

Energy Efficient Homes Program Evaluation, Measurement, and Verification Report 2018

Prepared for FirstEnergy Ohio Companies:
The Cleveland Electric Illuminating Company
Ohio Edison Company
The Toledo Edison Company

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1 Executive Summary

During 2018, The Cleveland Electric Illuminating Company (“CEI”), Ohio Edison Company (“OE”), and The Toledo Edison Company (“TE”) (collectively “Companies”) implemented the demand side management (“DSM”) Energy Efficient Homes Program for the Companies’ residential customers in their respective service territories.

Under contract with the Companies, ADM Associates, Inc. (“ADM”) performed evaluation, measurement and verification (“EM&V”) activities for the Energy Efficient Homes Program. The procedures used to perform the EM&V activities described in this report were informed by the approved State of Ohio Energy Efficiency Technical Reference Manual (“OH TRM”)¹, State of Pennsylvania Energy Efficiency Technical Reference Manual (“PA TRM”)², and ADM’s previous experience performing EM&V activities for the Companies’ DSM programs.

This report describes the methodologies, procedures, and data tracking systems utilized to conduct program evaluation activities, including data gathering, sampling and analysis methods. Participation by subprogram and utility are detailed in Table 1-1.

Table 1-1: Program Rebates by Measure and Utility

Subprogram	CEI	OE	TE	Participants
Audits	1,762	2,566	1,276	5,604
EE Kits	58,537	78,687	20,738	157,962
School Education	6,253	9,531	3,441	19,225
Behavioral	69,268	114,331	27,994	211,593
Total	135,820	205,115	53,449	394,384

Ex-post electric savings were calculated through detailed analysis of program tracking data and participant survey data. ADM conducted analyses of this data using technical reference manuals. ADM compared these results to the deemed savings values reported in the TRM. Per Ohio RC §4928.662, the methodology that generated higher energy savings was selected for each appliance category.

Annual ex-post verified electric savings were 108,346,048 kWh (a realization rate of 86 percent). Ex-post verified peak demand reduction was 11,838.22 kW (a realization rate of 76 percent).

¹ Vermont Energy Investment Corporation (VEIC), State of Ohio Energy Efficiency Technical Reference Manual, Prepared for Public Utilities Commission of Ohio, Draft of August 6, 2010, Revised September 30, 2013.

² Pennsylvania Public Utility Commission, Technical Reference Manual 2016.

Detailed tables listing energy savings and demand reductions by subprogram can be found in Appendix A: Required Savings Tables. Ex-post gross energy savings (kWh) and peak demand reduction (kW) for the program for each electric distribution company (“EDC”) are compared to ex-ante estimates in Table 1-2.

Table 1-2: Overall Evaluation Results³

Subprogram	EDC	Ex-Ante Savings		Ex-Post Savings		RR	
		kWh	kW	kWh	kW	kWh	kW
School Kits	CEI	2,193,707	229.44	1,601,481	142.95	73%	62%
School Kits	OE	3,343,711	349.71	2,441,022	217.88	73%	62%
School Kits	TE	1,207,188	126.26	881,288	78.66	73%	62%
School Education	Total	6,744,606	705.41	4,923,791	439.49	73%	62%
EE Kits	CEI	22,431,028	2,424.03	19,496,459	1,652.98	87%	68%
EE Kits	OE	30,992,668	3,372.61	26,762,411	2,315.89	86%	69%
EE Kits	TE	8,150,078	886.40	7,041,327	608.34	86%	69%
EE Kits	Total	61,573,774	6,683.03	53,300,197	4,577.20	87%	68%
Audits	CEI	586,106	110.36	462,310	69.17	79%	63%
Audits	OE	720,889	90.59	780,251	113.66	108%	125%
Audits	TE	610,465	71.68	618,040	82.49	101%	115%
Audits & Education	Total	1,917,459	272.63	1,860,602	265.32	97%	97%
Behavioral	CEI	17,087,029	2,820.34	14,958,121	2,044.29	88%	72%
Behavioral	OE	34,617,300	4,369.08	30,291,223	4,095.08	88%	94%
Behavioral	TE	3,668,933	665.91	3,012,114	416.84	82%	63%
Behavioral	Total	55,373,262	7,855.33	48,261,458	6,556.21	87%	83%
Program Total		125,609,101	15,516.40	108,346,048	11,838.22	86%	76%

A comprehensive process evaluation was performed during the 2018 program year and the key findings can be found in the following subsections.

³ All savings in this report are calculated at the retail level and do not include line losses.

2 Introduction and Purpose of Study

Under contract with the FirstEnergy's Ohio Utilities, The Cleveland Electric Illuminating Company ("CEI"), Ohio Edison Company ("OE"), and The Toledo Edison Company ("TE") (collectively "Companies"), ADM Associates, Inc. ("ADM") has performed evaluation, measurement, and verification ("EM&V") activities to confirm the energy savings ("kWh") and demand reduction ("kW") achieved through the energy efficiency programs that the Companies implemented in Ohio. The purpose of this report is to present the results of the impact evaluation effort undertaken by ADM to verify the energy savings and peak demand reductions that resulted from the Energy Efficient Homes Program during 2018. Additionally, this report presents the results of a process evaluation of the program. The process evaluation, completed by ADM and Tetra Tech, focused on participant and program staff perspectives regarding the program's implementation.

2.1 Percent of Savings from Income Qualified Customers

Questions were added to the evaluation survey to assess low income participation in this program. The survey was administered so that the customer disclosed their annual income range from a series of categories. Customers also reported the number of occupants in their household. This information was used to support the determination of whether the household is above or below 150% of Federal Poverty Level (FPL). Respondents were classified as low-income-qualified if the stated incomes were below 150% of FPL (Table 2-1).

Table 2-1: 2018 Federal Poverty levels and 150% of the FPL

Persons in Household	2018 Federal Poverty Level	150% Federal Poverty Level
1	\$12,140	\$18,210
2	\$16,460	\$24,690
3	\$20,780	\$31,170
4	\$25,100	\$37,650
5	\$29,420	\$44,130
6	\$33,740	\$50,610
7	\$38,060	\$57,090
8	\$42,380	\$63,570

The random digit dialing phone survey and online survey results were sorted by the number of people reported in each household as well as by reported household income ranges. For each of these groupings of occupants and incomes, ADM further broke down the data by reported participants in each electric distribution company ("EDC") and by

measure type. Participants that fell below the 150% Federal Poverty Level, shown in Table 2-1, were used to derive the low income program participation rates, a calculation that is feasible since the surveys represent a statically valid sample for the program population. Finally, to calculate the savings for the low-income portion of program participants, the ex-post energy and demand savings are multiplied by the percentage of low-income participants by EDC.

3 Impact Evaluation Objectives

The primary deemed savings and/or engineering algorithm source for determining program impacts for the Energy Efficiency Homes Program was the OH TRM. The PA TRM was used as a secondary calculation source for all measures not listed in the OH TRM. ADM also utilized the analysis of consumption data to estimate energy savings and demand impacts for the Audits & Education and Behavioral modification subprograms.

Per Ohio RC §4928.662, for all measure types listed in the OH TRM; all installation rates, deemed savings, and hours of use were calculated per the OH TRM (“Deemed”). In addition, ADM calculated gross savings for measures in the program with “as found” baseline conditions, hours of use, and in-service rates (“ISR”). The values reported for both ex-ante and ex-post energy savings (kWh) and peak demand reduction (kW) represent the higher calculated value obtained from both methodologies.

The impact evaluation component of this report estimates annual gross energy savings (kWh) and peak demand reduction (kW) as framed by the following five research questions:

- How many customers participated in the program?
- How many and which measure types were installed through the program?
- What percentage of each measure type can be verified as installed?
- What were the kWh savings achieved by the program?
- What was the kW reduction achieved by the program?

The methodology used to address each of these questions is provided in detail in each subprogram chapter.

4 Process Evaluation Objectives

The process evaluation is designed to research and document the program delivery mechanisms as well as the collective experiences of program participants, partners, and staff. ADM uses such information to assess if implementation strategies and/or program design could be improved to better serve residential customers. Table 4-1 provides a summary of the research questions and corresponding data collection activities.

Table 4-1: Energy Efficient Homes Program Research Questions

Researchable Questions	Activity to Support the Question
Were there any significant program design changes? If so, what influenced the change(s) how did the change(s) impact the program?	<ul style="list-style-type: none">■ Program staff interviews
Is the program being administered effectively in terms of program oversight, communication, staffing, training, and/or reporting?	<ul style="list-style-type: none">■ Program staff interviews
Is the program being implemented effectively in terms of the participation processes, application tools and marketing and outreach?	<ul style="list-style-type: none">■ Program staff interviews■ Participant survey
Were the program participants satisfied with their experiences?	<ul style="list-style-type: none">■ Participant survey
What changes can be made to the program's design or delivery to improve its effectiveness in future program years?	<ul style="list-style-type: none">■ Program staff interview■ Participant survey

To address these researchable issues, ADM reviewed program documentation, administered program surveys, and completed in-depth interviews with program staff and implementation partners. ADM began the process evaluation in August of 2018 with the development of data collection instruments and a review of program documentation. Data collection and analysis occurred September 2018 through February 2019.

Program Documentation Review: Program materials are an important data source for the process evaluation. ADM began by requesting all available documentation for program staff. This list included any operating or process manuals, implementation contracts, resident and agency outreach and education materials, agency newsletters, and the current price sheet.

Program Staff In-Depth Interviews: ADM researchers conducted in-depth interviews with key program staff that work with each subprogram. The objective of these interviews is to better understand program design objectives and delivery mechanisms, elicit feedback and suggestions for program improvements.

Participant Survey: ADM both administered online surveys and also contracted with VuPoint Research to administer phone surveys to customers that participated in the various Energy Efficient Homes subprograms. These survey efforts also included control group surveys where appropriate. Table 4-2 below provides a summary of 2018 survey activity and number of completes.

Table 4-2: Energy Efficient Homes Surveys – Number of Completes

Subprogram	Number of completes
School Education	
Parent/Participant Survey	218
Energy Efficiency Kits	
Participant Survey	219
Audits & Education	
Comprehensive Survey	70
Online Participant Survey	220
Telephone Participant Survey	33
Behavioral	
Participant Survey	221

5 School Education

The purpose of this chapter is to present the findings from the evaluation of the School Education subprogram, which reflects impact and process evaluation effort undertaken by ADM to verify the energy savings and peak demand reduction.

5.1 Description of School Education Subprogram

The School Education subprogram provides an opportunity for parents or guardians of students in grades kindergarten through 5th grade to request an Energy Efficiency Kit after the school has participated in the program. The program includes a 25-minute performance on energy conservation and corresponding curriculum for the classroom developed in partnership with AM Conservation and the National Theater for Children (“NTC”). Following these events, parents can request a kit of energy efficient measures through an electronic application on the Student Energy Kit website or request a kit through permission slip provided by teacher. Kits are shipped to the students’ homes within a few weeks of the request. In 2018, the School Education Kits include the following energy efficiency measures:

Table 5-1: School Education Kits Energy Efficiency Measures

Measure	School Kit
3-Way LED	1
15W LED	2
11W LED	1
9W LED	3
LED Nightlights	2

The total number of kits distributed by the Companies in 2018 by type and operating company is shown in Table 5-2.

Table 5-2: Count of Kits Delivered by Operating Company

Kit Type	EDC			
	CEI	OE	TE	Total
School	6,253	9,531	3,441	19,225

5.2 Sampling

ADM completed a census review of all measures listed in the tracking system to ensure there were no data entry errors or duplicate entries.

The sample size for the follow-up surveys in each service territory achieved a relative precision of $\pm 10\%$ at the 90% confidence interval. The sample size calculation for achieving 90% confidence with 10% precision is shown in the formula below.

$$n_0 = \frac{N \times \frac{1}{4}}{(N - 1) \times \frac{D^2}{Z_{\alpha/2}^2}}$$

Equation 5-1: Minimum Sample Size Formula for 90 Percent Confidence

Where:

n_0	= Minimum sample size
N	= Population size, assumed to be 100,000 or greater
$Z_{\alpha/2}$	= Z value at 90% confidence interval, 1.645
$\frac{1}{4}$	= The maximum value of $p(1-p)$ at $p=1/2$, a conservative estimate for sample size
D	= Relative Precision (0.10)

ADM surveyed 218 school education customers with respondents across the various EDCs. Surveying took place during the fourth quarter of 2018 with sample sizes that meet the requirement for ± 10 percent precision at the 90 percent confidence level for each company. The sampling plan is shown in Table 5-3.

Table 5-3: Sampling Plan 2018 School Education Kits Participants

EDC	Sampling Proportion	Sample Size: School Kits
CEI	0.34	n = 74
OE	0.33	n = 71
TE	0.33	n = 73
Total	1.00	n = 218

5.3 Energy Savings and Peak Demand Reduction Calculations

5.3.1 Data Collection

ADM audited a census of the School Education Kits data and found the data to be adequate for impact evaluation. The average ex-ante estimates of kWh savings and kW reduction for the School Education Kits are shown in Table 5-4.

Table 5-4: Ex-Ante Annual kWh & kW per Unit

Measure	Quantity per Kit	CEI		OE		TE	
		Ex-Ante kWh	Ex-Ante kW	Ex-Ante kWh	Ex-Ante kW	Ex-Ante kWh	Ex-Ante kW
3-Way LED	1	66	0.01	66	0.01	66	0.01
15W LED	2	117	0.01	117	0.01	117	0.01
11W LED	1	43	0.01	43	0.01	43	0.01
9W LED	3	104	0.01	104	0.01	104	0.01
LED Nightlights	2	21	0.00	21	0.00	21	0.00
Total Per Kit		351	0.04	351	0.04	351	0.04

5.3.2 Customer Surveys

Data for the sample of school kits participants were collected through an online survey delivered via email. The survey was distributed to determine measure specific installations as well as bulb installation quantities by room type. This data was used to calculate in service rates (“ISRs”), hours of use (“HOU”), and coincidence factors (“CF”) for peak demand.

5.3.3 Impact Analysis

The primary deemed savings and/or engineering algorithm source for determining program impacts was the OH TRM. The PA TRM was used as a secondary calculation source for all measures not listed in the OH TRM.

Per Ohio RC §4928.662, for all measure types listed in the OH TRM; all installation rates, deemed savings, and hours of use were calculated per the OH TRM (“Deemed”). In addition, ADM calculated gross savings for measures in the program with “as found” baseline conditions, hours of use, and installation rates. The values reported for both ex-ante and ex-post energy savings (kWh) and peak demand reduction (kW) represent the higher calculated value obtained from both methodologies.

The measures distributed in each kit and the source of the method utilized by ADM to determine energy and demand savings are presented in Table 5-5.

Table 5-5: School Kit Analysis Sources

Measure Type	Source for Analysis Method
9W LED	PA TRM
11W LED	PA TRM
15W LED	PA TRM
3 Way LED	PA TRM
LED Nightlights	PA TRM

Detailed below are the analysis methods used to calculate kWh and kW savings for the measures included in the School Kits.

LED Nightlights

The OH TRM does not specify an algorithm for LED nightlights, so energy savings were calculated using the PA TRM algorithm as follows:

$$\Delta kWh = \frac{(Watts_{base} - Watts_{NL}) * (NL_{hours} * 365)}{1000} * ISR$$

Equation 5-2: LED Nightlights Calculation of Energy Savings

Where:

$Watts_{base}$	= Wattage of baseline nightlight
$Watts_{NL}$	= Wattage of LED nightlight
NL_{hours}	= Average hours of use per day per Nightlight
ISR	= In Service Rate ⁴

According to the PA TRM, there is no measurable peak demand savings attributed to LED nightlights.

LED Bulbs

For LEDs, the kWh savings per measure were calculated per procedures set out in the PA TRM and OH TRM using Equation 5-3 and Equation 5-4. Equation 5-3: LED Bulb Calculation of Energy Savings

⁴ This rate will be determined by ADM through participant surveys.

$$\Delta kWh = \frac{Watts_{base} - Watts_{EE}}{1000} * HOU * (1 + WHF_e) * ISR$$

Equation 5-3: LED Bulb Calculation of Energy Savings

$$\Delta kW = \frac{Watts_{base} - Watts_{EE}}{1000} * CF * (1 + WHF_d) * ISR$$

Equation 5-4: Calculation of Peak Demand Savings

Where:

$Watts_{base}$	= Wattage of baseline bulb
$Watts_{EE}$	= Wattage of new bulb
ISR	= In Service Rate (i.e., percentage of units provided by the program that are actually installed as estimated by the lighting verification survey)
Hours	= Average hours of use per year = 1,040
WHF_e	= Waste Heat Factor for energy - to account for cooling savings from efficient lighting = 1.07
WHF_d	= Waste Heat Factor for demand – to account for cooling savings from efficient lighting = 1.21
CF	= Coincidence Factor = 0.11

5.4 Detailed Impact Evaluation Findings

This section presents the findings of the impact evaluation of the School Education subprogram. The 2018 evaluation results for estimated gross kWh energy savings and kW peak demand reductions for the School Education subprogram in the Companies' service territories are summarized in Table 5-6 and Table 5-7. The subprogram level kWh realization rate is 73% and kW is 62%.

Overall, the survey reported ISRs for the measures included in the School kits were approximately 20% lower than the TRM assumed ISRs, causing an appreciable offset between the ex-ante and ex-post calculated values. The differences between the ex-ante and ex-post savings calculations were primarily caused by discrepancies between the TRM ISRs (used to calculate the ex-ante values) and survey reported ISRs (used to calculate the ex-post values). Some of the largest difference was between the TRM and reported values for LED ISRs and the allocation of bulbs installed by room type. The ex-ante estimate used a deemed ISR of 92% from the PA TRM while the ex-post ISRs for

different LEDs were between 40% (15 watt bulbs) and 64% (9 watt bulbs). The ex-ante input for hours of use was the deemed hours of use from the OH TRM. The ex-post input for hours of use was calculated by allocating the percentage of installation by specific room type and assigning hours use by room type from the PA TRM.

Table 5-6: Ex-Post Annual kWh Savings by Operating Company

EDC	Ex-Ante kWh	Ex-Post kWh	Realization Rate
CEI	2,193,707	1,601,481	73%
OE	3,343,711	2,441,022	73%
TE	1,207,188	881,288	73%
Total	6,744,606	4,923,791	73%

Table 5-7: Ex-Post Annual kW Reduction by Operating Company

EDC	Ex-Ante kW	Ex-Post kW	Realization Rate
CEI	229.44	142.95	62%
OE	349.71	217.88	62%
TE	126.26	78.66	62%
Total	705.40	439.50	62%

5.4.1 In Service Rates

The ISR for each measure in the School Education Kit is shown in Table 5-8.

Table 5-8: Impact Evaluation ISRs Determined by Survey (Schools Kits)

Measure	N – Bulbs In Service	ISR
9W LED	379	64%
11W LED	89	46%
15W LED	162	40%
3-way LED	84	44%
LED Nightlight	327	81%

5.5 Detailed Process Evaluation Findings

The following section provides detailed findings from the process evaluation for the School Education subprogram of the Energy Efficient Homes Program.

5.5.1 Subprogram Operations Perspective

The following section provides an overview of the School Education subprogram's operations. It was developed through in-depth discussions with two key subprogram staff. ADM interviewed a senior account executive at AM Conservation Group ("AMCG") and the subprogram implementation manager at the Companies. The senior account executive at AMCG is the assistant program manager to the FE Ohio Program at AMCG. The subprogram implementation manager at the Companies is responsible for the School Education subprogram. The interviews addressed topics such as staff roles and responsibilities, 2018 subprogram operations and changes, marketing and outreach, subprogram communication, successes, and future changes to the subprogram.

Roles and Responsibilities

Subprogram staff explained each of their roles and responsibilities as it relates to the subprogram. The Companies' subprogram manager works as the single point of contact for the implementation contractor. Their role includes, but is not limited to, subprogram coordination, refinement and approval of the school list, approval of AMCG's invoice accruals, and tracking performance to goal. They also handle any customer issues that arise.

The Companies are contracted with AMCG to implement the School Education subprogram of the Energy Efficient Homes Program. ADM researchers spoke with a key staff person that identified themselves as an assistant program manager for the School Education component of the Energy Efficient Homes Program. Together with AMCG's program manager for the Companies', the assistant program manager handles day to day operations of the program including forecasting, curriculum approval, outreach and marketing oversight, reporting, data tracking, and kit fulfillment. AMCG staff will review the curriculum, ensure it's in line with state standards, ensure branding protocols are adhered to, and disclaimers are in place. Reporting tends to focus on the subprogram's progress towards goals. AMCG also manufactures and distributes the school education kits sent to students' homes.

AMCG and Company staff noted that the subprogram's administration remained largely unchanged from 2017 to 2018. AMCG staff noted that they continued to work closely with the National Theater for Children ("NTC") to deliver the subprogram offerings to the schools. NTC manages a call center responsible for contacting schools, developing the initial curriculum, as well as scheduling and conducting the live performances at participating schools.

Subprogram Goals and Design

Staff noted that the subprogram has two benchmarks: energy savings and number of school education kits distributed. Companies provide the kWh goals and then AMCG staff calculates the number of schools they need to reach per operating company.

AMCG staff reported that the School Education subprogram design was based on guidance from the Companies and it has been successful in achieving its objectives.

AMCG and staff from the Companies confirmed that subprogram curriculum is comprised of the following for each classroom:

- A teacher guide that includes recommendations for before and after the performance, keywords, class activities, and critical thinking questions
- Poster for the classroom
- Booklets and activities for the students
- Business Reply Card, for parents to provide feedback about their experience and what they installed
- Order cards for the school education kit
- The school education kit includes:
 - (1) Three-Way LED Bulb
 - (3) 9W LED Bulbs
 - (1) 11W LED Bulb
 - (2) 15W LED Bulbs
 - (2) LED Nightlights
 - (1) LED Glow Ring Toy

Typically, the School Education subprogram has two segments: Fall and Spring. AMCG staff noted that each school averages about 100 kits. AMCG staff indicated that incentives remained the same in 2018. Every teacher that enrolled 20 students or more received \$50. The school that ordered the most school education kits received \$2,500. And during the implementation of the program this year, every family that returned the business reply card was entered to win \$1,500. Subprogram staff noted that they believed the drawing was a significant motivator for parents to return their business reply cards.

Subprogram Implementation

Once a school is enrolled, teachers receive a sample school education kit and a lesson plan that outlines the curriculum objectives and tools for success. The sample kit is provided in advance of the live performance; the objective is to create enthusiasm and interest among the students. The National Theater for Children performs two acts based on the ages of the student audience. The performance stars characters that were part of the original curriculum. The actors address topics such as power generation as well as renewable and non-renewable resources. The performance also addresses topics such as energy and water conservation.

Students can order school education kits either before or after the performance. Orders are collected via forms that students return to teachers through the subprogram website⁵, or by phone. A screenshot of the website that students or teachers may use to place kit orders is provided in Figure 5-1.

Teachers and parents provide feedback on the subprogram and the kits via online surveys and the business reply cards. Staff noted that the feedback is overwhelmingly positive. Both AMCG and Companies' staff noted that the subprogram received no negative feedback during the 2018 subprogram year. Subprogram staff noted School Education is a smooth running and successful program.

⁵ <http://ohiostudentkit.com/>

Figure 5-1: Screenshot of Website Used to Order Kits

The screenshot shows the OhioStudentKit.com website. At the top left, there is a 'Home' link. The main heading is 'Welcome to OhioStudentKit.com!'. Below this, a paragraph states: 'Sign up here to receive an Energy Efficiency Kit for your home, available through The Energized Guyz in-school program from FirstEnergy's Ohio utilities.' To the right of the text is an illustration of an open box containing various items, with the OhioStudentKit.com logo on the box. Below the box is a red button that says 'Register Teacher Kit'. Below the button is a large red circle containing a white LED light bulb. To the right of the light bulb, under the heading 'What's in the kit?', is a list of items: 'One 3-Way LED Bulb', 'Three 9-Watt LED Bulbs', 'One 11-Watt LED Bulb', 'Two 15-Watt LED Bulbs', 'Two LED Night Lights', and 'One LED Glow Ring Toy'. On the left side of the page is a registration form with the following fields: 'Promo Code*' (text input), 'Parent/Guardian First Name*' (text input), 'Parent/Guardian Last Name*' (text input), 'Street Address*' (text input), 'Apt/Unit #' (text input), 'Zip*' (text input), 'City*' (text input), 'State*' (dropdown menu with 'Ohio' selected), 'Phone Number' (text input), 'Email Address' (text input), 'School Name*' (text input with a dropdown arrow), and 'Grade Level' (text input). Below the 'Email Address' field, there is a checkbox labeled 'Receive promotional info?' and a note: 'You will only receive a call or email if there is an issue with your request. I would like to receive periodic e-mails with energy-saving information and offers.' Below the 'School Name*' field, there is a note: 'By submitting this form I verify that I am 18 years or older and the parent and/or guardian making this request.' At the bottom of the form is a green 'Submit' button.

Home

Welcome to OhioStudentKit.com!

Sign up here to receive an Energy Efficiency Kit for your home, available through *The Energized Guyz* in-school program from FirstEnergy's Ohio utilities.

Promo Code*

Parent/Guardian First Name*

Parent/Guardian Last Name*

Street Address*

Orders are shipped via U.S. Post Office. Please provide the address where you receive your U.S. Mail.

Apt/Unit #

Zip*

City*

State*

Phone Number

Email Address

Receive promotional info? ☐ You will only receive a call or email if there is an issue with your request. I would like to receive periodic e-mails with energy-saving information and offers.

School Name*

Grade Level

By submitting this form I verify that I am 18 years or older and the parent and/or guardian making this request.

Submit

Register Teacher Kit

What's in the kit?

- One 3-Way LED Bulb
- Three 9-Watt LED Bulbs
- One 11-Watt LED Bulb
- Two 15-Watt LED Bulbs
- Two LED Night Lights
- One LED Glow Ring Toy

Subprogram staff noted that they hold IT calls once a week and have bi-weekly conference calls in order to discuss program updates and other topics related to implementation. Staff explained that they are also in frequent contact with AMCG staff through emails and phone calls in order to address subprogram open items as necessary. Subprogram staff also attending several live performances throughout the year.

The Companies' staff indicated that subprogram implementation is effective and efficient. They provided an extremely positive review of the subprogram. They noted that AMCG successfully fulfills the kit orders and provides subprogram data and invoicing in a timely manner. The Companies' staff attributed successful subprogram implementation to consistent communication between the Companies and AMCG and the institutional knowledge held by the various contractors who work to deliver the subprogram offerings.

The implementation contractor described the Companies' staff as being organized, easy to work with, and having efficient and effective communication.

Marketing

AMCG staff provided details on the School Education subprogram's marketing and outreach strategy. AMCG stated that they contract with the NTC to inform and enroll eligible schools in the subprogram. Staff stated that many schools are familiar with the NTC, as they offer a variety of school programs delivered through performing arts. AMCG staff shared several pieces of subprogram-related material with ADM including a copy of the business reply card, parent school education kit request card, teacher activity guide, student activity book, and an e-blast and letter template that are used to promote NTC's "The Energized Guyz" theatre program (see Figure 5-2). The NTC also has a call center responsible for additional direct outreach.

AMCG staff stated that once a school has participated in the subprogram, they are not eligible to participate under the existing contract. Subprogram staff work with ACMG and NTC to create a list of eligible schools to target for outreach. NTC staff makes initial contact with schools through methods including personal emails, email blasts, phone calls, marketing faxes, and letters addressed to school administrators. AMCG staff stated that most marketing is done through phone calls, faxing, and letters. They stated that targeted social media advertisements are used sparingly with approval from the Companies. Postcards with the NTC characters are included in marketing letters.

Figure 5-2: 2018 Teacher Program Bi-Fold Handout

HERE'S HOW YOU CAN WIN \$50 FOR YOUR CLASS

1. Send the **Classroom Rewards Forms** home with your students for their parents to complete.
2. Gather completed forms and mail them in the **postage-paid envelope***** provided, or e-mail to studentkit@nationaltheatre.com by scanning or taking pictures of the forms.
3. When you return 20 completed forms, NTC will send you a check for **\$50!**

© The National Theatre for Children 2018 ***Please note that the envelope provided is designed to hold a maximum of 20 forms.

WELCOME TO THE ENERGIZED GUYZ!

The Energized Guyz is an in-school program designed to empower elementary students to save energy.

How your class can make the most of this program:

1. Enjoy the Educational Materials
2. Laugh and learn at The Energized Guyz show
3. Save energy with Energy Efficiency Kits
4. Win a \$50 Classroom Reward**

Brought to you by

QUESTIONS?

OhioStudentKit.com
StudentKit@nationaltheatre.com

DETAILS INSIDE

THE EDUCATIONAL MATERIALS

Teacher Kit
 This kit contains LED bulbs and other energy efficiency items. When you receive your kit at the school, please register it at OhioStudentKit.com. After the program, install the kit items in your home to make your home more energy efficient.

Print Materials
 Distribute your student playbooks and use them with your students before and after the show as suggested. Use the classroom activities in your teacher guide along with your kit to show your students practical ways to save energy.

Digital Games & Activities
 Go to OhioStudentKit.com/Education to access digital games and activities for your classroom.

Dear Parents/Classroom Rewards Form
 These forms are provided to help you inform your students' parents that they can request an Energy Efficiency Kit for their homes and as a tool for earning Classroom Rewards. (see back cover)

THE KIT

Every family at your school can request their own Energy Efficiency Kit to be delivered to their home at no additional cost.*

Your students' families have three ways to sign up for a kit:

1. Use promo code **FE0H1819** at OhioStudentKit.com
2. Call 1-855-343-6600
3. Complete a Classroom Rewards Form for you to return.

THE SHOW



In this 25-minute interactive comedy, junior superhero Nikki Neutron is sent on a mission to stop energy from being wasted all over town. Along the way, Nikki and your students learn important lessons about resources and conservation and discover how we all can do our part to protect the planet.

THE REWARDS

While saving energy is its own reward, The Energized Guyz awards cash prizes for your efforts.**

\$50
 for YOUR CLASS when 20 of your families request the kit and return completed Classroom Rewards Forms. (see back cover)

\$1,250
 for the SCHOOL that saves the most energy by requesting the most Energy Efficiency Kits.

\$1,500
 for one lucky FAMILY that requests their Energy Efficiency Kit.

* Costs of these programs may be recovered through customer rates in accordance with Ohio law. For a complete list of commercial, industrial, residential and low-income energy efficiency programs, please visit www.energysaveOhio.com.
 ** Prizes may vary. See OhioStudentKit.com for details. Rewards are provided by The National Theatre for Children and are not associated with FirstEnergy's Ohio utilities.

Subprogram Strengths and Challenges

Both interviewees provided overwhelmingly positive sentiments regarding the subprogram's design, communication, implementation, and marketing. Program staff noted that it is a strong subprogram because it extends beyond distributing energy-efficient equipment; they feel it is strong because it disseminates information about energy efficiency as children learn through the curriculum, and then pass on the knowledge to their parents.

Neither interviewee noted any significant challenges for the subprogram in 2018. Subprogram staff noted that the one minor impediment for participation is scheduling. On occasion schools do not have time to participate in a subprogram year, but in most instances these schools work to schedule for the following year.

5.5.2 School Education Participant Survey

This section presents key findings from surveys, administered online by the evaluation group, completed by 218 parents/guardians whose children participated in the 2018 School Education Program. The survey gathered information regarding parents' perspectives, program awareness, measures installed and in-service rates, decision making, and overall program satisfaction.

School Education Kit Contents

Most of the respondents indicated that they have received all measures that were in the school education kit (see Table 5-9).

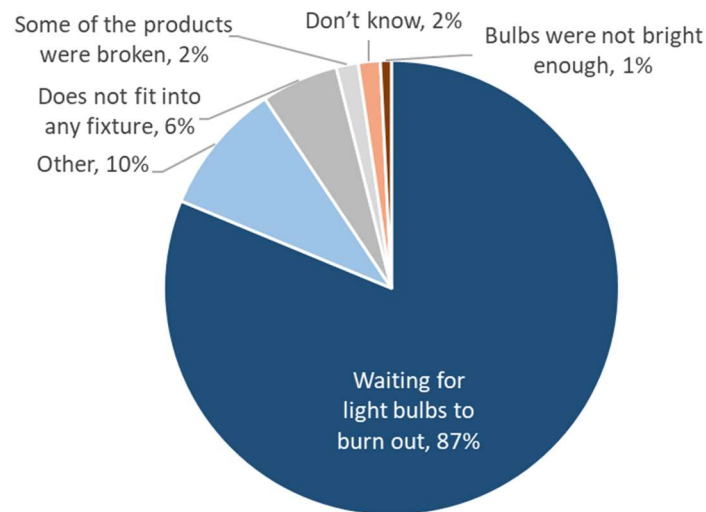
Table 5-9: Measures Received by Participants

Which of the following measures did you receive in your school education kit?	CEI	OE	TE	Total
	Percent	Percent	Percent	Percent
(2) 15W LED light bulbs	93%	97%	96%	95%
(2) LED nightlights	95%	96%	94%	95%
(3) 9W LED light bulbs	95%	93%	90%	93%
(1) 11W LED light bulb	92%	92%	90%	91%
(1) Three-way LED light bulb	86%	90%	90%	89%

Customer Installation of Measures

Participants provided feedback on the school education kit contents they installed. Forty-five percent of participants surveyed installed all measures, 53% of participants installed some of the products, and 2% did not install any measures. The reasons participants gave for not installing all or any of the school education kit measures are provided in Figure 5-3.

Figure 5-3: Reasons Measures Were Not Installed



Note: Percentages may exceed 100% because respondents could choose more than one response.

Each measure type, by installation rate, is provided in Table 5-10.

Table 5-10: Participant Installation of School Education Kit Measures

Measure	Percentage of Respondents
LED nightlights (N=203)	90%
9W LEDs (N=198)	80%
15W LEDs (N=203)	51%
11W LED (N=195)	46%
Three-Way LED (N=189)	44%

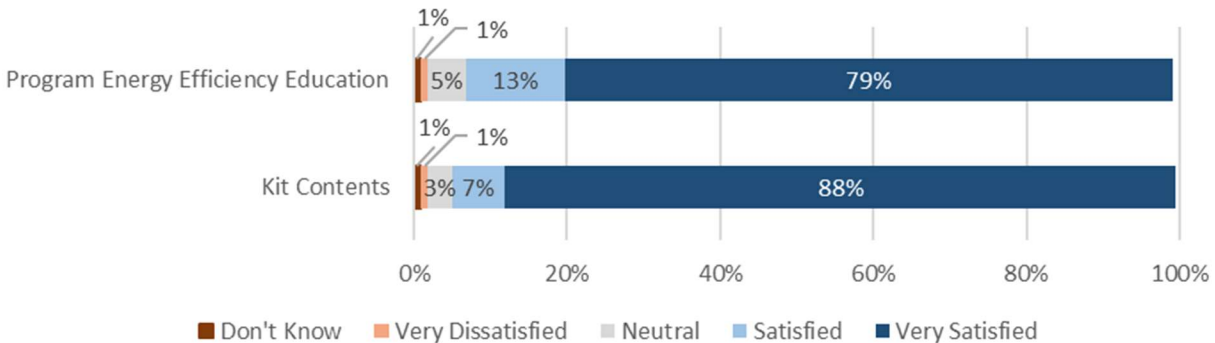
- **LED Nightlights:** Ninety percent of survey respondents indicated that they had installed one or both LED nightlights. About half of respondents who installed a nightlight did so in a location previously occupied by a standard-efficiency nightlight.
- **LEDs:** Eighty percent of respondents installed at least one of the three 9W LEDs and 43% installed all three provided bulbs. Almost half of survey-takers installed the 11W bulb and half of respondents also installed at least one 15W bulb.

- **Three-Way LED:** Forty-four percent of respondents indicated that they had installed the Three-Way LED bulb.

Customer Satisfaction

Survey respondents rated satisfaction with school education kit features on a 5-point scale of very dissatisfied to very satisfied. Most respondents reported 'Very satisfied' with the EE education and measures provided by the school education kit (see Figure 5-4).

Figure 5-4: Participant Satisfaction of Subprogram Aspects



Respondents found the LED nightlights to be the most useful at the highest frequency (37%), followed by the 9W LED (28%) and the 15W light bulbs (19%) (see Table 5-11).

Table 5-11: Most Useful Conservation Measure

What single item from the school education kit was MOST useful to you?	Percentage of Respondents N=216
(2) LED nightlights	37%
(3) 9W LED light bulbs	28%
(2) 15W LED light bulbs	19%
(1) Three-Way LED light bulb	14%
(1) 11W LED light bulb	2%

Participant Motivations and Preferences

Respondents provided information on why they participated. Multiple answers per respondent could be selected for this question. As displayed in Table 5-12, more than half of respondents indicated that they chose to participate because they sought ways to save energy (55%) and due to their children's interest in the kit (51%). Almost half of respondents also selected the reasons: the kit looked useful (49%), it had no additional cost (47%), and an interest in saving money (46%).

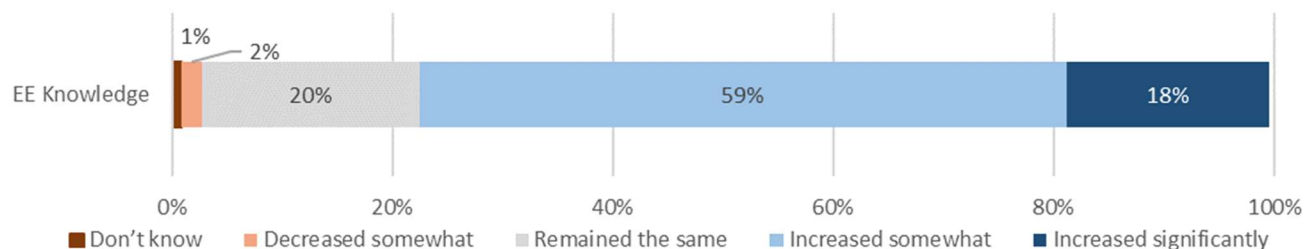
Table 5-12: Factors Motivating Participation

What factors influenced your decision to request a kit through this program?	Percentage of Respondents (n=218)
I was looking for ways to save energy in my home	55%
My child's interest in the kit	51%
The kit looked useful	49%
It had no additional cost	47%
Interested in saving money	46%
My child was interested	31%
Recommendation from a friend	12%
Other	3%
Don't know	1%

Note: Percentages may exceed 100% because respondents could choose more than one response.

