 2017

Wave 2 calling started March 14, 2018 and ended March 23, 2018

6.2 Process Evaluation Findings

6.2.1 Program Staff and Database Review

The program staff interviews were extremely useful in helping the evaluation team understand how the program operates, and the information obtained from the interviews was used to design the interview guides and surveys for program participants and contractors. Information from staff interviews are included throughout the findings section to add context around respondent answers.

An additional part of the evaluation activities included reviewing the program database to ensure the necessary information needed to track the program and conduct evaluation activities existed. Program staff use the tracking database to document customers who participated in the program, the details of the equipment being installed, and the savings associated with the project. Once the application is received, this information is passed to AESC, the vendor responsible for the technical review. AESC verifies the accuracy of the savings calculations, and provides Duke Energy with verification in a systematic format. Duke Energy engineers also review the application information to verify savings calculations.

The evaluation team utilized this same database to select samples for impact and process evaluation activities. For evaluation purposes, some necessary information was not electronically documented. Specifically, some contact information was missing from the file, specifically contact phone numbers and email addresses. Additionally, the quantities of installed equipment (particularly for lighting) and some savings values associated with projects was incorrect. Understanding which customers received a Custom incentive is critical in evaluating progress towards program goals and conducting an independent review of program participants.

The evaluation team recommends that post installation ECM quantities be tracked in the participation tracking database and incentive calculation worksheets so as to improve the evaluability of the program. . The evaluation team encountered several lighting projects where the ECM quantity was indicated to be “1”, but was known to be multiple based upon review of other project documentation, invoices, and/or application forms. The evaluation team determined that this was an internal policy for non one-for-one retrofits or in cases where measure-level savings represented a mix of post installation fixture wattages. This issue created a challenge when it came to determining what the program used for baseline watts per fixture in ex ante energy savings estimates. The evaluation team understands why this approach is used by the program team, but feels that accurately tracking post installation ECM quantities within the tracking database would make per fixture energy savings more transparent.

In conducting the process evaluation telephone efforts, some contact information associated with some participants was also out of date. Some level of personnel turnover at companies is expected, resulting in having contact information for people who no longer work for listed companies. Also, in trying to reach contractors, the evaluation team had more success on records where contractors provided a phone number for a cellphone. When office numbers were provided, many calls went straight to voicemail with very few messages returned. Contractors tend to work outside the office so the ability to reach them on their cell is key to gaining their feedback and having the ability to schedule a call during a convenient time.

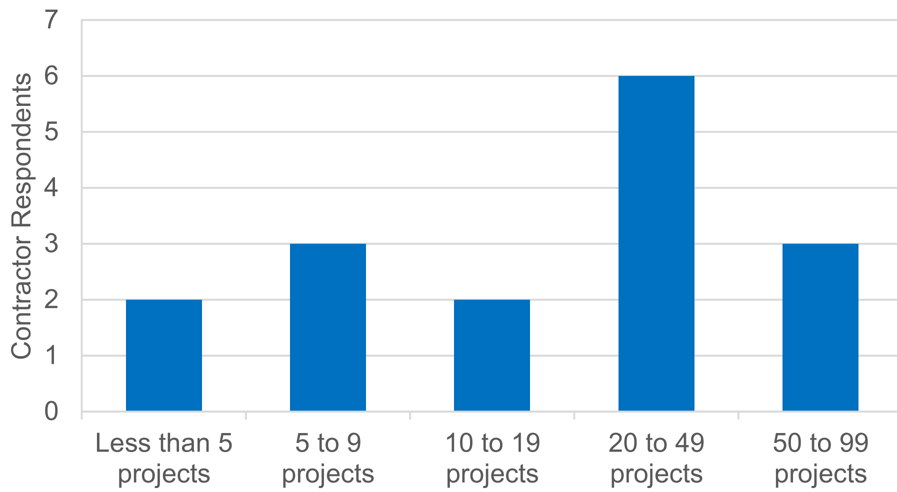
The evaluation team recommends that Duke pursue and obtain alternate site contact names, phone numbers, and email addresses from program participants to better ensure a line of communication is maintained between the contract information and the program records once a project is completed.

6.2.2 Contractors

The evaluation team interviewed 24 contractors who were involved in the installation of participating customer's projects during the evaluation period. Most of the interviewed contractors were companies that mainly provided lighting retrofit services (22 respondents). The remaining contractor respondents serve other end uses such as HVAC equipment and compressors. The amount of time these contractors have been involved in the program varied with two contractors indicating they have participated in Duke Energy's programs for one to two years, eight contractors indicating they have been involved between three to five years, and eleven have been involved for more than five years. Three contractors could not recall how long they have been participating in Duke's NR Custom program.

Responses regarding the number of projects contractors have completed during their time with the program varied from less than 5 projects to over 50 with most indicating between 20 and 50 projects. Figure 6-1 shows the number of contractors and an estimate of the number of projects they recall completing through the program since they began.

Figure 6-1 Number of Total Completed Projects



6.2.2.1 Communication

Duke Energy has a dedicated trade ally outreach team who travel and conduct in-person meetings. Trade allies can sign up and become an approved trade ally and be mentioned on Duke Energy's website. Most contractors reported that communication with Duke Energy program staff was effective and that staff was available when they had any questions about the program or application. Eleven contractor respondents indicated they have received trainings and information from Duke Energy about the NR Custom program in the form of one-on-one informational meetings, lunch and learns at the company, or webinars. Five contractors were not sure if they received a training, and the remaining nine reported not receiving a training. Few of the latter contractors indicated that they were able to gather the necessary information about the program from Duke Energy through the website or emails. Three contractors stated that additional trainings/information could be provided regarding savings estimations, non-lighting equipment, and new services provided by Duke Energy. Some specific comments included the following:

> *"The application seemed to be geared towards lighting, compressors are a small segment of the rebate process. A guide of everything that would be applicable to the program [not just related to compressors and dryers but if there is something else like vacuums] would be helpful."*

> *"...especially training with building automation would be beneficial. It's hard to know what path to achieve to save the customer money. It's hard to figure out if I have a viable custom incentive project."*

6.2.2.2 Customer Interaction

Many contractors felt they were at least partially responsible for customer awareness, especially in explaining the difference between custom and prescriptive and the application process. Fourteen contractor respondents felt that their customers were not aware of the program prior to telling them about it. Many of these contractors indicated, however, that the customers were aware of the availability of rebates through Duke Energy but did not specifically know about the Smart$aver programs or the custom incentives offering. Three contractors felt that few of their customers were aware of the program, and six other contractors reported that at least half of their customers knew about it. The remaining respondent could not comment on program awareness because he was not involved in sales.

When asked about the impact of the program on their recommendations of high efficiency equipment, 15 contractor respondents reported that they always recommend high efficiency equipment since that is the nature of their business (e.g. LED lighting, retrofits), and 3 contractor respondents indicated that they recommend high efficiency equipment over 90 percent of the time. Although most of the contractors also reported that their recommendations before and after the program have not changed, one contractor indicated that his recommendations of high efficiency equipment increased from 50 to 75 percent after learning about the program. One contractor, who indicated they always recommend high efficient equipment, added that "*once the rebates came into play we definitely started educating our customers and advising them to purchase high efficiency equipment*." The remaining respondents did not know or were not able to answer the question.

Contractors were asked to estimate the frequency in which their customers planned to purchase high efficiency equipment before and after learning about the program. Ten contractor respondents indicated that customer plans to purchase high efficiency equipment increased on average from 40 to 80 percent after learning about the program. Two contractors reported that customers' plans were the same before and after learning about the program with one contractor indicating they only sell high efficiency products. Some of the remaining respondents did not provide a percentage but indicated that the program helps sell more high efficiency equipment.

When talking with contractors, 6 of 24 respondents indicated that customers do not have any concerns about the program. From the remaining respondents, 15 contractors mentioned a variety of customer concerns about participating, as outlined in the table below. Uncertainty about the preapproval process was the frequently cited concern; it includes thinking that the preapproval process is going to be too long, or that the company is obliged to move forward with the project after getting preapproved. Three contractors felt there was some customers confusion about the differences between custom and prescriptive, specifically, the steps required in the application process, and the quality of the qualified equipment. Three contractors mentioned concern about the incentives not being as high as estimated and another contractor reported a concern about receiving incentive at all. Two contractors indicated that customers are sometimes skeptical and need reassurance from Duke Energy about the program and a confirmation that the contractor is a program trade ally. The remaining contractors reported that customers are sometimes not sure if the equipment qualifies, or if they can keep the old equipment.

Table 6-4 Contractor Reported Customer Concerns About the Program

Concern	Respondents
Uncertainty about the preapproval process	7
Unsure about the difference between custom and prescriptive	3
Unsure if the incentive will be as high as estimated	3
Skeptical about the program offerings	2
Unsure if they will receive the incentive	1
Unsure if the equipment qualifies	1
Unsure if they can keep the old equipment (in case it is still functional)	1
Respondents	**15**

Source: Question 7
Don't know responses are excluded.