Respondents provided feedback regarding their knowledge of and familiarity with energy efficiency behaviors and measures. As shown in Figure 5-5, 77% of respondents reported that their overall knowledge of energy efficiency, after they received the school education kit, increased somewhat or significantly.

Figure 5-5: Participant Knowledge with Energy Efficiency



Cross Program Awareness and Participation

Respondents provided feedback on whether they were aware of discounts and rebates offered by the Companies to help them purchase energy-efficient equipment and save energy in their home. Thirty-five percent were aware of the Companies' discounts and rebates and, within that group, 39% reported the school education kit as the source of awareness.

Survey respondents were asked whether they had purchased and installed any additional measures because of their experience with the Schools Education subprogram.

One-third of survey-takers did purchase and install additional energy efficiency measures due to receiving the school education kit. Of the 72 respondents that indicated that they did purchase and install additional items due to the information included in the school education kit, 85% reported purchasing and installing energy-efficient light bulbs. One-quarter (25%) of these survey-takers reported purchasing energy-efficient appliances. Multiple answers per respondent could be selected for this question (see Table 5-13).

Table 5-13: Additional Conservation Measures Installed

Measure Type	Percentage of Respondents (n=72)
Energy-efficient light bulbs	85%
Energy-efficient appliances such as refrigerators, clothes washer/dryers	25%
Energy-efficient nightlights	14%
Energy-efficient HVAC equipment	4%
Other	7%

Note: Percentages may exceed 100% because respondents could choose more than one response.

Home Characteristics

Participants' home characteristics are categorized in Table 5-14. More than three-quarters of recipients lived in single-family detached homes (79%) and a similar proportion owned their home (76%).

Table 5-14: Home Characteristics

Respondent Characteristic	Percentage of Respondents
Home Type (N=218)	
Single-family home, detached construction	79%
Single-family home, factory manufactured/modular	6%
Apartment with 4+ families	6%
Two or Three family attached residence	5%
Mobile home	1%
Other	1%
Own or Rent (N=216)	
Own	76%
Rent	23%
Year Built (N=218)	
Before 1960	33%
1960-1969	13%
1970-1979	14%
1980-1989	6%
1990-1999	9%
2000-2005	6%
2006 or Later	9%
Don't know	10%
Above Ground Living Space (N=216)	
Less than 1,000 square feet	8%
1,000-2,000 square feet	46%
2,000-3,000 square feet	27%
3,000-4,000 square feet	9%
4000-5000 square feet	2%
Don't know	9%
Heating Type (N=217)	
Natural gas heating	71%
Electric heating	18%
Other	9%
Don't know	2%

6 Energy Efficiency Kits

The purpose of this chapter is to present the results of the Energy Efficiency Kits subprogram impact and process evaluations. The objective was to verify the energy savings and peak demand reduction achieved during the 2018 program year.

6.1 Description of the Energy Efficiency Kits Subprogram

The Energy Efficiency Kit subprogram provides the Companies' customers with energy efficiency measures and educational materials to encourage residential energy usage reduction. The target market for the program is residential single-family homeowners.

The Companies contracted with Power Direct to deliver the Energy Efficiency Kits subprogram. Residential energy efficiency (EE) kits are provided to customers upon request, and the contents of kits vary slightly depending on the customers' water heating fuel source.⁶ Participants receive measure descriptions and installation guidelines with their kits and can choose which measures to install. The energy efficiency kits also contain educational materials regarding residential energy-saving behaviors, which encourage kit recipients to further reduce their electricity usage. Additionally, the kits include promotional materials for other energy efficiency incentive opportunities offered by the Companies such as appliance recycling rebates and ENERGY STAR® appliance rebates. This practice takes advantage of the unique kit distribution marketing channel and encourages cross-participation in multiple programs sponsored by the Companies.

The Energy Efficiency Kit subprogram requires customers to request kits via the electronic application on OhioEnergyKit.com or by calling a toll-free telephone number. The Companies verify that the prospective participant is a customer of one of the participating EDCs and that they have not already received a kit during the program Plan. Kits are typically shipped to customers within a few weeks of the request date. The energy efficiency kits include a help line telephone number that allows participants to report measure defects or ask questions regarding the program and specific measures.

⁶ Customers that state that they have an electric water heater receive an electric residential EE kit, while customers stating they do not have an electric water heater receive a standard residential EE kit.

The residential EE kit includes the following measures:

Table 6-1: Contents of EE Kits by Measure Type

Measures	All Electric	All Standard
3-Way CFL Bulb	1	1
15W LED Bulb(s)	1	2
9W LED Bulbs	3	3
LED Nightlights	2	3
Furnace Whistle	1	1
Swivel Faucet Aerator	1	
Low Flow Showerhead	1	

The total number of kits distributed by the Companies in 2018 by type and operating company is shown in Table 6-2.

Table 6-2: Count of EE Kit Types Delivered by Operating Company

Kit Type	Operating Company			
	CEI	OE	TE	Total
Electric	17,929	29,559	7,673	55,161
Standard	40,608	49,128	13,065	102,801
Total	58,537	78,687	20,738	157,962

6.2 Sampling

ADM completed a census review of all measures listed in the tracking system to ensure there were no data entry errors or duplicate entries.

The sample size for the follow-up surveys in each service territory achieved a relative precision of $\pm 10\%$ at the 90% confidence interval. The sample size calculation for achieving 90% confidence with 10% precision is shown in the formula below.

$$n_0 = \frac{N \times \frac{1}{4}}{(N - 1) \times \frac{D^2}{Z_{\alpha/2}^2}}$$

Equation 6-1: Minimum Sample Size Formula for 90 percent Confidence

Where:

- n_0 = Minimum sample size
- N = Population size, assumed to be 100,000 or greater
- $Z_{\alpha/2}$ = Z value at 90% confidence interval, 1.645

- $\frac{1}{4}$ = The maximum value of $p(1-p)$ at $p=1/2$, a conservative estimate for sample size
- D = Relative Precision (0.10)

ADM surveyed 219 residential EE kit customers with respondents across the various EDCs. Surveying was conducted during the 4th quarter of 2018 with sample sizes that meet the requirement for ± 10 percent precision (Table 6-3).

Table 6-3: Sampling Plan 2018 EE Kits Participants

EDC	Sampling Proportion	Sample Size: EE Kits
CEI	0.35	n = 76
OE	0.34	n = 74
TE	0.32	n = 69
Total	1.00	n = 219

6.3 Energy Savings and Peak Demand Reduction Calculations

6.3.1 Data Collection

ADM audited a census of the EE Kits data and found the data to be adequate for impact evaluation. The average ex-ante estimates of kWh savings and kW reduction for the EE Kits are shown in Table 6-4.

Table 6-4: Ex-Ante Annual kWh & kW per Unit

Kit Type	Measure	Quantity Per Kit	CEI		OE		TE	
			Ex-Ante kWh	Ex-Ante kW	Ex-Ante kWh	Ex-Ante kW	Ex-Ante kWh	Ex-Ante kW
Electric	3-way CFL	1	72	0.01	72	0.01	72	0.01
	15w LED	1	58	0.01	58	0.01	58	0.01
	9w LED	3	104	0.01	104	0.01	104	0.01
	LED Nightlight	2	21	0.00	21	0.00	21	0.00
	Furnace Whistle	1	12	0.00	12	0.00	12	0.00
	Low Flow Showerhead	1	178	0.02	178	0.02	178	0.02
	Low Flow Swivel Aerator	1	45	0.01	45	0.01	45	0.01
	Total Per Kit		490	0.06	490	0.06	490	0.06
Standard	3-way CFL	1	72	0.01	72	0.01	72	0.01
	15w LED	2	117	0.01	117	0.01	117	0.01
	9w LED	3	104	0.01	104	0.01	104	0.01
	LED Nightlight	3	32	0.00	32	0.00	32	0.00
	Furnace Whistle	1	12	0.00	12	0.00	12	0.00
	Total Per Kit		336	0.04	336	0.04	336	0.04

6.3.2 Customer Surveys

Data for the sample of energy efficiency kits participants was collected through a telephone survey. The survey was distributed to determine measure specific installations, bulb quantities by room type. This data was used to calculate ISRs, HOU, and coincidence factors for peak demand.

6.3.3 Impact Analysis

The primary deemed savings and/or engineering algorithm source for determining program impacts was the OH TRM. The PA TRM was used as a secondary calculation source for all measures not listed in the OH TRM.

Per Ohio RC §4928.662, for all measure types listed in the OH TRM; all installation rates, deemed savings, and hours of use were calculated per the OH TRM (“Deemed”). In addition, ADM calculated gross savings for measures in the program with “as found” baseline conditions, hours of use, and installation rates. The values reported for both ex-ante and ex-post energy savings (kWh) and peak demand reduction (kW) represent the higher calculated value obtained from both methodologies.

The measures distributed in each kit and the source of the method utilized by ADM to determine energy and demand savings are presented in Table 6-5.

Table 6-5: EE Kits Analysis Sources

Measure Type	Source for Analysis Method
9W LED	PA TRM
15W LED	PA TRM
3 Way CFL	OH TRM
LED Nightlights	PA TRM
Furnace Whistle	PA TRM
Aerators	PA TRM
Showerhead	OH TRM

Detailed below are the analysis methods used to calculate kWh and kW savings for the measures included in the Energy Efficiency Kits.

Furnace Whistles

The OH TRM does not specify an algorithm for furnace whistles, so energy savings are calculated using the PA TRM algorithm as follows:

$$\Delta kWh = MkW * EFLH * EI * ISR$$

Equation 6-2: Furnace Whistle Calculation of Energy Savings

Where:

MkW = Average motor full load electric demand (kW)
= 0.5 kW

EFLH = Estimated Full Load Hours (Heating and Cooling)⁷
= Will be taken from OH TRM

EI = Efficiency Improvement
=15%

ISR = In Service Rate⁸

According to the PA TRM, there is no measurable peak demand savings attributed to furnace whistles.

LED Nightlights

The OH TRM does not specify an algorithm for LED nightlights, so energy savings were calculated using the PA TRM algorithm as follows:

⁷ This is a location dependent variable which depends on customer's location (defined by zip code) and corresponding EFLH value in look-up table.

⁸ This rate will be determined by ADM through participant surveys.

$$\Delta kWh = \frac{(Watts_{base} - Watts_{NL}) * (NL_{hours} * 365)}{1000} * ISR$$

Equation 6-3: LED Nightlights Calculation of Energy Savings

Where:

$Watts_{base}$	= Wattage of baseline nightlight
$Watts_{NL}$	= Wattage of LED nightlight
NL_{hours}	= Average hours of use per day per Nightlight
ISR	= In Service rate ⁹

According to the PA TRM, there is no measurable peak demand savings attributed to LED nightlights.

LED Bulbs

For LEDs, the kWh savings per measure were calculated per procedures set out in the PA TRM and OH TRM using Equation 6-4 and Equation 6-5.

$$\Delta kWh = \frac{Watts_{base} - Watts_{EE}}{1000} * HOU * (1 + WHF_e) * ISR$$

Equation 6-4: LED Bulb Calculation of Energy Savings

$$\Delta kW = \frac{Watts_{base} - Watts_{EE}}{1000} * CF * (1 + WHF_d) * ISR$$

Equation 6-5: Calculation of Peak Demand Savings

Where:

$Watts_{base}$	= Wattage of baseline bulb
$Watts_{EE}$	= Wattage of new bulb
ISR	= In Service Rate (i.e., percentage of units provided by the program that are actually installed as estimated by the lighting verification survey)
Hours	= Average hours of use per year =1,040
WHF_e	= Waste Heat Factor for energy - to account for cooling savings from efficient lighting =1.07

⁹ This rate will be determined by ADM through participant surveys.

WHF_d = Waste Heat Factor for demand – to account for cooling savings from efficient lighting
= 1.21

CF = Coincidence Factor
= 0.11

3-Way CFL

Savings algorithms were taken from the OH TRM.

$$\Delta kWh = \frac{\Delta Watts}{1000} * HOU * (1 + IE_{kWh}) * 365.25 * ISR$$

Equation 6-6: 3-Way CFL Bulb Calculation of Energy Savings

Where:

$\Delta Watts$ = Compact Fluorescent Watts * 3.25
HOU = Average hours of use per day = 2.85
IE_{kWh} = HVAC Interactive effect
ISR = In Service Rate = 0.86

$$\Delta kW = \frac{\Delta Watts}{1000} * (1 + IE_{kW}) * CF * ISR$$

Equation 6-7: Calculation of Peak Demand Savings

Where:

IE_{kW} = HVAC Interactive effect
CF = Summer Peak Coincidence Factor = 0.11

Low Flow Showerhead

Savings algorithms were taken from the OH TRM.

$$\Delta kWh = ISR * (GPM_{base} - GPM_{low}) * kWh/GPM_{reduced}$$

Equation 6-8: Low Flow Showerhead Calculation of Energy Savings

Where:

GPM_{base} = Gallons per minute of baseline showerhead = 2.87
GPM_{low} = Gallons per minute of low flow showerhead
ISR = In Service Rate = 0.81
kWh/GPM_{reduced} = Assumed kWh savings per GPM Reduction

$$\Delta kW = \Delta kWh * 0.000112$$

Equation 6-9: Calculation of Peak Demand Savings

Faucet Aerator

Energy savings for faucet aerators included in EE Kits were calculated using the PA TRM algorithm as follows:

$\Delta kWh/yr$

$$= ISR \times ELEC \times \left[\frac{(GPM_{base} - GPM_{low}) \times T_{person/day} \times N_{persons} \times 365 \frac{days}{yr} \times DF \times (T_{out} - T_{in}) \times 8.3 \frac{Btu}{gal \cdot ^\circ F}}{\#_{faucets} \times 3412 \frac{Btu}{kWh} \times RE} \right]$$

Equation 6-10: Faucet Aerator Calculation of Energy Savings

Where:

GPM_{base}	= Gallons per minute of baseline showerhead = 2.2
GPM_{low}	= Gallons per minute of low flow showerhead = 1.5
$T_{person/day}$	= Average time of hot water usage per person per day
$N_{persons}$	= Average number of persons per home
DF	= Percentage of water flowing down drain
T_{out}	= Average mixed water temp flowing from faucet
T_{in}	= Average mixed water temp entering home = 55
$\#_{faucets}$	= Average number of faucets in home
RE	= Recovery efficiency of electric water heater

$$\Delta kW_{peak} = \Delta kWh/yr \times ETDF$$

Equation 6-11: Calculation of Peak Demand Savings

Where:

$ETDF$	= CF/HOU
CF	= $\frac{\%_{faucet\ use, peak} \times T_{person/day} \times N_{persons}}{\#_{faucets} \times 240 \frac{minutes}{daily\ peak}}$
HOU	= $\frac{T_{person/day} \times N_{persons} \times 365 \frac{days}{yr}}{\#_{faucets} \times 60 \frac{minutes}{hour}}$

6.4 Detailed Impact Evaluation Findings

This section presents the findings of the impact evaluation of the Energy Efficiency Kits subprogram.

The 2018 evaluation results for estimated gross kWh energy savings and kW peak demand reductions for the Energy Efficiency Kits subprogram in the Companies' service territories are summarized in Table 6-6. The subprogram level kWh realization rate is 87% and kW is 68%.

Though survey reported ISRs for the measures included in the residential EE kits were, on average, 15% lower than the TRM assumed ISRs, the survey reported ISRs for several kit measures were significantly higher than the TRM values used for the ex-ante estimates. For example, LED nightlights had survey reported ISRs of 65% and 79%, on average, for the standard and non-gas kits respectively, compared to an assumed rate of 40% in the TRM. Also, the survey reported ISR for faucet aerators was 10% higher than the rate assumed by the PA TRM and the survey reported ISR for furnace whistles was more than double the value used to determine the ex-ante estimate.

Conversely, the ISRs for the 3-way CFL and LED bulbs included in the kits were significantly lower than the TRM assumed rates of 86% and 92%, respectively (PA TRM). The survey reported ISRs were only 59% (3-way CFL bulbs) and between 49% and 63% for the various LEDs. As with the School kits, another key difference between the ex-ante and ex-post lighting savings came from the hours of use values used: the ex-ante input for hours of use was drawn from the OH TRM, whereas the ex-post value was calculated by allocating the percentage of installation by specific room type and assigning hours use by room type from the PA TRM. An additional discrepancy between the ex-ante and ex-post savings calculations can be attributed to the estimated full load hours ("EFLH") used to evaluate the furnace whistle savings. For the ex-ante estimate, this value uses Cleveland as a reference city; however, for ex-post savings this value was calculated as a weighted average of reference EFLHs (OH TRM) distributed based on survey participants' home zip codes.

The ex-post analysis realization rates ("RR") from the 2018 surveying effort are reported in Table 6-6.

Table 6-6: Ex-Post Annual kWh Savings by Kit Type

EDC	Kit Type	Ex-Ante kWh	Ex-Post kWh	Realization Rate
CEI	Electric	8,784,980	7,235,546	82%
	Standard	13,646,048	12,260,913	90%
	Total	22,431,028	19,496,459	87%
OE	Electric	14,483,531	11,929,026	82%
	Standard	16,509,137	14,833,385	90%
	Total	30,992,668	26,762,411	86%
TE	Electric	3,759,672	3,096,567	82%
	Standard	4,390,406	3,944,760	90%
	Total	8,150,078	7,041,327	86%
Grand Total		61,573,774	53,300,197	87%

Table 6-7 below shows the ex-post Annual kW demand savings by kit type for each EDC.

Table 6-7: Ex-Post Annual kW Reduction by Kit Type

EDC	Kit Type	Ex-Ante kW	Ex-Post kW	Realization Rate
CEI	Electric	1,002.55	720.27	72%
	Standard	1,421.48	932.70	66%
	Total	2,424.03	1,652.98	68%
OE	Electric	1,652.88	1,187.49	72%
	Standard	1,719.73	1,128.40	66%
	Total	3,372.61	2,315.89	69%
TE	Electric	429.06	308.25	72%
	Standard	457.34	300.08	66%
	Total	886.40	608.34	69%
Grand Total		6,683.03	4,577.20	68%

6.4.1 In Service Rates

The EE Kit ISR, as determined from the participant survey, for each measure is shown in Table 6-8.

Table 6-8: EE Kit Measures' In Service Rates Determined by Survey

Measure	N – Measures In Service	ISR
9W LED (3)	336	63%
15W LED	32	49%
3 Way CFL	106	59%
LED Nightlights (2 or 3)	349	71%
Furnace Whistle	34	23%
Faucet Aerator	19	33%
Showerhead	30	46%

6.5 Detailed Process Evaluation Findings

The following section provides detailed findings from the process evaluation for the Energy Efficiency Kits (“EE Kits”) subprogram of the Energy Efficient Homes Program.

6.5.1 Subprogram Operations Perspective

The following section provides an overview of the EE Kits subprogram’s operations constructed through in-depth discussions with subprogram staff and the subprogram implementation contractor. The interviews addressed topics such as staff roles and responsibilities, 2018 operations and changes, marketing, and outreach, as well as communication between the Companies and subprogram implementation contractor, Power Direct.

Roles and Responsibilities

Subprogram staff and the implementation contractor explained their roles and responsibilities as they relate to the subprogram. ADM interviewed the Companies’ residential program manager and the program implementation contractor in January 2019. The Companies’ subprogram manager stated that they work as the single point of contact between the Companies and the implementation contractor, and that they are responsible for overseeing implementation, performance and tracking, and providing guidance on subprogram delivery and issue resolution, as needed.

ADM spoke with the director of business operations for Power Direct. Power Direct’s role in the EE Kits subprogram is to generate program awareness, manage kit enrollment and fulfillment, and provide program reporting to the Companies. Power Direct contracts with various third parties to administer the program. The director of business operations stated they contract with a third-party call center to manage the enrollment process, a warehouse for assembling and shipping kits, and an IT company for setting up the

enrollment website and database management. They stated they have worked with these contractors for several years and have strong relationships with each of them.

Subprogram Goals and Design

The Companies' subprogram manager stated there were no significant changes to the subprogram's design in 2018. The director of business operations at Power Direct stated that the subprogram has specific goals for each operating company, as well as goals related to minimizing kit replacements and maximizing quality control.

ADM confirmed the kits' contents with program staff and the Power Direct staff. The contents vary for customers with electric water heating and non-electric water heating.

Both Electric and Non-Electric Customer Kits:

- (1) Three-Way CFL light bulb
- (3) 9W LED light bulbs
- Furnace whistle

Electric Kits:

- 15W LED light bulb
- LED nightlights
- Low flow showerhead
- Faucet aerator

Non-Electric:

- (2) 15W LED light bulbs
- (3) LED nightlights

Subprogram Implementation

As part of the process evaluation, the evaluation team reviewed the EE Kits subprogram's implementation process. According to Power Direct staff, for a period in 2018 they did not have the correct ratio of inventory to fulfill different kit types. During this period, some customers had to wait longer than the 4 – 6-week delivery window advertised. They stated that during this time some customers called in regarding the status of their kit; however, most customers were understanding.

Other than the inventory issue, the director stated that subprogram implementation was smooth and successful. The subprogram manager did not note any implementation issues.

Both interviewees indicated that there are strong systems of internal communication and subprogram tracking. Power Direct provides monthly reports and a scheduled weekly meeting. Subprogram staff and Power Direct are in frequent contact to address relevant issues.

Marketing

The Power Direct director reported that there have been no large or significant changes to marketing material or strategies, though they did report that Power Direct increased marketing efforts in 2018. They stated that at the start of the subprogram word-of-mouth referrals were a stronger part of enrollment. Power Direct is restricted from using mass marketing vehicles for the subprogram to avoid marketing to past participants. Instead, they perform targeted marketing through Facebook, email blasts, and outbound calling from their call center. Subprogram staff stated that the subprogram began utilizing Facebook ads this year and felt that they were a worthwhile investment. They stated the ads are targeted to customers that have not yet received a kit. Regarding outbound call center calls, the director of business operations shared that there is about a 50% refusal rate.

The director noted that the subprogram adds a referral slip to the EE kit contents as a way to encourage the participant to refer family and friends (see Figure 6-1). They stated that there were a significant number of referral responses from the slip this year.

Figure 6-1: Program Kit Referral Insert



Subprogram Strengths and Challenges

Both interviewees communicated strong support for the subprogram and related that it operated smoothly in the 2018 program year. The subprogram manager stated that this subprogram has been managed for the Companies since 2010 in other jurisdictions and administered in Ohio since 2013. They stated they understand how to successfully implement and market the subprogram. Power Direct stated that they have developed strong systems for enrollment and fulfillment, and they are continually fine-tuned. The director of operations shared that a significant success for the subprogram in 2018 was the response rate from their pink referral slips. They stated that the response rate was about 5%, which is much higher than last year.

6.5.2 Energy Efficiency Kits Participant Survey

This section presents key findings from surveys, administered online by the evaluation group, completed by 219 customers who participated in the 2018 Energy Efficiency Kits subprogram. The survey gathered information regarding subprogram awareness, measures installed and in-service rates, decision making and overall satisfaction and was designed for collecting data for the process evaluation and impact analysis.

Order Method and Kit Contents

Participants provided feedback regarding how they enrolled in the Energy Efficiency Kits subprogram. Seventy-three percent requested their Energy Efficiency Kit ("EE Kit") online, 22% requested it via telephone, and 5% did not recall.

The kit measures received are provided, by percentage of respondents, in Table 6-9. Multiple answers per respondent could be selected for this question.

Table 6-9: EE Measures Received by Participants

Which of the following measures did you receive in your energy efficiency kit?	CEI	OE	TE	Total
	Percentage of Respondents (n=76)	Percentage of Respondents (n=74)	Percentage of Respondents (n=69)	Percentage of Respondents (n=219)
Three-Way CFL light bulb	80%	84%	84%	83%
15W LED light bulb(s)	74%	86%	91%	84%
9W LED light bulbs	75%	82%	87%	81%
LED nightlights	82%	88%	94%	88%
Furnace whistle	63%	74%	62%	67%
Don't know	29%	39%	22%	30%

Note: Percentages may exceed 100% because respondents could choose more than one response.

Table 6-10: EE Measures Received by Participants (Electric)

Which of the following measures did you receive in your energy efficiency kit?	CEI	OE	TE	Total
	Percentage of Respondents (n=32)	Percentage of Respondents (n=27)	Percentage of Respondents (n=23)	Percentage of Respondents (n=82)
Faucet aerator	66%	70%	78%	71%
Low flow showerhead	78%	74%	87%	79%

Note: The number of respondents for the faucet aerator and low flow showerhead differ from the other measures; these were only included in Electric kits. Percentages may exceed 100% because respondents could choose more than one response.

Customer Installation of Measures

Participants provided feedback regarding installing the kit contents. Twenty-seven percent of participants surveyed stated they did install all kit measures, 69% installed some of the products, and 2% installed no measures. The reported reasons participants did not install all or any of the measures in the kit are detailed in Table 6-11. Sixty-six percent of respondents indicated they were waiting for bulbs to burn out. Multiple answers per respondent could be selected for this question.

Table 6-11: Reasons EE Measures Not Installed

Reason for Not Installing All Conservation Measures	Percentage of Respondents (n=157)
Waiting for light bulbs to burn out	66%
Does not fit into any fixture	10%
Some of the products were broken	3%
Bulbs were too bright	1%
Bulbs were not bright enough	1%
Other	29%
Don't know	2%

Note: Percentages may exceed 100% because respondents could choose more than one response.

The measures most frequently installed by customers were the LED nightlights (84%) and the 9W LED bulbs (84%) (see Table 6-12). Multiple answers per respondent could be selected for this question.

Table 6-12: Participant Installation of EE Measures

Kit Items Installed	Number of Respondents	Percentage of All Respondents
LED nightlight	192	87%
9W LED light bulb	178	84%
Three-Way CFL light bulb	181	59%
15W LED light bulb	183	49%
Low flow showerhead ¹⁰	65	46%
Faucet aerator	58	33%
Furnace whistle	146	23%

Note: Percentages may exceed 100% because respondents could choose more than one response.

The following provides a summary of surveyed installation findings for each measure category:

- **LED Nightlights:** Eighty-four percent of survey respondents indicated that they had installed at least one LED nightlight. Approximately 60% of all installed nightlights replaced standard-efficiency nightlights.
- **LEDs:** Eighty-four percent of respondents reported that they had installed at least one 9W LED. Regarding the 15W LED light bulb, 54% of participants stated that they had installed one or more in their homes.

¹⁰ Showerheads and Faucet Aerators were only included in electric kits which is the reason they have a smaller number of respondents.

- **Three-Way CFL:** Fifty-nine percent of respondents indicated that they had installed the Three-Way CFL bulb included in the kit.
- **Low Flow Showerhead:** The kits for homes with electric water heating also received the low flow showerhead measure. Almost half of recipients stated they installed the low flow showerhead.
- **Faucet Aerator:** The kits for homes with electric water heating also received a faucet aerator. Thirty-three percent of the survey participants installed the faucet aerator.
- **Furnace Whistle:** Twenty-three percent of respondents elected to install the furnace whistle.

Participant Motivations and Preferences

Respondents provided feedback regarding what influenced them to request the EE kit. Sixty-three percent of respondents indicated that they chose to participate because it required no additional cost. Respondents were also looking for ways to save energy in their home, as 58% provided that as a participation reason (see Table 6-13). Multiple answers per respondent could be selected for this question.

Table 6-13: Factors Motivating Participation

What factors influenced your decision to request a kit through this program?	Percentage of Respondents (n = 219)
Provided at no additional cost	63%
Looking for ways to save energy	58%
Interested in saving money	54%
The kit looked useful	50%
Recommendation from a friend	16%
Other	3%

Note: Percentages may exceed 100% because respondents could choose more than one response.

Respondents indicated which single item from the kit was most useful. As shown in Table 6-14, 34% of respondents considered the LED nightlight most useful and 22% found the Three-Way CFL the most useful.

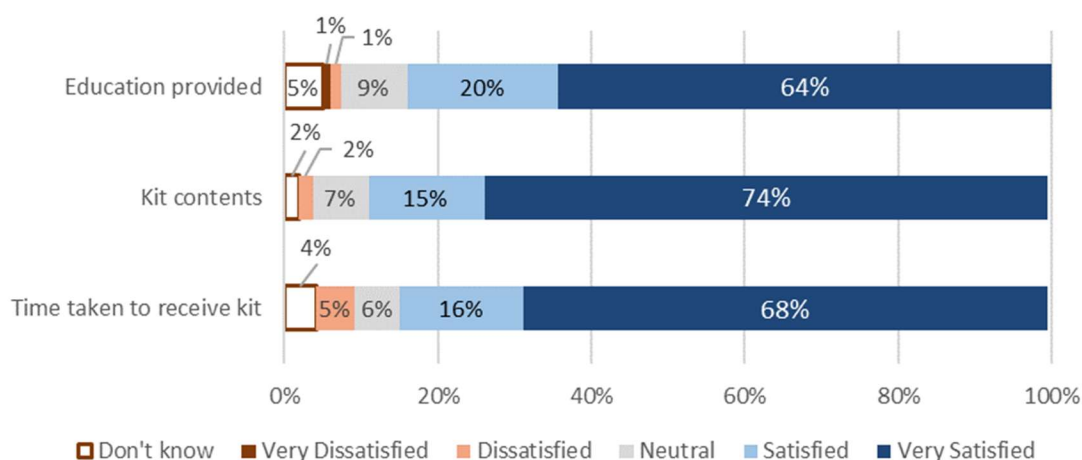
Table 6-14: Usefulness of Individual Conservation Measures

Most Useful Item	Number of Respondents	Percentage of Respondents
LED nightlight	216	34%
Three-Way CFL light bulb	216	22%
Low flow showerhead ¹¹	82	17%
9W LED light bulb	216	14%
15W LED light bulb	216	13%
Faucet aerator	82	2%
Furnace whistle	216	1%
Don't know	216	7%

Customer Satisfaction and Knowledge of EE

Survey respondents rated their satisfaction on several subprogram aspects. Participants' responses were recorded on a 5-point scale of 'Very dissatisfied' to 'Very satisfied' (see Figure 6-2). The majority of survey-takers rated their opinion of the aspects as 'Very Satisfied': education provided (64%), the kit contents (74%), and the time it took to receive the kits (68%).

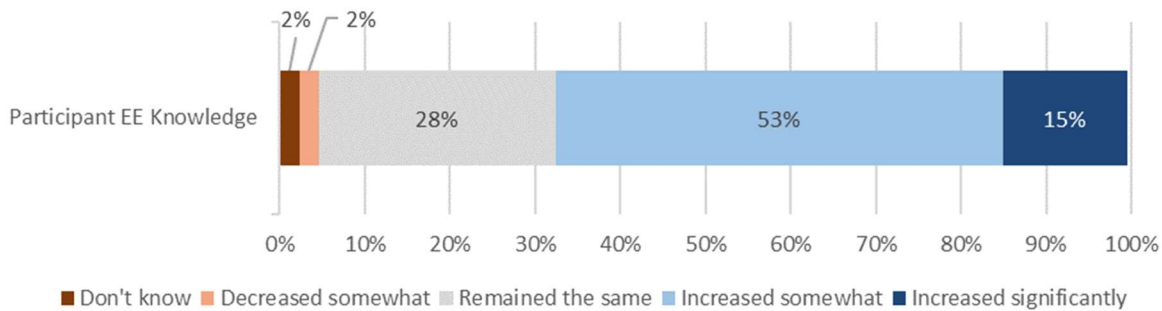
Figure 6-2: Participant Satisfaction of Subprogram Aspects



Respondents noted how their knowledge of ways to save energy in their home changed as a result of receiving the kit. A little more than two-thirds (68%) of respondents indicated that their knowledge of ways to save energy has increased somewhat or a lot (see Figure 6-3).

¹¹ Showerheads and Faucet Aerators were only included in electric kits which is the reason they have a smaller number of respondents.

Figure 6-3: Participant Knowledge with Energy Efficiency



Cross-Program Awareness and Participation

Respondents provided feedback regarding discount and rebate awareness offered by the Companies. Forty-six percent stated they were aware of the Companies' offerings of discounts and rebates to help customers purchase energy-efficient equipment. Of the respondents that were aware of the Companies' rebates and discounts, 37% learned about the rebates and discounts through information provided in the EE kit.

The survey included a series of questions related to participants' behaviors after subprogram participation. Twenty-two percent of participants indicated they have purchased or installed additional energy efficiency items because of subprogram information. Of those, 92% had purchased energy-efficient light bulbs, 23% purchased appliances, and 15% purchased nightlights (see Table 6-15). Multiple answers per respondent could be selected for this question.

Table 6-15: Post Installation of Conservation Measures

Purchases After Program Participation	Percentage of Respondents (n=48)
Energy-efficient light bulbs	92%
Energy-efficient appliances such as refrigerators, clothes washer/dryers	23%
Energy-efficient nightlights	15%
Energy-efficient HVAC equipment	8%
Other	8%

Note: Percentages may exceed 100% because respondents could choose more than one response.

Home Characteristics

Participants' home characteristics are categorized in Table 6-16. Almost three-quarters of recipients lived in single-family detached homes (73%) and a similar proportion owned their home (72%).

Table 6-16: Home Characteristics

Respondent Characteristic	Percentage of Respondents
Home Type (n=218)	
Single-family home, detached construction	73%
Apartment with 4+ families	9%
Condominium	6%
Two or Three family attached residence	3%
Single-family home, factory manufactured/modular	2%
Mobile home	1%
Other	4%
Don't know	1%
Own or Rent (n=218)	
Own	72%
Rent	27%
Don't know	1%
Year Built (n=217)	
Before 1960	39%
1960-1969	11%
1970-1979	12%
1980-1989	7%
1990-1999	7%
2000-2005	8%
2006 or Later	8%
Don't know	9%
Above Ground Living Space (n=217)	
Less than 1,000 square feet	12%
1,000-2,000 square feet	50%
2,000-3,000 square feet	20%
3,000-4,000 square feet	5%
Greater than 5,000 square feet	1%
Don't know	11%
Heating Type (n=217)	
Natural gas heating	72%
Electric heating	17%
Other	8%
Don't know	3%

7 Audits & Education

The purpose of this chapter is to present, in detail, the evaluation of the Audits & Education subprogram of the EE Homes program.

A total of 5,604 customers participated in the Audits & Education subprogram in 2018 as shown in Table 7-1. Of these customers, approximately 25% completed a Comprehensive audit, 56% conducted an online audit, and 19% participated in telephone audits.

Table 7-1: Participation by Audit Type and EDC

EDC	Comprehensive	Online	Telephone	Totals
CEI	292	1,144	326	1,762
OE	452	1,533	581	2,566
TE	640	464	172	1,276
Total Program	1,384	3,141	1,079	5,604

7.1 Description of the Audits & Education Subprogram

There are two types of audits in the Audits & Education subprogram: Comprehensive and Online. The Comprehensive Audit entails an in-home visit and the Online Audit is taken online by a participant or indirectly through a telephone call with support from a representative. Both Comprehensive and Online Audits include a report recommending specific energy-saving measures.

7.1.1 Comprehensive Audits

The target market for the Comprehensive Home Audit (CHA) are residential single-family homeowners, multi-family residences, and manufactured homes. The subprogram provides a comprehensive home energy audit with air infiltration testing using a blower door diagnostic test to improve the building envelope's thermal integrity. The subprogram also evaluates home appliance, lighting, and HVAC system efficiencies.

In the CHA subprogram, customers pay a discounted fee and can elect to have energy efficiency measures installed during the time of the audit and/or home improvement measures installed later by participating contractors. Customers who implement eligible energy savings measures are entitled to additional rebates from the Companies.

The CHA includes:

- An evaluation of the home's heating and cooling system, insulation levels, windows, doors, appliances, and lighting;

- A blower door diagnostic test to detect air leaks in the home's building envelope; and
- An energy audit report that recommends specific energy-saving measures appropriate for the home. Customers who implement the recommended measures are entitled to rebates from the Companies.

Energy efficiency measures that can be installed during the audit include:

- LED Bulbs and Nightlights
- Low Flow Showerheads
- Faucet Aerators (kitchens and bathrooms)
- Pipe Wrap Insulation
- Smart Strip Power Strips

Additional home improvement measures that may be recommended during a residential energy audit include the following items:

- Roof and Ceiling Insulation
- Wall Insulation
- Energy Star® Qualified Windows
- Air Sealing
- Duct Sealing

7.1.2 Online Audits

The Online Audit subprogram allows residential customers in single family and multi-family homes to analyze their home's energy use. Customers can learn of the Online Audit subprogram on the Companies' website as well as on the Energy Save Ohio website.

Customers can take a home energy audit at any time during the year. Home energy audits can be conducted in one of two ways: (a) using a personal computer to directly access the online software application (Home Energy Analyzer) on the Companies' website or (b) by phone with the assistance of a Companies' Contact Center Representative ("CSR"), who administers the online software audit over the phone and provides energy savings tips.

A home energy audit done by phone is typically initiated when a customer telephones the Companies' CSR with questions about an electricity bill. A CSR explains the bill to the customer in terms of the key factors that contribute to the customer's energy use. The

customer is offered a home energy audit that includes a review of the customer's billing history.

Upon completion of the Online Audit tool, a pie chart is displayed with categories of annual energy usage and where customers use the most energy in their home. Customers are then encouraged to explore tips on how to reduce energy usage in the category where they have the highest usage. These tips also lead to other program recommendations. After reviewing the tip category where the annual energy usage is the highest, customers can review the library of all Ways to Save tips

Although a telephone audit resembles an online audit in that the customer gets a review of usage history and feedback on basic ways to save energy. Customers receiving a telephone audit are offered a brochure on tips for saving energy in the home.

7.2 Sampling

ADM completed a census review of all measures listed in the tracking system to ensure there were no data entry errors or duplicate entries.

The sample size for the follow-up surveys in each service territory achieved a relative precision of $\pm 10\%$ at the 90% confidence interval. The sample size calculation for achieving 90% confidence with 10% precision is shown in the formula below.

$$n_0 = \frac{N \times \frac{1}{4}}{(N - 1) \times \frac{D^2}{Z_{\alpha/2}^2}}$$

Equation 7-1: Minimum Sample Size Formula for 90 percent Confidence

Where:

n_0	= Minimum sample size
N	= Population size, assumed to be 100,000 or greater
$Z_{\alpha/2}$	= Z value at 90% confidence interval, 1.645
$\frac{1}{4}$	= The maximum value of $p(1-p)$ at $p=1/2$, a conservative estimate for sample size
D	= Relative Precision (0.10)

ADM surveyed 70 comprehensive audit customers with respondents across the various EDCs. Surveys were conducted in the 1st quarter of 2019 with sample sizes that meet the requirement for ± 10 percent precision (Table 7-2).

Table 7-2: Sampling Plan 2018 Comprehensive Audits Participants

EDC	Sampling Proportion	Sample Size: Comprehensive Audits
CEI	0.21	n = 15
OE	0.33	n = 23
TE	0.46	n = 32
Total	1.00	n = 70

7.3 Impact Evaluation Methodology

This section describes ADM's approach to determine the energy savings and peak demand reduction realized by the Audits & Education subprogram.

7.3.1 Comprehensive Audit

Data Collection

ADM audited a census of the Comprehensive Audits data and found the data to be adequate for impact evaluation. The average ex-ante estimates of kWh savings and kW reduction for the Comprehensive Audits are shown in Table 7-3. These "per audit" savings values represent the average impact of each audit. To derive this value, the cumulative measure-level ex-ante savings for the entire Comprehensive Audits subprogram were divided by the total number of audits performed.

Table 7-3: Ex-Ante Average Annual kWh & kW per Audit

EDC	Ex-Ante kWh	Ex-Ante kW
CEI	673	0.08
OE	931	0.11
TE	795	0.09

Customer Surveys

The survey was distributed to determine measure specific installations and bulb quantities by room type. This data was used to calculate ISRs, HOU, and coincidence factors for peak demand. Any other measures installed by the subprogram were also verified with customers. A random sample of customers were invited to participate in a telephone survey.

Impact Analysis

The primary deemed savings and/or engineering algorithm source for determining program impacts was the OH TRM. The PA TRM was used as a secondary calculation source for all measures not listed in the OH TRM.

Per Ohio RC §4928.662, for all measure types listed in the OH TRM; all installation rates, deemed savings, and hours of use were calculated per the OH TRM (“Deemed”). In addition, ADM calculated gross savings for measures in the program with “as found” baseline conditions, hours of use, and installation rates. The values reported for both ex-ante and ex-post energy savings (kWh) and peak demand reduction (kW) represent the higher calculated value obtained from both methodologies.

The measures distributed during each audit, their ex-ante energy and demand savings, and the source of the method utilized to determine these are presented in Table 7-4.

Table 7-4: Comprehensive Audit Analysis Sources

Measure Type	Source for Analysis Method	CEI		OE		TE	
		Ex-Ante per unit kWh	Ex-Ante per unit kW	Ex-Ante per unit kWh	Ex-Ante per unit kW	Ex-Ante per unit kWh	Ex-Ante per unit kW
9W LED	PA TRM	37	0.01	37	0.01	37	0.01
11W LED	PA TRM	45	0.01	45	0.01	45	0.01
11W BR30 LED	PA TRM	58	0.01	58	0.01	58	0.01
3-Way LED	PA TRM	72	0.01	72	0.01	72	0.01
4W LED	PA TRM	27	0.003	27	0.003	27	0.003
5.5W LED	PA TRM	37	0.004	37	0.004	37	0.004
6W LED	PA TRM	37	0.004	37	0.004	37	0.004
9W Flood LED	PA TRM	50	0.01	50	0.01	50	0.01
9W Outdoor LED	PA TRM	68	0.00	68	0.00	68	0.00
LED Nightlight	PA TRM	24	0.004	24	0.004	24	0.004
Showerhead	OH TRM	237	0.002	237	0.002	237	0.002
Bathroom Aerator	OH TRM	25	0.003	25	0.003	25	0.003
Kitchen Aerator	OH TRM	86	0.003	86	0.003	86	0.003
1/2 Pipe Wrap	OH TRM	18	0.003	18	0.003	18	0.003
3/4 Pipe Wrap	OH TRM	27	0.01	27	0.01	27	0.01
Power Strip	OH TRM	62	0.01	62	0.01	62	0.01

Detailed below are the analysis methods used to calculate kWh and kW savings for the measures included in the Comprehensive Audits.

LED Bulbs

For LEDs, the kWh savings and kW reduction per measure will be calculated per procedures set out in the PA TRM and OH TRM using Equation 7-2 and Equation 7-3.

$$\Delta kWh = \frac{Watts_{base} - Watts_{EE}}{1000 \frac{W}{kW}} \times Hours \times WHFe \times ISR$$

Equation 7-2: LED Calculations for kWh Savings

$$\Delta kW = \frac{Watts_{base} - Watts_{EE}}{1000 \frac{W}{kW}} \times CF \times WHFd \times ISR$$

Equation 7-3: Calculations for Summer Peak Demand Reduction

Where:

$Watts_{base}$	= Deemed wattage of existing bulb
$Watts_{EE}$	= Watts of LED
ISR	= In Service Rate or percentage of units rebated that get installed (from participant surveys and site visits)
HOU	= Average hours of use per year = 1,040 (from Ohio TRM)
$WHFe$	= Waste Heat Factor for energy - to account for cooling savings from efficient lighting = 1.07 (from Ohio TRM)
CF	= Demand coincidence factor

LED Nightlights

The OH TRM does not specify an algorithm for LED nightlights, so energy savings will be calculated using Equation 7-4 from the PA TRM algorithm.

$$\Delta kWh = \frac{Watts_{base} - Watts_{NL}}{1000 \frac{W}{kW}} \times NL_{hours} * 365 \times ISR$$

Equation 7-4: LED Nightlights Calculation of kWh Savings

Where:

$Watts_{base}$	= Wattage of baseline nightlight, from program tracking data
$Watts_{NL}$	= Wattage of new bulb, from program tracking data
ISR	= In Service Rate or percentage of units rebated that get installed (from participant surveys)

NL_{hours} = Average hours of use per day per nightlight (12 per the PA TRM)

Per the PA TRM, there is no measurable kW reduction attributed to LED nightlights.

Low Flow Showerheads

For residential low flow showerheads, in which the subprogram intends for auditors to implement a direct installation/early replacement¹² policy, the kWh savings and kW savings per measure will be calculated using Equation 7-5 and Equation 7-6 from the OH TRM. Only savings pertaining to electric hot water heating will be calculated.

$$\Delta kWh = ISR * (GPM_{base} - GPM_{low}) * kWh/GPM_{reduced}$$

Equation 7-5: Low Flow Showerhead Calculation of Energy Savings

$$\Delta kW = \frac{\Delta kWh}{Hours} * CF$$

Equation 7-6: Calculation of Peak Demand Savings

Where:

GPM _{base}	= Gallons per minute of baseline showerhead = 2.87
GPM _{low}	= Gallons per minute of low flow showerhead = 1.60
ISR	= In Service Rate (i.e., percentage of units provided by the program that are actually installed as estimated by the lighting verification survey)
kWh/GPM _{reduced}	= Assumed kWh savings per GPM reduction = 173
Hours	= Average number of hours per year spent using showerhead = 29
CF	= Summer Peak Coincidence Factor = 0.00371

Faucet Aerators

Energy and demand savings for faucet aerators will be calculated using the Ohio TRM algorithms for residential low flow faucet aerators in which the subprogram intends for auditors to implement a direct installation/early replacement¹³ policy. Only savings pertaining to electric hot water heating will be calculated using

¹² See Ohio TRM, pp. 93-96.

¹³ See Ohio TRM, pp. 89-92.

Equation 7-7 and Equation 7-8. The subprogram may install aerators for either kitchen or bathroom faucets, or both.

$$\Delta kWh = ISR * \frac{\left(\left(\frac{GPM_{base} - GPM_{low}}{GPM_{base}} \right) * \#people * \frac{gals}{day} * \frac{days}{year} * DR \right) * 8.3 * \frac{(T_{ft} - T_{mains})}{1,000,000}}{\frac{F/home}{(DHW Recovery Efficiency / .003412)}}$$

Equation 7-7: Faucet Aerators Calculation of Energy Savings

Where:

ISR	= verified In Service Rate as verified by ADM onsite visits and surveys ¹⁴
GPM _{base}	= Gallons per minute of baseline faucet = 2.2 ¹⁵
GPM _{low}	= Gallons per minute ¹⁶ of low flow faucet ¹⁷
# people	= Average number of people per household = 2.46 ¹⁸
Gals/day	= Average gallons per person per day used by all faucets in the home = 10.9 ¹⁹
Days/year	= 365
DR	= Percentage of water flowing down the drain = 63% ²⁰
F/home	= Average number of faucets in the home = 3.5 ²¹
8.3	= Constant to convert gallons to pounds
T _{ft}	= Assumed temperature of the water used by faucet = 80 ²²
T _{mains}	= Assumed temperature of water entering house = 57.8 ²³

¹⁴ Assumed value is 1.0, based on direct install Program policy.

¹⁵ As stipulated by the Ohio TRM; see footnote 227 on p.90 of the Ohio TRM.

¹⁶ This rate was captured by ADM through install verification visits and participant surveys.

¹⁷ Assumed value is 1.5 for kitchen faucets and 1.0 for bathroom faucets, based on Program installation policy.

¹⁸ As stipulated by the Ohio TRM; see footnote 228 on p.90 of the Ohio TRM.

¹⁹ As stipulated by the Ohio TRM; see footnote 229 on p.90 of the Ohio TRM.

²⁰ If water is collected in a sink, a faucet aerator will not result in any saved water.

²¹ As stipulated by the Ohio TRM; see footnote 231 on p.90 of the Ohio TRM.

²² As stipulated by the Ohio TRM; see footnote 232 on p.90 of the Ohio TRM.

²³ As stipulated by the Ohio TRM; see footnote 233 on p.90 of the Ohio TRM.

DHW Recovery Efficiency

= Recovery efficiency of electric hot water heater
= 0.98

0.003412 = Constant to convert MMBtu to kWh

$$\Delta kW = \frac{\Delta kWh}{Hours} * CF$$

Equation 7-8: Calculation of Summer Coincident Peak Demand Savings

Where:

Hours = 21

CF = Summer Peak Coincidence Factor = 0.00262

Pipe Wrap

Energy and demand savings for adding insulation to un-insulated domestic hot water pipes will be calculated using the Ohio TRM algorithms for domestic hot water pipe insulation in which the subprogram intends for auditors to implement a direct installation/early replacement²⁴ policy. Only savings pertaining to electric hot water heating will be calculated using Equation 7-9 and Equation 7-10. Care will be taken that savings are not over reported due to interactive effects.

$$\Delta kWh = \frac{\left(\left(\frac{1}{R_{exist}} - \frac{1}{R_{new}} \right) * (L * C) * \Delta T * 8760 \right)}{\eta_{DHW} / 3413}$$

Equation 7-9: Pipe Wrap Calculation of Energy Savings

Where:

R_{exist} = R-value of un-insulated pipe = 1.0²⁵

R_{new} = R-value of hot water pipe after being wrapped with insulation.

L = Length of pipe wrapped by insulation from water heater up to the first elbow

C = Circumference of pipe wrapped by insulation in feet,

ΔT = 65° F ²⁶

8,760 = number of hours in a year.

η_{DHW} = Recovery efficiency of electric hot water heater = 0.98²⁷

²⁴ See Ohio TRM pp. 97-99.

²⁵ See Ohio TRM, p. 97, footnote 250.

²⁶ Average temperature difference between supplied water and outside air temperature = (see Ohio TRM, p. 97, footnote 251).

²⁷ See Ohio TRM, p.97, footnote 252.

3,413 = Conversion from Btu to kWh.

$$\Delta kW = \frac{\Delta kWh}{8760}$$

Equation 7-10: Calculation of Summer Coincident Peak Demand Savings

Where:

ΔkWh = savings from pipe wrap installation

8760 = number of hours in a year

Smart Strip Power Strips

Energy and demand savings for smart strip power strips will be determined per the Ohio TRM²⁸ using Equation 7-11. This measure characterization provides savings for a 5-plug strip and a 7-plug strip.

Energy Savings: $\Delta kWh_{5-Plug} = 56.5 \text{ kWh}$

$\Delta kWh_{7-Plug} = 102.8 \text{ kWh}$

$$\Delta kW = \frac{\Delta kWh}{Hours} * CF$$

Equation 7-11: Calculation of Summer Coincident Peak Demand Savings

Where:

Hours = Annual number of hours during which the controlled standby loads are turned off by the Smart Strip.

= 7,129

CF = Summer Peak Coincidence Factor for measure

= 0.8

$\Delta kW_{5-Plug} = 56.5 / 7129 * 0.8$

= 0.0063 kW

$\Delta kW_{7-Plug} = 102.8 / 7129 * 0.8$

= 0.012 kW

7.3.2 Online Audit

The impact evaluation addressed the following research questions.

- How much energy savings do online and telephone audit participants achieve when compared to non-participants?

²⁸ See Ohio TRM, p. 76.

- How do the two energy audit methods – online vs. telephone – compare in producing electric energy savings for customers?
- How effective is the program for online audit users compared to telephone audit users?

Data Cleaning and Quality Control

ADM checked, cleaned and incorporated the following data into the datasets used in the linear panel regression model:

- Monthly kWh consumption billing data provided by the Companies, for all treatment and control group samples for the period January 1, 2017, through December 31, 2018.
- Customer data which included:
 - Utility customer ID (Account Number)
 - Service Address Zip Code
 - Beginning and end dates of monthly electric bills, and number of days billed.
- Audits & Education subprogram delivery data which includes completion dates for each audit and audit method type (online vs. telephone).

ADM performed the following steps to prepare the data:

- Verified 2018 participants using the program delivery data.
- Merged the participant dataset with the raw billing data provided by the Companies.
- Cleaned the billing data of duplicate bills and information placed in the wrong columns.
- Removed nearly zero monthly consumption values.
- Assigned a single kWh value for each month for each Premise ID.
 - Monthly billing data is reported in inconsistent time periods, ADM uses the energy usages and time periods to assign a daily kWh value that was then averaged into a monthly kWh value.
- Filtered out statistical outliers by keeping premises where the average daily consumption values were larger than 3 kWh and less than twice of the standard deviation of the average daily consumption plus the mean of average daily consumption per month.
- Removed cross-participants from the dataset.

Mixed Effects Model

The mixed effects model specified in the equation below was used to determine daily average energy (kWh) savings for treatment group members in the Online Audits subprogram. A mixed effects model is referred to as a difference-in-difference model, as the difference in electricity usage between both a pre-period and a post-period, as well as the treatment and controls, is determined.

$$AEC_{i,t} = \beta_1 CDD_{i,t} + \beta_2 HDD_{i,t} + \beta_3 Post_{i,t} + \beta_4 Post_{i,t} * Treat_{i,t} + \beta_5 Post_{i,t} * CDD_{i,t} + \beta_6 Post_{i,t} * HDD_{i,t} + Customer_i + E_{i,t}$$

Equation 7-12: Mixed Effects Model

For the mixed effects panel model, the subscript *i* denotes individual customers and *t* = 1, ..., *T(i)* serves as a time index, where *T(i)* is the number of bills available for customer *i*. The model is defined as “mixed effects” because the model decomposes its parameters into fixed-effects (i.e. *Post*, *Treat*, and its various interactions) and random effects (i.e. the individual customer’s base usage). A fixed effect is assumed to be constant and independent of the sample, while random effects are assumed to be sources of variation (other than natural measurement error) that are uncorrelated with the fixed effects. The variables included in the regression model are specified below.

Where:

Average Electricity Consumption *AEC_{it}*

= Average daily use of electricity for period *t* for a customer (determined by dividing total usage over a billing period by number of days in that period)

Customer_i

= Unique random intercept for each customer to control for any customer specific differences.

Cooling Degree Days (*CDD*)

= Cooling degree days per period (determined by dividing total cooling degree days over a billing period by number of days in that period)

Heating Degree Days (*HDD*)

= Heating degree days per period (determined by dividing total heating degree days over a billing period by number of days in that period)

Post

= *Post* is a dummy variable that is 0 if the monthly period is before the customer received their first HER, 1 if the monthly period is after the customer received their first HER and 9 if the monthly period is in which the customer received their

first HER (commonly referred to as the “deadband” period). Deadband periods are dropped prior to running the model

Treat = Treat is a dummy variable that is 0 if the customer is a member of the control group and a 1 if the customer is a member of the treatment group.

Control Group Selection

The control group serves as a baseline on energy consumption for the subprogram participants during the pre and post period in the modeling analysis. ADM requested monthly billing data and assessor data for a pool of control group candidates from FE Ohio. The data was used to identify a control group that has similar property characteristics and energy consumption. Propensity score matching will then be used to match the participant and control properties based on average daily consumption during the summer and winter season.

Propensity score matching is a method by which the control group is “matched” to the treatment group via a propensity score, which is derived from observed characteristics of a customer’s likelihood of participating in the Online Audit subprogram. The probit model in Equation 7-13 below was used to estimate the propensity scores for all customers.

$$Participation = \alpha + \beta \cdot [SummerkWh] + \rho \cdot [WinterkWh] + \varepsilon$$

Equation 7-13: Propensity Score Matching for Online Audit Controls

Where:

Participation	= a binary variable that is 1 if the customer is an Online Audit program participant and 0 if they are a non-participant;
SummerkWh	= a continuous variable that captures the customer’s pre-assessment, weather normalized, average daily consumption during the summer months;
WinterkWh	= a continuous variable that captures the customer’s pre-assessment, weather normalized average daily consumption during the summer months;
ε	= an error term;
β	= a coefficient showing the changes in propensity to participate in the Online Audit program that occurs for a change in the SummerkWh variable; and
ρ	= a coefficient showing the changes in propensity to participate in the Online Audit program that occurs for a change in the WinterkWh variable.

This process is designed to select, for each treatment premise, the handful of homes in the control group that match the participating premise's consumption patterns as closely as possible. The resulting matched control group is significantly better fit to the treatment group than a random sample of control premises.

Energy Savings and Peak Demand Reduction Analysis

ADM combined all the Audits & Education treatment participants and using the associated (pre-treatment) control group calculated the average daily savings for the period between January 1, 2018 through December 31, 2018. The program participation levels in 2018 did not allow for enough data to run statistically valid models for individual breakouts by EDC. ADM used the participant counts for each EDC and parts of the program to calculate the savings attributable to the subsets. Estimates of savings will be developed for two groups of customers as defined by type of audit. The two groups are as follows:

- Telephone audits
- Online audits

Summarized, the steps in the kWh calculation are as follows:

- For Step 1, assumed the estimated regression model represents “typical” customer behavior. Multiply the savings coefficient ($-\beta_4$) by 365 to get annualized savings.
- In Step 2, determined preliminary program-level kWh savings for each audit group for each utility company by multiplying the per-participant kWh savings value for a group by the number of customers who are participants in that group for a utility company.
- In Step 3, determined kWh savings to attributed to downstream measures for each utility company. A review of the tracking and reporting system for each experimental cohort was done to identify EE program participation that occurred from the treatment start date onwards. Summed up treatment and control group kWh attributed to downstream measures using reported savings because all downstream measures were installed during the program year. Subtract dual participation control kWh from dual participation treatment kWh to get kWh attributed to downstream measures.
- In Step 4, determined program-level kWh savings by subtracting the kWh savings attributed to downstream measures.

The calculation of kW reductions will be based on the per-participant kWh savings values. The steps in the calculation of kW reductions are as follows.

- In Step 1, determined the per-participant kW reduction by multiplying the annualized savings from Step 4 of the kWh calculation by a coincident factor. The coincident factor is derived from the Savings Curve for Home Audits in 2018. The coincident factor is the average savings over all peak hours (3 PM – 6PM) in the months of June, July, and August on non-holiday weekdays.
- In Step 2, determined program-level kW reductions for each audit group for each utility company by multiplying the per-participant kW reduction value for a group by the number of customers who were participants in that group for a utility company.

7.4 Detailed Impact Evaluation Findings

7.4.1 Comprehensive Audits

This section presents the findings of the impact evaluation of the Comprehensive Audits subprogram.

The 2018 evaluation results for estimated gross kWh energy savings and kW peak demand reductions for the Comprehensive Audits subprogram in the Companies' service territories are summarized in Table 7-5 and Table 7-6. The subprogram level kWh realization rate is 97% and kW is 106%.

The variation in the ex-ante and ex-post savings calculation was primarily caused by the ISRs and allocation of LED bulb quantities by room type. For example, the ex-ante estimate used a deemed ISR of 92% from the PA TRM while the ex-post relied on data collected through the evaluation surveying efforts. The ex-post analysis ISRs from the 2018 surveying effort are reported in Table 7-5. Additionally, the ex-ante input for hours of use was the deemed hours of use from the OH TRM. The ex-post input for hours of use was calculated by allocating the percentage of installation by specific room type and assigning hours use by room type from the PA TRM.

Table 7-5: Ex-Post Annual kWh Savings by Operative Company

EDC	Ex-Ante kWh	Ex-Post kWh	Realization Rate
CEI	196,556	190,894	97%
OE	420,701	398,216	95%
TE	508,705	503,941	99%
Total	1,125,961	1,093,051	97%

Table 7-6 below shows the ex-post Annual kW demand savings by Operating Company.

Table 7-6: Ex-Post Annual kW Reduction by Operating Company

EDC	Ex-Ante kW	Ex-Post kW	Realization Rate
CEI	22.16	24.08	109%
OE	48.31	50.19	104%
TE	58.96	63.53	108%
Total	129.43	137.80	106%

In Service Rates

The Comprehensive Audits ISRs, as determined from the participant survey, for each measure is shown in Table 7-7.

Table 7-7: Comprehensive Audits Measures' In-Service Rates Determined by Survey

Measure	N	ISR
Indoor LED	263	96%
Outdoor LED	23	96%
LED Nightlights	11	16%
Aerators	40	95%
Showerhead	19	95%
Pipe Wrap	7	78%
Power Strip	2	100%

7.4.2 Online Audits

This section details the impact evaluation results for the 2018 Online Audits subprogram. The linear regression model for the Online Audits subprogram had a p-value = 0.00002835, adjusted R-Squared = 0.656, and showed an average daily savings 0.657 kWh. The energy savings of the Online Audits subprogram for each EDC are presented in Table 7-8 and Table 7-9.

Table 7-8: Ex-Post kWh Savings per Participant²⁹

CEI	Totals
kWh saved per participant	184.64
Number of participants	1,470
Total kWh saved	271,415
OE	Totals
kWh saved per participant	180.72
Number of participants	2,114
Total kWh saved	382,035
TE	Totals
kWh saved per participant	179.40
Number of participants	636
Total kWh saved	114,099
Combined Totals across Utilities	Totals
Number of participants	4,220
Total kWh saved	767,550

Table 7-9: Ex-Post kW Savings per Participant

CEI	Totals
kW reduction per participant	0.03
Number of participants	1,470
Total kW reduction	45.09
OE	Totals
kW reduction per participant	0.03
Number of participants	2,114
Total kW reduction	63.47
TE	Totals
kW reduction per participant	0.03
Number of participants	636
Total kW reduction	18.96
Combined Totals across Utilities	Totals
Number of participants	4,220
Total kW reduction	127.51

As shown in Table 7-10 verified ex-post electric savings were 767,550 kWh for all home energy audits combined. Of the total kWh savings, 74% were from online audits and 26% were from telephone audits. Table 7-10 also shows that verified critical peak demand reduction was 127.51 kW.

Table 7-10: Ex-Post kWh & kW by Audit Type

EDC & Audit Type	Ex-Ante Savings		Ex-Post Savings		RR	
	kWh	kW	kWh	kW	kWh	kW
CEI Online	303,160	68.64	211,224	35.09	70%	51%
CEI Telephone	86,390	19.56	60,191	10.00	70%	51%
All CEI	389,550	88.20	271,415	45.09	70%	51%
OE Online	217,686	30.66	277,038	46.02	127%	150%
OE Telephone	82,502	11.62	104,996	17.44	127%	150%
All OE	300,188	42.28	382,035	63.47	127%	150%
TE Online	74,240	9.28	83,242	13.83	112%	149%
TE Telephone	27,520	3.44	30,857	5.13	112%	149%
All TE	101,760	12.72	114,099	18.96	112%	149%
Total	791,498	143.20	767,550	127.51	97%	89.%

7.5 Detailed Process Evaluation Findings

The following section provides detailed findings from the process evaluation for the Audits and Education subprogram of the Energy Efficient Homes Program. The Audits and Education subprogram consists of both Online Audits and Comprehensive In-Home Audits.

7.5.1 Comprehensive Audits Subprogram Operations Perspective

The following section provides a detailed overview of the Comprehensive Audits and operational landscape, constructed through in-depth discussions with subprogram and implementation staff and a review of the various subprogram documents. The evaluation team interviewed both the Companies' subprogram implementation manager and the senior program manager for Franklin Energy ("Franklin") in January 2019. Franklin is the contractor responsible for implementing the subprogram. This section will summarize key elements of subprogram design, program management, marketing and outreach, project implementation, and quality control and verification.

²⁹ *Ex post* savings were calculated for both audit types across all three EDCs because there were not enough participants by audit type to report statistically significant results.

Subprogram Design

The evaluation team asked subprogram and implementation staff to describe the subprogram design. They stated that the residential comprehensive audit subprogram is segmented into single-family and multi-family homes. The implementor stated that they have five internal auditors in the field across Ohio and two additional external contractors who participate in the subprogram as demand requires.

For a single-family home, the subprogram staff stated that an auditor conducts a blower test, checks for a draft, and checks appliances. They summarized the audit as focusing on the shell of the home and the measures that consume the most electricity.

Auditors also perform direct installation of certain measures. Auditors install measures including LED light bulbs, smart power strips, aerators, low flow shower heads, and pipe wrapping depending on the customer's water heating type.

Multi-family audits are less extensive and are available to tenants who are self-metered. Auditors inspect customers' units to check their appliances and install energy-efficient lighting. There is no blower test for multi-family units. Auditors can install up to \$200 of energy savings products.

After the comprehensive audit the customer is given a report. It includes a summary of measures installed, other ways they can save throughout their home, and information on additional rebates they may be eligible to receive through the Companies.

Regarding participation cost, for single-family homes, if a Franklin Energy auditor completes the audit, the implementation staff stated that the maximum cost to the customer is \$250, and customers are informed that as long as they achieve 350 kWh in energy savings, they will qualify for an instant rebate. For customers that opt to participate with an external contractor, the contractor can charge up to \$350, and customers are able to receive a maximum rebate of \$250 via the mail. The subprogram staff stated that they were not aware of any 2018 customer that incurred additional costs for an audit. For multi-family units, there is no additional cost to the property or customers to participate.

Customers are paid a rebate for recommended installation work they perform after the audit. According to subprogram staff, they have a specific list of rebated measures affiliated with the subprogram (attic insulation, wall insulation, duct sealing, air sealing, and windows). After post-audit installation work is done, Franklin verifies what has been installed and a rebate form is provided. Customers are paid a rebate of 10 cents per kWh of savings.

Subprogram Management and Staffing

The Companies' program manager for residential energy efficiency programs is responsible for implementation and general oversight. They monitor progress and produce reports on the program's budget and savings. They are responsible for

managing the subprogram's primary implementation contractor activity. They address issues with implementation as they arise, as well as any general issues related to subprogram tracking and reporting.

Franklin's senior program manager is responsible for implementation, as well as overseeing field staff, contractors, the customer care center, and subprogram marketing team. They have three administrative staff that are assigned to assist them with the implementation of the subprogram. Franklin Energy has centralized IT, marketing, and customer care departments that assist with subprogram administration as needed.

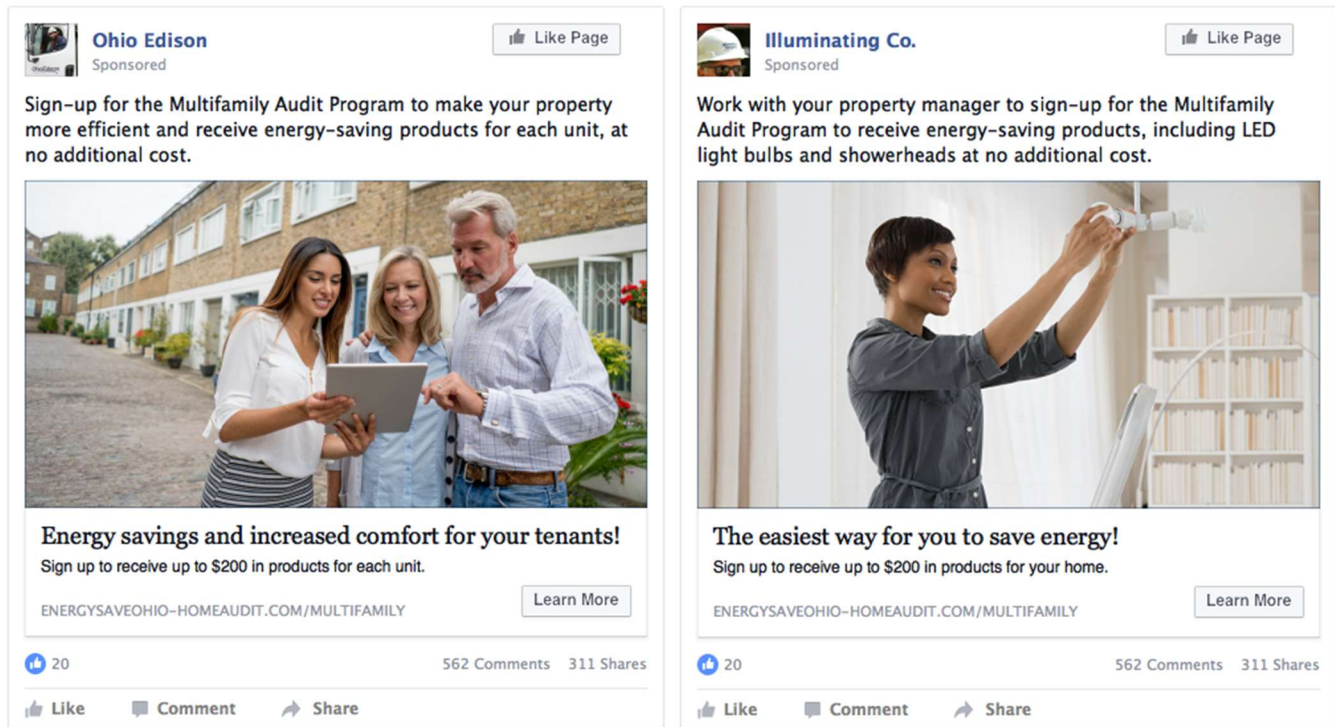
The implementation staff reported that staffing is sufficient and effective for subprogram administration. They reported that if the production schedule increases, they will bring in additional resources. The Companies' subprogram staff shared similarly positive sentiments regarding the level of staffing and the implementor's ability to react to subprogram demands.

Both the subprogram and implementation staff reported strong and frequent internal communication. They reported emailing frequently and usually speaking at least once on the phone each week. The implementation staff stated that the Companies' staff hold a weekly (as needed) data integration call. Additionally, a larger in-person monthly meeting is held to discuss the previous month's performance, subprogram trends, and marketing strategies. There is also an annual marketing meeting to plan for the upcoming year.

Marketing and Outreach

In 2018, Franklin Energy was responsible for marketing the subprogram. The subprogram implementation staff stated that most of their marketing effort is digital. They stated that targeted social media ads on Facebook are the bulk of marketing. Screenshots of samples of targeted ads are provided in Figure 7-1. These ads are aimed at property managers in the OE market and at tenants in CEI's market. Additionally, they stated that the Companies provide a customer list and then Franklin Energy segments that list geographically to create targeted email campaigns.

Figure 7-1: Targeted Facebook Ads



Other marketing strategies Franklin employs include bill inserts, direct mail, and community events. The subprogram implementor shared two examples of successful in-person community events. They spoke at Case Western's monthly sustainability lunch and Franklin also participated in the Northern Ohio Apartment Association trade show. They stated that the trade show appearances informed property management groups that this subprogram is open for their tenants' participation.

The implementation staff stated that the subprogram cross-promotes other programs offered by the Companies by listing them on the report that the in-home audit customers receive. They stated that the program list is updated as needed if the Companies make requests for changes.

Subprogram Implementation and Participation Process

As part of the process evaluation, the evaluation team reviewed the subprogram's implementation process. The evaluation team also spoke with subprogram staff regarding their perspectives on the 2018 subprogram year, what went well, barriers to participation, and what could be improved upon.

In 2018, customers became involved in the subprogram in various ways. Customers call into the Franklin call center, submit online inquiries, or can use a self-scheduling portal to set their appointments. Reminder e-mails are sent out forty-eight hours prior to all

appointments. A day prior to appointments, the auditor assigns calls to remind customers and confirm appointments. According to the subprogram implementation staff, the average duration between a customer's first contact with Franklin and their comprehensive audit is two to three weeks.

In regard to subprogram tracking, subprogram staff stated that Franklin uses a system that is connected to AEG which houses all program data. The subprogram implementation staff stated that for single-family audits, they use a program called Optimizer in the field to track installed measures and that program interfaces with the management platform called eManager. For multi-family, they use a tool called Clipboard and that then interfaces with eManager as well.

eManager houses all customer data including interactions with the call center and signed documents. Administrative staff verify the data in eManager and confirm an audit as complete. On the 2nd of every month, Franklin sends a file to the Companies with subprogram information that it is then integrated into their system.

Subprogram Strengths and Challenges

The evaluation team asked staff to describe the greatest subprogram strengths and opportunities for improvements. Below is a summary of their collective responses.

Both interviewees felt the Comprehensive Audits subprogram was successfully implemented in 2018, but there was room for improvement and growth. Subprogram and implementation staff reported that the subprogram has a dedicated team that works well together with frequent communication. They also shared that the subprogram has a solid design and implementation procedures are well understood.

Both interviewees noted that a barrier to successful implementation was subprogram awareness. Implementation staff stated that since the subprogram had been dormant, there was a lack of public awareness. They stated that they are striving to re-educate the customer base. Subprogram staff indicated that they felt awareness was increasing. They stated that the subprogram was working to target their marketing in areas where they felt they could get the most savings (e.g. older homes, multi-family locations).

The subprogram implementation manager shared that creating marketing content in language to help customers learn about the subprogram can be a challenge as it is not straightforward to market compared to other programs. They also stated that allowing for an instant rebate is helpful and informing customers that there is no out-of-pocket cost is a crucial selling point. The subprogram manager stated that the out-of-pocket cost does not seem to be a deterrent to participation as customers are aware of the instant rebate.

7.5.2 Comprehensive Audits - Participant Survey

This section presents key findings from a phone survey of 70 Comprehensive Audit subprogram participants. The evaluation team contracted with VuPoint Research to administer the telephone surveys. The surveys collected data on subprogram awareness and experience, energy-savings behaviors and equipment installed, satisfaction, and home characteristics.

Subprogram Awareness and Experience

The most frequently reported source of awareness about the Comprehensive Audit subprogram was “word-of-mouth” (30%). Other common sources of awareness survey respondents reported included bill inserts (17%), their property owners or landlords (13%), and the utility’s website (11%). Table 7-11 displays where survey respondents indicated that they learned about the program.

Table 7-11: Sources of Program Awareness

How did you first hear about the Home Energy Analyzer?	CEI		OE		TE		Total	
	n	Percent	n	Percent	N	Percent	n	Percent
Word-of-Mouth	2	13%	9	39%	10	31%	21	30%
Bill insert	4	27%	6	26%	2	6%	12	17%
Property Owner/Landlord	2	13%	1	4%	6	19%	9	13%
Utility website	4	27%	2	9%	2	6%	8	11%
Direct mail from electric company	1	7%	1	4%	3	9%	5	7%
Social media	0	0%	1	4%	3	9%	4	6%
Don't know	1	7%	2	9%	1	3%	4	6%
Other	0	0%	0	0%	3	9%	3	4%
Contractor	0	0%	0	0%	2	6%	2	3%
Print ad	1	7%	1	4%	0	0%	2	3%

Participants decided to complete comprehensive audits for various reasons. Nearly half of survey respondents (47%) reported that they decided to do a comprehensive home energy audit to “conserve energy” and two-fifths (40%) reported financial reasons or high bills as a reason they decided to do a comprehensive home energy audit. Another motivation respondents cited was to learn more about their home’s energy use (20%). A portion of respondents (13%) reported that they were not the individual who decided to sign up for the program or that their landlord or property manager had made the decision to participate.

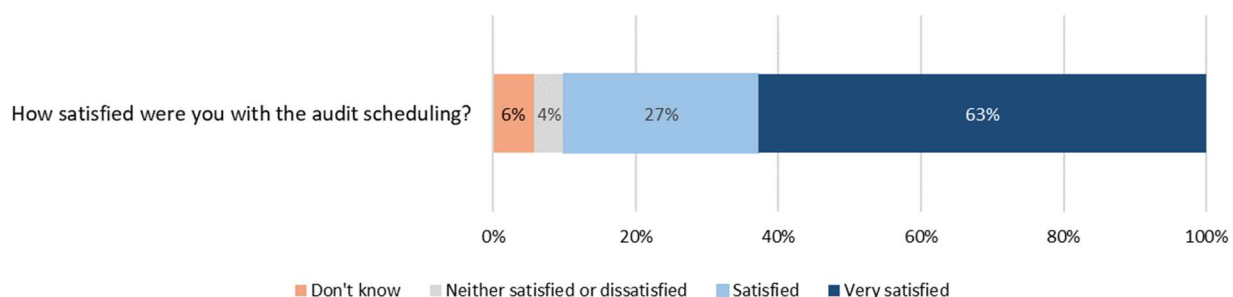
Survey respondents indicated that the most frequently reported method of scheduling the comprehensive audit (29%) was through a phone call to the utility. Almost one-quarter of respondents (23%) reported that their apartment manager or landlord setup or requested the audit. Other methods that respondents reported using to request the audit included

scheduling the appointment themselves online (13%), submitting an inquiry online (10%), or signing up at a community event (7%).

Seventy-percent of respondents stated that they received a reminder email or phone call two days before their appointment. Nineteen-percent of respondents reported that they did not receive an email or phone call reminder and 11% of respondents did not recall or were unaware if they received a reminder.