Eight of the 24 contractor respondents indicated that they use the program as a sales tool and that the program is helpful in selling energy efficient equipment. Many contractor respondents reported that the main reason some customers do not move forward with projects is financial in nature such as lack of funds or high costs (10 respondents). This was followed by reallocation of funds due to an emergency (2 respondents), project not meeting payback or ROI criteria (1 respondent), the prescriptive option being cheaper (1 respondent), and a timing issue (1 respondent). One contractor explained that they sometimes did not vet the customer well enough to assess their ability to move forward with the project before offering a potential custom incentive. Some specific comments included the following:

> *"Normally it's just because [the customers] decided not to complete the project in general. Whether the funds were not available or the project was not approved at the customer side for financial reasons."*

> *"Nothing to do with Duke, it's more where [the customers] need to be from a payback stand point, from corporate."*

> *"Something came up or some catastrophic thing happened, which made [the customer] reallocate the funds, or the customer realized that cost of opting in was too much to justify the reward."*

6.2.2.3 Application Process

Thirteen contractor respondents indicated that they received a request for additional information after submitting their initial application for preapproval. Typical requests were related to missing documents such as electricity bills (7 respondents), clarification about calculations and energy model assumptions (4 respondents), additional documentation about the equipment such as specification sheets (3 respondents), or updated W9 forms (2 respondents).

Based on contractor respondent feedback, the preapproval process takes on average 2.8 weeks for lighting projects and longer, 6 to 12 weeks, for non-lighting projects. Most contractors seemed satisfied with the duration, however, when asked if there were any suggestions to improve the program, seven contractor respondents had improvement suggestions specific to the application. Five contractor respondents requested shortening the preapproval process while four contractor respondents recommended streamlining the application process. Streamlining suggestions including simplifying the calculation requirements and paperwork by providing engineering services to reduce the burden on the contractors, or by tailoring it to non-lighting equipment (e.g. compressors). Some specific comments included the following:

> *"Every time, I have to submit duplicate documents. I understand the need for it but I would think that certain things could be kept on file. When I send an email, it would be with 11 or 13 attachments. A lot of stuff to send in."*

> *"Take out the need for a full-blown engineering solution so that a sales person like me could do [the application] without the need for an engineer. That's the difficulty there. If Duke would provide the engineering service, that would be helpful."*

> *"The pre-approval process is confusing for some customers, you get an estimated offer and it is turned into an actual offer. Sometimes it didn't come back a match penny for penny. A quicker turnaround time and explanation as why the incentive amount has changed would be helpful."*

Email applications have been used almost exclusively for the past three years. Although starting in 2016, an online application portal was launched. All but four contractors were aware of the online application portal, and 13 indicated they have used the portal and found it very useful. The contractor respondents who were aware of the online portal but have not used it (5 respondents) mentioned that they prefer to use paper and/or to have a tangible document to show to the customer. No matter the method, most contractors reported they submit the application for their customers.

6.2.2.4 Calculators

As part of the application process, and to receive incentives through the NR Custom program, an appropriate worksheet or calculator must be submitted. Duke Energy provides access to two types of calculators: Classic Custom and Custom-to-go. Classic Custom calculators are Excel-based worksheets available for five different technologies. One Custom-to-go Windows-based calculation tool is also available.

Contractors were asked how they typically estimate savings for projects that were submitted through the program. Sixteen respondents mentioned using Duke Energy provided tools while seven mentioned they only use their own/other tools (Table 6-5).

Table 6-5 Calculators Used by Contractors

Calculators Used	Respondents
Custom-to-go only	9
Own calculators only	7
Custom-to-go and own calculators	2
Classic Custom only	2
Classic Custom and own calculators	2
Custom-to-go, Classic Custom and own calculators	1
Respondents	**23**

Source: Question 24
Don't know responses are excluded.

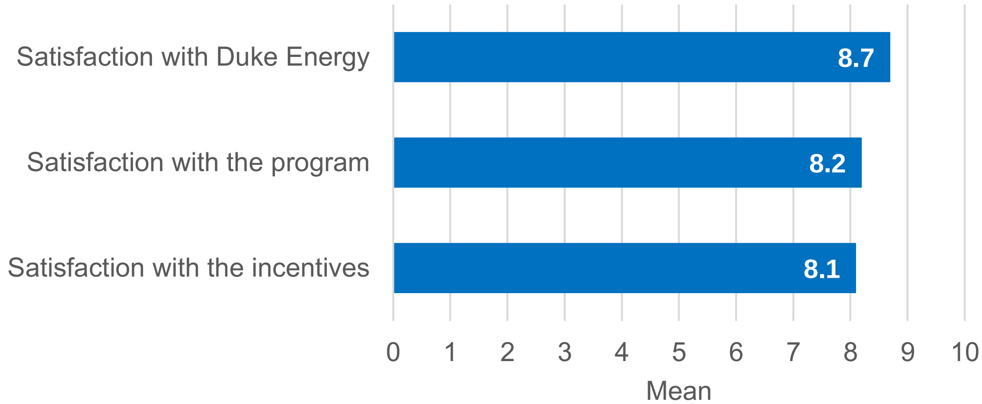
Contractor respondents who used Duke provided calculators were asked to rate their usefulness on a 0 to 10 scale where 0 was 'not at all useful' and 10 was 'very useful.' Both calculators were rated as being useful with mean scores of 9.0 and 8.3 for Custom-to-go and Classic Custom, respectively. While overall the usefulness of the calculators was high, those contractors who complete non-lighting projects rated the usefulness lower or use their own calculators.

Respondents who did not use the calculators provided by Duke reported using their own calculators because they are trained to use them, or their calculators are customized to their company or are more advanced.

6.2.2.5 Satisfaction

Overall, contractor respondents were satisfied with the NR Custom program and with Duke Energy. Respondents were asked to rate their satisfaction on a 0 to 10 scale where 0 was 'not at all satisfied' and 10 was 'very satisfied'. On average, contractor respondents rated their satisfaction with Duke Energy 8.7 and their satisfaction with the program 8.2. Using the same scale, contractors were also asked to rate their satisfaction with the incentives provided through the NR Custom program. Contractors were generally satisfied with the incentives, as shown in Figure 6-2.

Figure 6-2 Contractor Satisfaction with Program Components



Source: Questions 13, 16, 17
Don't know responses are excluded.

Most contractor respondents felt the incentives was the most influential in customers' decision to purchase high-efficiency equipment; on average a rating of 8 on a 0 to 10 scale where 0 was 'not at all influential' and 10 was 'very influential.' Other factors that play a role in customers deciding to purchase high-efficiency equipment mentioned by the contractors included planning and financing (3 respondents), reliability of the equipment (2 respondents), energy and long term monetary savings (2 respondents), and increased capacity (1 respondent).

As far as improvements to the program, nine contractor respondents indicated no changes were needed. Most of the remaining contractor respondents (7 of 12) had suggestions related to the application process, as described above. Other responses varied between increasing the incentives to make the custom program more attractive to customers (e.g., to encourage controls offerings such as motion sensors) (3 respondents), increasing transparency in relation to savings estimations or changes in the final incentives amount received by the customer (2 respondents), moving more lighting equipment to prescriptive (1 respondent), and keeping contractors informed about program changes (e.g., new W9 form) (1 respondent).

Table 6-6 Contractor Suggestions for Program Improvements

Suggestion	Overall
Shorten preapproval time	5
Streamline the application process	4
Increase the incentives	3
Increase transparency	2
Move more lighting equipment to prescriptive	1
Keep contractors informed about program changes	1
Respondents	**12**

Source: Question Q31
Don't know responses are excluded.

Some specific comments included the following:

> *"The only thing that comes to mind is the value of potential incentives for controls offerings to encourage folks to utilize controls more frequently, for example motion sensors. That's the single biggest thing. Also, the incentive could be more generous."*

> *"The only thing they could do is make it more easier to explain to our customers and for us to estimate the savings and ROI upfront."*

> *"Shorten preapproval time… the actual incentive amounts should be higher. Custom projects tend to cost the customers more money so anything you can do to make the incentive amount more attractive to the customer."*

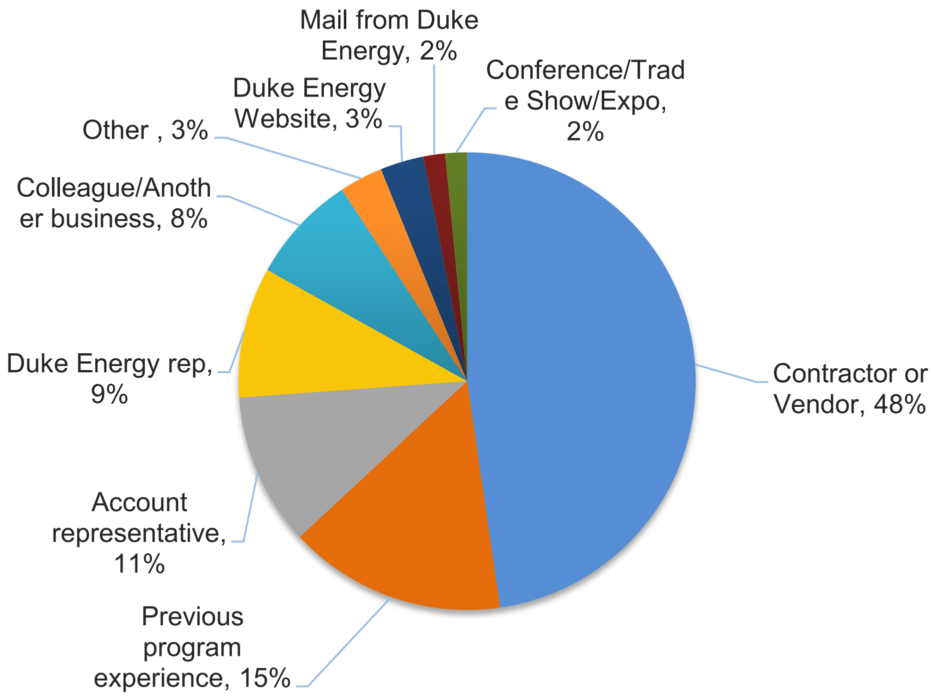
6.2.3 Participants

Surveys were conducted with program participants, or customers who received a rebate through the NR Custom program. This section provides detailed findings from 65 customer respondents who completed the surveys.