Regarding the promptness of the home auditors, over three-quarters (76%) of respondents recalled that their auditor was on time for their appointment. Only 7% of respondents stated that their home auditor was late to their appointment. Nearly one-fifth (17%) of survey respondents stated they did not recall if their home auditor was on time for their appointment. Ninety-percent of survey respondents reported that they were either “satisfied” (27%) or “very satisfied” (63%) with the scheduling of their home energy audit. Figure 7-2 displays survey respondents’ level of satisfaction with scheduling their audit.

Figure 7-2: Audit Scheduling Satisfaction



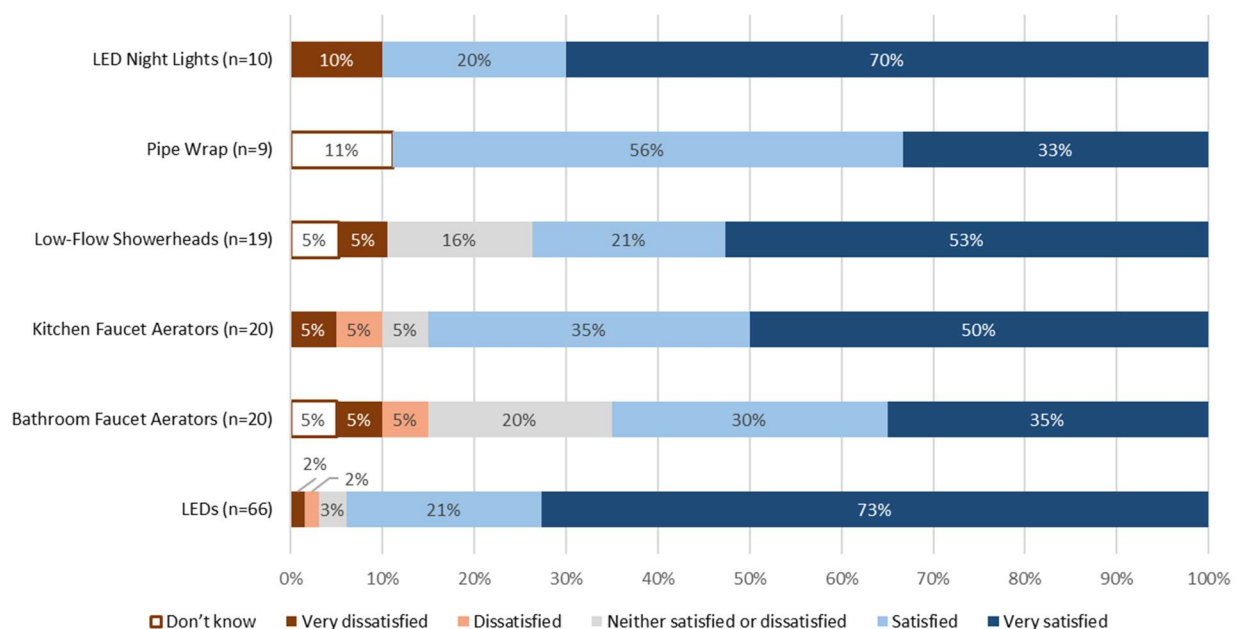
When asked if their home auditor was knowledgeable, courteous, professional, clean, and presentable, the vast majority of respondents (90%) answered affirmatively. The remaining 10% of respondents could not recall their auditor’s demeanor, level of professionalism, or presentability. Respondents were also asked whether their home auditor offered any additional energy saving home improvements recommendations during the audit. Forty-four percent of survey respondents reported that the home auditor made additional energy saving home improvement recommendations. Of these respondents, 90% reported being either “very satisfied” (65%) or “satisfied” (26%) with the recommendations that the auditor gave them during their visit.

Subprogram Satisfaction

Participants verified the measures they received during their comprehensive audits and provided feedback on these measures. The majority of respondents reported that they received the measures that records indicated and were satisfied with these measures. Survey respondents that received LED light bulbs and LED night lights reported very high levels of satisfaction (94% and 90% overall satisfaction respectively). Overall, the majority

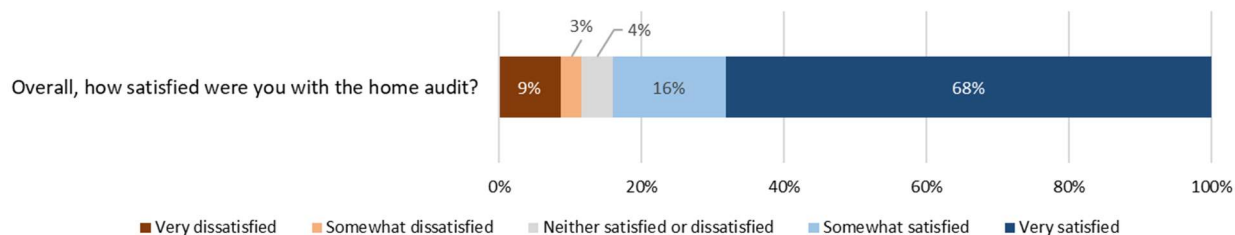
of survey respondents reported being “satisfied” or “very satisfied” with the measures they received through their comprehensive audit. Figure 7-3 displays survey respondent satisfaction with the various measures they received through the program. Our records indicated that only two survey respondents received smart power strips; both respondents indicated they were “very satisfied” with this measure.

Figure 7-3: Measure Satisfaction



Overall, most survey respondents (84%) reported being either “very satisfied” (68%) or “satisfied” (16%) with their home audit. Furthermore, over half of survey respondents (51%) stated that they had recommended the program to others. Figure 7-4 displays survey respondents’ overall level of satisfaction with their comprehensive audit.

Figure 7-4: Overall Audit Satisfaction



Home Characteristics

The most commonly reported type of home was “Single-family home, factory detached or manufactured/modular”(46%). The second most reported type of home was “apartment” (38%). About half of survey respondents (46%) reported renting their home, while the

other half (46%) reported owning their home. Survey respondents also reported their home size, the year their home was built, and the type of fuel they use to heat their home and home's water. Survey respondents' reported home characteristics are displayed in Table 7-12.

Table 7-12: Home Characteristics

Home Characteristics	Percentage of Respondents
Single-family home, factory detached or manufactured/modular	46%
Apartment	38%
Two or three family attached residence	3%
Condominium	3%
Other	3%
Don't know/Refused	7%
Own or Rent	
Own	46%
Rent	46%
Refused	9%
Year Build	
Before 1960	29%
1960-1969	4%
1970-1979	20%
1980-1989	6%
1990-1999	4%
2000-2005	3%
2006 or Later	4%
Don't know/Refused	30%
Above Ground Living Space	
Less than 1,000 square feet	13%
1,000-2,000 square feet	26%
2,000-3,000 square feet	19%
3,000-4,000 square feet	7%
Greater than 5,000 square feet	1%
Don't know/Refused	34%
Heating Type – Water	
Natural gas	41%
Electricity	41%
Propane	1%
Don't know/Refused	16%
Heating Type – Home	
Natural gas	41%
Electricity	44%
Propane	1%
Don't know/Refused	13%

7.5.3 Online Audits Subprogram Operations Perspective

The following section provides an overview of the Online Audits subprogram design and operational landscape, constructed through in-depth discussions with subprogram staff and a review of the various customer outreach and education documents. ADM interviewed the Companies' program manager for the Online Audits subprogram. This section summarizes key elements of program design, program management, marketing and outreach, project implementation, and quality control and verification.

Subprogram Design

The evaluation team asked subprogram staff to provide feedback on 2018 subprogram design, as well as energy and non-energy savings goals. The evaluation team interviewed the Companies' residential program manager in January 2019

The main design change in 2018 was that the program changed implementation contractors, ("vendors"), for the online audit tool. The move from Aclara to Oracle managing the Online Audits subprogram was successful. The subprogram manager stated that they were part of a transition team at and it had been well planned and executed.

They stated that the main interface is the same, but Oracle has enhanced the online audit tool substantially. The new tool is more user friendly and has not had any reported loading issues. The tool has pictures, energy saving tips, and can link to other programs offered by the Companies that are specifically relevant to a customer's inputs. An additional asset is the home information gathered during an online audit can feed into the behavioral Home Energy Report subprogram if the customer is enrolled in that program. The shift from Aclara to Oracle as a vendor has improved subprogram tracking and cross-promotional marketing capabilities.

Subprogram Management and Staffing

The Companies' subprogram manager is responsible for subprogram implementation, general oversight, and are the primary point of contact between the Companies and Aclara. The subprogram manager addresses issues with implementation as they arise, as well as any general program issues related to subprogram tracking and reporting.

The Companies' customer call center is responsible for resolving issues that result from customers using the Home Energy Analyzer tool, as well as performing customer phone audits. Oracle is responsible for hosting the online Home Energy Analyzer tool and does not play a role in the outreach and/or support of the subprogram itself. The subprogram manager stated that Oracle's current role is similar to Aclara's previous role.

The subprogram manager hosts a bi-weekly phone meeting to discuss topics related subprogram activity, progress towards goals, guideline interpretation, and project-specific issues. Staff also email and speak on the phone as needed between the regularly

scheduled meetings. Subprogram staff indicated the relationship and level of communication among the Companies' subprogram manager, Oracle, the customer call center, and the Companies' IT department are strong and adequately support the administration needs of the subprogram.

Marketing and Outreach

In 2018 the Companies had minimal marketing effort related directly to online audits. The subprogram manager stated that the subprogram is marketed through materials that direct customers to the EnergySaveOhio.com website (e.g. Facebook ads, billboards). They also stated that the subprogram is listed in a brochure that highlights all residential energy efficiency programs.

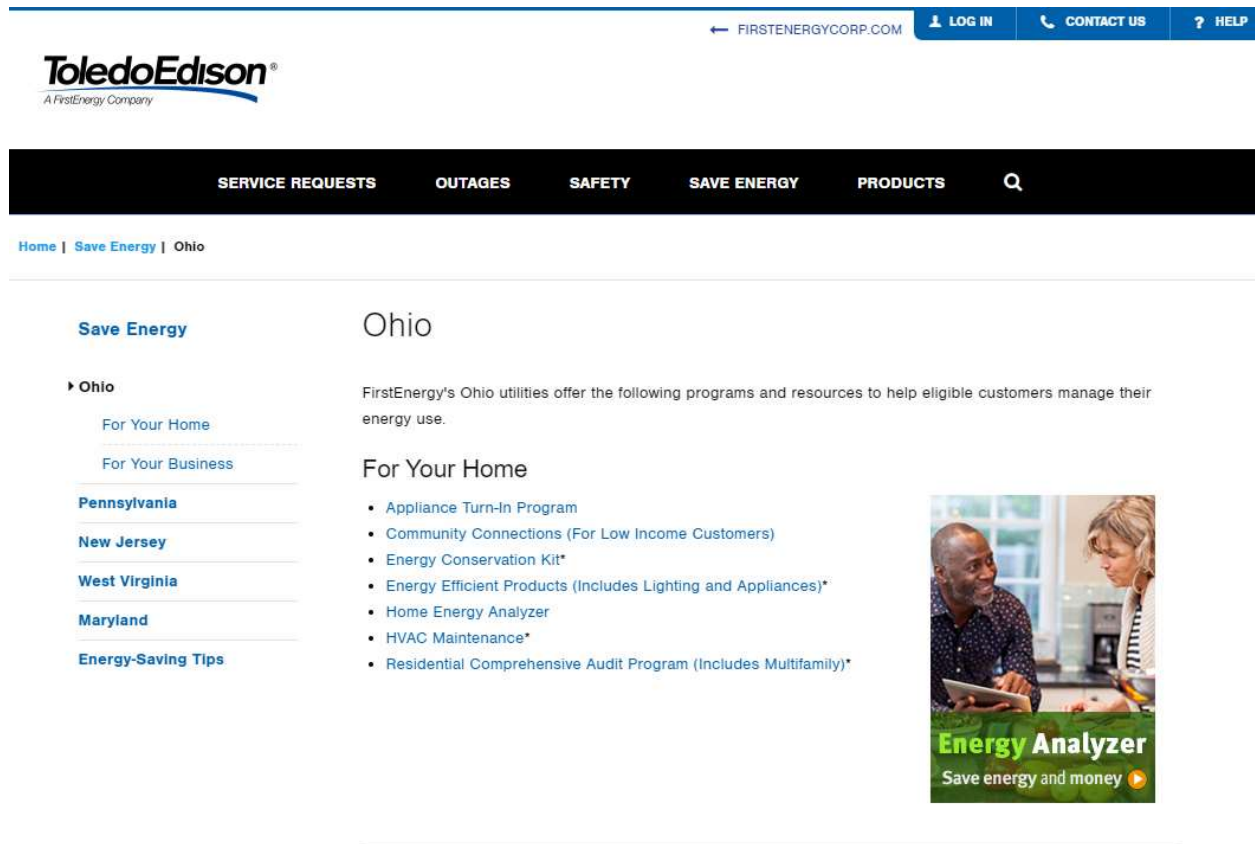
The subprogram staff noted that the online audit tool vendor, Oracle, also implements the Behavioral subprogram. Last year, the subprogram manager noted feeling that migrating the Online Audit subprogram to Oracle would help to streamline the Audit and Education offerings by reducing the various ways customers can view their home's energy usage information. They stated that Oracle hosting the subprogram has substantially improved implementation.

Subprogram Implementation and Participation Process

As part of the process evaluation, the evaluation team reviewed implementation and participation processes including the audit tool and the subprogram website. The evaluation team also spoke with subprogram staff regarding their perspectives on the 2018 subprogram year, what went well, and what could be improved upon.

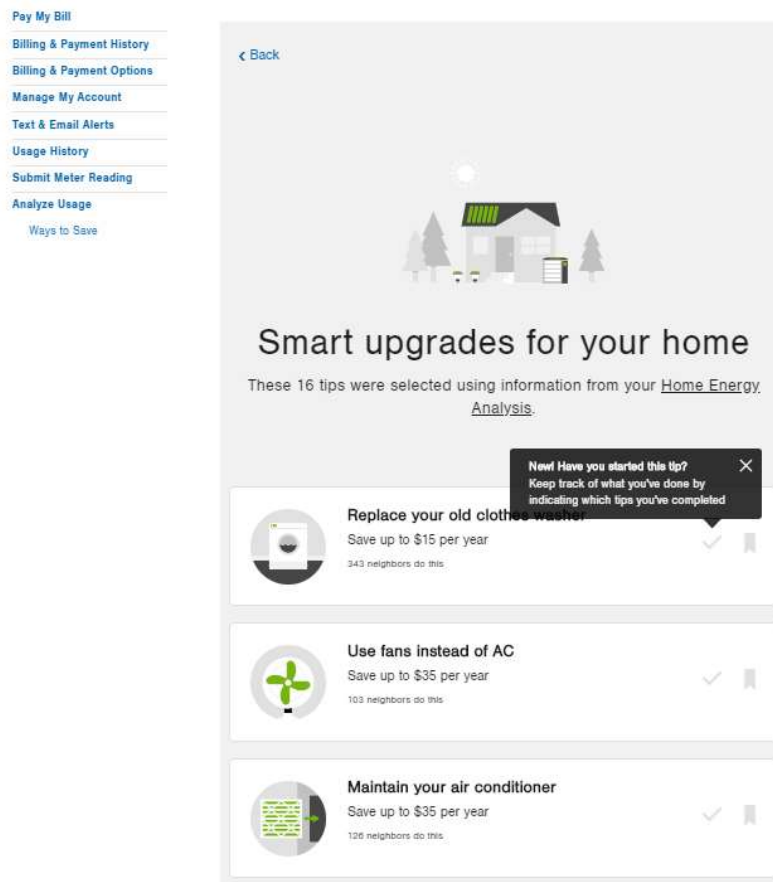
In 2018, customers participated in an Online Audit in one of two ways: (1) accessed the Home Energy Analyzer tool online on the Companies' website or (2) by phone with the assistance of a customer call center representative. According to staff, customers typically became aware of the Home Energy Analyzer tool through the Energy Save Ohio website, shown in Figure 7-5.

Figure 7-5: Home Page of Energy Save Ohio Website



The process for accessing the online audit has not changed with the shift from Aclara to Oracle. To access the tool, the customer clicks the Home Energy Analyzer link. After entering their account number, they are brought to the tool's homepage or the energy dashboard where they can view their account summary, bill highlights, electricity costs by end use, and historical usage data. Once inside the Home Energy Analyzer, the customer can access energy savings tips through the "Ways to Save" page. This page contains buttons with titles such as "Save when working from home" and "Ways to save at no cost to you". Customers select a heading and then are able to see specific energy saving tip checklists. See Figure 7-6 for an example of one of the checklists.

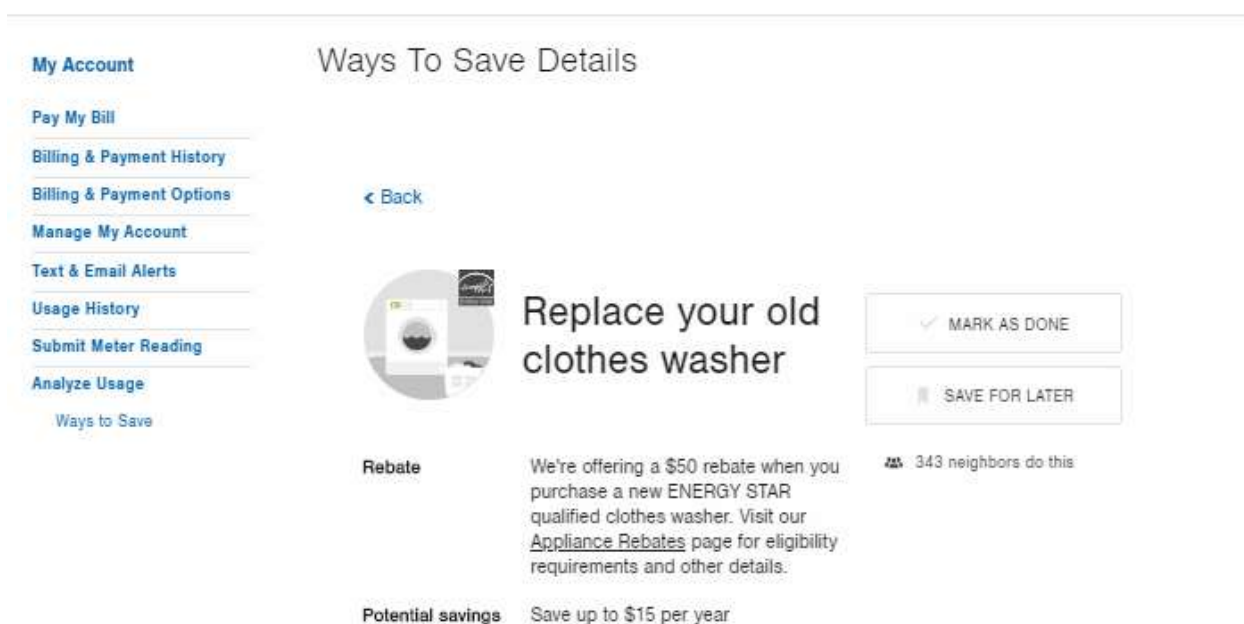
Figure 7-6: Ways to Save: Energy Saving Checklist Example



The checklists provide savings tips for lighting, heating, cooling, and improving the home's thermal envelope. The subprogram manager stated that with the shift to Oracle hosting the tool, it now includes links to specific programs at the Companies that could benefit customers. A screenshot of a specific tip that links to another one of the Companies' programs is provided in Figure 7-7.

Oracle provides reporting to the Companies regarding customers' responses to the Online Audit and website statistics such as the number of users that interacted with the tool. The subprogram manager shared that there is a strong internal reporting system, but they are working to hone their internal system to reduce the amount of manipulation required for inputting the data into their internal reporting tool ("Qlikview"). They stated that Aclara did not previously send over such rich data, whereas Oracle is able to capture many datapoints. Regarding data tracking and reporting, the subprogram manager stated that the current systems and processes are sufficient.

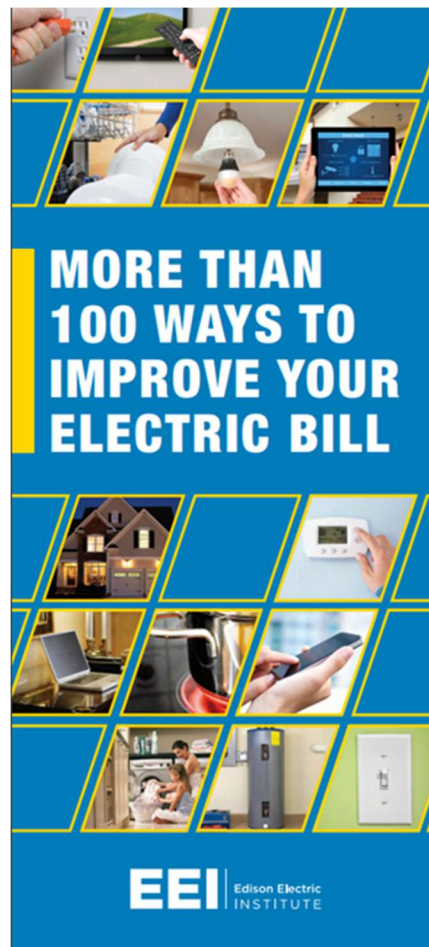
Figure 7-7: Ways to Save: Program Referral



Subprogram staff stated that customers were also considered participants of the Online Audits subprogram if they called into the Companies' customer center to discuss issues, such as high bills, and received energy savings tips. A customer service representative ("CSR") asks the customer questions about his/her home including size, ownership status, heating type, and usage patterns. Subprogram staff clarified that the telephone audit does not utilize the same tool as the Online Audit. The CSR may provide the customer with the top 3 energy users, tips for saving energy, a brochure about energy savings (see Figure 7-8), and/or a link to the Energy Save Ohio website.

As part of the participant survey effort, ADM obtained feedback from customers who participated via the online tool or the customer call center. Their collective feedback is summarized in Sections 7.5.4 and 7.5.5 respectively.

Figure 7-8: Energy Saving Brochure



Subprogram Strengths and Challenges

The evaluation team asked staff to describe the greatest subprogram strengths and opportunities for improvements. The subprogram manager stated that the new online audit tool is the subprogram's core strength. They stated that it is easy to use and is a substantial improvement from the previous tool. The new tool allows reporting to the Companies on customer inputs and interactions with the website. Subprogram staff expressed excitement regarding the tool's capability of gathering customer responses and providing the Companies with data to inform specific marketing based on responses. They shared that the customized tips now link to additional EE programs and that this change was a marked improvement. Additionally, according to subprogram staff, the loading issues are no longer an issue.

When asked about opportunities for improvement and the future of the subprogram, the subprogram manager stated that there were no planned changes.

7.5.4 Online Audits - Participant Survey Results

This section presents key findings from surveys, administered online by the evaluation group, completed by 220 Online Audit subprogram participants. The surveys collected data on subprogram awareness and experience, energy-savings behaviors and equipment installed, satisfaction, and home characteristics.

Subprogram Awareness and Experience

The majority (85%) of Online Audit participants first learned about the Home Energy Analyzer via the Companies' website (see Table 7-13).

Table 7-13: Sources of Program Awareness

How did you first hear about the Home Energy Analyzer?	CEI		OE		TE		Total	
	n	Percent	n	Percent	n	Percent	n=219	Percent
FirstEnergy Utility Website	69	88%	62	85%	55	81%	186	85%
Word-of-Mouth	2	3%	3	4%	3	4%	8	4%
Other	2	3%	5	7%	5	7%	12	5%
Don't know	5	6%	3	4%	5	7%	13	6%

Participants decided to complete an online audit for various reasons; most frequently mentioned was for the purpose of learning more about how their home energy use (62%). Other reasons for completing an audit include concerns over a high bill (49%) and interest in energy conservation (51%).

Almost two-thirds of respondents (65%) completed the entire online audit (31% reported that they were unsure). Those who did not complete the entire audit mostly replied they were satisfied with the results upon leaving the site early (50%).

Using the Home Energy Analyzer tool, 59% of respondents indicated they found detailed energy savings ideas. Many reviewed changes in their bills/usage over time (53%) and answered questions about home appliances (53%).

The Home Energy Analyzer is designed to provide customers with detailed energy savings suggestions. Seventy-seven percent of participants reported receiving suggestions that involve no-cost/low-cost ways to save energy immediately (see Table 7-14). Multiple answers per respondent could be selected for this question.

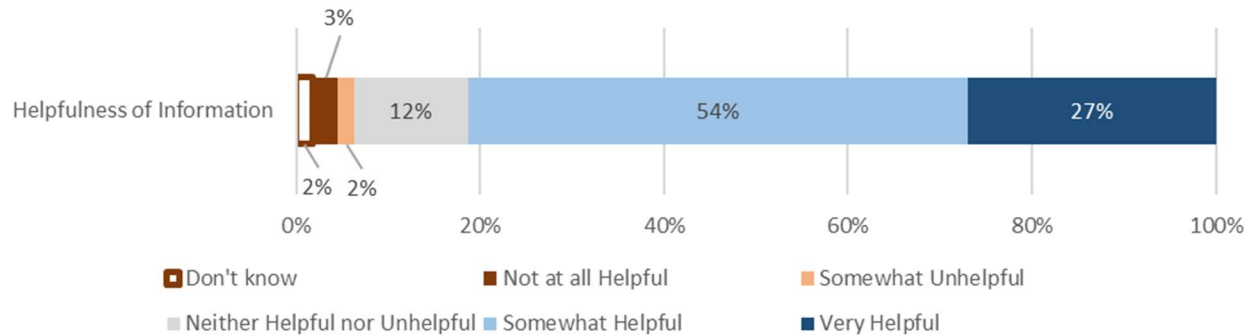
Table 7-14: Types of Savings Suggestions Provided by the Home Energy Analyzer

What kind of detailed energy saving suggestions did you receive?	CEI		OE		TE		Total	
	n	Percent	n	Percent	n	Percent	n	Percent
No-cost /low-cost ways to save energy immediately	57	73%	55	77%	55	82%	167	77%
Ways to save requiring investment but will pay off	31	40%	28	39%	24	36%	83	38%
Ways to save that would not be cost-justified	23	29%	24	34%	12	18%	59	27%
Other	4	5%	2	3%	4	6%	10	5%

Note: Percentages may exceed 100% because respondents could choose more than one response.

The majority of participants (81%) rated the information provided by the Home Energy Analyzer as somewhat or very helpful (see Figure 7-9).

Figure 7-9: Helpfulness of Information Provided by Home Energy Analyzer

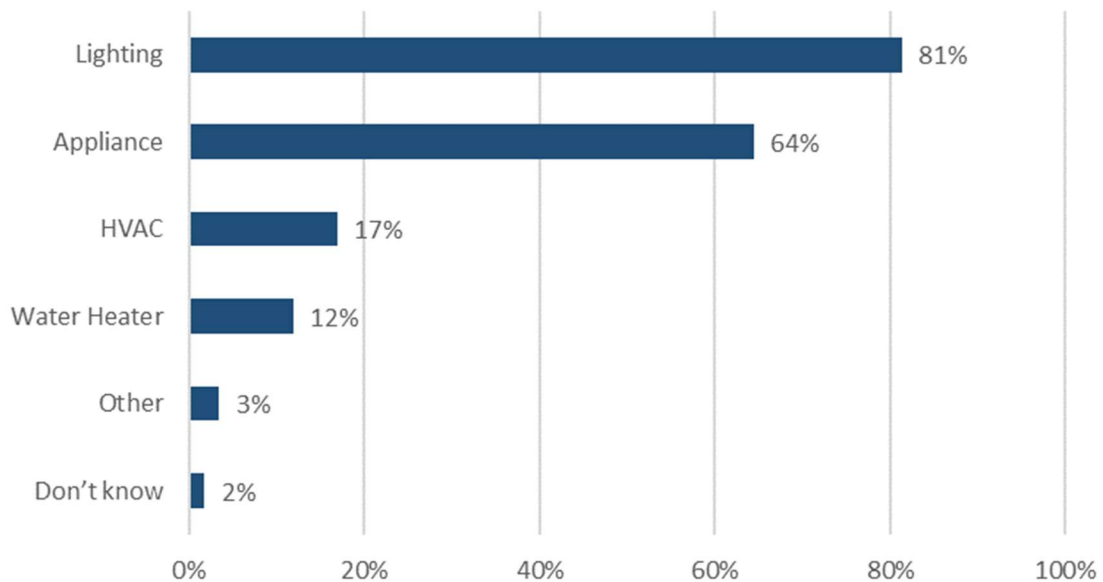


Energy Savings Actions

Participants provided feedback regarding what energy savings actions they were able to take due to using the Home Energy Analyzer. Approximately three-fourths of the respondents made behavioral changes (73%), a quarter improved weatherization (23%), and a quarter upgraded appliances or equipment (27%).

Of those that made a structural change, most upgraded lighting (81%). The categories of upgrades are displayed in Figure 7-10.

Figure 7-10: Structural Changes Made by Participants

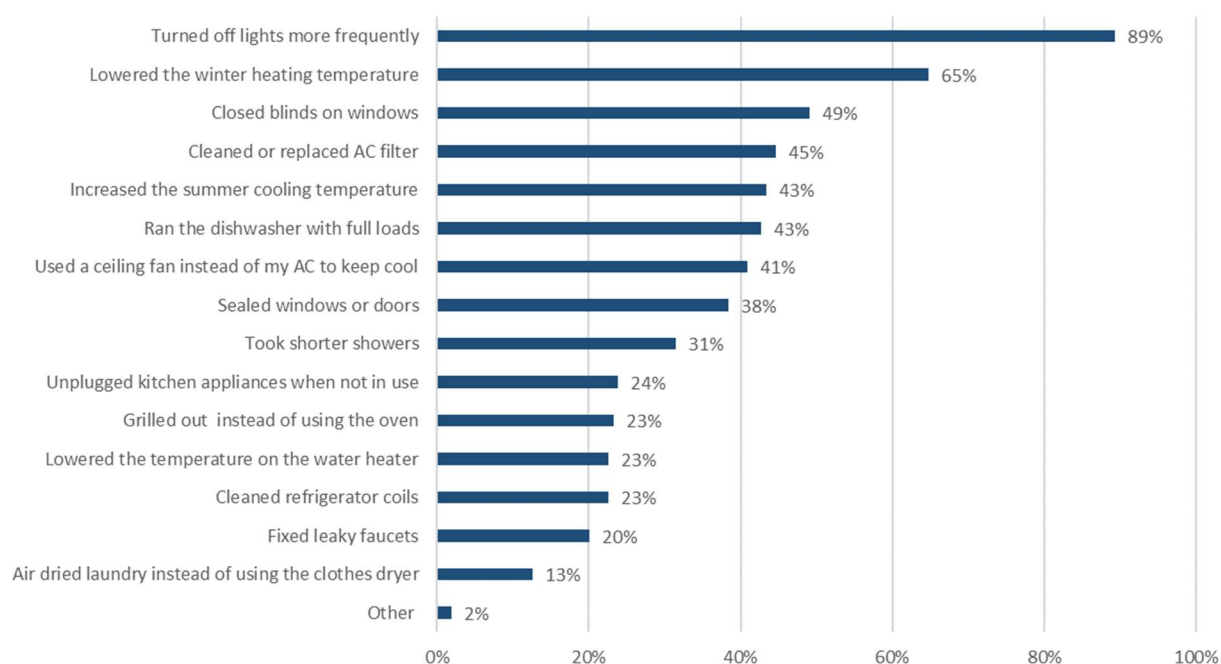


Note: Percentages may exceed 100% because respondents could choose more than one response.

Of those that upgraded appliances/equipment, 91% indicated the equipment was still installed and, of those, 94% indicated they were either somewhat or very satisfied with their new appliances/equipment.

The most frequent behavioral change subprogram participants made after using the Home Energy Analyzer tool was turning off lights more frequently (89%), followed by lowering the winter heating temperature (65%) (see Figure 7-11).

Figure 7-11: Behavioral Changes Made by Participants



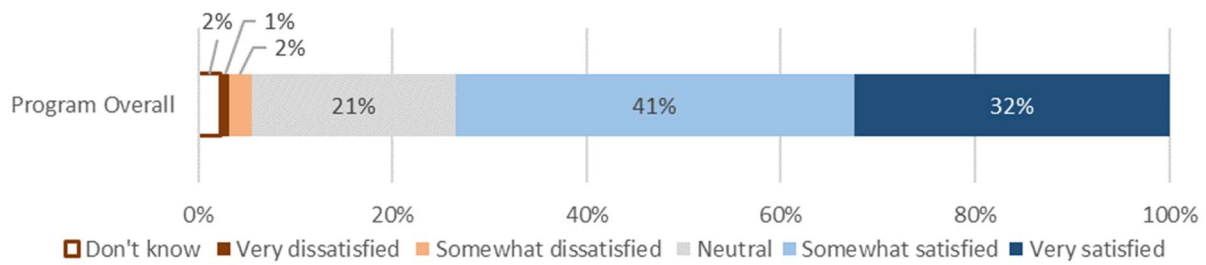
Note: Percentages may exceed 100% because respondents could choose more than one response.

Survey respondents provided feedback on whether or not they've noticed savings on their electric bills since they made the behavioral changes. Thirty-eight percent said they have noticed a decrease in their electric bill, 31% have not, and 24% indicated it was too soon to tell. Of those that did notice a decrease, 95% were very or somewhat satisfied with the savings.

Subprogram Satisfaction

Regarding participants overall satisfaction with the subprogram, 41% were somewhat satisfied, 32% were very satisfied, and 21% were neutral (see Figure 7-12).

Figure 7-12: Subprogram Satisfaction



Home Characteristics

The majority of survey respondents described their homes as single-family, detached (63%) and a similar proportion owned their home (66%), and 71% of homes were between 1,000 – 3,000 square feet. Home characteristics are summarized in Table 7-15.

Table 7-15: Home Characteristics

Home Characteristics	Percentage of Respondents
Single-family home, detached	63%
Apartment with 4+ families	19%
Single-family home, manufactured	5%
Condominium	5%
Two or Three family attached residence	4%
Mobile home	2%
Other	3%
Own or Rent	
Own	66%
Rent	34%
Year Built	
Before 1960	41%
1960-1969	13%
1970-1979	14%
1980-1989	5%
1990-1999	7%
2000-2005	6%
2006 or Later	7%
Don't know/Refused	6%
Above Ground Living Space	
Less than 1,000 square feet	19%
1,000-2,000 square feet	50%
2,000-3,000 square feet	21%
3,000-4,000 square feet	3%
4,000-5,000 square feet	1%
Don't know/Refused	6%

7.5.5 Telephone Audits - Participant Survey Results

This section summarizes feedback received from 33 customers who participated in the Audits and Education subprogram through the Companies' customer call center. ADM contracted with the Bennett Group to administer telephone surveys. The surveys collected data on the motivation for reaching out to the Companies customer call center,

experiences with customer service representatives, energy-savings behaviors and equipment installed, satisfaction, and home characteristics.

Call Center Experience

Participants discussed the initial reason they reached out to the customer call center. Forty-eight percent of participants reached out because of a high-bill complaint; the complete distribution of responses is displayed in Table 7-16 below. Within the 'Other' category, most commonly mentioned reasons regarded payments. Multiple answers per respondent could be selected for this question.

Table 7-16: Reasons for Contacting Customer Call Center

Reasons for Contacting Call Center	Percentage of Respondents (n=33)
High Bill Complaint	48%
Meter Issue	15%
Power Outage	9%
Interested in ways to conserve energy	3%
Other	39%
Don't Know	3%

Note: Percentages may exceed 100% because respondents could choose more than one response.

Customers provided feedback regarding what they discussed with the customer service representative. Sixty-seven percent of respondents spoke about ways to save energy, 58% discussed historical bills and usage, and 58% found out about the 3 top energy users in their homes (see Table 7-17). Multiple answers per respondent could be selected for this question.

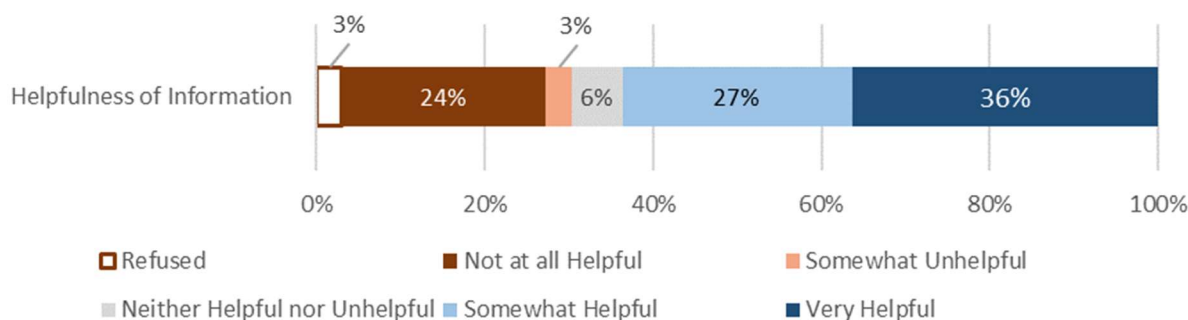
Table 7-17: Topics Discussed with Call Center

Reasons for Contacting Call Center	Percentage of Respondents (n=33)
Ways you could save energy in your home	67%
Review changes in your bill/usage over time	58%
Find out about your top 3 home energy uses	58%
Answer questions about your home appliances	36%
Get offered literature about saving energy at home	36%
Other	15%

Note: Percentages may exceed 100% because respondents could choose more than one response.

Sixty-three percent of participants thought the information provided by the customer service center was either somewhat or very helpful (see Figure 7-13).

Figure 7-13: Helpfulness of Information Provided by Customer Call Center



As a means for follow-up, customer service representatives may send customers a brochure with energy savings tips and/or a link to the online Home Energy Analyzer tool. Thirty-six percent indicated they received an energy savings brochure. Of those that received the energy savings tips (12 customers), 75% rated them as either somewhat or very helpful.

EE Behaviors and Upgrades

After the call is complete, the customer may decide to make some sort of structural or behavioral change to conserve energy. Just over two-thirds of the customers (67%) reported they made one or more change including weatherization improvements, appliance upgrades, or behavioral changes after the call.