6.2.3.1 Marketing Practices

Prior to 2016, the program largely focused on account managers as the primary source of program promotion. In 2016, traditional marketing channels were used such as direct mail, ads on social media or other websites and emails to a subset of customers by segment. Starting in 2016, contractor outreach representatives marketed the program directly to contractors, which Duke staff indicates accounts for a significant percentage of projects. When asked how they heard about the program, the three primary sources of awareness of the NR Custom program among participant respondents were their contractor or vendor (48 percent), previous experience with the program (15 percent), and their account representative (11 percent). Figure 6-3 shows breakdown of the awareness sources among customer respondents. Sources of awareness were similar between the two territories.

Figure 6-3 Participant Source of Program Awareness



Source: Question Q1
Don't know responses are excluded.

For respondents who heard about the program from their contractor, account representative, or business energy advisor, the majority of respondents indicated they were provided with enough information about the program and no additional follow-up or information was needed. This supports what was reported by the interviewed contractors and the role they play in increasing program awareness. This also shows that contractors, in addition to Duke staff, are well-versed on the program and can answer customer questions.

Program website materials note that the NR Custom incentives “can help you offset up-front costs and improve your bottom line.” When respondents were asked what made them decide to apply for the NR Custom Incentive program, the incentives, energy savings, and the monetary savings were most frequently mentioned by participants.

Table 6-7 Reasons for Participating in Smart $aver Custom Incentive Program

Reason	DEC	DEP	Overall
Duke Energy rebate/incentive	22	4	40%
The energy savings	15	4	29%
The monetary savings	14	5	29%
Ability to get a better product cheaper	7	2	14%
Needed new equipment	3	2	8%
ROI/payback	5	0	8%
Other	5	0	8%
Respondents	**52**	**13**	**65**

Source: Question Q6
Don't know responses are excluded.

6.2.3.2 Application Process

According to program staff, the review process takes about four to six weeks. Staff mentioned they have worked to improve the turnaround, which is now around 20 days. While Duke staff felt the review process could be improved, program participants were satisfied with the review process (Table 6-8). When asked about their satisfaction with various aspects of the application process, respondents rated their satisfaction highly, with mean scores for each aspect of the application 8.7 or higher for participants (using a 0 to 10 scale where 0 is 'very dissatisfied' and 10 is 'very satisfied'). Only one participant respondent (from DEC) rated their satisfaction low for an aspect of the application process (less than 4) and this was due to the complexity of the application.

Table 6-8 Satisfaction with Application Process

	DEC		DEP		Overall	
Application Aspect	Mean	Respondents	Mean	Respondents	Mean	Respondents
Process to fill out and submit your application	8.9	45	9.5	12	9.0	57
Staff time it took to submit the application	8.7	49	8.8	13	8.7	62
Duke Energy's processing and preapproval of your application	9.1	51	9.5	13	9.2	64

Source: Questions Q8, Q9, Q10
Don't know responses are excluded.

About half of participant respondents indicated they received a request for additional information after submitting their initial application for preapproval. Most respondents could not recall the specifics around the request although of the 19 respondents who recalled, most noted that it was additional equipment specifications (11 respondents), or building/address specifications (5 respondents).

As far as who was involved in completing the application, over half of participant respondents (57 percent) indicated their contractor filled out the NR Custom program application. Someone within the organization was the second most common way the application was completed (25 percent), followed by a combination of the contractor and someone within the organization (18 percent). These responses were similar across the two territories although the contractor was slightly more likely to be involved in the DEP territory.

6.2.3.3 Calculators

As mentioned above, as part of the application process and to receive incentives through the program, an appropriate worksheet or calculator must be submitted. In addition to the feedback contractors provided, participant respondents were also asked if they used any of the calculators provided by Duke Energy or if they used their own methods to calculate energy savings. While contractors were the most common method used to calculate energy savings, one-third of respondents reported using the tools Duke Energy provided (Table 6-9). This is similar to the feedback received from contractors where 16 of the 23 contractors indicated they used Duke tools to calculate savings.

Table 6-9 Calculators Used by Participants

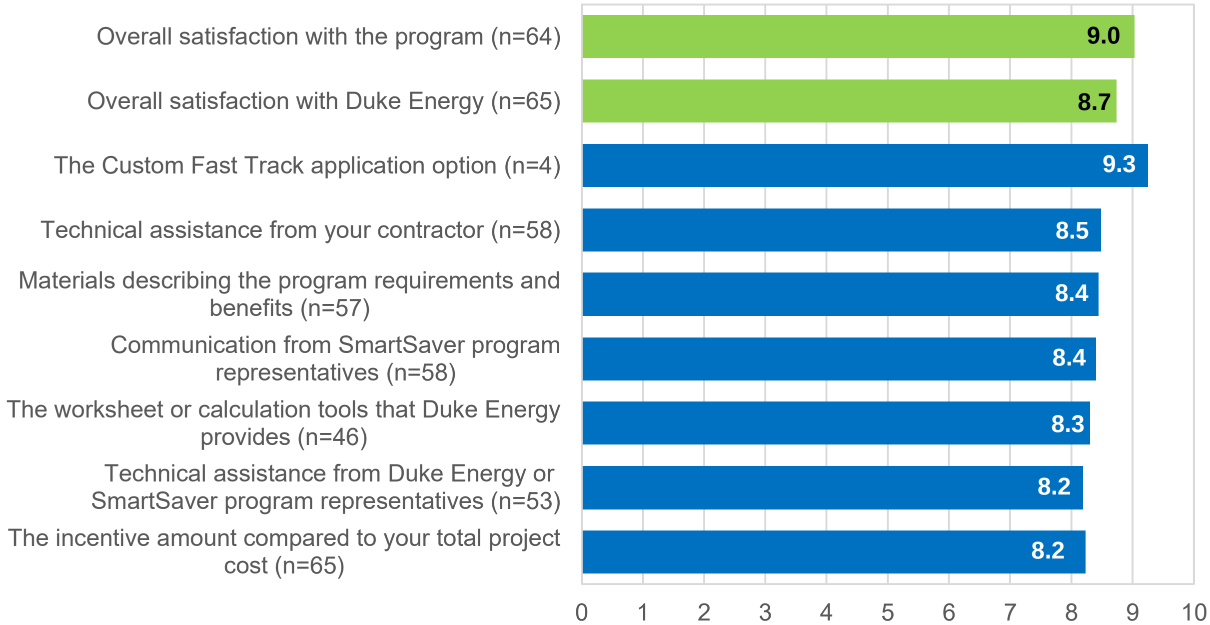
Calculators Used	DEC	DEP	Overall
Contractor calculated only	37%	25%	34%
Own methods only	27%	42%	30%
Custom-to-go only	29%	25%	28%
Custom-to-go and own methods	4%	0%	3%
Own methods and contractor	2%	8%	3%
Custom-to-go and contractor	2%	0%	2%
Respondents	**49**	**12**	**61**

Source: Question Q12
Don't know responses are excluded.

6.2.3.4 Program Satisfaction

Overall, program participants were highly satisfied with the NR Custom program. Respondents were asked to rate their overall experience with the program and with Duke Energy on a scale of 0 to 10, where 0 is 'very dissatisfied' and 10 is 'very satisfied.' Respondents rated their overall satisfaction with the program overall highly, 9.0 overall, and rated Duke Energy highly as their service provider, 8.7 overall. Respondents were also asked to rate the value of different program components on a similar 0 to 10 scale. All program aspects were rated an average of 8.2 or higher.

Figure 6-4 Program Participant Satisfaction and Value of Program Aspects

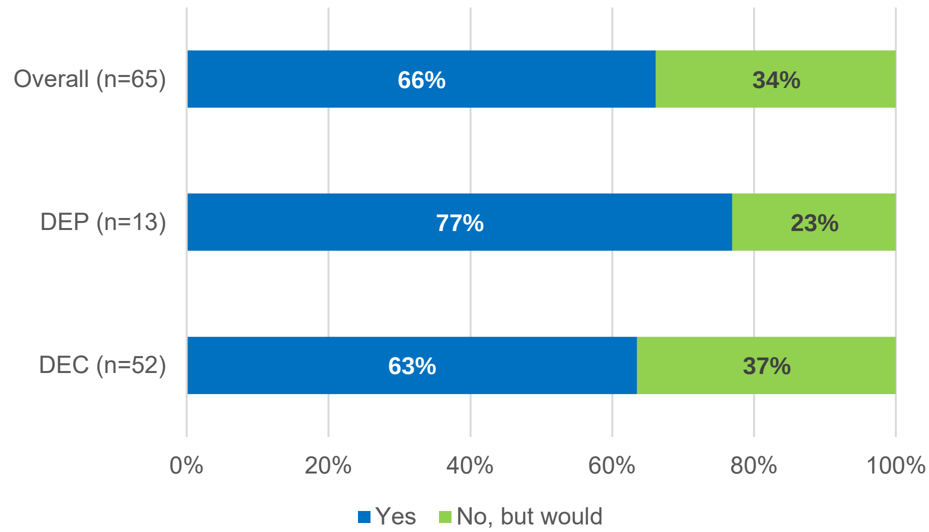


Source: Question SAT5, SAT11, SAT13
Don't know responses are excluded.

As far as the program aspect that is most valuable to their organization, about half of the participant respondents indicated the incentive compared to their total project cost, which correlates with the contractor responses (19 of 45 respondents). This was followed by the technical assistance they received from their contractor (13 of 45 respondents).

As another gauge of satisfaction, customers were asked if they have recommended the program to others. As shown in the figure below, most participants reported that they had already recommended the program. If provided the opportunity, the remaining respondents said they would recommend the program. Furthermore, all respondents but one indicated they would participate in the program again. The one respondent who did not indicate he would participate in the program again was not sure (did not know) and provided no indication of dissatisfaction throughout the survey.

Figure 6-5 Have You Recommended the Program to Others?



Source: Questions SAT8, SAT9

The primary reason respondents reported rating the program highly (providing a rating of an 8 or higher) was the ease of the process. This was followed by the availability of the incentive/monetary savings, and the energy savings they expect to achieve.

Table 6-10 Reasons for Rating the Program Highly

Reason	DEC	DEP	Overall
Ease of the process	21	3	24
Incentive/Monetary savings	14	8	22
Energy savings	7	3	10
Duke service	3	2	5
Contractor service	1	0	1
Respondents	**45**	**12**	**57**

Source: Question SAT12o
Don't know responses are excluded.

Seven participant respondents rated their satisfaction less than an 8. While some had to do with the application process, other responses varied. Below are specific comments respondents provided along with how they rated their overall satisfaction with the program in parentheses.

> *"Some parts of it were easy, did exactly what they said, and other parts were harder to get done, some of the application process. People who don't know about lighting like we do would not be able to do those applications".* (5)

> *"I'd like to be more informed about what's going on. I'm a person who likes someone to give me a call instead of shooting an email at me."* (5)

> *"Well because it was almost not worth the trouble of going through the application process for an incentive of $27. It took me hours."* (6)

> *"Some of the time it's a lot of work. For some of the products they understand they offer significant incentives, and for technology they don't understand they don't offer much incentive. You can see that in the incentives they offer."* (7)

> *"There were difficulties getting status updates during the application process. There seemed to be a long time for approval."* (7)

> *"Give me more."* (7)

> *"On the plus side for receiving the incentive, and on the negative having to opt in or opt out."* (7)

When asked what they would change about the NR Custom program, over half of participant respondents (33 of 64) indicated they would not change anything. Of the remaining respondents, 13 respondents mentioned the incentive. Specifically, 12 respondents asked for higher incentives and 1 respondent asked not to reduce the incentives. Other suggestions included simplifying the application especially in relation to the language used and the calculations needed (5 respondents), extending the deadlines for pre- and post-approval especially for large projects (4 respondents), updating or extending the list of eligible equipment (3 respondents), increasing awareness about the program (3 respondents), and decreasing the initial processing time (3 respondents).

Table 6-11 Recommended Program Changes

Reason	DEC	DEP	Overall
Nothing	25	8	33
Increase rebate amount	11	2	13
Simplify application	4	1	5
Extend deadlines	3	1	4
Updating or extending the equipment list	2	1	3
Increase awareness	2	1	3
Decrease the preapproval time	2	1	3
Other	2	0	2
Remove the preapproval requirement	0	1	1
Make the website more user friendly	1	0	1

Reason	DEC	DEP	Overall
Streamlining the process	1	0	1
Interaction with staff & contractor	1	0	1
Improve payment process	1	0	1
Respondents	**51**	**13**	**64**

Source: Question SAT1
Don't know responses are excluded.

Some specific comments included the following:

> *"Clearer and more up-to-date list of appliances that qualify for the program."*

> *"More interaction between Duke and the third party especially during initial approval and application."*

> *"They reduced the incentive in 2018. Because of that, we are going to evaluate how we approach our lighting."*

> *"More publicity. We would not have known about it without our vendor, Batteries Plus. More advertising to businesses."*

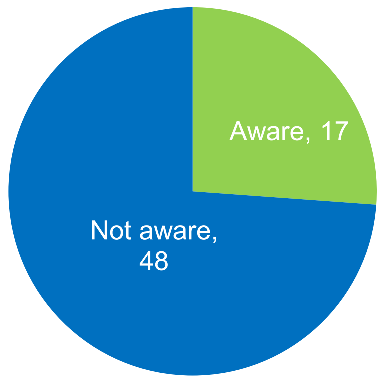
6.2.3.5 Fast Track

Duke Energy offers a fast track option where customers with a project under a tight timeline can pay a $550 fee to accelerate the review of their project from four to six weeks to about one week. Customers must also commit to participating in a kick off meeting and promptly responding to any requests.

When customers were asked about their awareness and interest in the offering, over one-quarter (17 of 65 participant respondents) were aware of the Fast Track offering.[10] Awareness was similar between DEC and DEP respondents. Four DEC respondents have utilized the Fast Track offering, two participants found out from their contractors, one participant from their account representative, and one participant from their business energy advisor.

[10] Fourteen contractor respondents reported being aware of the Fast Track option. An additional five contractor respondents did not know it was offered by Duke Energy.

Figure 6-6 Awareness about the NR Custom Program Fast Track Option



Source: Question FT10
Don't know responses are excluded.

Respondents who have not utilized the fast track option were asked about their interest in the offering. Over half of respondents (32 of 55 respondents) indicated they would be willing to pay a fee to have an accelerated review of their application if they had a project under a tight timeline. For those who were not willing to pay the fee, six participants explained that the extra fee would reduce the return on investment or increase the costs. Other respondents indicated reasons such as not having projects that would require needing an expedited process or under tight deadlines (5 respondent), or delaying the project or planning ahead to avoid having to pay a fee (4 respondents). Four other participant respondents reported that they cannot afford to pay that money or get approval for it. Other respondent mentioned that the fee "*defeats the purpose*," or that they would have to *"find something else."*

While the fee may be a barrier, the meetings may not be. Over two-thirds of respondents (43 of 58 respondents) would be willing to participate in an entrance meeting and respond to requests about the project specifications in a timely manner. Fifteen participant respondents indicated they would not be willing to pay the fee nor participate in the necessary meetings. Overall, when asked about the value of the Fast Track option, responses were mixed. The average response was 5.4 (on a 0 to 10 scale with 0 being 'not at all valuable' and 10 being 'very valuable'). Nine respondents rated the value a 0 (not at all valuable), 17 respondents rated the value a 5, and 9 respondents provided a rating of 10 (very valuable). Other respondents were sprinkled in between, resulting in mixed feedback on the value of the service.

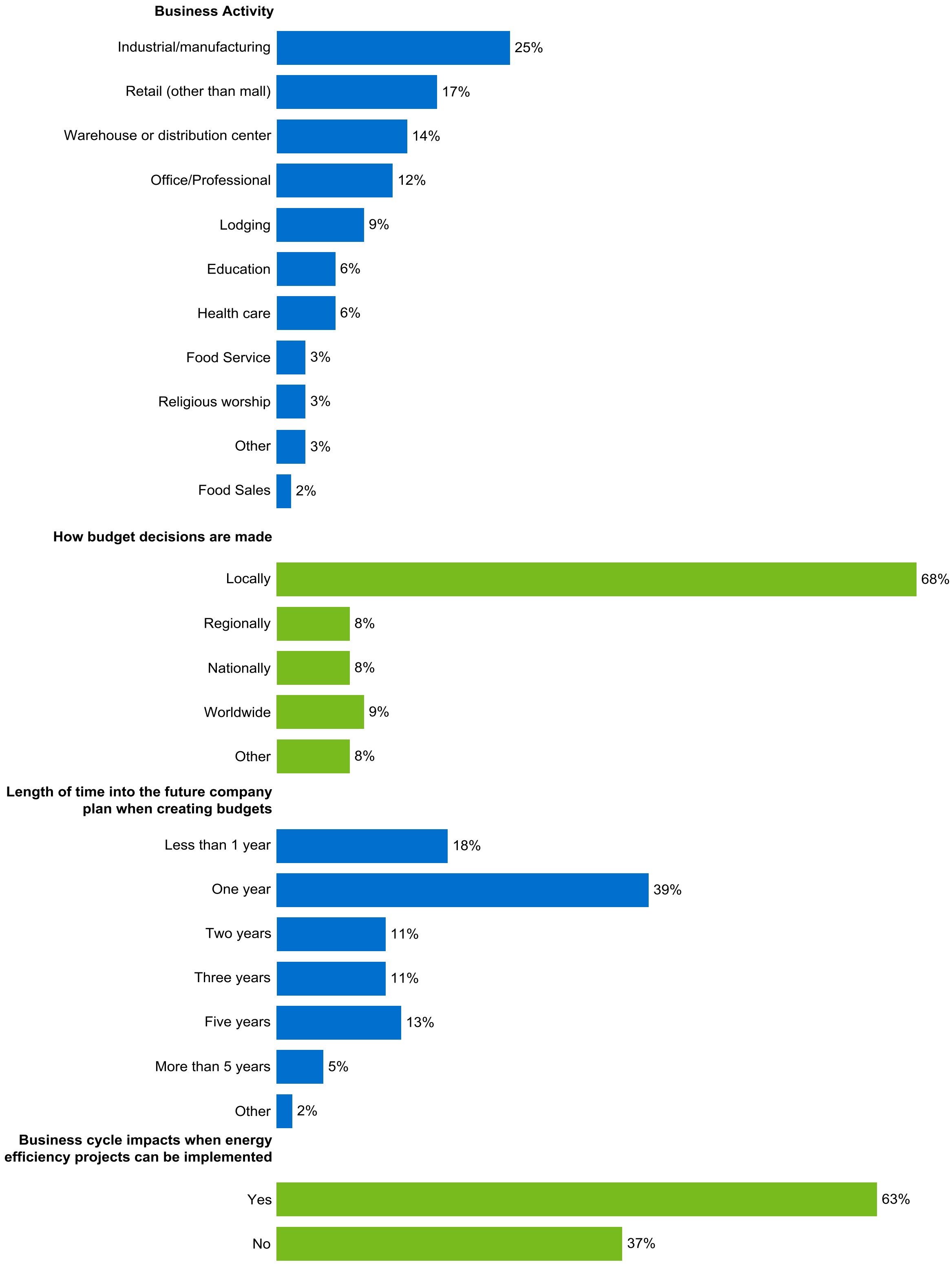
6.2.3.6 Participating Customer Characteristics