Of those that made behavioral changes (n = 11), common habits adopted included turning off the lights more frequently, closing window blinds, lowering winter heating temperature, and using the microwave to cook food.

Of those that made structural changes (n = 8), the most frequent changes mentioned by customers were EE lighting and EE HVAC upgrades.

Of the participants that did make changes to conserve energy, over half (55%) said their electric bill decreased. All behavioral changes were still being implemented at the time of survey administration.

Home Characteristics

Participants provided feedback regarding their homes' characteristics. The most common home type was single-family, detached (33%) and the majority of survey-takers owned their homes (61%). Also, approximately three-fourths of the homes were between 1,000 – 3,000 square feet (73%). All home characteristics as reported by respondents are summarized in Table 7-18.

Table 7-18: Home Characteristics

Home Characteristics	Percentage of Respondents
Single-family home, detached construction	33%
Don't know	27%
Apartment with 4+ families	15%
Single-family home, factory manufactured/modular	12%
Two or Three family attached residence	9%
Mobile home	3%
Own or Rent	
Own	61%
Rent	39%
Year Built	
Before 1960	30%
1960-1969	6%
1970-1979	24%
1980-1989	9%
1990-1999	6%
2000-2005	6%
2006 or Later	3%
Don't know/Refused	15%
Above Ground Living Space	
Less than 1,000 square feet	6%
1,000-2,000 square feet	55%
2,000-3,000 square feet	18%
3,000-4,000 square feet	3%
4,000-5,000 square feet	3%
Don't know/Refused	15%

8 Behavioral Modification

For the 2018 program year, the Companies contracted with Oracle Corporation (Oracle) to administer the Behavior Modification (“Behavioral”) subprogram targeted at residential customers. The evaluation of the 2018 Behavioral subprogram consisted of two main components:

- Participants in the program received monthly usage reports (Home Energy Reports, “HER”) which contained information about their current and historical energy use; and how their energy use compared to that of a group of similar households (both average and most efficient neighbors).
- Low-cost measures, practices, or behaviors they could take to reduce their energy use. The reports were delivered via the United States Postal Service with the option of also receiving the report through e-mail.

A total of 211,593 customers participated in the Behavioral subprogram in 2018. Table 8-1 below details participant counts by operating company.³⁰

Table 8-1: Participation Levels for 2018 Behavioral Subprogram by Utility

EDC	Participants
CEI	69,268
OE	114,331
TE	27,994
Total	211,593

The impact evaluation component was framed by the following research question:

- To what extent has the program resulted in electric energy savings (monthly and annual kWh) for program participants in each of the three Ohio utilities?

The goal of the process evaluation component was to determine participant satisfaction and program effectiveness. The process evaluation was framed, therefore, by the following research questions:

- Did customers remember receiving the Home Energy Reports (“HER”), and if so, had they done anything to save electricity in the home in response to the information in the report?

³⁰ Participation counts determined from data supplied by the implementation contractor. Reported participation counts are from the beginning of the program year. Participants may be lost due to attrition over the course of the program year.

- If customer did not do anything in response to the HER, why not?
- How satisfied are customers with the Behavioral subprogram?

8.1 Description of Behavioral Modification Subprogram

The Behavioral subprogram provides HERs to residential customers in FirstEnergy's OH service territory. These reports detail customers' historical energy usage; compares the energy usage to similar households (both an average household and a most-efficient neighbor household); and provides information regarding low-cost measures, practices, or behaviors that customers can engage in to reduce energy usage. Participating customers received a total of 6 HERs during program year 2018.

The Behavioral program utilized an opt-out randomized control trial (RCT) design—a type of experimental design in which a treatment group is compared to a control group that is determined to be statistically similar prior to treatment onset. The Companies targeted high energy users³¹ as the target population for the Behavioral Modification subprogram. After selecting the initial target population, Oracle randomly assigned each household to either the treatment (household receives a HER) or control group (household receives no communication from Oracle). The program was designed as an opt-out program—treatment group participants automatically began receiving the HER measure at the beginning of the treatment period and could un-enroll from the program if they did not wish to continue to receive the HER.³²

8.2 Sampling

Oracle selected program participants with the following criteria:

- Oracle started with a randomly selected participant group. Then randomly selected new participants based on pre-specified eligibility criteria.
 - Participants must have a valid mailing address and not be an outlier in terms of high or low energy use.
 - Oracle chose customers from the group of highest usage households among those eligible.
- Participants are randomly assigned to the treatment group and the control group. The overall size of the treatment group was based on program needs/savings goals.

³¹ It is important to note that targeting of high-use customers will produce savings estimates that are not representative of the full customer population and should not be extrapolated beyond the calculation of energy savings for this program.

³² The lifetime of HERS measures are not currently well-understood—therefore, participants who opt-out of the program are still considered part of the treatment group.

- Two cohorts were created for each utility company. The first cohort began treatment in 2013, while an additional cohort began treatment in 2017.

Once the treatment group has received its first report, tracking energy usage between the two groups begins. Customers can opt-out of the program at any time by going online or calling the customer experience call center, however, customers who opt-out of receiving home energy reports are still included in the treatment group for the purpose of tracking program savings. As customers move out (for either the participant or control groups) they prospectively drop from the RCT; meaning that any additional data for that customer that may be in the billing data beyond their move-out date will be filtered out from the data set.

8.3 Impact Evaluation Methodology

Impact evaluation for the program made use of a regression analysis of monthly billing data. The regression model compares the monthly energy use of the participant group to that of a control group while, simultaneously, controlling for individual variability in the pre-treatment period. The main purpose of the regression analysis is to isolate and quantify the treatment effect on monthly energy usage. The following section describes ADM's gross impact evaluation methodology.

8.3.1 Data Gathering

Monthly billing data dating back to 12 months prior to each experimental cohort's treatment start date through December 2018 was requested from the Companies for all participants. ADM utilized a map of account numbers to treatment or control group assignment and cohort assignment to categorize monthly billing data. Additionally, ADM obtained all downstream residential program participation data dating back to the treatment start date for each cohort to make later adjustments for cross-program participation.

8.3.2 Data Preparation

Most of the Companies' residential customers currently use traditional meters, which are read monthly. On occasion, meter reads are not available at the time a customer is billed; therefore, the Companies generate an estimated meter read based on building load profiles and customer's historical usage. The customer's subsequent metered bill features an adjustment factor to accommodate for any differences between the estimated read and the actual read.

As part of the data preparation process, ADM corrected for estimated reads and adjusted actual reads by using a "true-up" process. For each metered read and all estimated reads immediately preceding it, ADM totaled the billed usage and number of days spanning

those bills. The total billed usage for that cumulative period was then divided by the total number of days to generate an average usage per day value. This average usage per day value was then multiplied by the number of days in each individual bill to generate a corrected usage value. Because the number of estimated reads per actual read is inconsistent, the number of estimated reads prior to the first actual read in the provided dataset could not be assumed. Therefore, the first metered read and all estimated reads preceding it were excluded from the dataset. Similarly, estimated reads that did not have a corresponding actual read (generally towards the tail end of provided billing data) were also excluded from analysis. The following equation provides the equation for calculating the adjusted usage for billing data after the first metered read and all prior estimated reads have been excluded:

$$Adjusted\ usage = \sum_i^n Billed\ usage \times \frac{Billing\ days_m}{\sum_i^n Billing\ days}$$

Equation 8-1: Billing Data Adjustment Calculation

Where:

i = First estimated bill in a sequence of estimated bills leading to a metered bill.

n = A metered bill providing an adjustment factor for preceding estimated bills.

m = The billing month of interest.

Billed usage = The total kWh billed in a monthly bill.

Billing days = The total number of days in a monthly bill's billing period.

Billing periods for customers do not fall on consistent dates between participants. For example, one customer's June bill may run from May 16th to June 17th while another's may run from May 20th to June 20th. Furthermore, the billing periods do not correspond to calendar months. To make the monthly billing data consistent between participants, ADM calendarized the data. Calendarization is the process of correcting monthly billing data to match calendar dates. For example, if 15 days in a billing period belonged to June and 15 days belonged to July; 50% of the billed usage would be attributed to June and 50% attributed to July. The proportionated usage and number of days that fall under a given calendar month are then summed to generate a calendarized usage value and the number of billed days for that month. The equation on the following page provides the method for calculating the monthly usage by calendar month:

$$Monthly\ usage_m = \sum_i^n \left(Adjusted\ usage_i \times \frac{Month\ days_i}{Billing\ days_i} \right)$$

Equation 8-2: Monthly Billing Data Calculation

Where:

i = First bill containing the month of interest.

n = Last bill containing the month of interest.

m = The month of interest.

Monthly usage = The calendarized monthly usage for a given month.

Month days = The number of days belonging to the month of interest in a billing period.

Billing days = The number of days in a billing period.

After calendarization was completed, an average daily usage value was calculated by dividing the monthly usage by the number of billed days in a month. Additionally, data was filtered using the following criteria:

- Customer months that had less than one billed day or exceed the total number of days in that calendar month for that year were excluded from analysis—months that meet these criteria have overlapping bills and are unreliable for analysis.
- Months that were present after a customer's move out date were also excluded from analysis.
- Customer months in which average daily usage exceeded 300 kWh or was less than -300 kW were considered outliers and were excluded from analysis.
- Pre-treatment data was limited to the 12 months prior to the treatment start date for each experimental cohort.

8.3.3 Billing Analysis

ADM utilized a post-only regression model known as the lagged seasonal (LS) model. The LS model predicts average daily usage in the post-period using a series of variables constructed from their pre-treatment usage and an interaction of the treatment impact over time.³³ Given the need to correct for estimated meter reads, ADM used broader

³³ The Uniform Methods Project presents multiple regression specifications that can be used in the estimation of Residential Behavioral Program savings. All models should converge on similar results, however, post-only models, such as the LS-model, can sometimes result in better model precision over a fixed effects model with customer-specific intercept terms (<https://www.nrel.gov/docs/fy17osti/68573.pdf>, pg. 18).

seasonal lag-terms instead of using a month-specific lag-term. The control variables constructed were average daily pre-use, average daily pre-use during summer, and average daily pre-use during winter. Summer months were defined as the months of June - September, and winter months were defined as the months of December - March.

$$\begin{aligned}
 daily_{usage_{it}} = & \beta_0 + \\
 & \beta_{t_Jan} treatment_i \cdot month_{Jan} + \cdots + \beta_{t_Dec} treatment_i \cdot month_{Dec} + \\
 & \beta_{a_Jan} \cdot month_{Jan} \cdot avg_preusage_i + \cdots + \beta_{a_Dec} \cdot month_{Dec} \cdot avg_preusage_i + \\
 & \beta_{s_Jan} \cdot month_{Jan} \cdot avg_preusage_summer_i + \cdots + \beta_{s_Dec} \cdot month_{Jan} \\
 & \quad \cdot avg_preusage_summer_i + \\
 & \beta_{w_Jan} \cdot month_{Jan} \cdot avg_preusage_winter_i + \cdots + \beta_{w_Dec} \cdot month_{Dec} \\
 & \quad \cdot avg_preusage_winter_i + \\
 & \beta_{m_Jan} \cdot month_{Jan} + \cdots + \beta_{m_Dec} \cdot month_{Dec} + \\
 & \beta_{pa} \cdot avg_preusage_i + \beta_{ps} \cdot avg_preusage_summer_i + \beta_{pw} \cdot avg_preusage_winter_i + \varepsilon
 \end{aligned}$$

Equation 8-3: Regression Model

Where:

$daily_{usage_{it}}$ = the average daily usage for customer i in month t ,

$treatment_i$ = a dummy variable – 1 if customer i is in treatment group, 0 if in control group,

$month_{Jan}$ to $month_{Dec}$ = a series of dummy variables representing the months present in the dataset,

$avg_preusage_i$,

$avg_preusage_summer_i$,

$avg_preusage_winter_i$ = the three pre-usage variables for customer i ,

β_0 = the intercept,

β_{t_Jan} to β_{t_Dec} = a series of regression coefficients representing the difference in average daily usage between the treatment group and the control group in a given month,

β_{a_Jan} to β_{a_Dec} = a series of regression coefficients controlling for individual variability in the predicted kWh as a function of each participants' annual pre-treatment usage.

β_{s_Jan} to β_{s_Dec} = a series of regression coefficients controlling for individual variability in the predicted kWh as a function of each participants' summer pre-treatment usage.

β_{w_Jan} to β_{w_Dec} = a series of regression coefficients controlling for individual variability in the predicted kWh as a function of each participants' winter pre-treatment usage.

β_{m_Jan} to β_{m_Dec} = a series of regression coefficients controlling the main effect of month.

β_{pa} , β_{ps} , and β_{pw} to = a series of regression coefficients controlling for the main effect of the pre-usage variables.

ε = the error term.

Because the treatment effect is interacted with the time variable, the data set can be truncated to observations corresponding only to the months of interest without any impact to the savings calculation.

By default, the model specification is fitted using standard OLS regression, which treats the variability of each observation as independent. However, because multiple observations are taken per participant over the course of time, observations from the same participant do not vary independently. Therefore, the standard error of the regression coefficient must be adjusted appropriately prior to interpreting the statistical significance of any given regression coefficient. ADM utilized a standard cluster-robust standard error correction to correct for the variation attributable to panel-data observations.³⁴

8.3.4 Method for Calculating Program Level Savings

Monthly kWh savings are then taken by using the following equation:

$$monthly_savings_t = -1 \cdot \beta_{1t} \cdot days_t \cdot participants_t$$

Equation 8-4: Monthly kWh Savings

Where:

t = a given month in the program year,

β_{1t} = the regression coefficient for the treatment effect of month t

$days_t$ = the number of days in the given month

³⁴ Arai, Mahmood (2015). Cluster-robust standard errors using R. Department of Economics, Stockholm University, Stockholm, Sweden. URL https://www.ne.su.se/polopoly_fs/1.216115.1426234213!/menu/standard/file/clustering1.pdf.

$participants_t$ = the number of active participants in month t

Because the regression equation predicts average daily usage as a function of the treatment effect, and the treatment indicator has been coded as “1”, the regression coefficient for the treatment effect of a given month should be negative if savings occurs. Therefore, multiplying the savings calculation by -1 will correct the sign of the results.

Dual Participation Correction

Participants in both the treatment and control groups participate in other FirstEnergy energy efficiency programs. Furthermore, the “Home Energy Report” measure received by participants in the treatment group may cause treatment group participants to seek out other programs and measures offered in the Companies’ efficiency portfolio more than the control group. To the extent that the treatment group participates in other Company energy efficiency programs at a rate above and beyond that of the control group, those incremental savings will be reflected in the gross energy savings calculated using the method above. However, savings for these items will also have been attributed to their respective programs and subprograms. ADM corrected for dual participation that occurred after treatment began to the extent that the treatment group participated at a higher rate than the control group.

Adjustment for Downstream Measures

For downstream measures, ADM conducted a review of the tracking and reporting system for each experimental cohort to identify EE program participation that occurred from the treatment start date onwards. The following steps detail the process of correcting for these measures:

- The measures for the treatment group and control group were assigned to an appropriate month based on the reported date of installation for measures installed after the treatment start date.
- For each month of the program year, the annual savings for all measures installed prior to the month of interest dating back to the treatment start date that had not yet reached the end of their effective useful life were summed for all active participants for each group. For measures installed prior to 2018, ADM used verified savings for dual participation analysis. For measures installed during 2018, ADM utilized reported savings due to verification activities occurring concurrently to the evaluation of the Behavioral program.
- The totaled savings for each group was then divided by 365.25 and then divided by the number of active customers in each group to create a daily average dual participation savings value per home.

- For each month, the daily average dual participation savings value per home for the control group was then subtracted from the daily average dual participation savings value per home from the treatment group. This resulted in an adjustment factor which was then multiplied by the number of active participants in the treatment group and subtracted from the monthly kWh savings.

Adjustment for Upstream Measures

Customer identifying information is not captured for point-of-sale rebates (commonly referred to as upstream measures). As with downstream program participation, participating in the Behavioral program may encourage participants to seek out additional cost-saving measures via FirstEnergy's residential upstream portfolio. The Evaluation Framework for Pennsylvania Act 129³⁵ provides an approximation of the effect of Behavioral program participation on upstream program participation and flat multipliers that can be used to discount the impact of upstream program participation on Behavioral program savings.

The following table provides the multiplier used as a function of the number of years since the treatment start date:

Table 8-2: Participation Levels for 2018 Behavioral Subprogram by Utility

Years Since Enrollment	Multiplier
1	99.25%
2	98.50%
3	97.75%
4 or more	97.00%

The multiplier is applied after downstream program participation has already been accounted for.

Method for Calculating kW Reduction

Annual savings for the Behavioral program is assumed to be primarily driven by reducing end use energy consumption (e.g., reducing HVAC usage or reducing interior lighting usage). On average, we can anticipate that the savings curve for the Behavioral program is directly related to the underlying end use load profiles from these primary savings drivers. Residential end use profiles tend to be collinear with one another, with weather-dependent loads closely resembling HVAC load profiles and plug-loads resembling residential lighting profiles. Therefore, although references are made to these two load

³⁵ NMR Group, Inc., EcoMetric Consulting, LLC, & Demand Side Analytics, LLC (2016). Evaluation Framework for Pennsylvania Act 129 Phase III Energy Efficiency and Conservation Programs. Pennsylvania Public Utility Commission. Pennsylvania. URL http://www.puc.state.pa.us/Electric/pdf/Act129/SWE_PhaseIII-Evaluation_Framework102616.pdf.

profiles, these profiles are intended to best-approximate other, collinear end uses. Therefore, ADM used these two load profiles to generate peak demand savings. To generate peak demand savings, ADM used the following method:

Step 1: Normalize kWh Savings

ADM normalized the kWh savings value predicted by the impact evaluation regression model into a percent savings value by dividing each month's savings by the total annual savings as follows:

$$\% \text{ savings}_{my} = \frac{kWh \text{ savings}_{my}}{kWh \text{ savings}_y}$$

Equation 8-5: Normalization kWh Usage

Step 2: Calculate Monthly Load Factors for Component Variables

The model assumes a linear relationship between the end uses of interest and the percent savings calculated above. Because load shape information is available for multiple residential end uses at an 8,760 resolution, ADM can estimate the relationship between end use load shapes and percent savings to estimate total demand savings. To make sure that the model is interpretable, hourly load factors must be aggregated to a monthly resolution, providing a monthly load shape with 12 data points. To calculate monthly load shapes, ADM will take the sum of all hourly loads in a given month for each end use of interest.

Step 3: Fixed Multivariate Regression

To determine the relationship between the percent savings and the residential end uses, ADM used a multivariate regression approach. Because the model was used to assign weights to each end use, ADM held the intercept constant at 0 to ensure that the model produced percent weights for each end use. The following equation provides the model specification used:

$$\% \text{ savings}_{my} = \beta_1 \text{end use}_{\text{heat pump}} + \beta_2 \text{end use}_{\text{interior lighting}}$$

Equation 8-6: Fixed Multivariate Regression

The regression coefficients for the above regression equation represent the relationship of each of the component variables to percent savings. Because both independent and dependent variables are calculated in units of months, the numerator of the regression weights are time invariant and can be used to estimate the percent contribution across any unit of time.

Step 4: Demand Savings Calculation

After obtaining the percent weight of each of the three end uses, the 8,760 end use load profiles are then scaled by applying the percent weight to the normalized end use load profile. The total normalized whole house load can then be assumed to be the sum of the weighted load of the two end uses at a given hour. Averaging this value for all hours of the peak demand window will provide an average peak demand whole building load. Multiplying this value by the total annual kWh savings will then predict the kW savings for the program year.

As with gross energy savings, ADM anticipates that some participants in the treatment group will also participate in other Company programs. Because the peak demand savings is predicted from the dual participation adjusted monthly savings, an additional adjustment does not need to be made.

8.4 Detailed Impact Evaluation Findings

The sections below detail the impact evaluation results for the Behavioral subprogram in 2018.

For all participants in across all service territories during 2018, ex-ante expected annual savings were 55,373,263 kWh. The ex-post verified annual electricity savings for all participants in 2018 were 48,261,458 kWh. The realization rate for electric savings was 87 percent.

For all participants combined across all service territories during 2018, ex-ante expected critical peak demand reduction was 7,855.33 kW. The ex-post verified critical peak demand reduction was 6,556.21 kW. The realization rate for demand savings was 83 percent.

Table 8-3 Shows program-level results for kWh savings and kW reductions for the 2018 Behavioral subprogram for each of the Companies.

Table 8-3: Program Level Results for 2018 Behavioral Modification Subprogram

EDC	Ex-Ante Savings		Ex-Post Savings		Realization Rate	
	kWh	kW	kWh	kW	RR kWh	RR kW
CEI	17,087,029	2,820.34	14,958,121	2,044.29	88%	72%
OE	34,617,300	4,369.08	30,291,223	4,095.08	88%	94%
TE	3,668,933	665.91	3,012,114	416.84	82%	63%
Total	55,373,262	7,855.33	48,261,458	6,556.21	87%	83%

Ex-ante kWh and ex-post kWh differed from one another primarily due to correction for cross-program participation in other Company energy efficiency programs. The Uniform

Methods Project advises evaluators to make corrections for participation in other portfolio offerings that may be induced by behavioral program participation in order to avoid double-counting of savings. Ex-ante kWh savings and ex-ante kW savings do not currently correct for cross-savings, thus resulting in a greater reduction in realization rate. The total savings attributable to cross-program participation was 4,388,863 kWh (or roughly 8% of ex-ante kWh). Additional differences may stem from program participation counts. Ex-ante kWh savings are based off an assumed treatment group population of 211,593 customers at the start of the program year. Beginning in 2018, the Companies began submitting all residential customer billing to ADM through an automated SFTP feed. Using this data set, ADM verified 208,703 customer accounts still active at the start of the program year. The number of verified customer accounts was used to generate ex-post kWh and therefore contributes to lower realized savings.

These two sources of differences were passed through to peak demand savings, thus contributing to lower realized savings. Without excluding cross-program participation savings from peak demand savings, ADM's peak demand savings estimate is 7,160.90, or 91% of ex-ante savings. Discrepancies between ex-ante and ex-post savings may also stem from differences in the savings estimation used by Oracle and ADM.

As an implementer for Home Energy Report (HER) programs nationally, Oracle has calculated peak demand savings for HERs programs using advanced metering infrastructure (AMI) data for service territories in which AMI data is present, including territories in a similar geographical region as the three FirstEnergy utility territories in Ohio. Leveraging data from the AMI-based HER programs that they implement, Oracle has noted good correspondence between 8,760 whole building residential load shapes and peak demand savings. Oracle has established a method for estimating peak demand savings by using the ratio of average daily peak demand to average daily usage that can be used to estimate peak demand savings for HERs for utilities that do not have AMI data available. This coincidence factor is approximately 1.40 for Ohio Edison, 1.42 for Toledo Edison, and 1.38 for The Illuminating Company.

Conversely, ADM currently calculates ex-post savings estimates for peak demand for HER programs in Ohio using residential end-use load shapes. Due to a lack of territory specific end-use load shapes, ADM utilizes load shapes extrapolated from a third-party system (Portfolio Pro). Due to collinearity between residential end-use load shapes, ADM uses two end-use load shapes (air source heat pumps and interior lighting) to approximate all residential end-use load shapes. Using the monthly energy savings observed for the program, ADM estimates a relative weight for each of the two end-use load shapes using a regression of the monthly savings on the monthly end-use loads. These weights are then applied to the respective 8,760 curves and the two curves are super-imposed to approximate an 8,760-efficiency curve for the program. Demand savings are then estimated by applying total annual program savings to the 8,760-

efficiency curve and taking the average demand savings during the peak demand window.

It should be noted that both ex-ante and ex-post peak demand savings are estimates rather than measurements of peak demand savings. This is because data resolution for the three FirstEnergy companies cannot currently support the necessary resolution of data needed to produce accurate measurements of peak demand savings. In general, ignoring cross-program participation, the realization rate for the program is currently 91%. Both methods have benefits and potential drawbacks. Oracle's ex-ante estimation benefit from being able to leverage AMI data from other utility territories to approximate the relationship between peak demand savings and peak to non-peak usage. ADM's estimation method benefits from attempting to calculate a true-peak using end-use loads in absence of 8,760 data, however, due to the non-regional nature of the end-use loads, there may be some shifts in the end-use load data that cannot currently be accounted for. Despite the differences in method, in absence of AMI data, both methods provide similar savings estimates (realization rate of 91% prior to discounting cross-program savings).

8.4.1 Household-Level kWh and kW Savings

The results from the regressions reported in Table 8-4 were used to determine annual kWh savings and kW reductions at the program level by month.

The 2018 program was administered from January 2018 through December 2018. Average savings was obtained by dividing the program-level savings by the total number of participants. Average savings per home for Toledo Edison were generally lower than the average savings observed for the other two EDCs. A review of the regression coefficients presented in Table 8 7 shows lower savings in winter months for Toledo Edison while winter month savings for both Ohio Edison and Cleveland Electric Illuminating Company were high. The monthly savings profiles are consistent with differences in space heating technology, with Toledo Edison most likely having a high saturation of non-electric space heating relative to the other two EDCs. Further research may be necessary to determine the impact of space heating fuel on EDC-level savings.

Table 8-4: Ex-Post Annual Savings and Reductions per Customer by EDC

EDC	Annual Savings (kWh/year)	Peak Demand Savings (kW)	Number of Participants	Average Savings Per Household (kWh/year)	Average Peak Demand Savings (kW)
CEI	14,958,121	2,044.29	69,268	215.95	0.03
OE	30,291,223	4,095.08	114,331	264.94	0.04
TE	3,012,114	416.84	27,994	107.60	0.01
Total	48,261,458	6,556.21	211,593	228.09	0.02

8.4.2 Subprogram-Level kWh Savings

Subprogram-level savings were determined by multiplying the average daily treatment effect by the number of days in that month and the number of active customers in that month. The ex-post subprogram-level kWh savings by utility are shown in Table 8-5 below. Total kWh savings is 48,261,458 kWh for 2018.

Table 8-5: Ex-Post Subprogram-Level Electric Energy Savings (kWh) by EDC

Month	CEI	OE	TE	Total
	Monthly Savings (kWh/month)	Monthly Savings (kWh/month)	Monthly Savings (kWh/month)	Monthly Savings (kWh/month)
January	1,230,597	2,734,524	169,454	4,134,575
February	963,985	2,657,288	116,943	3,738,216
March	1,069,321	3,032,036	212,478	4,313,835
April	739,435	2,859,510	157,621	3,756,566
May	987,932	2,079,406	285,782	3,353,120
June	1,249,302	1,820,776	303,110	3,373,188
July	1,445,348	1,967,621	249,329	3,662,299
August	1,378,214	2,150,564	325,065	3,853,843
September	1,368,598	1,780,933	314,481	3,464,012
October	1,361,166	2,156,850	252,153	3,770,170
November	1,495,559	3,319,349	252,795	5,067,703
December	1,668,665	3,732,365	372,902	5,773,932
Total kWh	14,958,121	30,291,223	3,012,114	48,261,458

8.4.3 Subprogram-Level Critical Peak Demand Impacts

Subprogram-level ex-post peak demand savings were calculated using the method detailed in the methodology section above.

Table 8-6: Ex-Post Subprogram-Level kW Reductions During Critical Peak Hours by EDC

EDC	Program Demand Reductions (kW)
CEI	2,044.29
OE	4,095.08
TE	416.84
Total kW	4,511.92

8.4.4 Results of Regression Analysis

The regression coefficients for the treatment effect, the standard error of the coefficient, and the R-squared of the model are reported below by month for both the 2013 cohort and the 2018 cohort by operating company. The model specification and variable definitions can be found in the methodology section above.

Table 8-7: Average Daily Treatment Effect by Month and Cohort

Month	CEI		OE		TE	
	2013 Group	2018 Group	2013 Group	2018 Group	2013 Group	2018 Group
January	-0.602 (0.241)	-0.621 (0.196)	-0.914 (0.247)	-0.81 (0.222)	-0.095 (0.372)	-0.28 (0.219)
February	-0.627 (0.217)	-0.512 (0.178)	-0.907 (0.213)	-0.894 (0.192)	0.022 (0.321)	-0.266 (0.195)
March	-0.601 (0.201)	-0.528 (0.166)	-0.876 (0.2)	-0.951 (0.185)	0.018 (0.285)	-0.406 (0.183)
April	-0.622 (0.169)	-0.318 (0.138)	-0.769 (0.164)	-0.963 (0.154)	-0.111 (0.232)	-0.283 (0.154)
May	-0.644 (0.15)	-0.473 (0.12)	-0.811 (0.146)	-0.618 (0.133)	-0.385 (0.203)	-0.394 (0.132)
June	-0.808 (0.18)	-0.625 (0.136)	-0.78 (0.172)	-0.56 (0.149)	-0.264 (0.254)	-0.494 (0.161)
July	-0.806 (0.202)	-0.74 (0.154)	-0.904 (0.186)	-0.557 (0.162)	-0.506 (0.28)	-0.302 (0.175)
August	-0.829 (0.2)	-0.691 (0.155)	-0.987 (0.182)	-0.607 (0.159)	-0.613 (0.272)	-0.394 (0.175)
September	-0.764 (0.174)	-0.751 (0.138)	-0.959 (0.164)	-0.493 (0.146)	-0.522 (0.232)	-0.436 (0.151)
October	-0.603 (0.149)	-0.781 (0.125)	-0.919 (0.152)	-0.644 (0.146)	-0.425 (0.212)	-0.349 (0.139)
November	-0.722 (0.189)	-0.874 (0.167)	-1.01 (0.193)	-1.145 (0.193)	-0.132 (0.282)	-0.479 (0.195)
December	-0.786 (0.215)	-0.944 (0.193)	-1.077 (0.223)	-1.255 (0.224)	-0.15 (0.311)	-0.674 (0.22)
R-Squared	0.5341	0.7544	0.5514	0.7569	0.5347	0.7247

8.5 Detailed Process Evaluation Findings

The following section provides detailed findings from the process evaluation for the Behavioral subprogram of the Energy Efficient Homes Program.

8.5.1 Subprogram Operations Perspective

The following section provides a detailed overview of the Behavioral subprogram design and operational landscape, constructed through in-depth discussions with the Companies' subprogram staff and Oracle program implementation staff. The evaluation team conducted interviews with the Companies' subprogram manager and an associate delivery manager for the implementation contractor in January 2019. The evaluation team also reviewed the various mechanisms used to communicate with customers and guide subprogram implementation practices. This section summarizes key elements of subprogram design, subprogram management, marketing and outreach, and subprogram implementation.

8.5.2 Subprogram Goals and Design

Subprogram staff provided feedback on energy and non-energy goals and subprogram design. Subprogram staff, in conjunction with the portfolio design team, develop the subprogram's energy savings goals. This interdisciplinary team utilizes the subprograms' historical participation data and takes into consideration portfolio level needs, goals, and possible constraints.

The subprogram is designed to generate greater awareness of home energy use and ways to manage energy use through energy efficiency conservation and education. Customers are selected and receive customized HERs (Home Energy Reports) that contain information about their homes' energy use, compares that energy use to that of a group of similar households (both average and most efficient neighbors), and educates customers on low-cost measures, practices, and behaviors to reduce their energy use.

A sample HER is displayed in Figure 8-1. Customers receive the HER by mail and those customers that have e-mail addresses on file with the Companies also receive electronic HERs. All customers can opt-out of receiving the reports in any or all forms. Customers can opt-out of the program at any time by going online or calling the customer experience call center.

Figure 8-1: Sample Home Energy Report (HER)



8.5.3 Subprogram Management and Staffing

ADM evaluators spoke with interviewees about their roles and responsibilities as it pertains to the Behavioral subprogram. The subprogram manager is responsible for subprogram implementation, general oversight and is the interface between the Companies and subprogram implementation contractor, Oracle. They are responsible for forecasting the subprogram budget and energy savings, addressing implementation issues, and resolving customer service issues that arise.

The associate service delivery manager at Oracle is responsible for supporting the implementation of the Behavioral subprogram. They reported that Oracle is responsible for creating the data output to track energy savings. Oracle owns the software that creates the Home Energy Reports which are distributed to participants.

The associate service delivery manager is the point person to coordinate the Behavioral subprogram's design and communication. They stated they are in frequent communication with the Companies' subprogram manager regarding upcoming report content including utilizing the reports to promote or cross promote, adding or removing tips, and any new features that could be potentially incorporated into reports. Oracle uses third-party companies for different aspects of subprogram support, including printing and mailing the reports, and the customer experience call center.

The Companies' subprogram manager hosts a weekly meeting with Oracle to obtain status updates, discuss any issues related to the development and/or delivery of the HER, and report progress metrics, including online tools. They reported that they have a strong working relationship in regard to the subprogram administration. The subprogram manager and Oracle staff also email and speak on the phone as needed between the regularly scheduled meetings. The staff interviewed indicated the relationship and level of communication between the Companies' subprogram manager and program implementer team support the subprogram's administration needs.

8.5.4 Marketing and Outreach

Customers cannot opt-in to receive HERs; therefore, there is no direct marketing associated with the Behavioral subprogram. Oracle staff indicated that HERs are used to cross promote different Companies' programs. The associate delivery manager stated that the report had five different promotions in 2018: appliance rebate, in-home comprehensive energy audits, AC rebates, LED rebates, and smart thermostats. The Companies' subprogram manager provides content and the implementor inserts that content within the HERs.

8.5.5 Subprogram Participation

The Behavioral subprogram began this cycle of operation in 2017. Oracle began the subprogram in 2017 with the same population of participants that were active in the Companies' Behavioral subprogram when it was operating in 2014. Some past participants were no longer active customers. To address attrition from the original 2014 cohort and achieve a similar participant level as in 2014, additional participants were selected based on the following eligibility criteria:

- Participants must have a valid mailing and email address and not be an outlier in terms of high or low energy use.
- Eligible customers with highest usage households are chosen. The reason to select the highest energy users to participate is because those are the households with the greatest savings potential.
- Participants are then randomly assigned to the treatment group and the control group. The overall size of the treatment group is based on subprogram needs/savings goals.
- On rare occurrences, customers have requested to participate in the subprogram and receive a Home Energy Report. In such instances, the customer is put on a list and Oracle adds them if they meet the eligibility criteria.

Once the treatment group receives its first report, tracking energy usage between the two groups begins. On a monthly basis, Oracle completes a reporting template with results and shares this with the Companies. Overall, subprogram staff indicated that the template used to report savings activity is sufficient.

8.5.6 Subprogram Strengths and Challenges

ADM inquired with subprogram staff and the subprogram implementation staff regarding the subprogram's strengths and challenges. The subprogram implementor stated that Oracle's working relationship with the Companies was one of the subprogram's key strengths. They stated that communication is strong, clear, and frequent between the Companies subprogram manager and Oracle staff. The Companies' subprogram manager also related that the shift from Aclara to Oracle in the Online Audit subprogram has improved the Behavioral subprogram by allowing for HERs to contain more specific customer data gained during Online Audits. If customers who are enrolled in the Behavioral subprogram decide to take an Online Audit, that information is used to enhance their HER. For instance, a customer may provide their home's square footage in their Online Audit. This additional information enables Oracle to give Behavioral subprogram participants richer analysis and neighbor comparison regarding their energy

usage. The shift from Aclara to Oracle in the Online Audit subprogram has increased program synergy.

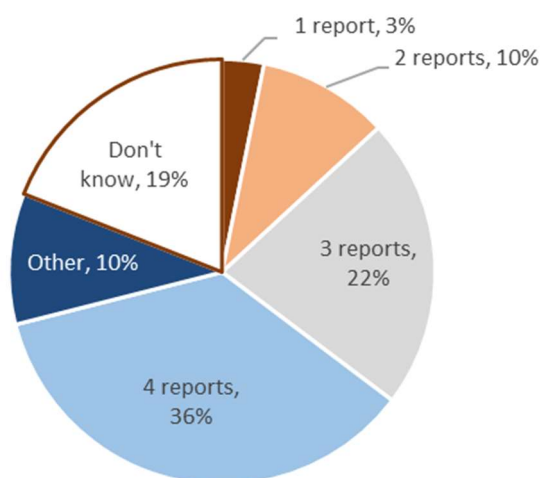
8.5.7 Behavioral Modification Participant Survey

This section presents key findings from participant surveys, administered online by the evaluation group, completed by 221 Behavioral subprogram participants. The surveys collected data on subprogram experiences, energy efficiency knowledge, experiences with installed equipment and energy efficiency behaviors, cross program awareness, satisfaction, and home characteristics.

Subprogram Experiences

The number of HERs survey respondents recall receiving during 2018 are presented in Figure 8-2. Most respondents (36%) recalled receiving 4 reports. Seventy-three percent of people surveyed had read all or some of the reports received.

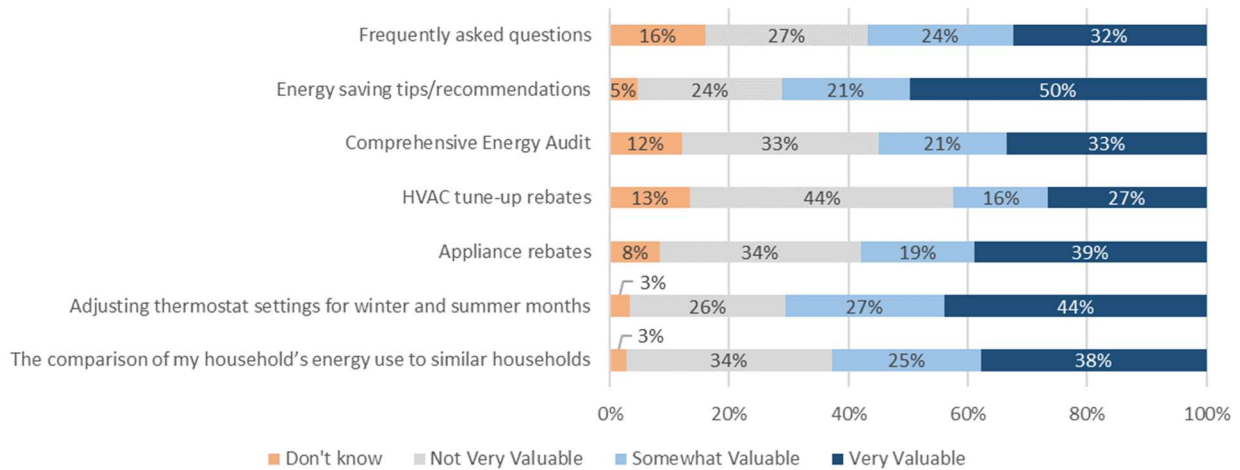
Figure 8-2: Number of Reports Received in 2018



Most respondents found the information on the HERs to be somewhat or very easy to understand (82%), as well as being somewhat or very accurate (52%).

Respondents were asked to rank the value of their HER information. Respondents reported “Very Valuable” at the highest frequency (50%) for the energy savings tips/recommendations, followed by how to adjust thermostat settings (44%) (see Figure 8-3).

Figure 8-3: Value of Information Provided in HERs



In addition to receiving the HERs, participants in the subprogram also received emails with energy savings tips. Most respondents reported receiving those emails (65%) and out of those who recalled emails, 92% said they had read all or some of the emails. Thirty-four percent of those who read the emails found the information to be somewhat or very valuable.

In addition to the HERs, participants can also access their homes' energy use and saving tips via the subprogram website. Twenty-three percent of respondents indicated they had visited the website. They provided additional feedback regarding the extent to which they explored the website and accessed energy savings tips that were unique to their homes (see Table 8-8).

Table 8-8: Experience with the Subprogram Website

Which of the following best describes your experience(s) with the subprogram website?	Percentage of Respondents
You logged in on the website with your utility account number and reviewed energy use information and tips that were unique to your home.	56%
You have not created an account on the website, but you visited the website site and reviewed the general energy savings tips.	28%
Other	8%
Don't know	8%

EE Knowledge

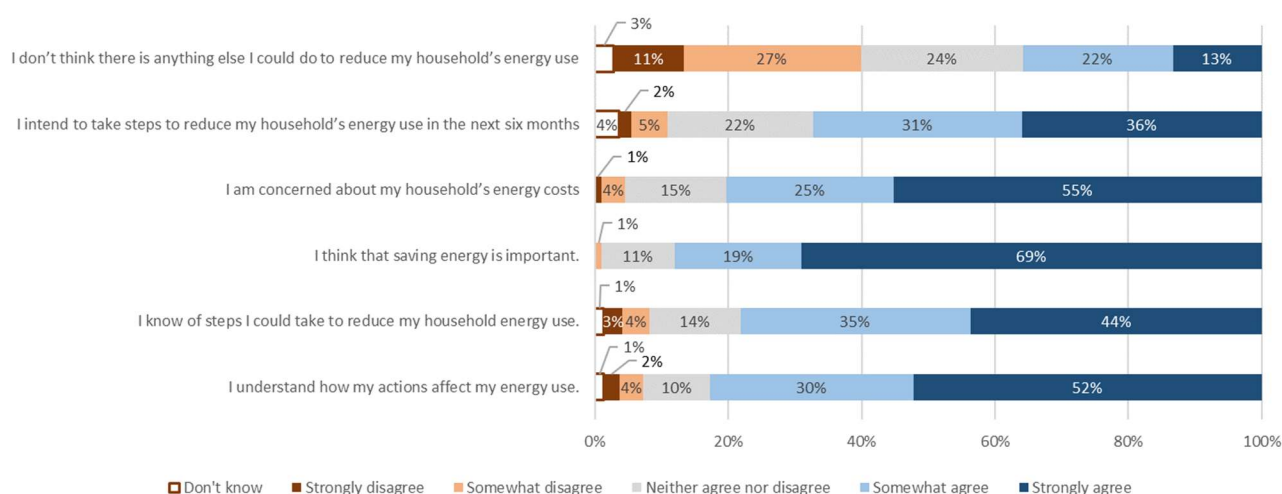
The participants were surveyed about energy efficiency attitudes, knowledge, and intent. On a scale of 1 to 5, where 1 meant "Not at all knowledgeable" and 5 meant "Very

knowledgeable”, the majority of respondents (65%) reported a 4 or 5 about their knowledge of ways to save energy in their homes.

Using a scale of 1 to 5, with 1 meaning "You have not done much" and 5 meaning "You have done almost everything you can", most participant survey respondents (52%) rated their households' efforts to save energy a 4 or 5.

Figure 8-4 summarizes how subprogram participants either agreed or disagreed with statements about energy efficiency. Respondents most strongly agreed that saving energy is important (69%) and that they were concerned about their households' energy costs (55%).

Figure 8-4: Energy Efficiency Knowledge and Intent

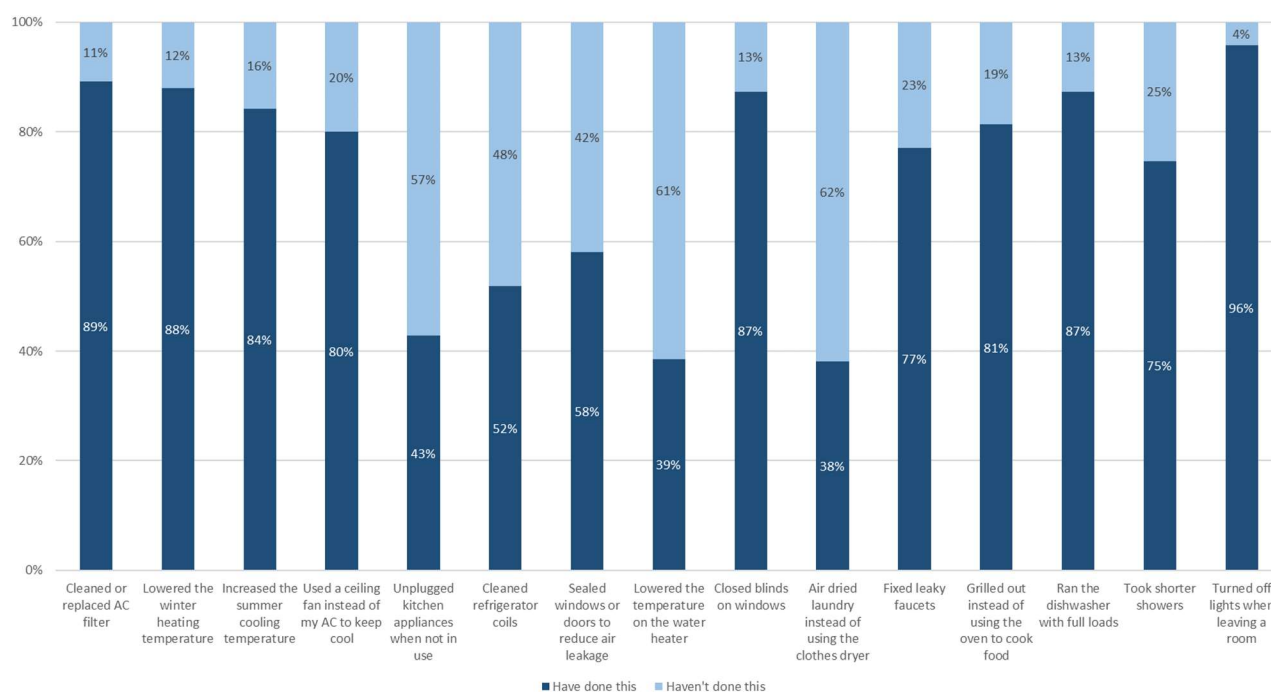


EE Behaviors and Upgrades

Respondents provided feedback regarding ways they conserve energy in their homes, energy efficiency measures installed, and any rebates received. During 2018, 76% of subprogram participants reported taking actions to reduce their energy use.

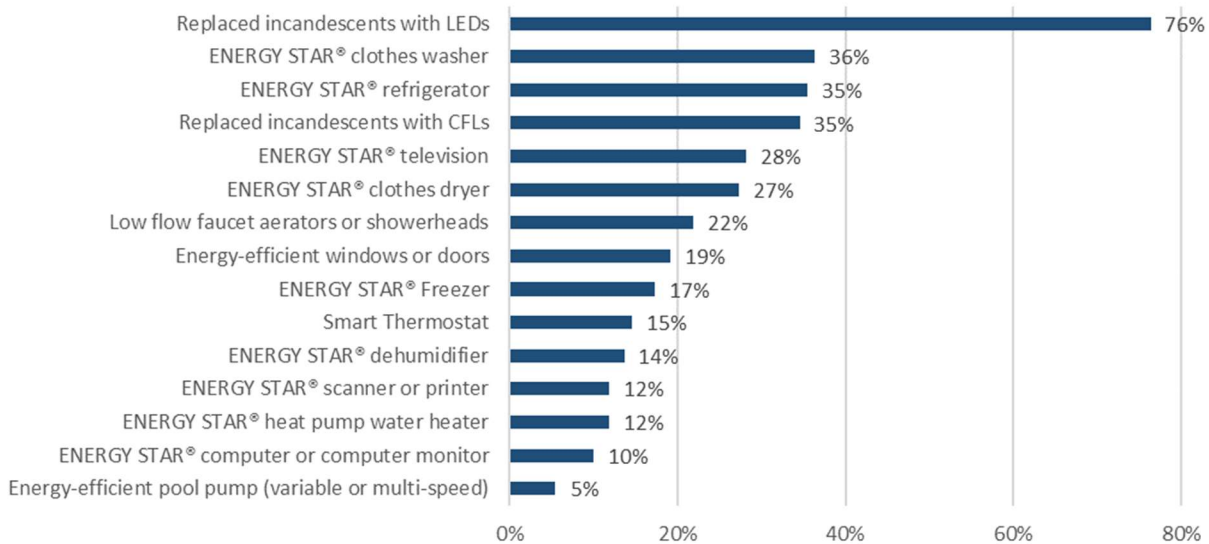
Forty-three percent of those respondents reported that the information provided through the HERs, tips emails, or subprogram website were very or somewhat important in their decision in taking actions to save energy in 2018. Specific actions taken are summarized in Figure 8-5.

Figure 8-5: Energy Reducing Actions Taken



Most survey-takers (51%) installed energy-efficient equipment/appliances or made energy efficiency improvements in 2018 (see Figure 8-6).

Figure 8-6: Energy-Efficient Equipment Installed



Note: Percentages may exceed 100% because respondents could choose more than one response.

Of those who purchased a dryer, 20% applied for a Company rebate. As did 13% of those who purchased new washers, and 18% of those who purchased refrigerators. The main reason rebates were not applied for was a lack of awareness (65%).

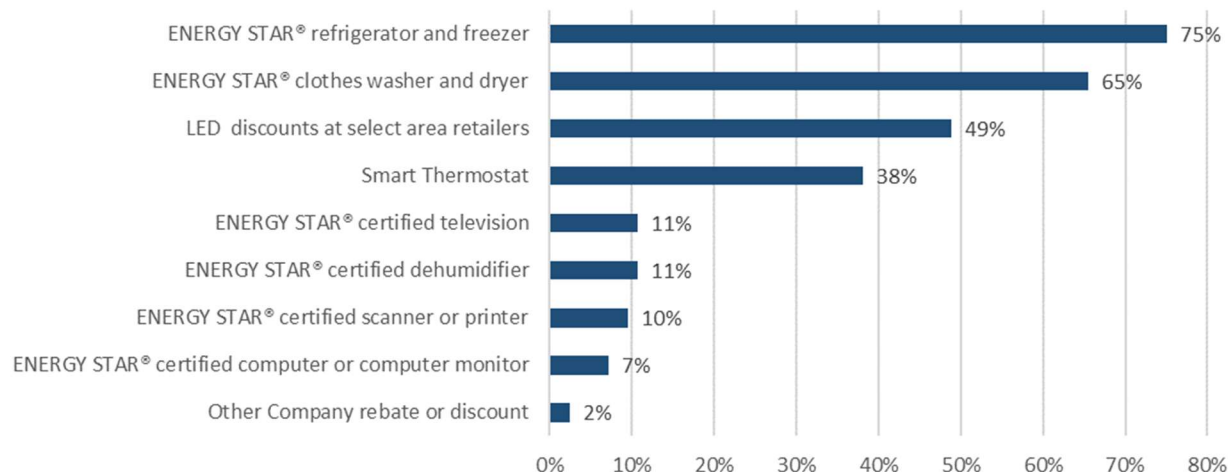
Of those who installed energy-efficient equipment/appliances or made energy efficiency improvements, 46% reported the information provided through the home energy reports, tips emails, or subprogram website as being somewhat or very important in that decision.

Cross Program Awareness and Participation

All survey-takers were asked about their awareness of Companies' EE-related discounts and rebates. Forty percent of respondents had heard of such offerings.

Specific rebates and discounts recalled are provided in Figure 8-7. Subprogram participants who were aware of discounts and rebates most noted being aware of ENERGY STAR® refrigerators and freezers discounts and rebates (75%). Other rebates and discounts of which participants were aware of included ENERGY STAR® clothes washers and dryers (65%) and LED light bulb discounts at select area retailers (49%).

Figure 8-7: Energy-Efficient Equipment Discount/Rebate Awareness



Note: Percentages may exceed 100% because respondents could choose more than one response.

How survey-takers learned of rebates and discounts are categorized in Table 8-9. Most frequently mentioned were emails from the Companies (34%). Other common sources included Home Energy Reports (30%) or print advertisements (22%). Multiple answers per respondent could be selected for this question.

Table 8-9: Sources of Rebate/Discount Awareness

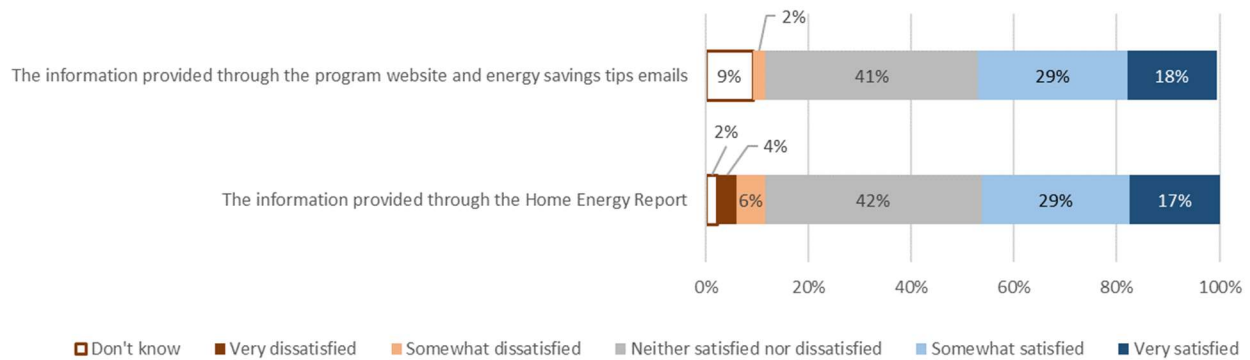
How did you learn of the rebates and discounts that the Company provides?	Percentage of Respondents (n=86)
Email from Company	34%
Home Energy Report	30%
Print advertisement	22%
Company website	17%
Service provider or contractor	10%
Friend, family, or colleague	10%
Internet search	3%
Other	7%
Don't know	5%

Note: Percentages may exceed 100% because respondents could choose more than one response.

Subprogram Satisfaction

Subprogram participants indicated their levels of satisfaction with the information promoted by the website/emails, as well as the HER-provided information. At least forty-six percent of respondents reported being somewhat or very satisfied with information sourced from either the website/emails or HERs (see Figure 8-8).

Figure 8-8: Satisfaction with Program Information



Home Characteristics

Survey respondents provided feedback regarding their homes' characteristics, such as overall home sizes and types of fuel used to heat their homes. Most program participants (61%) lived in a home between that was between 1,000 and 3,000 square feet.

The majority of the program participants surveyed used natural gas to heat both water (52%) and their homes (54%). Electricity was the second most common way to heat both the water (40%) and their homes (31%). The "other" category for respondents' home and water heating included respondents that heated their home and water with wood, oil, or a combination of fuel types. Most respondents reported living in a household with three or fewer people (61%). See Table 8-10 for survey respondent characteristics.

Table 8-10: Home Characteristics

Home Characteristic	Percentage of Respondents
Home Heating Fuel	
Natural gas	54%
Electricity	31%
Propane	5%
Other	10%
Water Heating Fuel	
Natural gas	52%
Electricity	40%
Propane	5%
Other	2%
Don't know	1%
Number of people Living in Home	
1	7%
2	35%
3	19%
4	17%
5	8%
6 or more	4%
Don't Know/Refused	11%
Above Ground Living Space	
Less than 1,000 sq. ft	7%
1,000 - 2,000 sq. ft	49%
2,001 - 3,000 sq. ft	32%
3,001 - 4,000 sq. ft	10%
4,001 - 5,000 sq. ft	1%
More than 5,000 square feet	2%
Don't Know	25%

9 Low Income Program Participation

The Companies expanded their evaluation, measurement and verification effort to identify participation and savings from low income customers in the residential programs. A “low income” customer was defined by household income below 150% of the 2018 Federal Poverty Level.

Table 9-1 shows the quantity of units, kWh, and kW that can be attributed to low income population participant in the EE Homes Program.

Table 9-1: Savings Attributable to Low Income Customers

EDC	Subprogram		Percentage of Low Income Purchasers	Quantity	kWh Savings	kW Savings
CEI	Online Audits		12%	175	45,512	5.26
	Comprehensive Audits		20%	58	38,179	4.82
	Behavioral		7%	4,744	1,024,529	140.02
	Energy Efficiency Kits	Standard	14%	5,537	1,671,943	127.19
		Electric	25%	4,482	1,808,887	180.07
	School Education		22%	1,352	346,266	30.91
	Sub-Total		12%	16,350	4,935,315	488.26
OE	Online Audits		13%	271	34,826	8.32
	Comprehensive Audits		26%	118	103,882	13.09
	Behavioral		12%	14,096	3,734,534	504.87
	Energy Efficiency Kits	Standard	19%	9,407	2,840,436	216.08
		Electric	11%	3,284	1,325,447	131.94
	School Education		38%	3,624	928,276	82.86
	Sub-Total		15%	30,801	8,967,401	957.16
TE	Online Audits		16%	103	18,413	3
	Comprehensive Audits		31%	200	157,482	19.85
	Behavioral		8%	2,240	240,969	33.35
	Energy Efficiency Kits	Standard	28%	3,692	1,114,824	84.81
		Electric	9%	667	269,267	26.80
	School Education		26%	896	229,376	20.47
	Sub-Total		15%	7,797	2,030,330	188.34
Totals	Online Audits		13%	549	98,750	16.64
	Comprehensive Audits		27%	376	299,543	37.76
	Behavioral		10%	21,080	5,000,032	678.24
	Energy Efficiency Kits	Standard	18%	18,637	5,627,202	428.07
		Electric	15%	8,434	3,403,600	338.82
	School Education		31%	5,872	1,503,918	134.24
	EE Homes Program Total		14%	54,948	15,933,046	1,633.76

10 Conclusions and Recommendations

The major conclusions and recommendations for each Home Performance subprogram are summarized below.

10.1 School Education Conclusions

- Findings from interviews with subprogram staff and the subprogram implementation contractor suggest that the School Education subprogram has continued to perform very effectively in the Companies' service territories and that there are no significant issues with subprogram design, marketing, implementation, or communication.
- The implementation contractor is well-suited to effectively and efficiently manage the subprogram. The Companies' staff noted that AMCG successfully fulfills the kit orders and provides subprogram data and invoicing in a timely manner. AMCG staff and the Companies' staff attributed successful subprogram implementation to consistent communication between the Companies and AMCG and the staff's experience and developed implementation knowledge.
- Most participants were motivated to order the school education kit to save home energy and/or because of their children's interest and most participants rated the kit contents and education it provided with 'Very Satisfied' scores. Most bulbs were installed, but "waiting for other bulbs to burn out" was the main reason a bulb was not installed.
- Over three-fourths of recipients gained overall knowledge of energy efficiency due to the kit. About one-third of survey-takers purchased additional measures due to kit receipt. One-third of recipients were aware of Company discounts and rebates.

10.2 Energy Efficiency Kits Conclusions

- The most significant change that occurred in 2018 was the move from CFLs to LEDs. Although there is one specialty CFL still in the kit, all other kit bulbs are LEDs.
- Survey respondents indicated they most frequently requested kits over the phone. Once received, 94% of respondents reported installing some or all of the measures. The measure most frequently installed was the LED nightlights, followed by 9-Watt LED bulb, the 15-watt LED bulb, and the 3-way CFL. The primary reason for not installing measures was the customer was waiting for other bulbs to burn out or they just have not had the time yet.

- Customers reported that saving energy and money were the primary benefits that motivated them to order the Energy Efficiency kit. They found the 3-way CFL, the 9-watt LED, and the 15-watt LED as the most useful measures.
- Customers reported high levels of satisfaction with the Energy Efficiency Kits subprogram. Over 90% of respondents were satisfied or very satisfied with the kit contents and the educational materials provided in the kit. Over 80% of respondents were either satisfied or very satisfied with the time it took to receive the kit. Many customers (67%) also noted that their knowledge of ways to save energy increased significantly.
- Participants' reported moderate levels of cross-program awareness. About half of the survey respondents were aware of other opportunities to receive rebates or purchase energy-efficient equipment at discounted prices. Of those that were aware of other programs, just under half reported they learned of other opportunities through the kit.

10.3 Audits & Education Conclusions

- Both subprogram staff and implementors felt the Comprehensive Audits subprogram was well implemented in 2018. Subprogram and implementation staff reported that the subprogram has a dedicated team that works well together with frequent communication. They also shared that the subprogram has a solid design and implementation procedures are well understood.
- There is currently a lack of public awareness about the subprogram, however awareness is increasing. Subprogram and implementation staff stated the subprogram had been dormant. The subprogram implementor stated that they market the subprogram through several channels and most marketing is digital. Subprogram staff stated future marketing was to be focused on areas with the most potential for savings.
- The subprogram implementor stated that allowing for an instant rebate is helpful and informing customers that there is no out-of-pocket cost is a crucial selling point for the subprogram. The subprogram manager stated that the out-of-pocket cost does not seem to be a deterrent to participation as customers are aware of the instant rebate.
- Regarding subprogram implementation, both the subprogram manager and implementor stated that consent from individual tenants at multi-family homes was a barrier to achieving larger subprogram energy savings.
- The Home Energy Analyzer changed hosts in 2018 from Aclara to Oracle. Subprogram staff reported that the shift was well planned and executed. Oracle fills the same role as Aclara had. Communication among the subprogram

manager, subprogram staff, customer call center, and Oracle is sufficient to support the subprogram's administrative needs.

- According to the subprogram manager, the online audit tool improved substantially in 2018. The tool now collects customers' responses and provides customers with links to other Companies' subprograms and enhanced marketing opportunities. The subprogram manager stated that the change in vendor has been a large improvement and sees future potential to capitalize on the new capabilities.
- Customers can also complete an audit via the customer call center. The customer typically calls for high bill complaint. The audit is similar to (but does not use) the same software as the online users. The representative may identify top three energy users and provide tips over the phone. They may also direct them to the Energy Save Ohio website and send them an energy efficient tips brochure in the mail.
- Most surveyed participants learned about the Home Energy Analyzer through the Companies' website and reported they accessed the tool because of interest in their home's energy use, interest in energy conservation, or due to high energy bills. Most participants found the information provided somewhat or very helpful. Almost three-fourths of those surveyed made behavioral changes; over one-quarter upgraded their appliances or equipment.

10.4 Behavioral Modification Conclusions

- The subprogram design and implementation did not significantly change in 2018. The roles of the subprogram manager and the subprogram implementer also remained the same. Cross-promotion is a report feature. The subprogram implementer stated that appliance rebates, in-home energy audit, AC rebates, LED rebates, smart thermostat programs were cross-promoted in HERs in 2018. The Companies' subprogram manager considers this subprogram an efficient gateway to market other energy efficiency programs to customers.
- The shift from Aclara to Oracle in the Online Audit subprogram has increased residential energy efficiency program synergy. If Behavioral subprogram customers complete an Online Audit, the home information gathered allows their HERs to be updated. Oracle considers the subprogram's straightforward implementation process and strong working relationship with the Companies' staff as strengths.
- Most recipients find the information easy to understand and about half feel the data provided are very or somewhat accurate. Program participants reported that the most valuable information provided in the Home Energy Reports was the energy savings tips/recommendations and advice on setting thermostats. Almost three-

fourths of those surveyed made behavioral changes; about half upgraded their appliances or equipment. Forty percent of those surveyed were aware of Company rebates and discounts. Less than a fifth of those who purchased appliances applied for a Company rebate.

10.5 Recommendations

ADM offers the following recommendations for consideration for future program cycles.

School Education Recommendations:

- Continue working with AMCG and NTC for subprogram delivery. Interview feedback suggests the staff works well together and the implementation contractors have the institutional knowledge to deliver consistent results. Both AMCG and subprogram staff at the Companies noted that the subprogram received no negative feedback during the 2018 subprogram year.
- Continue to consider and develop the concept of subprogram expansion to serve older students with more advanced energy efficient measures (e.g. smart thermostats). Subprogram staff noted the School Education is a smooth running and successful subprogram; it has the potential to expand and increase its impact with a new audience.
- Increase attention towards informing recipients of Company discounts and rebates with the kits' documentation.

Energy Efficiency Kits Recommendations:

- Continue to operate the Energy Efficiency Kit program. Both subprogram and implementation staff reported a strong subprogram year. Continue to insert referral slips into kits to promote new customer enrollments.
- Increase attention towards informing recipients of Company discount and rebates with the kits' documentation.

Audits & Education Recommendations:

Comprehensive Audits

- Continue to market the subprogram to increase awareness. Utilize targeted Facebook ads and email blasts. Continue presenting at community forums and events.
- Consider revisiting marketing language to ensure customers understand the instant rebate and the subprogram pricing.
- Consider piloting an offering with a lower advertised cost to understand if the perceived audit cost is a deterrent to certain populations.

Online Audits

- Continue to utilize the Online Audit program as a means for cross-promoting other residential energy efficiency programs offered by the Companies. The subprogram manager stated that the customers' responses could be used to market other energy saving Company programs.
- Ensure all participants in a telephone-based audit receive energy-efficient documentation. Most who received brochures found it helpful yet only about one-third of those surveyed recalled receiving an item.
- Review the habit changes undertaken and modify audit information to target behaviors performed infrequently that would lead to measurable savings.
- Research if additional focus on appliance and equipment upgrades, and accompanying discounts/rebates, will encourage more customers to undertake such improvements.

Behavioral Modification Recommendations:

- Continue to utilize the HERs to inform residential customers about their home energy use and cross-promote Companies' rebate programs. Promote the online audit tool to update customers' home characteristics and, subsequently, improve HER data.
- Increase attention towards informing recipients of Company discount and rebates within HERs.
- Review the habit changes undertaken and modify HER information to target behaviors performed infrequently that would lead to measurable savings.
- Consider analyzing opt-outs with available data or customer input to better understand trends in the aim of increasing retention.

11 Appendix A: Required Savings Tables

Tables showing measure-level participation counts and savings for the Program were provided in various locations throughout this report. This appendix provides additional tables summarizing savings results. Lifetime savings were calculated as shown in Equation 11-1 below.

$$\text{Lifetime Savings} = \text{Measure Life} \times \text{Annualized Savings}$$

Equation 11-1: Normalization kWh Usage

11.1 School Education

Table 11-1: Annual kWh & kW Savings by Operating Company

EDC	Ex-Ante Savings		Ex-Post Savings		RR	
	kWh	kW	kWh	kW	kWh	kW
CEI	2,193,707	229.44	1,601,481	142.95	73%	62%
OE	3,343,711	349.71	2,441,022	217.88	73%	62%
TE	1,207,188	126.26	881,288	78.66	73%	62%
Total	6,744,606	705.40	4,923,791	439.50	73%	62%

Table 11-2 Annual Ex-Post & Lifetime Savings

EDC	Ex-Post Savings		Lifetime
	kWh	kW	kWh
CEI	1,601,481	142.95	22,169,259
OE	2,441,022	217.88	33,791,013
TE	881,288	78.66	12,199,651
Total	4,923,791	439.50	68,159,923

11.2 Energy Efficient Kits

Table 11-3 :Annual kWh & kW Savings by Operating Company

EDC	Ex-Ante Savings		Ex-Post Savings		RR	
	kWh	kW	kWh	kW	kWh	kW
CEI	22,431,028	2,424.03	19,496,459	1,652.98	87%	68%
OE	30,992,668	3,372.61	26,762,411	2,315.89	86%	69%
TE	8,150,078	886.40	7,041,327	608.34	86%	69%
Total	61,573,774	6,683.03	53,300,197	4,577.20	87%	68%

Table 11-4:Annual Ex-Post & Lifetime Savings

EDC	Ex-Post Savings		Lifetime
	kWh	kW	kWh
CEI	19,496,459	1,652.98	233,734,835
OE	26,762,411	2,315.89	318,400,522
TE	7,041,327	608.34	83,824,204
Total	53,300,197	4,577.20	635,959,562

11.3 Audits & Education

11.3.1 Comprehensive Audits

Table 11-5: Annual kWh & kW Savings by Operating Company

EDC	Ex-Ante Savings		Ex-Post Savings		RR	
	kWh	kW	kWh	kW	kWh	kW
CEI	196,556	22.16	190,894	24.08	97%	109%
OE	420,701	48.31	398,216	50.19	95%	104%
TE	508,705	58.96	503,941	63.53	99%	108%
Total	1,125,961	129.43	1,093,051	137.80	97%	106%

Table 11-6: Annual Ex-Post & Lifetime Savings

EDC	Ex-Post Savings		Lifetime
	kWh	kW	kWh
CEI	190,894	24.08	2,647,915
OE	398,216	50.19	5,135,878
TE	503,941	63.53	6,385,315
Total	1,093,051	137.80	14,169,108

11.3.2 Online Audits

Table 11-7: Annual kWh & kW Savings by Operating Company

EDC	Ex-Ante Savings		Ex-Post Savings		RR	
	kWh	kW	kWh	kW	kWh	kW
CEI	389,550	88.20	271,416	45.09	70%	51%
OE	300,188	42.28	382,035	63.47	127%	150%
TE	101,760	12.72	114,099	18.96	112%	149%
Total	791,498	143.20	767,550	127.51	97%	89%

Table 11-8: Annual Ex-Post & Lifetime Savings

EDC	Ex-Post Savings		Lifetime
	kWh	kW	kWh
CEI	271,416	45.09	1,146,106
OE	382,035	63.47	814,248
TE	114,099	18.96	342,298
Total	767,550	127.51	2,302,651

11.4 Behavioral Modification

Table 11-9: Annual kWh & kW Savings by Operating Company

EDC	Ex-Ante Savings		Ex-Post Savings		RR	
	kWh	kW	kWh	kW	kWh	kW
CEI	17,087,029	2,820.34	14,958,121	2,044.29	88%	72%
OE	34,617,300	4,369.08	30,291,223	4,095.08	88%	94%
TE	3,668,933	665.91	3,012,114	416.84	82%	63%
Total	55,373,263	7,855.33	48,261,458	6,556.21	87%	83%

Table 11-10: Annual Ex-Post & Lifetime Savings

EDC	Ex-Post Savings		Lifetime
	kWh	kW	kWh
CEI	14,958,121	2,044.29	14,958,121
OE	30,291,223	4,095.08	30,291,223
TE	3,012,114	416.84	3,012,114
Total	48,261,458	6,556.21	48,261,458

12 Appendix B: School Education Survey Instrument

12.1 School Education Participant Survey

Survey Variables

Variable	Definition
CUSTOMER NAME	Name of customer
UTILITY	Name of EDC
EMAIL	Email address
TELEPHONE	10 digit phone number

Email Survey Introduction

Dear [CUSTOMER NAME],

I'm contacting you on behalf of [UTILITY]. According to our records, your home was recently sent an Energy Conservation Kit through your child's school. We would like to hear about your experience. Please take a few moments to complete the online survey using the password provided below.

Your response will be kept anonymous and will be used to improve the program in the future. A \$5 gift card will be provided as a thank you for your time.

You can access the survey at:

Your password is:

Thank you in advance for your time!

Kind Regards,

ADM Associates / Contractor to [UTILITY]

Energy Conservation Kit Verification

1. Do you recall receiving an Energy Conservation Kit though your child's school containing a variety of energy-efficient light bulbs?
 1. Yes
 2. No [TERMINATE]
 98. Don't Know [TERMINATE]
2. Which of the following did you receive in your energy conservation kit?

[Check all that apply]

1. (1) Three-way LED light bulb
2. (2) 15W LED light bulb
3. (1) 11W LED light bulb
4. (3) 9W LED light bulbs
5. (2) LED nightlights

Measure Installation Verification

3. Did you install *all* of the products you received in the Energy Conservation Kit?
 1. Yes, I installed everything
 2. No, I installed only some of the products I received
 3. No, I did not install any of the products I received

[SHOW Q4 IF Q3=2 or 3]

4. Why did you not install any/some of the products?
 1. Some of the bulbs were broken
 2. Waiting for light bulbs to burn out
 3. Bulbs were too bright
 4. Bulbs were not bright enough
 5. Does not fit into any fixture
 6. Other (Specify)
 98. Don't know

[SHOW Q5 IF Q4 = 1]

5. Did you contact the [UTILITY] about the broken items?
 1. Yes
 2. No
 98. Don't Know

[SHOW Q6 IF Q5 = 1]

6. Were the broken items replaced?
 1. Yes
 2. No
 98. Don't Know

[SHOW Q7-Q19 IF Q3=1 or 2]

7. How many of the 9 Watt LED Bulbs are currently installed in your home (up to a maximum of 3 bulbs)?

1. 0
2. 1
3. 2
4. 3
98. Don't know

[SHOW Q8 - Q11 IF Q7>0]

8. Where did you install the [INSERT AMOUNT FROM Q7] 9W LED bulb(s) and how many in that room?

[grid format, first bulb, second bulb, etc.]

	Number Installed in Room
1. Living room	
2. Bathroom	
3. Kitchen	
4. Outdoors	
5. Family Room	
6. Bedroom	
7. Garage	
8. Hallway	
9. Office	
10. Laundry Room	
11. Dining Room	
97. Other	
97. Other	
97. Other	

98. Don't know

9. Is the 11 Watt LED currently installed in your home?

1. Yes
2. No
98. Don't know

[SHOW Q10 IF Q9=1]

10. Where did you install the 11W bulb?

1. Living room
2. Bathroom
3. Kitchen
4. Outdoors
5. Family Room
6. Bedroom
7. Garage
8. Hallway
9. Office
10. Laundry Room
11. Dining Room
97. Other
98. Don't know

11. How many of the 15 Watt LED bulbs are currently installed in your home (up to maximum of 2 bulbs)?

1. 0
2. 1
3. 2
98. Don't know

[SHOW Q12 IF Q11>0]

12. Where did you install the [INSERT QUANTITY] 15W LED bulb(s) and how many in that room?

[grid format, first bulb, second bulb, etc.]

	Number Installed in Room
1. Living room	
2. Bathroom	
3. Kitchen	
4. Outdoors	
5. Family Room	
6. Bedroom	
7. Garage	
8. Hallway	
9. Office	
10. Laundry Room	
11. Dining Room	
97. Other	
97. Other	.
97. Other	.

98. Don't know

13. Is the 3-Way LED currently installed in your home?

1. Yes
2. No

[SHOW Q14 IF Q13=1]

14. Where did you install the 3-Way LED bulb?

1. Living room
2. Bathroom
3. Kitchen
4. Outdoors
5. Family Room
6. Bedroom
7. Garage
8. Hallway
9. Office
10. Laundry Room
11. Dining Room
97. Other
98. Don't know

15. How many of the two LED nightlights are currently installed in your home?

1. 0
2. 1
3. 2
98. Don't know

[SHOW Q16 IF Q15= 2 or 3]

16. Please describe where the first nightlight was installed.

1. Where there was no nightlight before (new nightlight)
2. Where a standard nightlight was previously installed
98. Don't know

[SHOW Q17 IF Q15 = 3]

17. Please describe where the second nightlight was installed.

1. Where there was no nightlight before (new nightlight)
2. Where a standard nightlight was previously installed
98. Don't know

[SHOW Q18 if Q15 = 1]

18. Why are you not using the LED nightlight?

1. I had no use for it
2. I already had LED nightlight(s)
3. It was too bright
4. It was not bright enough
5. Other (Specify)
98. Don't know

Satisfaction

19. Do you have any suggested changes that should be made to the items included in the kit?

1. [Open Ended]

20. Which of the following kit items was the MOST useful to you?

1. 9W/11W/15W 3-Way LED bulb
2. 15W LED bulbs
3. 11W LED bulb
4. 9W LED bulbs
5. LED nightlights
98. Don't know

21. Using a scale of 1-5 where 1 means very dissatisfied, and 5 means very satisfied, how satisfied or dissatisfied are you with each of the following program components?

- a. The items included in the kit
- b. The energy efficiency education provided through the program

[SHOW Q22 IF Q21 a-b = 1 or 2]

22. Why were you dissatisfied?

1. [Open Ended]

23. What factors influenced your decision to request a kit through this program?
[Select all that apply]

1. My child's interest in the kit
2. I was looking for ways to save energy in my home
3. Recommendation from a friend
4. The kit looked useful
5. It had no additional cost
6. Interested in saving money
7. My child was interested
8. Other (Specify)
98. Don't know

24. Since receiving the kit, would you say that your knowledge of ways to save energy has...

1. Increased significantly
2. Increased somewhat
3. Remained the same
4. Decreased somewhat
5. Decreased significantly
98. Don't know

25. Would you say your participation in the Schools Education Program has: [UTILITY = Specific UTILITY]

1. Greatly increased your satisfaction with [UTILITY]
2. Somewhat increased your satisfaction with [UTILITY]
3. Did not affect your satisfaction with [UTILITY]
4. Somewhat decreased your satisfaction with [UTILITY]
5. Greatly decreased your satisfaction with [UTILITY]
98. Don't know

Program Awareness & Cross Program Participation

26. Are you aware that [UTILITY] offers discounts and rebates to help its customers purchase energy-efficient equipment to help them save energy in their homes?

1. Yes
2. No
98. Don't know

[SHOW Q27 if Q26 = 1]

27. Did you become aware of any of these discounts and rebates through receiving the energy conservation kit?

1. Yes
2. No
98. Don't know

28. Have you purchased and installed any additional energy-efficient items because of the information provided to you in the kit?