Facility types varied across participant respondents' locations. The most frequently mentioned types of businesses were industrial/manufacturing (25 percent), followed by retail (17 percent), warehouse or distribution center (14 percent) and office building (12 percent). The facility types are consistent with how the program was marketed, which initially targeted larger industrial customers. Historically, there have been a lot of large customers that would normally participate in a custom program, but now more of the large customers are opting out, which will narrow the number of customers eligible for the program.[11]

When participants were asked how their companies make budget decisions and whether they were decided locally, regionally, nationally, worldwide or something else, most respondents reported that decisions are made locally (68 percent). Most respondents tended to plan one year (39 percent) or less than 1 year (18 percent) into the future when creating budget and financial plans. The figure below shows the participant business characteristics.

[11] The opt in/out requirements are different between DEC and DEP. DEC is a one year opt in period for the calendar year and customers have a window where they are able to opt in and opt out. DEP you can opt in at any time. As soon as a customer receives their incentive, they opt in for 3 years.

Figure 6-7 Smart $aver Custom Incentive Program Participant Characteristics



Source: Questions C1, C2, C3, C4
Don't know responses are excluded.

7 Conclusions and Recommendations

7.1 Impact Evaluation

Conclusion 1: The evaluation team's analysis resulted in a 105.4% realization rate (energy) for the DEC NR Custom Program and 105.7% for the DEP NR Custom Program. The strong realization rates indicate that Duke Energy's internal processes for project review, savings estimation, and installation verification are working to produce high quality estimates of project impacts. Reported energy and demand savings could be increased by incorporating interactive factors into ex-ante impact estimates for lighting measures.

Recommendation 1: The evaluation team recommends that Duke continue to operate this program with the current level of rigor. For interior lighting projects, Duke should consider developing and applying deemed interactive factors to quantify the interactive effects between lighting retrofits and their associated HVAC systems.

Conclusion 2: Assumptions used in ex ante energy savings estimates are well-documented, but there are opportunities for improvement on new construction lighting projects and some non-lighting projects.

Recommendation 2: The evaluation team recommends that any adjustments made to baseline assumptions on new construction projects be well-documented within the incentive calculation spreadsheet developed by the program. This will provide better transparency when deviations from a lighting power density approach are used in ex-ante energy savings estimates.

Conclusion 3: The NR Custom Program uses T12 baseline fixture wattages in ex-ante energy savings estimates for applicable linear fluorescent to LED tube retrofit measures. This practice is defensible given the availability of high color rendering index (CRI) replacement lamps; however, peer Demand Side Management (DSM) programs no longer credit energy or demand savings beyond a T8 baseline.

Recommendation 3: It is recommended that the Duke NR Custom Program consider using a T8 equivalent when developing ex-ante energy and demand savings estimates for T12 to LED tube retrofit measures.

7.2 Process Evaluation

Conclusion 1: The program is operating as intended and has resulted in high satisfaction across participant and contractor respondents. The most common source of program awareness for customers was their contractor, which is consistent with how the program is marketed.

Technical assistance from the contractor was the highest rated aspect of the program, which highlights the contractors' technical competence and the significant role contractors play in the program. Many customer respondents also commented on how their contractors are knowledgeable which made the entire process easy.

Recommendation 1: Continue program outreach efforts and continue to engage contractors in the program and keep them informed of the program and any future changes to increase awareness among customers and encourage the installation of program-qualifying equipment.

Conclusion 2: As part of the application process, an appropriate worksheet or calculator must be submitted. Duke Energy provides access to two types of calculators: Classic Custom and Custom-to-go. Over two-thirds of contractors and one-third of participant respondents indicated they have used Duke's tools to calculate savings. Contractors who used Duke Energy's provided tools rated their usefulness high. That said, contractors who install non-lighting equipment were more likely to use their own calculators or rated the usefulness of Duke's calculators low.

Recommendation 2a: Continue to keep the Custom-to-Go and Classic Custom calculators updated and available to customers and contractors who need a tool to estimate savings.
Recommendation 2b: Consider reviewing the calculators for non-lighting equipment to ensure they perform as expected and do not require lighting-specific information.

Conclusion 3: Program participants were generally satisfied with the review process. Most contractors were also satisfied with the process. However, five contractors felt the preapproval process could be improved. Specifically, three indicated that the non-lighting preapproval process can take significantly longer than lighting preapproval. As different technologies come into the market, it will be important to ensure customers are getting feedback in a timely manner.

Recommendation 3: Monitor the time it takes to review applications for preapproval to ensure the time does not exceed six weeks.

Conclusion 4: Most participant respondents reported high satisfaction with the application process, although five respondents indicated the program could benefit from simplifying the application. A few contractors also recommended the application is geared towards lighting projects, leading to some confusion in what information is needed.

Recommendation 4: Streamline the application paperwork to minimize customer burden and collect only the information relevant to specific equipment types.

Appendix A Summary Forms

Duke Energy Carolinas Smart $aver NR Custom Program

Completed EMV Fact Sheet

Description of Program

Duke Energy's Non-Residential Smart $aver® Custom Incentive Program (NR Custom) offers financial assistance to qualifying commercial, industrial and institutional customers in the Duke Energy Carolinas (DEC) service territory to enhance their ability to adopt and install cost-effective electrical energy efficiency projects. The Program targets energy saving projects involving more complicated or alternative technologies, or those measures not covered by the non-residential Smart $aver Prescriptive Program. The intent of the program is to encourage the implementation of energy efficiency projects that would not otherwise be completed without the company's technical or financial assistance. The program requires pre-approval prior to the project implementation.

Summary		Strata	Verified Net Savings (kWh)
Region(s)	*Carolinas*	*Lighting*	*59,695,834*
Evaluation Period	*Jan 1, 2016 – Dec 31, 2017*		
Annual kWh Net Savings	*95,479,738*	*Non-lighting*	*35,783,904*
Coincident kW Net Impact - Summer	*15,054*		
Coincident kW Net Impact - Winter	*14,829*		
Net-to-Gross Ratio	*79.2%*		
Process Evaluation	*Yes*		
Previous Evaluation(s)	*N/A*		

Evaluation Methodology

mpact Evalulation Activities

- *59 On-site Measurement & Verification*

Impact Evaluation Findings

- *Energy Realization Rate: 105.4%*
- *Summer Demand Realization Rate: 115.9%*
- *Winter Demand Realization Rate: 123.9%*
- *Net-to-gross: 79.2%*

Process Evaluation Activities (DEC & DEP Combined)

- *Program Staff; 2 interviews with program staff*
- *Trade Allies; 24 in-depth interviews*
- *Participants; 81 telephone surveys*

Process Evaluation Findings

- *Primary source of program awareness is contractors*
- *Satisfaction with program is high among participants and trade allies*
- *Contractor assistance was most valuable program component as rated by participants*
- *Program-provided calculators are being used by participants and are useful to contractors*
- *Contractors value the program and use incentives to encourage customers to purchase high efficiency equipment*
- *Program application and processes are geared toward lighting projects leading to some confusion*

Duke Energy Progress Smart $aver NR Custom Program

Completed EMV Fact Sheet

Description of Program

Duke Energy's Non-Residential Smart $aver® Custom Incentive Program (NR Custom) offers financial assistance to qualifying commercial, industrial and institutional customers in the Duke Energy Progress (DEP) service territory to enhance their ability to adopt and install cost-effective electrical energy efficiency projects. The Program targets energy saving projects involving more complicated or alternative technologies, or those measures not covered by the non-residential Smart $aver Prescriptive Program. The intent of the program is to encourage the implementation of energy efficiency projects that would not otherwise be completed without the company's technical or financial assistance. The program requires pre-approval prior to the project implementation.