1. Yes
2. No
98. Don't know

[SHOW Q29 IF Q28 = 1]

29. What did you purchase and install? [Select all that apply]

1. Energy-efficiency light bulbs
2. Energy-efficient nightlights
3. Energy-efficient appliances such as refrigerators, clothes washer/dryers
4. Energy-efficient HVAC equipment
5. Other (Specify)
98. Don't know

[SHOW Q30 IF Q29 = 3]

30. Did you apply for a rebate for the appliance(s)?

1. Yes
2. No
98. Don't know

[SHOW Q31 IF Q30 = 2]

31. Why didn't you apply for a rebate?

1. I did not know about the rebate
2. The rebate was too small to go through the process
3. I forgot to apply
4. Other (Specify)
98. Don't know

Demographic Information

A few questions about your home and income level follow. These are anonymous and will be used solely for the purpose of combining different customers' responses. You can choose to not answer any of these questions.

32. Which of the following best describes this residence?

1. Single-family home, detached construction
2. Single-family home, factory manufactured/modular
3. Mobile home
4. Row house
5. Two or Three family attached residence
6. Apartment with 4+ families
7. Condominium
97. Other (Specify)
98. Don't know

33. Approximately when was your home built?

1. Before 1960
2. 1960-1969
3. 1970-1979
4. 1980-1989
5. 1990-1999
6. 2000-2005
7. 2006 or Later
97. Don't know

34. What is the approximate square footage of this residence?

1. Less than 1,000 square feet
2. 1000-2000 square feet
3. 2000-3000 square feet
4. 3000-4000 square feet
5. 4000-5000 square feet
6. Greater than 5000 square feet
98. Don't Know

35. Do you own or rent your residence?

- 1. Own
- 2. Rent
- 98. Don't know

36. What type of heating system does this residence have?

- 1. Natural gas heating
- 2. Electric heating
- 3. Other (Specify)
- 98. Don't know

37. How many people are living or staying at this address?

Include everyone who is living or staying here for more than 2 months. Include yourself if you are living or staying here for more than 2 months. Include anyone else staying here who does not have another place to stay, even if they are here for less than two months.

Do not include anyone who is living somewhere else for more than two months, such as a college student living away or someone in the Armed Forces on deployment.

- 1. Record Number [1-97]
- 98. Don't know

38. What is your approximate total household income?

- 1. Less than \$18,000
- 2. \$18,000 to less than \$25,000
- 3. \$25,000 to less than \$31,000
- 4. \$31,000 to less than \$38,000
- 5. \$38,000 to less than \$44,000
- 6. \$44,000 to less than \$51,000
- 7. \$51,000 to less than \$57,000
- 8. \$57,000 to less than \$64,000
- 9. \$64,000 to less than \$70,000
- 10. \$70,000 to less than \$77,000
- 11. \$77,000 to less than \$83,000
- 12. \$83,000 to less than \$90,000
- 13. \$90,000 or more
- 98. Don't know
- 99. Refused

Customer Contact Information

39. Thank you for your time in answering questions regarding the Energy Conservation Kits Program in Ohio. We are finished at this time. We would like to provide you with a \$5 gift card of your choice for your participation. To do that, we will need your name and an email address where we can send you a link to your gift card.

1. First Name and Last Name:
2. Email Address

You should be receiving an email with the link to your gift card in 10 days or less. If you have any questions regarding this survey or would like to know the status of your gift card, please send an email to adm-surveys2018@admenergy.com. Once again thank you for your participation on behalf of [UTILITY]. Have a great day!

13 Appendix C: Energy Efficiency Kits Reference Materials and Survey Instrument

13.1 Application, Marketing, and Kit Literature

MAKE YOUR METER
happy.
Request an Energy Conservation Kit designed to reduce energy use and save money on future home energy bills.



FirstEnergy
Ohio Edison • The Illuminating Company • Toledo Edison

FirstEnergy Energy Conservation Kit Program

FirstEnergy has contracted with Power Direct Energy to administer this program. Power Direct Energy maintains this site and its content. To request a kit over the phone, call 1-888-257-2838. For assistance with signing up for a kit online, please contact a Power Direct Energy program representative at 1-888-225-8996, Monday-Friday between the hours of 9am-7pm EST.

Ohio residential customers of The Illuminating Company, Ohio Edison and Toledo Edison are now eligible to receive an energy conservation kit. You will not be charged separately for this kit. The kit includes nine compact fluorescent light bulbs (CFLs), a smart strip/surge protector, a furnace filter whistle, and two LED night lights.** [Click here to learn more about the cost of this kit.](#)

To complete your enrollment in the Energy Conservation Kit program and receive your kit, please complete the fields below. If you received a postcard, you can use the invitation code listed above your name to enroll. If you do not have an invitation code, you will need to provide your 12 digit account number, which can be found on the upper right hand corner of your electric bill.

Invitation Code: *	<input type="text"/>	or Account #: *	<input type="text"/>	(do not include any dashes or spaces)
Contact Name: *	<div><input type="text"/><input type="text"/></div> <div>FirstLast</div>			
Email Address:	<input type="text"/>			
Confirm Email:	<input type="text"/>			
Phone Number: *	<div><input type="text"/>-<input type="text"/>-<input type="text"/></div> <div>######</div>			
ZIP Code: *	<input type="text"/>			
Water Heating Fuel: *	<div><div>—Select—</div><div></div></div>	Non-electric water heating fuel includes natural gas, oil, propane, wood and other.	Heating Fuel: *	<div><div>—Select—</div><div></div></div> <div>Non-electric heating fuel includes natural gas, oil, propane, wood and other.</div>
Referral Source: *	<div><div>—None—</div><div></div></div>			

Shipping Information

The kit may be shipped to your mailing address (where your bill is sent), service address (the location where you receive your electricity) or an alternative address. Please select where you would like the kit to be shipped. Note that the kit can only be shipped to addresses in the state of Ohio.

- ☒ Mailing Address
☐ Service Address
☐ Other

**One Energy Conservation Kit per residential account.

Clear Form

Submit Request

13.2 Residential Energy Efficiency Kits Participant Survey

Survey Variables [DO NOT DISPLAY]

Variable	Definition
CUSTOMER NAME	Name of customer
UTILITY	Name of EDC
EMAIL	Email address
TELEPHONE	10 digit phone number

Email Survey Introduction [DO NOT DISPLAY]

Dear [CUSTOMER NAME],

I'm contacting you on behalf of [UTILITY]. According to our records you recently requested an energy conservation kit though [UTILITY]. We would like to hear about your experience. Please take a few moments to complete the online survey using the password provided below.

Your response will be kept anonymous and will be used to improve the program in the future. A \$5 gift card will be provided as a thank you for your time.

You can access the survey at:

Your password is:

Thank you in advance for your time!

Kind Regards,

ADM Associates / Contractor to [UTILITY]

Energy Conservation Kit Verification [DO NOT DISPLAY]

1. Do you recall receiving an Energy Conservation Kit containing a variety of energy-efficient light bulbs among other items?
 1. Yes
 2. No [TERMINATE]
 98. Don't Know [TERMINATE]
2. What kind of water heater is in your home?
 1. Electric
 2. Gas
 3. Other (Specify)
 98. Don't know

3. How did you hear about the Energy Conservation Kit?

1. Contractor
2. Social Media
3. Bill Insert
4. Direct Mail from electric company
5. Energy Save Ohio website
6. Print Ad
7. TV
8. Word-of-Mouth
97. Other (Specify)
98. Don't know

4. How did you request the kit?

1. Online
2. Telephone
98. Don't know

[SHOW Q5 IF Q2 = 1]

5. Which of the following did you receive in your energy conservation kit? **[Check all that apply]**

1. (1) Three-way CFL light bulb
2. (1) 15W LED light bulb
3. (1) 11W LED light bulb
4. (3) 9W LED light bulbs
5. (2) LED nightlights
6. (1) Furnace whistle
7. (1) Faucet aerator
8. (1) Low-flow showerhead
98. Don't know

[SHOW Q6 IF Q2 = 2 OR 3 OR 98]

6. Which of the following did you receive in your energy conservation kit? **[Check all that apply]**

1. (1) Three-way CFL light bulb
2. (2) 15W LED light bulb
3. (1) 11W LED light bulb
4. (3) 9W LED light bulbs
5. (3) LED nightlights
6. (1) Furnace whistle
98. Don't know

Measure Installation Verification [DO NOT DISPLAY]

7. Did you install *all* of the products you received in the Energy Conservation Kit?

1. Yes, I installed everything
2. No, I installed only some of the products I received
3. No, I did not install any of the products I received
98. Don't know

[SHOW Q8 IF Q7 = 2 OR 3; Check all that apply]

8. Why did you not install all of the products?

1. Some of the products were broken
2. Waiting for light bulbs to burn out
3. Bulbs were too bright
4. Bulbs were not bright enough
5. Does not fit into any fixture
6. Other (Specify)
98. Don't know

[SHOW Q9 IF Q8 = 1]

9. Did you contact [UTILITY] about the broken items?

1. Yes
2. No
98. Don't know

[SHOW Q10 IF Q8 = 1]

10. Were the broken items replaced?

1. Yes
2. No
98. Don't know

Verification for Customers with Electric Water Heaters

[Ask section if Q2=1]

[SHOW Q11 IF Q5 = 4]

11. How many of the 9 Watt LED Bulbs are currently installed in your home (up to a maximum of 3 bulbs)?

1. 0
2. 1
3. 2
4. 3
98. Don't know

[SHOW Q12 IF Q7 = 2, 3, or 4]

12. Where did you install the [INSERT ANSWER FROM Q7] 9W LED bulb(s) and how many in that room? **[GRID FORMAT, FIRST BULB, SECOND BULB, ETC.]**

	Number Installed in Room
1. Living room	
2. Bathroom	
3. Kitchen	
4. Outdoors	
5. Family Room	
6. Bedroom	
7. Garage	
8. Hallway	
9. Office	
10. Laundry Room	
11. Dining Room	
97. Other	0.
1. 97. Other	2.
3. 97. Other	4.

98. Don't know

[SHOW Q13 IF Q5 = 2]

13. Is the 15 Watt LED currently installed in your home?

- 1. Yes
- 2. No
- 98. Don't know

[SHOW Q14 IF Q9 = 1]

14. Where did you install the 15 Watt LED bulb?

- 1. Living room
- 2. Bathroom
- 3. Kitchen
- 4. Outdoors
- 5. Family Room
- 6. Bedroom
- 7. Garage
- 8. Hallway
- 9. Office
- 10. Laundry Room
- 11. Dining Room
- 97. Other
- 98. Don't know

[SHOW Q15 IF Q5 = 3]

15. Is the 11 Watt LED currently installed in your home?

- 1. Yes
- 2. No
- 98. Don't know

[SHOW Q16 IF Q15 = 1]

16. Where did you install the 11 Watt LED bulb?

- 1. Living room
- 2. Bathroom
- 3. Kitchen
- 4. Outdoors
- 5. Family Room
- 6. Bedroom
- 7. Garage
- 8. Hallway
- 9. Office
- 10. Laundry Room
- 11. Dining Room
- 98. 97. Other – Write in
- 98. Don't know

[SHOW Q17 IF Q5 = 1]

17. Is the 3-Way CFL currently installed in your home?

- 1. Yes
- 2. No
- 98. Don't know

[SHOW Q18 IF Q17 = 1]

18. Where did you install the 3-Way CFL bulb?

- 1. Living room
- 2. Bathroom
- 3. Kitchen
- 4. Outdoors
- 5. Family Room
- 6. Bedroom
- 7. Garage
- 8. Hallway
- 9. Office
- 10. Laundry Room
- 11. Dining Room
- 99. Other- Write In
- 98. Don't know

[SHOW Q19 IF Q5 = 5]

19. How many of the two LED nightlights are currently installed in your home?

- 1. 0
- 2. 1
- 3. 2
- 98. Don't know

[SHOW Q20 IF Q15 = 2 or 3]

20. Please describe where the first nightlight was installed.

- 1. Where there was no nightlight before (new nightlight)
- 2. Where a standard nightlight was previously installed
- 98. Don't know

[SHOW Q21 IF Q15 = 3]

21. Please describe where the second nightlight was installed.

- 1. Where there was no nightlight before (new nightlight)
- 2. Where a standard nightlight was previously installed
- 98. Don't know

Verification for Customers with Gas Water Heater

[SHOW Section if Q2=2, 3, or 98]

[SHOW Q22 IF Q6 = 4]

22. How many of the 9 Watt LED Bulbs are currently installed in your home (up to a maximum of 3 bulbs)?

- 1. 0
- 2. 1
- 3. 2
- 4. 3
- 98. Don't know

[SHOW Q23 IF Q22 = 2, 3, or 4]

23. Where did you install the [INSERT QUANTITY from Q22] 9W LED bulb(s) and how many in that room? **[GRID FORMAT, FIRST BULB, SECOND BULB, ETC.]**

	Number Installed in Room
1. Living room	
2. Bathroom	
3. Kitchen	
4. Outdoors	
5. Family Room	
6. Bedroom	
7. Garage	
8. Hallway	
9. Office	
10. Laundry Room	
11. Dining Room	
0. 97. Other	1.
2. 97. Other	3.
4. 97. Other	5.

98. Don't know

[SHOW Q24 IF Q6 = 2]

24. How many of the 15 watt LED Bulbs are currently installed in your home (up to a maximum of 2 bulbs)?

1. 0
2. 1
3. 2
98. Don't know

[SHOW Q25 IF Q24 = 2 or 3]

25. Where did you install the [ENTER QUANTITY FROM Q24] 15 Watt LED bulb(s) and how many in that room? [GRID FORMAT, FIRST BULB, SECOND BULB]

	Number Installed in Room
1. Living room	
2. Bathroom	
3. Kitchen	
4. Outdoors	
5. Family Room	
6. Bedroom	
7. Garage	
8. Hallway	
9. Office	
10. Laundry Room	
11. Dining Room	
6. 97. Other	7.
8. 97. Other	9.
0. 97. Other	1.

98. Don't know

[SHOW Q26 IF Q6 = 3]

26. Is the 11 Watt LED currently installed in your home?

- 1. Yes
- 2. No
- 98. Don't know

[SHOW Q27 IF Q26 = 1]

27. Where did you install the 11 Watt LED bulb?

- 1. Living room
- 2. Bathroom
- 3. Kitchen
- 4. Outdoors
- 5. Family Room
- 6. Bedroom
- 7. Garage
- 8. Hallway
- 9. Office
- 10. Laundry Room
- 11. Dining Room
- 97. Other – Write In
- 98. Don't know

[SHOW Q28 IF Q6 = 1]

28. Is the 3-Way CFL currently installed in your home?

- 1. Yes
- 2. No
- 98. Don't know

[SHOW Q29 IF Q28 = 1]

29. Where did you install the 3-Way CFL bulb?

1. Living room
2. Bathroom
3. Kitchen
4. Outdoors
5. Family Room
6. Bedroom
7. Garage
8. Hallway
9. Office
10. Laundry Room
11. Dining Room
97. Other – Write In
98. Don't know

[SHOW Q30 IF Q6 = 5]

30. How many of the three LED nightlights are currently installed in your home?

1. 0
2. 1
3. 2
4. 3
98. Don't know

[SHOW Q31 IF Q30 = 2, 3 or 4]

31. Please describe where the first nightlight was installed.

1. Where there was no nightlight before (new nightlight)
2. Where a standard nightlight was previously installed
98. Don't know

[SHOW Q32 IF Q30 = 3 or 4]

32. Please describe where the second nightlight was installed.

1. Where there was no nightlight before (new nightlight)
2. Where a standard nightlight was previously installed
98. Don't know

[SHOW Q33 IF Q30 = 4]

33. Please describe where the third nightlight was installed.

1. Where there was no nightlight before (new nightlight)
2. Where a standard nightlight was previously installed
98. Don't know

[SHOW Q34 IF Q5 = 6 OR Q6 = 6]

34. Is the furnace whistle currently installed in your home?

1. Yes
2. No
98. Don't know

[SHOW Q35 IF Q6 = 8]

35. Is the low flow showerhead currently installed in your home?

1. Yes
2. No
98. Don't know

[SHOW Q36 IF Q6 = 7]

36. Is the faucet aerator currently installed in your home?

1. Yes
2. No
98. Don't know

Satisfaction [DO NOT DISPLAY]

[SHOW Q37 IF Q2 = 1]

37. Which of the following kit items was the MOST useful to you?

1. (1) Three-way CFL light bulb **[SHOW IF Q5 = 1]**
2. (1) 15W LED light bulb **[SHOW IF Q5 = 2]**
3. (1) 11W LED light bulb **[SHOW IF Q5 = 3]**
4. (3) 9W LED light bulbs **[SHOW IF Q5 = 4]**
5. (2) LED nightlights **[SHOW IF Q5 = 5]**
6. (1) Furnace whistle **[SHOW IF Q5 = 6]**
7. (1) Faucet aerator **[SHOW IF Q5 = 7]**
8. (1) Low-flow showerhead **[SHOW IF Q5 = 8]**

[SHOW Q38 IF Q2 = 2, 3 or 98]

38. Which of the following kit items was the MOST useful to you?

1. (1) Three-way CFL light bulb **[SHOW IF Q6 = 1]**
2. (2) 15W LED light bulb **[SHOW IF Q6 = 2]**
3. (1) 11W LED light bulb **[SHOW IF Q6 = 3]**
4. (3) 9W LED light bulbs **[SHOW IF Q6 = 4]**
5. (3) LED nightlights **[SHOW IF Q6 = 5]**
6. (1) Furnace whistle **[SHOW IF Q6 = 6]**

39. Do you have any suggested changes to the items included in the kit?

1. Record Response: _____ **[Open Ended]**

40. Using a scale of 1-5 where 1 means very dissatisfied, and 5 means very satisfied, how satisfied or dissatisfied are you with each of the following program components?

- a. Process to request the kit
- b. Time it took to receive the kit
- c. The items included in the kit
- d. The energy efficiency education provided through the program

[SHOW Q41 IF Q40a-d = 1 OR 2]

41. Why were you dissatisfied?

1. _____ **[Open Ended]**

42. What factors influenced your decision to request a kit through this program?
[Check all that apply]

1. I was looking for ways to save energy in my home
2. Recommendation from a friend
3. The kit looked useful
4. It was provided at no additional cost
5. Interested in saving money
6. Other (Specify)
98. Don't know

43. Since receiving the kit, would you say that your knowledge of ways to save energy has...

1. Increased significantly
2. Increased somewhat
3. Remained the same
4. Decreased somewhat
5. Decreased significantly
98. Don't know

44. Would you say your participation in the Energy Conservation Kit Program has:
[UTILITY = Specific UTILITY]

1. Greatly increased your satisfaction with [UTILITY]
2. Somewhat increased your satisfaction with [UTILITY]
3. Did not affect your satisfaction with [UTILITY]
4. Somewhat decreased your satisfaction with [UTILITY]
5. Greatly decreased your satisfaction with [UTILITY]
98. Don't know

Program Awareness & Cross-Program Participation [DO NOT DISPLAY]

45. Are you aware that [UTILITY] offers discounts and rebates to help its customers purchase energy-efficient equipment to help them save energy in their homes?

- 1. Yes
- 2. No
- 98. Don't know

[SHOW Q46 IF Q45 = 1]

46. Did you become aware of any of these discounts and rebates through receiving the energy conservation kit?

- 1. Yes
- 2. No
- 98. Don't know

47. Have you purchased and installed any additional energy-efficient items because of the information provided to you in the kit?

- 1. Yes
- 2. No
- 98. Don't know

[SHOW Q48 IF Q47 = 1]

48. What did you purchase and install? **[Select all that apply]**

- 1. Energy-efficient light bulbs
- 2. Energy-efficient nightlights
- 3. Energy-efficient appliances such as refrigerators, clothes washer/dryers
- 4. Energy-efficient HVAC equipment
- 97. Other (Specify)
- 98. Don't know

[SHOW Q49 IF Q48 = 3]

49. Did you apply for a rebate for the appliance(s)?

- 1. Yes
- 2. No
- 98. Don't know

[SHOW Q50 IF Q49 = 2]

50. Why didn't you apply for a rebate? **[Select all that apply]**

1. I did not know about the rebate
2. The rebate was too small to go through the process
3. I forgot to apply
97. Other (Specify)
98. Don't know

Demographic Information [DO NOT DISPLAY]

51. A few questions about your home and income level follow. These are anonymous and will be used solely for the purpose of combining different customers' responses. You can choose to not answer any of these questions. Which of the following best describes this residence?

1. Single-family home, detached construction
2. Single-family home, factory manufactured/modular
3. Mobile home
4. Row house
5. Two or Three family attached residence
6. Apartment with 4+ families
7. Condominium
97. Other (Specify)
98. Don't know

52. Approximately when was this residence built?

1. Before 1960
2. 1960-1969
3. 1970-1979
4. 1980-1989
5. 1990-1999
6. 2000-2005
7. 2006 or Later
98. Don't know

53. What is the approximate square footage of this residence?

1. Less than 1,000 square feet
2. 1000-2000 square feet
3. 2000-3000 square feet
4. 3000-4000 square feet
5. 4000-5000 square feet
6. Greater than 5000 square feet
98. Don't Know

54. Do you own or rent your residence?

- 1. Own
- 2. Rent
- 98. Don't know

55. What type of heating system does this residence have?

- 1. Natural gas heating
- 2. Electric heating
- 3. Other (Specify)
- 98. Don't know

56. How many people are living or staying at this address?

Include everyone who is living or staying here for more than 2 months. Include yourself if you are living or staying here for more than 2 months. Include anyone else staying here who does not have another place to stay, even if they are here for less than two months.

Do not include anyone who is living somewhere else for more than two months, such as a college student living away or someone in the Armed Forces on deployment.

- 1. _____ **[Record Number (1-97)]**

57. What is your approximate total household income?

- 1. Less than \$18,000
- 2. \$18,000 to less than \$25,000
- 3. \$25,000 to less than \$31,000
- 4. \$31,000 to less than \$38,000
- 5. \$38,000 to less than \$44,000
- 6. \$44,000 to less than \$51,000
- 7. \$51,000 to less than \$57,000
- 8. \$57,000 to less than \$64,000
- 9. \$64,000 to less than \$70,000
- 10. \$70,000 to less than \$77,000
- 11. \$77,000 to less than \$83,000
- 12. \$83,000 to less than \$90,000
- 13. \$90,000 or more
- 98. Don't know
- 99. Refused

Customer Contact Information [DO NOT DISPLAY]

58. Thank you for your time in answering questions regarding the Energy Conservation Kits Program in Ohio. We are finished at this time. We would like to provide you with a \$5 gift card of your choice for your participation. To do that, we will need your name and an email address where we can send you a link to your gift card.

1. First Name and Last Name
2. Email Address

You should be receiving an email with the link to your gift card in 10 days or less. If you have any questions regarding this survey or would like to know the status of your gift card, please send an email to adm-surveys2018@admenergy.com. Once again thank you for your participation on behalf of [UTILITY] . Have a great day!

14 Appendix D: Audits & Education Survey Instruments

14.1 Online - Comprehensive Audit Participant Survey

Survey Variables [DO NOT DISPLAY]

Variable	Definition
CUSTOMER NAME	Name of customer
UTILITY	Name of EDC
EMAIL	Email address
TELEPHONE	10 digit phone number
DATE	Installation date (date audit occurred)
LEDS	1 = measure installed, 0 = measure not installed
AERATORS	1 = measure installed, 0 = measure not installed
SHOWERHEADS	1 = measure installed, 0 = measure not installed
PIPEWRAP	1 = measure installed, 0 = measure not installed
SPS	1 = measure installed, 0 = measure not installed
NIGHTLIGHTS	1 = measure installed, 0 = measure not installed
LED QTY	LED quantity
BATHROOM AERATOR QTY	Bathroom aerator quantity
KITCHEN AERATOR QTY	Kitchen aerator quantity
SHOWERHEAD QTY	Showerhead quantity
SPS QTY	Smart Power strip quantity
NIGHTLIGHT QTY	LED nightlight quantity

Phone Survey Introduction

Hello, [CUSTOMER NAME], my name is [Interviewer Name],

I'm contacting you on behalf of [UTILITY]. According to our records you had a Comprehensive Home Audit on or around [DATE]. We would like to hear about your experience.

Your response will be kept anonymous and will be used to improve the program in the future. A \$5 gift card will be provided as a thank you for your time.

If another person in your household would be familiar with the Comprehensive Home Audit, may I speak with him/her?

PROGRAM PARTICIPATION VERIFICATION AND AWARENESS

1. Do you recall having a program affiliated contractor perform a comprehensive home energy audit on or around [DATE]?

1. Yes
2. No
98. Don't know

[DISPLAY Q2 IF Q1 = 2 or 3]

2. To clarify, during a Comprehensive Energy Audit the auditor may have installed LED bulbs, showerheads, and/or pipe wrap.

He/she also may have inspected your insulation, windows, and ducts. Did you have such a visit in 2018?

1. Yes
 2. No [Terminate survey]
3. How did you hear about the Comprehensive Home Audit Program?
 1. Contractor
 2. Social media
 3. Bill insert
 4. Direct mail from electric company
 5. Utility website
 6. Print ad
 7. TV
 8. Word-of-Mouth
 97. Other (Specify)
 98. Don't know
 99. Refused

4. Can you tell me why you decided to do a comprehensive home energy audit? What were your concerns? [Select all that apply]
1. To learn more about my home's energy use
 2. Financial (high bills)
 3. Conserve energy
 97. Other (Specify)
 98. Don't know
 99. Refused

SCHEDULING

5. How did you request a comprehensive home energy audit?
1. Scheduled my appointment myself, on website
 2. Submitted an inquiry online
 3. Signed up in-person at a local community event
 4. Called my utility
 97. Other (Specify)
 98. Don't Know
 99. Refused
6. Starting with the first time you contacted the program about the home audit, about how many days passed before the appointment?
1. Number of days _____
 98. Don't know
 99. Refused
7. Did you receive an email or phone call 2 days before as an appointment confirmation?
1. Yes
 2. No
 98. Don't Know
 99. Refused
8. Was your home auditor on time for your appointment?
1. Yes
 2. No
 98. Don't Know
 99. Refused

9. Was your home auditor knowledgeable, courteous, professional, clean, and presentable?

- 1. Yes
- 2. No
- 98. Don't Know
- 99. Refused

10. How satisfied were you with the scheduling of your comprehensive home energy audit? **[Read responses]**

- 1. Very dissatisfied
- 2. Dissatisfied
- 3. Neither satisfied or dissatisfied
- 4. Satisfied
- 5. Very satisfied
- 99. Don't know

[DISPLAY Q11 IF Q10 < 5]

11. Why you are not satisfied with scheduling)? _____

[OPEN]

- 99. Refused

PROGRAM INSTALLATION VERIFICATION

[SHOW IF Q12 IF LEDS = 1]

12. Our records show that you had LEDs directly installed in your home by a home energy auditor. Is this correct?

- 1. Yes
- 2. No
- 98. Don't know
- 99. Refused

[SHOW Q13 IF AERATORS = 1]

13. Our records show that you had Kitchen and/or Bath Faucet Aerators directly installed in your home by a home energy auditor. Is this correct?

- 1. Yes
- 2. No
- 98. Don't Know
- 99. Refused

[SHOW Q14 IF SHOWERHEADS = 1]

14. Our records show that you had Low Flow Showerheads directly installed in your home by a home energy auditor. Is this correct?

- 1. Yes
- 2. No
- 98. Don't know
- 99. Refused

[SHOW Q15 IF PIPEWRAP = 1]

15. Our records show that you had Pipe Wrap Insulation directly installed in your home by a home energy auditor. Is this correct?

- 1. Yes
- 2. No
- 98. Don't know
- 99. Refused

[SHOW Q16 IF SPS = 1]

16. Our records show that you had Smart Power Strips directly installed in your home by a home energy auditor. Is this correct?

- 1. Yes
- 2. No
- 98. Don't know
- 99. Refused

[SHOW Q17 IF NIGHTLIGHTS = 1]

17. Our records show that you had LED nightlights directly installed in your home by a home energy auditor. Is this correct?

- 1. Yes
- 2. No
- 98. Don't know
- 99. Refused

LED

[READ TEXT AND SHOW Q18 IF Q12 = 1]

Questions about the LEDs that may have been installed in your home follow

18. According to our records, you had [LED QTY] LEDs installed in your home by a home energy auditor. Is that correct?

- 1. Yes
- 2. No
- 98. Don't know
- 99. Refused

[SHOW Q19 IF Q18 = 2]

19. What is the correct number of LEDs that were installed by the auditor?

- 1. Open ended: _____
- 99. Refused

[SHOW Q20 – Q28 IF Q12 = 1]

20. In what rooms where the LEDs installed?

Room	Number Installed in Room
Bedrooms	
Bathrooms	
Living Room	
Kitchen	
Entry Way	
Dining Room	
Garage	
Basement	
Den	
Stairway	
Office	
Hallway	
Other Room [Fill in Room Type]	
Other Room [Fill in Room Type]	
Other Room [Fill in Room Type]	

21. Did the LEDs replace traditional incandescent light bulbs, replace another LED, or were they installed in a new fixture? **[Select all that apply]**

- 1. Incandescent
- 2. LEDs
- 3. Installed in new fixture
- 98. Don't know
- 99. Refused

[SHOW Q22 IF Q21 = 1]

22. How many watts were the old incandescent bulbs? **[Select all that apply]**

- 1. 60 watts or higher
- 2. Less than 60 watts
- 98. Don't know
- 99. Refused

[SHOW Q23 IF Q21 = 2]

23. How many of the new LEDs were installed in a new light fixture?

- 1. Open ended: _____
- 99. Refused

24. Before the LEDs were installed by the home energy auditor, did you have any LEDs installed in your home?

- 1. Yes
- 2. No
- 98. Don't know
- 99. Refused

[SHOW Q25 IF Q24 = 1]

25. How many LEDs were installed in your home before the home energy audit?

- 1. Open ended: _____
- 99. Refused

26. Would you purchase LEDs in the future?

- 1. Yes
- 2. No
- 98. Don't know
- 99. Refused

27. How satisfied or dissatisfied are you with the new LEDs? Would you say you are...

[Read responses]

- 1. Very dissatisfied
- 2. Dissatisfied
- 3. Neither satisfied or dissatisfied
- 4. Satisfied
- 5. Very satisfied
- 98. Don't know
- 99. Refused

[SHOW Q28 IF Q27 = 1 OR 2]

28. Why are you dissatisfied with your new LEDs?

- 1. Open ended: _____
- 99. Refused

FAUCET AERATORS

[READ TEXT and SHOW Q29 IF BATHROOM AERATOR QTY > 0]

Questions about the kitchen and/or bath faucet aerators that may have been installed in your home follow

29. According to our records, you had [BATHROOM AERATOR QTY] faucet aerators installed in your bathroom. Is that correct?

- 1. Yes
- 2. No
- 98. Don't know
- 99. Refused

[SHOW Q30 IF Q29 = 2]

30. What is the correct number of bathroom faucet aerators that were installed?

- 1. Open ended: _____
- 99. Refused

31. Did you remove any of the bathroom faucet aerators?

- 1. Yes
- 2. No
- 98. Don't know
- 99. Refused

[SHOW Q32 IF Q31 = 1]

32. How many bathroom faucet aerators did you remove?

- 1. Open ended: _____
- 99. Refused

33. How satisfied or dissatisfied are you with the new bathroom faucet aerators?
Would you say you are... **[Read responses]**

- 1. Very dissatisfied
- 2. Dissatisfied
- 3. Neither satisfied or dissatisfied
- 4. Satisfied
- 5. Very satisfied
- 98. Don't know
- 99. Refused

[SHOW Q34 IF Q33 = 1 OR 2]

34. Why are you dissatisfied with your bathroom faucet aerators?

- 1. Open ended: _____
- 99. Refused

[SHOW Q35 IF KITCHEN AERATORS QTY > 0]

35. According to our records, you had [KITCHEN AERATOR QTY] faucet aerators installed in your kitchen. Is that correct?

- 1. Yes
- 2. No
- 98. Don't know
- 99. Refused

[SHOW Q36 IF Q35 = 2]

36. What is the correct number of kitchen faucet aerators that were installed?

- 1. Open ended: _____
- 99. Refused

37. Did you remove any of the kitchen faucet aerators?

- 1. Yes
- 2. No
- 98. Don't know
- 99. Refused

[SHOW Q38 IF Q37 = 1]

38. How many kitchen faucet aerators did you remove?

Open ended: _____

39. How satisfied or dissatisfied are you with the kitchen faucet aerators? Would you say you are... **[Read responses]**

- 1. Very dissatisfied
- 2. Dissatisfied
- 3. Neither satisfied or dissatisfied
- 4. Satisfied
- 5. Very satisfied
- 98. Don't know
- 99. Refused

[SHOW Q40 IF Q39 = 1 OR 2]

40. Why are you dissatisfied with your kitchen faucet aerators?

- 1. Open ended: _____
- 99. Refused

LOW FLOW SHOWERHEADS

[READ TEXT AND SHOW Q41 IF Q14 = 1]

Questions about the low flow showerheads that may have been installed in your home follow

41. Our records show that the home energy auditor installed [SHOWERHEAD QTY] low flow showerheads. Is that correct?

- 1. Yes
- 2. No
- 98. Don't know
- 99. Refused

[SHOW Q42 IF Q41 = 2]

42. What is the correct number of low flow showerheads that were installed?

- 1. Open ended: _____
- 99. Refused

43. Did you remove any of the low flow showerheads?

- 1. Yes
- 2. No
- 98. Don't know
- 99. Refused

[SHOW Q44 IF Q43 = 1]

44. How many of the low flow showerheads did you remove?

- 1. Open ended: _____
- 99. Refused

45. How satisfied or dissatisfied are you with the low flow showerheads? Would you say you are... **[Read responses]**

- 1. Very dissatisfied
- 2. Dissatisfied
- 3. Neither satisfied or dissatisfied
- 4. Satisfied
- 5. Very satisfied
- 98. Don't know
- 99. Refused

[SHOW Q46 IF Q45 = 1 OR 2]

46. Why are you dissatisfied with your low flow showerheads?

- 1. Open ended: _____
- 99. Refused

PIPE WRAP INSULATIONS

[READ TEXT AND Q47 – Q49 IF Q15 = 1]

Questions about the pipe wrap insulations that may have been installed in your home follow

47. Our records show that the home energy auditor installed pipe wrap insulation for your hot water heater. Is that correct?

- 1. Yes
- 2. No
- 98. Don't know
- 99. Refused

[SHOW Q48 IF Q47 = 1]

48. Was an insulating tank blanket installed in addition to the pipe wrap installation?

- 1. Yes, the auditor installed an insulating tank blanket
- 2. No, there was a preexisting tank blanket
- 3. No, heater is tankless
- 4. No, there was no existing insulating tank blanket and the auditor didn't install one
- 98. Don't know
- 99. Refused

49. How satisfied or dissatisfied are you with the pipe wrap insulation? Would you say you are... **[Read responses]**

- 1. Very dissatisfied
- 2. Dissatisfied
- 3. Neither satisfied or dissatisfied
- 4. Satisfied
- 5. Very satisfied
- 98. Don't know
- 99. Refused

[SHOW Q50 IF Q49 = 1 OR 2]

50. Why are you dissatisfied with the pipe wrap for your hot water heater?

- 1. Open ended: _____
- 99. Refused

SMART STRIP POWER STRIPS

[READ TEXT AND SHOW Q51 IF Q16 = 1]

Questions about the smart power strips that may have been installed in your home follow

51. Our records show that the home energy auditor installed [SPS QTY] smart power strips. Is that correct?

- 1. Yes
- 2. No
- 98. Don't know
- 99. Refused

[SHOW Q52 IF Q51 = 2]

52. What is the correct number of smart power strips that were installed?

- 1. Open ended: _____
- 99. Refused

53. Did you remove any of the smart power strips?

- 1. Yes
- 2. No
- 98. Don't know
- 99. Refused

[SHOW Q54 IF Q53 = 1]

54. How many of the smart power strips did you remove?

- 1. Open ended: _____
- 99. Refused

55. How satisfied or dissatisfied are you with the smart power strips? Would you say you are... **[Read responses]**

- 1. Very dissatisfied
- 2. Dissatisfied
- 3. Neither satisfied or dissatisfied
- 4. Satisfied
- 5. Very satisfied
- 98. Don't know
- 99. Refused

[SHOW Q56 IF Q55 = 1 OR 2]

56. Why are you dissatisfied with your smart power strips?

- 1. Open ended: _____
- 99. Refused

NIGHTLIGHTS

[READ TEXT AND Q57 - Q62 IF Q17 = 1]

Questions about the nightlights that may have been installed in your home follow.

57. Our records show that the home energy auditor installed [NIGHTLIGHT QTY] nightlights. Is that correct?

- 1. Yes
- 2. No
- 98. Don't know
- 99. Refused

[SHOW Q58 IF Q57 = 2]

58. What is the correct number of nightlights that were installed?

- 1. Open ended: _____
- 99. Refused

59. Did you remove any of the nightlights?

- 1. Yes
- 2. No
- 98. Don't know
- 99. Refused

[SHOW Q60 IF Q59 = 1]

60. How many of the nightlights did you remove?

- 1. Open ended: _____
- 99. Refused

61. How satisfied or dissatisfied are you with the nightlights? Would you say you are...

[Read responses]

- 1. Very dissatisfied
- 2. Dissatisfied
- 3. Neither satisfied or dissatisfied
- 4. Satisfied
- 5. Very satisfied
- 98. Don't know
- 99. Refused

[SHOW Q62 IF Q61 = 1 OR 2]

62. Why are you dissatisfied with your nightlights?

- 1. Open ended: _____
- 99. Refused

RETROFIT RECOMMENDATIONS PURSUED

63. Did the auditor make recommendations for additional energy saving home improvements such as installing insulation, new windows, or duct sealing?

- 1. Yes
- 2. No [Skip to Home Customer Satisfaction]
- 98. Don't know [Skip to Customer Satisfaction]
- 99. Refused [Skip to Customer Satisfaction]

[SHOW Q64 IF Q63 = 1]

64. How satisfied or dissatisfied are you with the recommendations made by the auditor? **[Read responses]**

- 1. Very dissatisfied
- 2. Dissatisfied
- 3. Neither satisfied or dissatisfied
- 4. Satisfied
- 5. Very satisfied
- 98. Don't know
- 99. Refused

CUSTOMER SATISFACTION

65. Did you receive the rebate that reduced your out of pocket cost for the service?

- 1. Yes
- 2. No
- 98. Don't know
- 99. Refused

66. Have you noticed any savings on your electric bill since removing your old appliance(s)?

- 1. Yes
- 2. No
- 3. Too soon to tell
- 98. Don't know
- 99. Refused

67. Overall, how satisfied were you with the home audit? **[Read responses]**

- 1. Very satisfied
- 2. Somewhat satisfied
- 3. Neither satisfied nor dissatisfied
- 4. Somewhat dissatisfied
- 5. Very dissatisfied
- 98. Don't know **[Don't read]**
- 99. Refused **[Don't read]**

68. Have you recommended the program to others?

- 1. Yes
- 2. No
- 98. Don't know
- 99. Refused

[If Q68 = 2, show Q69]

69. If provided the opportunity, would you recommend the program to others?

- 1. Yes
- 2. No
- 99. Refused

HOME DEMOGRAPHICS

A few questions about your home and income level follow. These are anonymous and will be used solely for the purpose of combining different customers' responses. You can choose to not answer any of these questions.

70. What type of fuel is used to heat water for your home?

- 1. Natural gas
- 2. Electricity
- 3. Propane
- 4. Other (Specify)
- 98. Don't know
- 99. Refused

71. What type of fuel is used to heat your home?

- 1. Natural gas
- 2. Electricity
- 3. Propane
- 4. Other (Specify)
- 98. Don't know
- 99. Refused

72. How many people are living or staying at this address? Include everyone who is living or staying here for more than 2 months. Include yourself if you are living or staying here for more than 2 months. Include anyone else staying here who does not have another place to stay, even if they are here for less than two months. Do not include anyone who is living somewhere else for more than two months, such as a college student living away or someone in the Armed Forces on deployment.

- 1. Open ended: _____
- 98. Don't know
- 99. Refused

73. Including wages, salaries, pensions, Social Security and other sources of income for all members of your household, what was your total household income before taxes in 2018? Please select from the following categories.

1. Less than \$18,000
2. \$18,000 to less than \$25,000
3. \$25,000 to less than \$31,000
4. \$31,000 to less than \$38,000
5. \$38,000 to less than \$44,000
6. \$44,000 to less than \$51,000
7. \$51,000 to less than \$57,000
8. \$57,000 to less than \$64,000
9. \$64,000 to less than \$70,000
10. \$70,000 to less than \$77,000
11. \$77,000 to less than \$83,000
12. \$83,000 to less than \$90,000
13. \$90,000 or more
98. Don't know
99. Refused

74. Which of the following best describes your residence?

1. Single-family home, detached construction
2. Single-family home, factory manufactured/modular
3. Mobile home
4. Row house
5. Two or Three family attached residence
6. Apartment with 4+ families
7. Condominium
97. Other (Specify)
98. Don't know
99. Refused

75. Do you own or rent this residence?

1. Own
2. Rent
98. Don't know
99. Refused

76. Approximately when was your residence built?

1. Before 1960
2. 1960-1969
3. 1970-1979
4. 1980-1989
5. 1990-1999
6. 2000-2005
7. 2006 or Later
98. Don't know
99. Refused

77. About how much above-ground living space do you have in your residence?

1. Less than 1,000 square feet
2. 1,000-2,000 square feet
3. 2,000-3,000 square feet
4. 3,000-4,000 square feet
5. 4,000-5,000 square feet
6. Greater than 5,000 square feet
98. Don't know
99. Refused

78. About how much below-ground living space do you have in your residence?

1. Less than 1,000 square feet
2. 1000-2000 square feet
3. 2000-3000 square feet
4. 3000-4000 square feet
5. 4000-5000 square feet
6. Greater than 5000 square feet
98. Don't know
99. Refused

Customer Contact Information

79. Thank you for your time in answering questions regarding the Comprehensive Audits Program in Ohio. We are finished at this time. We would like to provide you with a \$5 gift card for your participation. To do that, we will need your name and an email address where we can send you a link to your gift card.

1. First and Last name
2. Email address

You should be receiving an email with the link to your gift card in 10 or less days. If you have any questions regarding this survey or would like to know the status of your gift card, please send an email to adm-surveys2018@admenergy.com. Once again thank you for your participation on behalf of [UTILITY]. Have a great day!

14.2 Online - Online Audit Participant Survey

Survey Variables [DO NOT DISPLAY]

Variable	Definition
CUSTOMER NAME	Name of customer
UTILITY	Name of EDC
EMAIL	Email address
TELEPHONE	10 digit phone number
DATE	Reporting date - mm/dd/yyyy

Email Survey Introduction [DO NOT DISPLAY]

Dear [CUSTOMER NAME],

I'm contacting you on behalf of [UTILITY]. According to our records you completed a home energy audit via the Home Energy Analyzer online tool on or around [DATE]. We would like to hear about your experience. Please take a few moments to complete the online survey using the password provided below.

Your response will be kept anonymous and will be used to improve the program in the future. A \$5 gift card will be provided as a thank you for your time.

You can access the survey at:

Your password is:

Thank you in advance for your time!

Kind Regards,

ADM Staff Contact

ADM Associates / Contractor to [UTILITY]

1. According to our records you used the Home Energy Analyzer on or around [DATE] to complete a home energy audit. Do you recall doing so?
 1. Yes
 2. No [TERMINATE]
 98. Don't Know [TERMINATE]

2. How did you hear about the Home Energy Analyzer?
 1. [UTILITY] website
 2. Word-of-Mouth
 3. Other (Specify)
 98. Don't know
3. Can you tell me why you decided to do an online home energy audit? What were your concerns?

[Select all the apply]

1. Investigate –To learn more about my home's energy use
 2. Financial (High Bills)
 3. Conserve Energy
 4. Other (Specify)
 97. Don't know
4. Using the Home Energy Analyzer, did you? **[Select all the apply]**
 1. Review changes in your bill/usage over time
 2. Answer questions about your home appliances
 3. Answer questions about weatherizing your home
 4. Get detailed energy saving ideas for your home
 5. Other (Specify)
 97. Don't know
5. Did you complete the entire online audit?
 1. Yes
 2. No
 98. Don't know

[SHOW Q6 IF Q5 = 2]

6. What made you stop at the location you did?
 1. Completed the entire survey
 2. Was satisfied with the results
 3. Ran out of time
 4. Further improvements were out of budget
 97. Other (Specify)
 98. Don't know
7. What kind of detailed energy-saving suggestions did you receive? Did they involve: **[Select all the apply]**
 1. No-cost /low-cost ways to save energy immediately
 2. Ways to save requiring investment but will pay off
 3. Ways to save that would not be cost-justified
 97. Other (Specify)

8. How helpful was the information provided by the Home Energy Analyzer?

1. Very Helpful
2. Somewhat Helpful
3. Neither Helpful nor Unhelpful
4. Somewhat Unhelpful
5. Not at all Helpful
98. Don't know

[SHOW Q9 IF Q8 = 4 or 5]

9. What aspects were not helpful?

[Open Ended _____]

10. What aspect of the Home Energy Analyzer was most helpful to you?

[Open Ended _____]

11. What energy-saving actions were you able to take, if any, as a result of using the Home Energy Analyzer?

[Select all that apply]

1. Improved the energy efficiency of my home through weatherization improvements such as added insulation, air sealing, and/or high efficiency doors/windows
2. Upgraded home appliance(s) or equipment to ones that are more energy efficient (such as kitchen appliances, lighting, or HVAC equipment)
3. I've made Behavioral changes (turn off the lights when leaving a room, adjust the thermostat before leaving the house)
4. No changes made yet
98. Don't know

[SHOW Q12 IF Q11 = 1]

12. What home weatherization improvements have you made?

[Select all that apply]

1. Wall insulation
2. Attic insulation
3. Knee wall insulation
4. Radiant barrier
97. Other (Specify)
98. Don't know

[SHOW Q13 IF Q11 = 1]

13. How satisfied are you with the home weatherization improvements you made?

1. Very satisfied
2. Somewhat satisfied
3. Neither satisfied nor dissatisfied
4. Somewhat dissatisfied
5. Very dissatisfied
98. Don't know

[SHOW Q14 IF Q11 = 2]

14. What appliances and/or equipment did you upgrade?

[Select all that apply]

1. Energy Efficient Appliance(s)
2. Energy Efficient HVAC
3. Energy Efficient Lighting
4. Energy Efficient Water Heater
97. Other (Specify)
98. Don't know

[SHOW Q15 IF Q11 = 2]

15. Are the appliance(s) and the equipment that you just mentioned still installed?

1. Yes, it's still installed
2. No, I removed it/took it out
98. Don't know

[SHOW Q16 IF Q15= 1]

16. How satisfied are you with your new appliances or equipment?

1. Very satisfied
2. Somewhat satisfied
3. Neither satisfied nor dissatisfied
4. Somewhat dissatisfied
5. Very dissatisfied
98. Don't know

[SHOW Q17 IF Q11 = 3]

17. What behavioral changes did you make?

[Select all that apply]

1. Turned off lights more frequently
2. Cleaned or replaced air conditioner filter
3. Lowered the winter heating temperature setting on my thermostat (so that the heater ran less)
4. Increased the summer cooling temperature setting on my thermostat (so that the air conditioner ran less)
5. Used a ceiling fan instead of my air conditioner to keep cool
6. Unplugged kitchen appliances when not in use
7. Cleaned refrigerator coils
8. Sealed windows or doors to reduce air leakage
9. Lowered the temperature on the water heater
10. Closed blinds on windows to reduce heating from the sun
11. Air dried laundry instead of using the clothes dryer
12. Fixed leaky faucets
13. Grilled out instead of using the oven to cook food
14. Ran the dishwasher with full loads
15. Took shorter showers
16. Other (Specify)

[SHOW Q18 IF Q11 = 3]

18. Are you continuing to do the behavioral changes you identified?

1. Yes, behavior still practiced
2. No, I stopped doing that
98. Don't know

[SHOW Q19 IF Q11= 2 or 3]

19. Have you noticed any savings on your electric bill since you made these changes?

1. Yes, my electric bill has decreased
2. No, there does not seem to be a change in my electric bill
3. Not sure or too soon to tell
98. Don't know

[SHOW Q20 IF Q19 = 1]

20. How satisfied are you with the savings you noticed on your electric bill since making these changes?

1. Very satisfied
2. Somewhat satisfied
3. Neither satisfied nor dissatisfied
4. Somewhat dissatisfied
5. Very dissatisfied
98. Don't know

21. Overall, how satisfied are you with the Home Energy Audit Program? Would you say you are:

1. Very satisfied
2. Somewhat satisfied
3. Neither satisfied nor dissatisfied
4. Somewhat dissatisfied
5. Very dissatisfied
98. Don't know

[SHOW Q22 IF Q21 = 4 or 5]

22. Why do you give it that rating?
[OPEN]

23. Do you have any suggestions to improve the Home Energy Analyzer?

1. Yes
2. No
98. Don't know

[SHOW Q24 IF Q23 = 1]

24. What are your suggestions for improving the Home Energy Analyzer?
[OPEN]

Demographic Information

A few questions about your home and income level follow. These are anonymous and will be used solely for the purpose of combining different customers' responses. You can choose to not answer any of these questions.

25. Which of the following best describes your home?

1. Single-family home, detached construction
2. Single-family home, factory manufactured/modular
3. Mobile home
4. Row house
5. Two or Three family attached residence
6. Apartment with 4+ families
7. Condominium
8. Other (Specify)
98. Don't know

26. Do you own or rent this residence?

1. Own
2. Rent
98. Don't know

27. Approximately when was your home built?

1. Before 1960
2. 1960-1969
3. 1970-1979
4. 1980-1989
5. 1990-1999
6. 2000-2005
7. 2006 or Later
98. Don't know

28. Would you estimate the above-ground living space is about:

1. Less than 1,000 square feet
2. 1,000-2,000 square feet
3. 2,000-3,000 square feet
4. 3,000-4,000 square feet
5. 4,000-5,000 square feet
6. Greater than 5,000 square feet
98. Don't know

29. Do you have any below-ground living space like a converted basement?

1. Yes
2. No
98. Don't know

[SHOW Q30 IF Q29 = 1]

30. Would you estimate the below-ground living space is about:

1. Less than 1,000 square feet
2. 1,000-2,000 square feet
3. 2,000-3,000 square feet
4. 3,000-4,000 square feet
5. 4,000-5,000 square feet
6. Greater than 5,000 square feet
98. Don't know

31. How many people are living or staying at this address? Include everyone who is living or staying here for more than 2 months. Include yourself if you are living or staying here for more than 2 months. Include anyone else staying here who does not have another place to stay, even if they are here for less than two months.

Do not include anyone who is living somewhere else for more than two months, such as a college student living away or someone in the Armed Forces on deployment.

1. _____ Record Number [1-97]
98. Don't know

32. What is your approximate total household income?

1. Less than \$18,000
2. \$18,000 to less than \$25,000
3. \$25,000 to less than \$31,000
4. \$31,000 to less than \$38,000
5. \$38,000 to less than \$44,000
6. \$44,000 to less than \$51,000
7. \$51,000 to less than \$57,000
8. \$57,000 to less than \$64,000
9. \$64,000 to less than \$70,000
10. \$70,000 to less than \$77,000
11. \$77,000 to less than \$83,000
12. \$83,000 to less than \$90,000
13. \$90,000 or more
98. Don't know
99. Refused

Customer Contact Information

33. Thank you for your time in answering questions regarding the Online Audit Program in Ohio. We are finished at this time. We would like to provide you with a \$5 gift card of your choice for your participation. To do that, we will need your name and an email address where we can send you a link to your gift card.

1. First Name and Last Name
2. Email Address

You should be receiving an email with the link to your gift card in 10 days or less. If you have any questions regarding this survey or would like to know the status of your gift card, please send an email to adm-surveys2018@admenergy.com. Once again thank you for your participation on behalf of [UTILITY] . Have a great day!

14.3 Telephone - Telephone Audit Participant Survey

Survey Variables [DO NOT DISPLAY]

Variable	Definition
CUSTOMER NAME	Name of customer
UTILITY	Name of EDC
EMAIL	Email address
TELEPHONE	10 digit phone number
DATE	Reporting date - mm/dd/yyyy

Phone Survey Introduction

Hello. My name is _____. I am calling on behalf of [UTILITY]. You recently called the Customer Service Center and I'd like to speak with you about your experience. After the call is through, I'd like to provide you a \$5 gift card as a way of saying thank you for your time. I'm wondering if you made the call and if you have a few minutes to answer my questions?

(If not the right person) May I please speak to the person who would know the most about this call?

REPEAT INTRODUCTION AND CONTINUE

(If the correct person) Do you have 5 to 10 minutes to complete a survey regarding your experiences with the call and information provided?

1. Yes
2. No [TERMINATE SURVEY]

1. Our records indicate that you called the Customer Service Center on or around [DATE]. Can you tell me why you called the Customer Service Center? What were your concerns?

[Check all that apply, Prompt if necessary]

1. High Bill Complaint
 2. Meter Issue
 3. Power Outage
 4. Interested in ways to conserve energy
 5. Other (Specify)
 98. Don't Know
 99. Refused
2. What did the Customer Service Center Representative discuss with you?
[Open Ended _____]
 3. Did the Customer Service Representative discuss any of the following:

Topics	Yes	No	Don't Know	Refused
a) Review changes in your bill/usage over time	1	2	98	99
b) Answer questions about your home appliances	1	2	98	99
c) Ways you could save energy in your home	1	2	98	99
d) Find out about your top 3 home energy uses	1	2	98	99
e) Offer literature about saving energy at home	1	2	98	99

4. How helpful was the information provided over the phone? Would you say it was:

[Read Responses]

1. Very Helpful
 2. Somewhat Helpful
 3. Neither Helpful nor Unhelpful
 4. Somewhat Unhelpful
 5. Not at all Helpful
 98. Don't know
 99. Refused
- [SHOW Q5 IF Q4 = 4 or 5]**
5. What aspects of the phone conversation with Customer Service were not helpful?
[OPEN]

6. Did the Customer Service Representative send you any of the following?

Topics	Yes	No	Don't Know	Refused
a) Brochure(s) on Energy Savings Tips	1	2	98	99
b) PC Link to Home Energy Analyzer software	1	2	98	99
c) Other(Specify)				

[SHOW Q7 IF Q6a) = 1]

7. How helpful were the Energy Saving Tips? Would you say...

[Read Responses]

1. Very Helpful
2. Somewhat Helpful
3. Neither Helpful nor Unhelpful
4. Somewhat Unhelpful
5. Not at all Helpful
98. Don't Know

[SHOW Q8 IF Q6b) =1]

8. Have you viewed the Online Energy Analyzer from the link that was sent to you? If so, have you used it?

[Do Not Read Responses]

1. Yes, I viewed but have not used it
2. Yes, I have viewed it and I have used it
3. No, I have not viewed it
98. Don't Know
99. Refused

9. What energy-saving actions were you able to take, if any, as a result of your telephone call to the Customer Service Center?

[Read Responses, Check all that apply]

1. Improved the energy efficiency of my home through weatherization improvements such as added insulation, air sealing, and/or high efficiency doors/windows
2. Upgraded home appliance(s) to ones that are more energy efficient (such as kitchen appliances, lighting, or HVAC equipment)
3. I've made Behavioral changes (turn off the lights when leaving a room, adjust the thermostat before leaving the house)
4. No changes made yet
98. Don't know
99. Refused

[SHOW Q10 IF Q9 = 1]

10. What home weatherization improvements have you made?

[Read Responses, Check all that apply]

1. Wall insulation
2. Attic insulation
3. Knee wall insulation
4. Radiant barrier
5. Other (Specify)
98. Don't know
99. Refused

[SHOW Q11 IF Q9 = 1]

11. How likely would you have been to make those home weatherization improvements had you NOT called the Customer Call Center? **[Read Responses]**

1. Very Unlikely (Meaning you definitely *would not* have made those improvements if you had not called)
2. Somewhat Unlikely
3. Neutral
4. Somewhat Likely
5. Very Likely (You definitely *would have* made those improvements anyway)
98. Don't know
99. Refused

[SHOW Q12 IF Q9 = 2]

12. What appliances and/or equipment did you purchase...

[Read Responses, Check all that apply]

1. Energy Efficient Appliance(s)
2. Energy Efficient HVAC
3. Energy Efficient Lighting such as LED light bulbs
4. Energy Efficient Water Heater
97. Other (Specify)
98. Don't Know
99. Refused

[SHOW Q13 IF Q9 = 1]

13. Are the appliance(s) and the equipment you just mentioned still installed?

[Do Not Read Responses]

1. Yes, they are still installed
2. No, I removed it/took it out

- 98. Don't know
- 99. Refused

[SHOW Q14 IF Q13 = 1]

14. How satisfied are you with your new appliances or equipment?

[Read Responses]

- 1. Very satisfied
- 2. Somewhat satisfied
- 3. Neither satisfied nor dissatisfied
- 4. Somewhat dissatisfied
- 5. Very dissatisfied
- 98. Don't know
- 99. Refused

[SHOW Q15 IF Q13 = 1]

15. How likely would you have been to install those appliances or equipment had you NOT called the Customer Call Center? **[Read Responses]**

- 1. Very Unlikely (Meaning you definitely *would not* have made those improvements if you had not called)
- 2. Somewhat Unlikely
- 3. Neutral
- 4. Somewhat Likely
- 5. Very Likely (You definitely *would have* made those improvements anyway)
- 98. Don't know
- 99. Refused

[SHOW Q16 IF Q9 = 3]

16. What behavioral changes did you make?

[Read Responses, Check all that apply]

1. Turned off lights more frequently
2. Cleaned or replaced air conditioner filter
3. Lowered the winter heating temperature setting on my thermostat (so that the heater ran less)
4. Increased the summer cooling temperature setting on my thermostat (so that the air conditioner ran less)
5. Used a ceiling fan instead of my air conditioner to keep cool
6. Unplugged kitchen appliances when not in use
7. Cleaned refrigerator coils
8. Sealed windows or doors to reduce air leakage
9. Lowered the temperature on the water heater
10. Closed blinds on windows to reduce heating from the sun
11. Air dried laundry instead of using the clothes dryer
12. Fixed leaky faucets
13. Grilled out instead of using oven to cook food
14. Ran the dishwasher with full loads
15. Took shorter showers
97. Other (Specify)
98. Don't Know

[SHOW Q17 IF Q9 = 3]

17. Are you continuing to do the behavioral changes you identified?

[Do Not Read Responses]

1. Yes, behavior still practiced
2. No, I stopped doing that
98. Don't know
99. Refused

[SHOW Q18 IF Q17 = 1]

18. How satisfied are you with the savings you noticed on your electric bill since making these changes?

[Read Responses]

1. Very satisfied
2. Somewhat satisfied
3. Neither satisfied nor dissatisfied
4. Somewhat dissatisfied
5. Very dissatisfied
98. Don't know
99. Refused

[SHOW Q19 IF Q9 = 3]

19. How likely would you have been to make those behavioral changes had you NOT called the Customer Call Center? **[Read Responses]**

1. Very Unlikely (Meaning you definitely *would not* have made those changes if you had not called)
2. Somewhat Unlikely
3. Neutral
4. Somewhat Likely
5. Very Likely (You definitely *would have* made those changes anyway)
98. Don't know
99. Refused

[SHOW Q20 IF Q9 = 1, 2 or 3]

20. Have you noticed any savings on your electric bill since you made these changes?

[Do Not Read Responses]

1. Yes, my electric bill has decreased
2. No, there does not seem to be a change in my electric bill
3. Not sure or too soon to tell
98. Don't know
99. Refused

Demographic Information [DO NOT DISPLAY]

21. Which of the following best describes your home?

[Read Responses]

1. Single-family home, detached construction
2. Single-family home, factory manufactured/modular
3. Mobile home
4. Row house
5. Two or Three family attached residence
6. Apartment with 4+ families
7. Condominium
97. Other _____ (Specify)
98. Don't know
99. Refused

22. Do you own or rent this residence?

1. Own
2. Rent
98. Don't know
99. Refused

23. Approximately when was your home built?

1. Before 1960
2. 1960-1969
3. 1970-1979
4. 1980-1989
5. 1990-1999
6. 2000-2005
7. 2006 or Later
98. Don't know
99. Refused

24. Would you estimate the above-ground living space is about:

1. Less than 1,000 square feet
2. 1,000-2,000 square feet
3. 2,000-3,000 square feet
4. 3,000-4,000 square feet
5. 4,000-5,000 square feet
6. Greater than 5,000 square feet
98. Don't know
99. Refused

25. How many people are living or staying at this address? Include everyone who is living or staying here for more than 2 months. Include yourself if you are living or staying here for more than 2 months. Include anyone else staying here who does not have another place to stay, even if they are here for less than two months.

Do not include anyone who is living somewhere else for more than two months, such as a college student living away or someone in the Armed Forces on deployment.

1. _____ Record Number [1-97]
98. Don't know
99. Refused

26. What is your approximate total household income?

[Read Responses]

1. Less than \$18,000
2. \$18,000 to less than \$25,000
3. \$25,000 to less than \$31,000
4. \$31,000 to less than \$38,000
5. \$38,000 to less than \$44,000
6. \$44,000 to less than \$51,000
7. \$51,000 to less than \$57,000
8. \$57,000 to less than \$64,000
9. \$64,000 to less than \$70,000
10. \$70,000 to less than \$77,000
11. \$77,000 to less than \$83,000
12. \$83,000 to less than \$90,000
13. \$90,000 or more
98. Don't know
99. Refused

Customer Contact Information [DO NOT DISPLAY]

27. Thank you for your time in answering questions regarding the Online Audits Program in Ohio. We are finished at this time. We would like to provide you with a \$5 gift card of your choice for your participation. To do that, we will need your name and an email address where we can send you a link to your gift card.

1. First Name and Last Name
2. Email Address

You should be receiving an email with the link to your gift card in 10 days or less. If you have any questions regarding this survey or would like to know the status of your gift card, please send an email to adm-surveys2018@admenergy.com. [REPEAT EMAIL ADDRESS] Once again thank you for your participation on behalf of [UTILITY] . Have a great day!

15 Appendix E: Behavioral Survey Instrument

15.1 Behavioral Participant Survey

Survey Variables [DO NOT DISPLAY]

Variable	Definition
CUSTOMER NAME	Name of customer
UTILITY	Name of EDC
EMAIL	Email address
TELEPHONE	10 digit phone number

Email Survey Introduction

Dear [CUSTOMER NAME],

I am contacting you on behalf of [UTILITY]. According to our records, you receive Home Energy Reports that provide information about your home's energy use. We would like to hear about your experience. Please take a few moments to complete the online survey using the password provided below.

If someone else is more knowledgeable about the Home Energy Reports, we ask that you please forward this email to that household member.

Your response will be kept anonymous and will be used to improve the program in the future. A \$5 gift card will be provided as a thank you for your time.

You can access the survey at:

Your password is:

Thank you in advance for your time!

Thank you,

[ADM STAFF Name]

ADM Associates / Contractor to [UTILITY]

Home Energy Reports, Tips Emails, And Website

1. According to our records you have received Home Energy Reports from [UTILITY] with information on your household's energy use and tips on how to save energy.

Do you recall receiving these reports during 2018?

1. Yes
2. No **[TERMINATE SURVEY]**
98. Don't know **[TERMINATE SURVEY]**

[SHOW Q2 IF Q1 = 1]

2. In 2018, about how many reports do you recall receiving?

1. 1
2. 2
3. 3
4. 4
5. Other _____
98. Don't know

[SHOW Q3 IF Q1 = 1]

3. Which of the following best describes how often you read the reports?

1. You have read all or most of them
2. You have read some of them
3. You have not read any of them
98. Don't know

[SHOW Q4 IF Q3 = 1 OR 2]

4. Using the scale below, please indicate how valuable you find the following information provided in the reports. **[SCALE: 1 (Not at all valuable) – 5 (Very valuable), 98 = Don't know]**

- a. The comparison of my household's energy use to similar households
- b. Adjusting thermostat settings for winter and summer months
- c. Appliance rebates
- d. HVAC tune-up rebates
- e. Comprehensive Energy Audit
- f. Energy saving tips/recommendations
- g. Frequently asked questions

[SHOW Q5 IF Q3 = 1 OR 2]

5. How easy or difficult would you say the information in the Home Energy Report was to understand?

1. Very easy
2. Somewhat easy
3. Neither easy nor difficult
4. Somewhat difficult
5. Very Difficult
98. Don't know

[SHOW Q6 IF Q3 = 1 OR 2]

6. How accurate do you think the information on your home energy usage is?

1. Very accurate
2. Somewhat accurate
3. Neither accurate or inaccurate
4. Somewhat inaccurate
5. Very inaccurate
98. Don't know

[SHOW Q7 IF Q3 = 1 OR 2]

7. Do you have any suggestions for improving the Home Energy Report?

1. Open ended: _____

8. In addition to the Home Energy Report, [UTILITY] also sends emails with energy-saving tips. Do you recall receiving these emails?

1. Yes
2. No
98. Don't know

[SHOW Q9 IF Q8 = 1]

9. Which of the following best describes how often you read the tips emails?

1. You have read all or most of them
2. You have read some of them
3. You have not read any of them
98. Don't know

[SHOW Q10 IF Q9 = 1 OR 2]

10. How valuable would you say the energy saving tips emails are? **[SCALE: 1 (Not at all valuable) – 5 (Very valuable), 98 = Don't know]**

11. In addition to the Home Energy Report, you can access your home's energy use information and additional energy savings tips via the program website at energysaveOhio.com. Have you ever visited this website?

1. Yes
2. No
98. Don't know

[SHOW Q12 IF Q11 = 1]

12. Which of the following best describes your experience(s) with the program website? **[Select all that apply]**

1. You logged in to the website with your utility account number and reviewed energy use information and tips that were unique to your home.
2. You have not created an account on the website, but you visited the website site and reviewed the general energy savings tips.
97. Other (Specify)
98. Don't know

[SHOW Q13 IF Q12 = 1]

13. Which of the following best describes how often you log in to the program website to view information on your home's energy use?

1. I've logged in multiple times
2. I've logged in just once
98. Don't know

[SHOW Q14 IF Q12 = 1 OR 2]

14. How valuable would you say the energy-savings tips and information, available on the website, are? **[SCALE: 1 (Not at all valuable) – 5 (Very valuable), 98 = Don't know]**

[SHOW Q15 IF Q9 = 1 OR 2]

15. Have you had any difficulty implementing any of the energy-saving tips or recommendations?

1. Yes
2. No
98. Don't know

[SHOW Q16 IF Q15 = 1]

16. What difficulties have you had?

1. Open ended: _____

[SHOW Q17 IF Q8 = 1 OR Q12 = 1 OR 2]

17. Do you have any suggestions for improving the energy-savings tips and information provided on the program website or via email?

1. Open ended: _____

Energy Efficiency Attitudes, Knowledge, And Intent

18. Overall, on a scale of 1 to 5, where 1 means not at all knowledgeable and 10 means very knowledgeable, how knowledgeable are you about ways to save energy in your home? **[SCALE: 1 (Not at all knowledgeable) – 5 (Very knowledgeable, 98 = DON'T KNOW)]**

19. How would you rate your household's efforts to save energy in your home? Using a scale of 1 to 5, with 1 meaning "you have not done much" and 5 meaning "you have done almost everything you can" to lower your monthly electric bill in your home. **[SCALE: 1 (You have not done much) – 5 (You have done almost everything you can), 98 = DON'T KNOW]**

20. Using the following scale, please rate the extent to which you agree or disagree with the following statements. **[SCALE: 1 = Strongly disagree, 2 = Somewhat disagree, 3 = Neither agree nor disagree, 4 = Somewhat agree, 5 = Strongly agree, 98 = Don't know]**

- a. I understand how my actions affect my energy use
- b. I know of steps I could take to reduce my household energy use
- c. I think that saving energy is important
- d. I am concerned about my household's energy costs
- e. I intend to take steps to reduce my household's energy use in the next six months
- f. I don't think there is anything else I could do to reduce my household's energy use

Energy Efficiency Behaviors

21. In 2018, have you taken any actions to reduce your energy use?

- 1. Yes
- 2. No
- 98. Don't know

[SHOW Q22 IF Q21 = 1]

22. What actions have you taken? **[SCALE: 1 = Have done this, 2 = Have not done this,]**

- a. Cleaned or replaced air conditioner filter
- b. Lowered the winter heating temperature setting on my thermostat (so that the heater ran less)
- c. Increased the summer cooling temperature setting on my thermostat (so that the air conditioner ran less)
- d. Used a ceiling fan instead of my air conditioner to keep cool
- e. Unplugged kitchen appliances when not in use
- f. Cleaned refrigerator coils
- g. Sealed windows or doors to reduce air leakage
- h. Lowered the temperature on the water heater
- i. Closed blinds on windows to reduce heating from the sun
- j. Air dried laundry instead of using the clothes dryer
- k. Fixed leaky faucets
- l. Grilled out instead of using the oven to cook food
- m. Ran the dishwasher with full loads
- n. Took shorter showers
- o. Turned off lights when leaving a room

[SHOW Q23 IF Q21 = 1]

23. Did you take any additional actions not listed?

- 1. Yes
- 2. No

[SHOW Q24 IF Q23 = 1]

24. What additional actions have you taken?

- 1. Open ended: _____

[SHOW Q25 IF Q21 = 1]

25. Thinking about the actions you took to save energy in 2018, how important was the information provided through the Home Energy Reports, tips emails, or program website in your decision to take those actions? **[SCALE: 1 (Not at all important) - 5 (Very important)]**

26. In 2018, have you installed any energy-efficient equipment/appliances or made any energy efficiency improvements?

- 1. Yes
- 2. No
- 98. Don't know

[SHOW Q27 IF Q26 = 1]

27. What energy-efficient equipment or appliances have you installed? **[Select all that apply]**

1. ENERGY STAR clothes dryer
2. ENERGY STAR clothes washer
3. ENERGY STAR refrigerator
4. ENERGY STAR freezer
5. Energy-efficient pool pump (variable or multi-speed)
6. Smart Thermostat (e.g., Nest, Lyric, Ecobee, Sensi)
7. Energy-efficient windows or doors
8. Replaced incandescent light bulbs with LED (light emitting diode) lightbulbs
9. Replaced incandescent light bulbs CFL (compact fluorescent) lightbulbs
10. Low flow faucet aerators or showerheads
11. ENERGY STAR heat pump water heater
12. ENERGY STAR dehumidifier
13. ENERGY STAR computer or computer monitor
14. ENERGY STAR scanner or printer
15. ENERGY STAR television
97. Other (Specify)

[SHOW Q28 IF Q27 = 1, 2, OR 3] [REPEATED FOR EACH 1,2, or 3 selected]

28. Did you apply for a rebate from [UTILITY] for the [ANSWER Q27]?

1. Yes
2. No
98. Don't know

[SHOW Q29 IF Q28 = 2]

29. Why did you not apply for or receive a rebate for that equipment?

1. I was not aware rebates were available
2. The rebate amount was too low
3. I forgot
4. Other (Specify)
98. Don't know

[SHOW Q30 IF Q26 = 1]

30. Thinking about the energy-efficient equipment you installed in 2018, how important was the information provided through the home energy reports, tips emails or program website in your decision to install that equipment? **[SCALE: 1 (Not at all important) – 5 (Very important)]**

AWARENESS OF HOME ENERGY ADVISOR AND REBATES

31. Prior to this survey, were you aware that [UTILITY] provided an online tool called the Home Energy Analyzer to help customers understand and manage their household energy use? Keep in mind this is different from the program website.

- 1. Yes
- 2. No
- 98. Don't know

[SHOW Q32 IF Q31 = 1]

32. How did you learn of the Home Energy Analyzer online tool?

- 1. [UTILITY] email
- 2. Found it while browsing [UTILITY] website
- 3. Friend, family, or colleague
- 4. Other (Specify)
- 98. Don't know

[SHOW Q33 IF Q31 = 1]

33. Have you logged onto the Home Energy Analyzer online tool in the past six months?

- 1. Yes
- 2. No
- 98. Don't know

34. Prior to this survey, were you aware that [UTILITY] offers discounts and rebates on energy-efficient equipment for your home?

- 1. Yes
- 2. No
- 98. Don't know

[SHOW Q35 IF Q34 = 1]

35. Which of the following types of energy-efficient equipment rebates or discounts were you aware of? **[Select all that apply]**

1. LED lightbulbs discounts at select area retailers
2. ENERGY STAR clothes washers and dryers
3. ENERGY STAR refrigerator and freezer
4. Smart Thermostat (e.g., Nest, Lyric, Ecobee, Sensi)
5. ENERGY STAR certified dehumidifier
6. ENERGY STAR certified computer or computer monitor
7. ENERGY STAR certified scanner or printer
8. ENERGY STAR certified television
9. Not aware of any rebates or discounts
10. Another [UTILITY] rebate or discount (Please describe)

36. How did you learn of the rebates and discounts that [UTILITY] provides? **[Select all that apply]**

1. Home Energy Report
2. Email from [UTILITY]
3. Internet search
4. [UTILITY] website
5. Print advertisement
6. Service provider or contractor
7. Friend, family, or colleague
8. Recorded phone message
97. Other (Specify)
98. Don't know

Satisfaction

37. Using the scale below, how satisfied or dissatisfied are you with the following:
[SCALE: 1 = Very dissatisfied, 2 = Somewhat dissatisfied, 3 = Neither satisfied nor dissatisfied, 4 = Somewhat satisfied, 5 = Very satisfied, 98 = Don't know]

- a. The information provided through the Home Energy Report
- b. The information provided through the program website and energy savings tips emails

[SHOW Q38 IF ANY IN Q37= 1 OR 2]

38. Why are you dissatisfied?

2. Open ended: _____

Home Characteristics

A few questions about your home and income level follow. These are anonymous and will be used solely for the purpose of combining different customers' responses. You can choose to not answer any of these questions.

39. What type of fuel is used to heat water for your home?

- 1. Natural gas
- 2. Electricity
- 3. Propane
- 4. Other (Specify)
- 98. Don't know

40. What type of fuel is used to heat your home?

- 1. Natural gas
- 2. Electricity
- 3. Propane
- 4. Other (Specify)
- 98. Don't know

41. What is the approximate square footage of the living space of your home? Your best guess is ok.

- 1. _____ square feet
- 98. Don't know

42. Including yourself, how many people currently live in your home year-round?

- 1. _____ people
- 98. Don't know

43. How many people are living or staying at this address? Include everyone who is living or staying here for more than 2 months. Include yourself if you are living or staying here for more than 2 months. Include anyone else staying here who does not have another place to stay, even if they are here for less than two months.

Do not include anyone who is living somewhere else for more than two months, such as a college student living away or someone in the Armed Forces on deployment.

1. _____ **[Record Number (1-97)]**

98. Don't know

99. Refused

44. What is your approximate total household income? **[READ CATEGORIES]**

1. Less than \$18,000

2. \$18,000 to less than \$25,000

3. \$25,000 to less than \$31,000

4. \$31,000 to less than \$38,000

5. \$38,000 to less than \$44,000

6. \$44,000 to less than \$51,000

7. \$51,000 to less than \$57,000

8. \$57,000 to less than \$64,000

9. \$64,000 to less than \$70,000

10. \$70,000 to less than \$77,000

11. \$77,000 to less than \$83,000

12. \$83,000 to less than \$90,000

13. \$90,000 or more

98. Don't know

99. Refused

45. Do you have any other comments you would like to provide about your experience with this program, or energy efficiency in general?

3. Open ended: _____

Customer Contact Information [DO NOT DISPLAY]

Thank you for your time in answering questions regarding the Home Energy Reports Program in Ohio. We are finished at this time. We would like to provide you a \$5 gift card of your choice for your participation. To do that, we will need your name and an email address where we can send you a link to your gift card.

1. First Name and Last Name

2. Email Address:

You should be receiving an email with the link to your gift card in 10 days or less. If you have any questions regarding this survey or would like to know the status of your gift card, please send an email to adm-surveys2018@admenergy.com. Once again thank you for your participation on behalf of [UTILITY] . Have a great day!