Summary		Strata	Verified Net Savings (kWh)
Region(s)	*Progress*	*Lighting*	*5,336,890*
Evaluation Period	*Jan 1, 2016 – Dec 31, 2017*		
Annual kWh Net Savings	*13,444,668*	*Non-lighting*	*8,107,778*
Coincident kW Net Impact - Summer	*1,498*		
Coincident kW Net Impact - Winter	*1,954*		
Net-to-Gross Ratio	*78.8 combined*		
Process Evaluation	*Yes*		
Previous Evaluation(s)	*N/A*		

Evaluation Methodology

Impact Evaluation Activities

- *33 for DEP and 59 for DEC On-site Measurement & Verification*

Impact Evaluation Findings

- *Energy Realization Rate: 105.7%*
- *Summer Demand Realization Rate: 99.5%*
- *Winter Demand Realization Rate: 122.7%*
- *Net-to-gross: 78.8 combined%*

Process Evaluation Activities (DEC & DEP Combined)

- *Program Staff; 2 interviews with program staff*
- *Trade Allies; 24 in-depth interviews*
- *Participants; 81 telephone surveys*

Process Evaluation Findings

- *Primary source of program awareness is contractors*
- *Satisfaction with program is high among participants and trade allies*
- *Contractor assistance was most valuable program component as rated by participants*
- *Program-provided calculators are being used by participants and are useful to contractors*
- *Contractors value the program and use incentives to encourage customers to purchase high efficiency equipment*
- *Program application and processes are geared toward lighting projects leading to*

Appendix B Survey Instruments

Duke Energy Nonresidential Custom Carolinas Program
Participant Survey

Sample Variables

CONTACT NAME Primary customer contact name

MEASURE Summary of project measure implemented
1 lighting
2 process
3 compressed air
4 HVAC

MeasureType Type of measure sampled

LightFlag Customers who will get asked the T12 lighting questions

LightingType Specific lighting type rebated through the program

YEAR The year the measure was completed and paid

PREMISE_ADDR The address of the site where the measure was installed

INCENTIVE The amount of the incentive paid for the measure

CONTRACTOR Flag that customer worked with external contractor

1 Worked with contractor
0 Implemented within company

FASTTRACK Flag that customer went through the Custom Fast Track application process

1 Fast track customer
0 Standard process customer

STRATUM
NC North Carolina
SC South Carolina

TOTAL_KWH

PROGRESS

0 States

1 Progress case

Introduction and Screening

INT01 Hello, my name is [NAME], and I am calling on behalf of Duke Energy. May I speak with [CONTACT NAME] or the person who decided to participate in <UTILITY>'s SmartSaver Custom Incentive program?

01 Yes
02 No

MULTCHK [ASK IF MULTFLAG=1] [INTERVIEWER: Is this the first case of a multiple?

01 Yes, first case
02 No, subsequent case [SKIP TO Q1]

PREAMBLE I'm calling from Tetra Tech, an independent research firm. We were hired by Duke Energy to talk with some of their customers about their participation in the SmartSaver Custom Incentive Program.

Our records indicate that you participated in Duke Energy's SmartSaver Custom Incentive Program that included a [MEASURE] project in [YEAR] at [PREMISE_ADDR]. Are you able to answer questions about your company's participation in this program?

01 Yes, I'm able to answer SKIP TO SCREEN1
02 Yes, but information isn't quite right (specify) SKIP TO SCREEN1
03 No, I'm not able to answer
04 We have not participated [THANK AND TERMINATE 82]
99 Refusal [THANK AND TERMINATE 91]

OTHER_R Is it possible that someone else in your organization would be more familiar with the program or the project that was completed?

01 Yes
02 No [THANK AND TERMINATE 81]
99 Refusal [THANK AND TERMINATE 91]

AVAILABLE_R May I please speak with that person?

01 Yes
02 No (When would be a good time to call back?)
03 We have not participated [THANK AND TERMINATE 82]
99 Refusal [THANK AND TERMINATE 91]

SCREEN1 Were you involved in the decision to complete the [MEASURE] project?

01 Yes
02 No SKIP TO OTHER_R

PREAMBLE2 Great, thank you. I'd like to assure you that I'm not selling anything, I would just like to ask your opinion about this program. Your responses will be kept confidential and your name will not be revealed to anyone. For quality and training purposes, this call will be recorded.

Program Awareness and Marketing

Q1 [IF MULTCHK=2 SKIP TO MEASCHK] How did you first hear about the SmartSaver Custom Incentive Program? (Select one)

01	Account representative	
02	Business Energy Advisor	
03	Contractor / Vendor	[CONTRACTOR = 1]
04	Email from Duke Energy	
05	Mail from Duke Energy	
06	Colleague/Another business	
07	Conference/Trade Show/Expo	
08	Duke Energy website	
09	Duke Energy representative (other than an account rep)	
10	Previous program experience / participation	
11	Other (specify)	
88	Don't know	

Q2 [ASK IF Q1 = 1, 2 or 3] Did the [response from Q1] provide you with enough information about the program?

01	Yes	SKIP TO Q4
02	No	

Q3 [ASK IF Q1 = 1, 2 or 3] What additional information would you have liked [response from Q1] to provide?

[RECORD VERBATIM]

Q4 [ASK IF Q1<>3] Did you work with a contractor or vendor to implement the [MEASURE] project or did you work with internal staff at your company?

01	Worked with a contractor / vendor	[CONTRACTOR = 1]
02	Internal staff at company	[CONTRACTOR = 0]
03	Both the contractor and internal staff	[CONTRACTOR = 1]
88	Don't know	[CONTRACTOR = 0]

Q5 Before your [MEASURE] project in [YEAR], had you participated in the SmartSaver program before?

01 Yes
02 No
88 Don't know

Q6 What made you decide to apply to the SmartSaver program?

[RECORD VERBATIM]

Q7 [IF CONTRACTOR=1] Did someone at your company fill out your application for the SmartSaver Custom Incentives program or did your contractor or vendor?

01 Someone at my company
02 Contractor / Vendor
03 Both someone at our company and the contractor
88 Don't know

Q7a [ASK IF Q7=1,3] Did you submit your application by hard copy application or electronically?

01 Hard copy
02 Electronically
03 Other (specify)
88 Don't know
99 Refused

Q8 Using a scale of 0 to 10, where 0 is "very dissatisfied" and 10 is "very satisfied", how satisfied are you with the process to fill out and submit your application?

___ [RECORD RESPONSE]
77 Does not apply
88 Don't know
99 Refused

Q9 Using the same scale of 0 to 10, where 0 is "very dissatisfied" and 10 is "very satisfied", how satisfied are you with the staff time it took to submit the application and necessary paperwork?

___ [RECORD RESPONSE]
77 Does not apply
88 Don't know
99 Refused

Q10 Using the same scale [OPTIONAL: "of 0 to 10, where 0 is "very dissatisfied" and 10 is "very satisfied"], how satisfied are you with Duke Energy's processing and preapproval of your application?

___ [RECORD RESPONSE]
88 Don't know
99 Refused

Q11 [IF Q8=1,2,3 OR Q9=1,2,3 OR Q10=1,2,3] What could the program have done differently to make the application process easier?

[RECORD VERBATIM]

Q12 Did you use the Custom-to-Go calculators provided by Duke Energy, or did you calculate energy savings using your own methods? [SELECT ALL THAT APPLY]

01 Custom-to-Go
02 Own methods
03 Other (specify)
04 Contractor / Vendor calculated
88 Don't know

Q12a [ASK IF Q12 = 4] How did the contractor/vendor calculate the energy savings? [SELECT ALL THAT APPLY]

01 Custom-to-Go calculators provided by Duke Energy
02 Own methods
03 Other (specify)
88 Don't know

Q13 After submitting your initial application for preapproval, did you receive any requests for additional information while Duke Energy was processing your application?

01 Yes
02 No
88 Don't know

Q13O [ASK IF Q13=1] What additional information was requested?

[IF DON'T KNOW OR DOES NOT RECALL PROBE: Do you recall if it was information about your building, the equipment installed or the prior equipment?)

[RECORD VERBATIM]

Q14 Was your project under pressure to be completed in a short amount of time?

01 Yes
02 No

Q15 Did you work with a Duke Energy-provided Energy Advisor as part of this project?

01 Yes
02 No
88 Don't know

Q16 [ASK IF Q15 = 1] Using a scale of 0 to 10, where 0 is "very dissatisfied" and 10 is "very satisfied", how satisfied are you with the Energy Advisor?

___ [RECORD RESPONSE]

88 Don't know
99 Refused

Equipment Questions

E1 Was the [MEASURE] equipment part of a newly constructed building or major renovation of an existing facility?

01 Yes [SKIP TO MeasChk]
02 No
88 Don't know
99 Refused

E2 Did the [MEASURE] equipment you purchased replace an existing [MeasureType]?

01 Yes
02 No [SKIP TO MeasChk]
88 Don't know [SKIP TO MeasChk]
99 Refused [SKIP TO MeasChk]

E3 About how old was your existing [MEASURE] equipment?

___ Years
888 Don't know

E4 What condition was your existing [MEASURE] unit when you decided to purchase a new one? (Read list)

01 Operating with no performance issues
02 Operating but in need of repair
03 No longer operating (broken, did not work)
88 [DO NOT READ] Don't know
99 [DO NOT READ] Refused

Net-to-Gross

MeasCHK [ASK IF MULTCHK = 2 ELSE SKIP TO FR1]
[INTERVIEWER QUESTION: Is this case's MEASURE variable the same as a previous case's MEASURE variable?]

1 Yes; Duplicate measure
2 No, New measure [SKIP TO Q4_MULT]

DecisionCHK [ASK IF MeasCHK=1]
Now, thinking about the [MEASURE] project at [PREMISE_ADDR], was the decision making process the same or different from the previous [MEASURE] project we discussed?

1 Same decision making process [SKIP TO INT99]
2 Different decision making process

Q4_MULT [ASK IF MULTCHK=02] Did you work with a contractor or vendor to implement the [MEASURE] project or did you work with internal staff at your company?

01	Worked with a contractor / vendor	[CONTRACTOR = 1]
02	Internal staff at company	[CONTRACTOR = 0]
03	Both the contractor and internal staff	[CONTRACTOR = 1]
88	Don't know	[CONTRACTOR = 0]

FR1 Which of the following is most likely what would have happened if you had not received the incentive from Duke Energy? (Read list)

01 Canceled or postponed the project at least one year
02 Reduced the size, scope, or efficiency of the project
03 Done exactly the same project
04 Done nothing
88 [DO NOT READ] Don't know

FR2 [ASK IF FR1=2] By how much would you have reduced the size, scope, or efficiency of the project? Would you say a small amount, a moderate amount, or a large amount?

01 Small amount
02 Moderate amount
03 Large amount
88 Don't know

FR3 [ASK IF FR1=3] Would your business have paid the additional $[INCENTIVE AMOUNT] to complete the project on your own?

01 Yes
02 No
88 Don't know

FR4 On a scale of 0 to 10, with 0 being "not at all influential" and 10 being "extremely influential", how would you rate the influence of the following factors on your decision to complete the [MEASURE] project? [RANDOMIZE ORDER]

FR4A The incentive provided by Duke Energy
FR4B The interaction with Duke Energy SmartSaver program representatives
FR4C SmartSaver marketing materials
FR4D [ASK IF Q5=1] Previous experience with the SmartSaver program
FR4E [IF CONTRACTOR=1] Your contractor's or vendor's recommendation

___ Record influence [0-10]
77 Not applicable
88 Don't know
99 Refused

FR5 [ASK IF CONTRACTOR=1] Was there anything your contractor or vendor said to make you choose the equipment that you ended up installing?

01 Yes [SPECIFY: What did they say?]
02 No
88 Don't know

T12 Questions

[Ask if LightFlag = 1, Else skip to SP1]

TL1 Would you have continued using linear fluorescent T12 fixtures if you had not received a financial incentive to upgrade to [LightingType]?

01 Yes
02 No
88 Don't know

TL2 [If TL1 = 1] How long could replacement lamps have allowed you to continue to use T12 fixtures?

TL2_months ___ Months
TL2_years ___ Years

TL3 Were you previously purchasing high Color Rendering Index (CRI) T12 replacement lamps as a means of postponing full fixture replacements?

01 Yes
02 No
88 Don't know

Spillover

[IF MULTCHK=02 SKIP TO INT99]

SP1 Since your participation in the SmartSaver program, did you complete any additional energy efficiency projects at this facility or another facility served by Duke Energy that did not receive incentives through a Duke Energy program?

01	Yes	
02	No	SKIP TO SAT1
88	Don't know	SKIP TO SAT1
99	Refused	SKIP TO SAT1

SP2 What energy efficient products, equipment, or improvements did you install or implement? (Select all that apply)

01	Lighting	
02	Heating / Cooling	
03	Hot Water	
04	Appliances / Office	
05	Insulation	
06	Motor / Variable Frequency drives (VFDs)	
07	Compressed Air	
08	Refrigeration	
09	Other1 [SPECIFY]	
10	Other2 [SPECIFY]	
88	Don't know	SKIP TO SAT1

[ASK SP3-SP4 FOR EACH MENTIONED IN SP2]

SP3 Can you describe the [SP2] equipment? [For example: What was the brand or model? Efficiency rating? Dimensions? or Capacity?]

[RECORD VERBATIM]

SP4 How many [SP2] units did you install?

_____ [RECORD RESPONSE] 1-999
888 Don't know
999 Refused

SP5 On a scale of 0 to 10, with 0 meaning "not at all influential" and 10 meaning "extremely influential", how influential was your participation in the SmartSaver program on your decision to complete the additional energy efficiency project(s)?

___ [RECORD RESPONSE]
77 Not applicable
88 Don't know
99 Refused

Customer Satisfaction

SAT1 What would you change about the SmartSaver Custom Incentive Program, if anything? (DO NOT READ, Select all that apply)

01 Would not change anything
02 Remove pre-approval requirement
03 Improve initial processing time
04 Increase rebate amount
05 Other (specify)
88 Don't know

SAT2 [ASK IF SAT1=3] What would you consider to be a reasonable amount of time for processing the initial application?

___ [RECORD VERBATIM]

SAT3 [ASK IF SAT1=4] What percent of the project's cost do you think would be reasonable for the SmartSaver program to pay?

___ [RECORD PERCENT]
888 Don't know
999 Refused

SAT4 Was the incentive you received close to the amount you originally calculated when completing your application?

01 Yes
02 No
88 Don't know

Fast Track Feedback

FT10 Duke Energy offers a fast track option where customers can pay a fee to accelerate the review of a project from 4 to 6 weeks to about one week. Before today, were you aware this is now offered?

01	Yes	
02	No	SKIP TO SAT5
88	Don't know	SKIP TO SAT5

FT1 Did you participate in the Smart $Saver Custom Fast Track option?
[IF NEEDED: "There is typically a several hundred dollars fee for the accelerated review."]

01	Yes	
02	No	SKIP TO SAT5
88	Don't know	SKIP TO SAT5

FT2 How did you hear about the SmartSaver Custom Fast Track option?

01 Account representative
02 Business Energy Advisor
03 Contractor
04 Other (specify)
88 Don't know

FT3 Why did you choose the Custom Fast Track option?

[RECORD VERBATIM]

FT4 Did you have any difficulty responding to the Custom Fast Track questions or requests?

01 Yes
02 No
03 No follow-up questions were asked
88 Don't know

FT5 [ASK IF FT4=1] What was challenging about responding to the SmartSaver program's requests?

[RECORD VERBATIM]

FT6a Were you involved in the kickoff phone call to discuss the scope of the project or to answer any questions Duke Energy had about your project or the building?

01	Yes	
02	No	SKIP TO FT8
88	Don't know	SKIP TO FT8

FT6b Were you notified in advance of the kickoff phone call what would be discussed or any information you would need available?

01 Yes
02 No
88 Don't know

FT7 [ASK IF FT6b=1] What was discussed during the kickoff call?

[RECORD VERBATIM]

FT8 Did your participation in the Fast Track option allow you to complete your project on schedule?

01 Yes
02 No
88 Don't know

FT9 [ASK IF FT8 = 2] What drove the delay in your project being completed as planned?

[RECORD VERBATIM]

FT9a Will you use the Fast Track option again in the future if you have a project under a tight timeline?

01 Yes
02 No [SPECIFY: Why not?]
88 Don't know

SAT5 Using a scale of 0 to 10, where 0 is "not at all valuable" and 10 is "very valuable", how valuable are the following SmartSaver program components to your organization? [RANDOMIZE LIST]

FOR SAT5A through SAT5G

__ Record value [1-10]
NA Not applicable
DK Don't know
RE Refused

SAT5A Materials describing the program requirements and benefits
SAT5B Communication from SmartSaver program representatives
SAT5C Technical assistance from Duke Energy or SmartSaver program representatives
SAT5D [IF CONTRACTOR=1] Technical assistance from your contractor or vendor
SAT5E The incentive amount compared to your total project cost
SAT5F The worksheet or calculation tools that Duke Energy provides
SAT5G [IF FT1=1] The Custom Fast Track application option

[ASK IF MULTIPLE SAT5 COMPONENTS RATED EQUALLY VALUABLE]
[SKIP IF ONE SINGLE COMPONENT IS RATED HIGHEST]
[SKIP IF ALL SAT5 COMPONENTS ARE EQUAL TO ZERO]

SAT7 Which of the following SmartSaver program components is most valuable to your organization? [READ LIST, SELECT ONE] [RANDOMIZE CHOICES]

01 Materials describing the program requirements and benefits
02 Communication from SmartSaver program representatives
03 Technical assistance from Duke Energy or SmartSaver program representatives
04 Technical assistance from your contractor or vendor
05 The incentive amount compared to your total project cost
06 The worksheet or calculation tools that Duke Energy provides
07 The Custom Fast Track application option
88 [DO NOT READ] Don't know
99 [DO NOT READ] Refused

SAT8 Have you recommended the SmartSaver Custom Incentive Program to anyone?

01 Yes SKIP TO SAT10
02 No
88 Don't know

SAT9 If provided the opportunity, would you recommend the SmartSaver Custom Incentive Program to anyone?

01 Yes
02 No
88 Don't know

SAT10 Would you consider participating in the SmartSaver Custom Incentive Program again in the future?

01 Yes
02 No [SPECIFY: Why not?]
88 Don't know [SPECIFY: Please explain.]

SAT11 Considering all aspects of the program, using a scale of 0 to 10, where 0 is "very dissatisfied" and 10 is "very satisfied", how would you rate your overall satisfaction with the SmartSaver Custom Incentive program?

___ [RECORD RESPONSE]
88 Don't know
99 Refused

SAT12 Why do you say that?

[RECORD VERBATIM]

SAT13 Using a scale of 0 to 10, where 0 is "very dissatisfied" and 10 is "very satisfied", how would you rate your overall satisfaction with Duke Energy?

___ [RECORD RESPONSE]
88 Don't know
99 Refused

SAT14 [ASK IF SAT13=0,1,2,3] Why do you say that?

[RECORD VERBATIM]

C_FT11_SKIP [IF FT1=1 SKIP TO C1]

FT11 [IF FT10 = 1, ELSE SKIP TO FT13] How did you become aware of the Smart $aver Custom Fast Track offering?

01 Account representative
02 Business Energy Advisor
03 Contractor / Vendor
04 Duke Energy website
05 Other (specify)
88 Don't know

FT12 Why did you choose not to participate in the offering?

[RECORD VERBATIM]

FT13 If you have a project under a tight timeline, would you be willing to pay several hundred dollars for an accelerated review of your SmartSaver application?

01 Yes
02 No [SPECIFY: Why not?]
88 Don't know

FT14 Would you be willing to participate in a meeting or teleconference and respond to requests about the project specifications in a timely manner?

01 Yes
02 No
88 Don't know

FT15 Using a scale of 0 to 10, where 0 is "not at all valuable" and 10 is "very valuable", how valuable would the fast track application option be for future projects?

___ [RECORD RESPONSE]
88 Don't know
99 Refused

Customer Characteristics

C1 What is the main business activity at [PREMISE_ADDR]?

01 Office/Professional
02 Warehouse or distribution center
03 Food sales
04 Food service
05 Retail (other than mall)
06 Mercantile (enclosed or strip malls)
07 Education
08 Religious worship
09 Public assembly
10 Health care
11 Lodging
12 Public order and safety
13 Industrial/manufacturing [SPECIFY]
14 Agricultural [SPECIFY]
15 Vacant (majority of floor space is unused)
16 Other [SPECIFY]
88 Don't know

C2 Are your company's budget decisions made locally, regionally, nationally, worldwide, or something else?

01 Locally
02 Regionally
03 Nationally
04 Worldwide
05 Other (specify)
88 Don't know

C3 When creating budgets and financial plans, how far into the future does your company plan?

00 Less than 1 year
01 One year
02 Two years
03 Three years
04 Four years
05 Five years
06 More than 5 years
07 Other (specify)
88 Don't know

C4 Does your business' production schedule or business cycle affect when you can implement energy efficiency projects?

[PROBE: A business cycle refers to time periods when your business' activities might be significantly different. For example, a school might have to wait until summer to implement projects, while a manufacturing facility might wait until production is lower."]

01 Yes (Please describe that schedule or cycle)
02 No
03 Don't know

C7 Would you like someone from Duke Energy to contact you directly to provide more information or answer any questions you might have about their energy efficiency programs?

[PROBE: We will not share your responses to this survey, only pass along your contact information]

01 Yes
02 No [SKIP TO C9]

C8_phone To confirm, what's the best number to reach you at?

[RECORD VERBATIM]

C8_name And who should they get in touch with? [Can you spell your name?]

[RECORD VERBATIM]

C9 [IF MULTFLAG=1 SHOW: "[INTERVIEWER, If R has more surveys to complete read: Now I'd like to ask you a smaller selection of questions about another location we have on record for your firm." OTHERWISE READ: "Those are all the questions I have. I'd like to thank you for your help with this survey."]
Do you have any comments you would like to share with Duke Energy?

01 Yes [SPECIFY]
02 No

INT99 [SKIP IF MULTCHK=02] That completes the survey, thank you very much for your time.

CP Completed

INT98 That completes the survey, thank you very much for your time.

CM Completed

Duke Energy Carolinas Smart$aver Custom Incentive Program Participating Trade Ally Interview Guide

This document serves as a guide for interviews with companies that provided services to Smart$aver Custom Incentive program participants.

Background for respondent: We are working with Duke Energy to evaluate their Smart$aver Custom Incentive program in the Carolinas. As part of this evaluation, we are speaking to contractors such as yourself. We will be asking about your experience with the program in the past and improvements you would suggest for the future. Your responses to these questions will be confidential and will not be associated with you or your company when we prepare our report for Duke Energy.
I would like to record this call so I can review it later and make sure I capture your responses accurately. Is that OK?

Trade Ally Background

1 What is your role at <company>? What services does your company provide to your customers?

2 How long has <company> been participating in the Duke Energy Smart$aver Custom Incentive program? About how many projects would you say you have completed since then?

Program Interaction

3 How did your company first get involved with the Smart$aver Custom Incentive program?

4 Who do you interact with at Duke Energy in connection with the Custom program?

5 What information or training has Duke Energy provided as part of the Custom program? Is the information/training sufficient? Is there anything additional Duke Energy could provide?

6 Do your customers tend to already know about the Custom program, or do you introduce it to them? Do you use the program as a sales tool?

7 What types of concerns do customers have about the program, if any? Is there anything Duke Energy could provide to address these concerns?

Attribution

8 Approximately how many projects have you completed through the Smart$aver Custom Incentive program in 2017?

__ [RECORD # OF PROJECTS]

9 In what percent of your sales situations did you recommend high-efficiency equipment *before* you learned about the Smart$aver Custom Incentive program?

___ [RECORD 0-100%]

10 And in what percent of your sales situation do you recommend high-efficiency equipment now that you have worked with the Smart$aver Custom Incentive program?

___ [RECORD 0-100%]

11 In what percent of your sales situations did the customer plan to purchase high-efficiency equipment *before* you told them about the Smart$aver Custom Incentive program?

___ [RECORD 0-100%]

12 And in what percent of your sales situation did the customer purchase high-efficiency equipment *after* you told them about the Smart$aver Custom Incentive program?

___ [RECORD 0-100%]

13 Using a similar 0 to 10 scale, this time with 0 being “not at all satisfied” and 10 being “very satisfied” how satisfied are you with the Smart$aver Custom Incentive program?

__ [RECORD 0-10]

14 Using a scale from 0 to 10 where 0 is “not at all influential” and 10 is “very influential”, how influential was the Smart$aver Custom Incentive program in customers deciding to purchase high-efficiency equipment?

__ [RECORD 0-10]

15 [if not already discussed] Can you talk a little bit about your typical sales process? Do you provide customers with multiple equipment options? How do these options differ? (Probe if they are all high efficiency options, combination of high efficiency and standard efficiency, etc.)

16 Again, using a 0 to 10 scale, with 0 being “not at all satisfied” and 10 being “very satisfied”, how satisfied are you with the incentives provided through the Smart$aver Custom Incentive program?

__ [RECORD 0-10]

17 Using the same scale, how satisfied are you with Duke Energy overall?

__ [RECORD 0-10]

17.a Why did you give Duke Energy that rating?

18 What percent of the projects in 2017 where you sold or installed high-efficiency equipment were eligible but DID NOT receive an incentive through a Duke Energy energy-efficiency program?

___ [RECORD 0-100%]

19 [IF Q18>0] Why do you or your customers not request an incentive for these energy efficiency projects? If you requested an incentive but did not receive one, why was that?

T12 Lamp Questions (for Lighting contractors)

Next I have a few questions about lighting systems.

20 Of your linear fluorescent lighting system sales in 2017, what percent were T12s?

___ [RECORD 0-100%]

21 Are you still stocking and selling linear fluorescent T12 lighting systems and replacement lamps?
(Capture any additional contractor comments in TL2 (e.g., yes, but…))

22 [if still stocking T12s] Thinking of your 2018 sales of linear fluorescent lighting system sales, what percent will be T12s?

___ [RECORD 0-100%]

Program Participation

I have just a few more questions for you.

23 Are you familiar with any changes that Duke Energy made to the Custom program in 2016 or 2017? (If needed: for example, changes to the application, calculations, or pilot offerings?) How did you learn about these changes? Did Duke Energy communicate these changes clearly enough? How useful were these offerings? What are customers' reactions to these offerings?

24 Do you utilize Duke Energy's classic custom or custom-to-go calculators to estimate savings, do you use your own calculators or do you use a combination of each? If used any of Duke's calculators, ask how useful is the calculator was in estimating energy savings (using a scale from 0 to 10 where 0 is "not at all useful" and 10 is "very useful")? If not used, why haven't you used Duke's calculators? Probe for which calculator they use (lighting, HVAC, etc.). In what situations do you use one calculator over another? Would you find it valuable to have a combined calculator for both custom and prescriptive?

25 Do you complete applications for your customers, or do they complete the applications? Do you complete the applications online or paper? Why do you complete using that method? Do you have any feedback on the application process?

26 Have you received requests for more information after submitting an application? Were any of these requests difficult to respond to? Is there anything Duke Energy could do to help you anticipate these requests before submitting the application?

27 On average, roughly how long is the pre-approval process from the time you submit the application to approval?

28 Were you aware there was on online application portal to submit the application online? If aware, have you used this method? If used the online portal, how was the process? (Did you like it?) If not used, is there anything preventing you from using this method?

29 Why do some customers not move forward with projects through the program? Are there enrollment processes that could be simplified to encourage customers to complete projects? What program aspects are most influential in their decision?

30 From your perspective, what is the most valuable part of the Smart$aver Custom Incentive program? Why do you say that?

31 From your perspective, what part of the Smart$aver Custom Incentive program needs the most work? Why? What could Duke Energy do to improve this?

32 Do you have any other feedback that you would like to share with Duke Energy about this program?

Nexant
Headquarters
101 2nd Street, Suite 1000
San Francisco CA 94105-3651
Tel: (415) 369-1000
Fax: (415) 369-9700
www.nexant.com