2013 Portfolio Status Report of the Energy Efficiency and Peak Demand Response Programs

VOLUME II

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APPENDIX F

COMMUNITY ASSISTANCE PROGRAM: Program Year 2013 Evaluation Report

Prepared for: AEP Ohio



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Confidential and Proprietary Community Assistance Program Program Year 2013 Evaluation Report

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Executive Summary

This document presents a summary of the findings and results from the evaluation of the Community Assistance Program (CAP) implemented by AEP Ohio for the program year January 1, 2013 through December 31, 2013. The objectives of the evaluation are to quantify the energy and demand savings impacts of the program and to provide valuable feedback to AEP Ohio on program effectiveness. Detailed methodology and findings are described in the body of the report following the Executive Summary.

Program Description

The Community Assistance Program's primary objective is to reduce energy use for residential lowincome customers by installing a range of cost-effective weatherization upgrades and energy efficiency measures in eligible dwellings. The program is administered by an implementation contractor, Ohio Partners for Affordable Energy (OPAE), through a network of local community-based agencies, in coordination with AEP Ohio. Eligible participants include AEP Ohio customers with a total annual household income at or below 200 percent of federal poverty guidelines.

Key Impact Findings and Recommendations

Navigant used engineering algorithms to verify the energy and demand savings for the Community Assistance Program. The program reported *ex ante* 16,743 MWh of energy savings and 1.46 MW of demand savings in 2013. The verified (*ex post*) energy and demand savings for 2013 were 14,799 MWh and 1.27 MW. *Ex post* energy and demand savings (MWh) exceeded program energy savings goals of 12,390 MWh and 1.23 MW, as shown in Table ES-1. The realization rates were 88 percent for MWh and 86 percent for peak kW.

	2013 Program Goals	<i>Ex-Ante</i> Savings (a)	<i>Ex-Post</i> Savings (b)	Realization Rate RR = (b) / (a)	Percent of Goal
Energy Savings (MWh)	12,390	16,743	14,799	88%	119%
Demand Savings (MW)	1.23	1.47	1.27	86%	103%

Table ES-1. Savings Estimates for 2013 Community Assistance Program

In 2013, the average number of CFLs installed in participating homes was over 18. The on-site visits verified that the bulbs are being placed in what are deemed¹ to be high use areas as discussed in more detail below.

» **Impact Recommendation #1:** AEP Ohio should work with OPAE to develop a protocol for CFL installation that directs that CFLs be installed in areas where the occupant claims it is a high use area, which is likely to be more accurate than the deemed high use area.

¹ http://www.drmediaserver.com/CFLGuide/index.html

AEP Oho uses deemed per-unit average values in the TRM saving algorithms. The tracking system can hold more detailed measure information that would allow a more accurate estimate of savings than using average values. However, many of the more detailed measure fields in the tracking system are often empty or have incorrect data.

» **Impact Recommendation #2:** Program staff should improve the quality of the data in the tracking system and then use the measure details from the tracking system to estimate savings.

Key Process Findings and Recommendations

The objectives of the process evaluation were to develop an understanding of the final program design and implementation strategies, as well as to document program processes and tracking efforts, and to identify and recommend potential program improvements. The data collection approach for the process evaluation was in-depth interviews with AEP Ohio program staff, the program administrator, program implementers, and community based agencies. On-site visits gathered information on the community based agencies' performance.

This was the first full year that the new online tracking system was used. There is an extensive amount of useful information that is gathered in the tracking system. Many of the fields were left empty or entered incorrectly.

» Process Recommendation #1: Due to the newness of the tracking system and the amount of data gathered, it may require multiple data entry instruction sessions for all parties to become proficient in using the system. OPAE should follow-up with the community-based agencies on correct data entry methods. Data entry instructions for 2014 should be modified to focus on data entry areas where common problems were found, such as missing information in certain fields.

The majority of the installed CFLs are being installed in high use areas. However, Navigant's on-site visits have found that some CFLs provided through the program are not installed and are in boxes. It is likely that the CFLs are in boxes either due to participants removing these or the community-based agencies leaving these with the participant to install at a later date.

- » **Process Recommendation #2:** To address the issues of participants removing installed CFLs and agencies leaving blubs with the participant, several actions can be taken.
 - 1) Follow the ENERGY STAR guidelines for installing the CFLs in the proper location for occupant satisfaction.²
 - 2) Educate the participant about the energy savings of a CFL.³
 - 3) Ask the participant if they want the CFLs.

² http://www.drmediaserver.com/CFLGuide/index.html

³ https://www.energystar.gov/index.cfm?c=cfls.pr_cfls_savings

4) For those CFLs that are not being installed by the community-based agencies, OPAE should remind the agencies that this is a direct install program where all bulbs claimed must be installed in the participant's home.

The majority of CFLs distributed by CAP are being installed in high use areas as designated by the Department of Energy.⁴ Some CFLs are being installed in rooms that are not designated as high use areas by the Department of Energy, but still could be high use areas.

» Process Recommendation #3: The community-based agencies should continue to use a combination of their judgment and the occupants input to decide if an area is high use and warrants a CFL replacement.

The community-based agencies expressed apprehension over the revised cost per kWh savings threshold that is being implemented for the 2014 program year. The community-based agencies are unsure that they will be able to meet the new targets.

» **Process Recommendation** #4: Continue to monitor the cost per kWh savings threshold to ensure that it is a reasonable goal that will encourage a successful program.

⁴ http://www.energystar.gov/ia/partners/manuf_res/CFL_PRG_FINAL.pdf

1. Program Description

1.1 Program Overview and Description

The Community Assistance Program (CAP) launched in mid-year 2010 and is administered by an implementation contractor, Ohio Partners for Affordable Energy (OPAE), through a network of local community-based agencies, in coordination with AEP Ohio. Eligible participants must have a total annual household income at or below 200 percent of federal poverty guidelines, and be the customer of record for AEP Ohio. The program objective is to reduce energy use for residential low-income customers by installing a range of cost-effective weatherization upgrades and energy efficiency measures in eligible dwellings.

The two major objectives of the evaluation were to: (1) quantify energy and demand savings impacts from the program, and (2) determine key process-related program strengths and weaknesses and identify ways in which the program can be improved. Navigant conducted the following activities to collect the information necessary to achieve these evaluation objectives:

- 1. A program documentation review
- 2. In-depth interviews with AEP Ohio staff
- 3. In-depth interviews with OPAE and agencies
- 4. Tracking system review
- 5. On-site verification of installed measures, quantities, and other parameters critical to estimating energy and demand savings for a sample of 70 participants
- 6. Billing Analysis

1.1.1 Implementation Strategy

The overall implementation strategy for this program is to provide funding to the implementation contractor to target weatherization services and energy efficient measure installations in the low-income sector.

1.1.2 Role of AEP Ohio Employees

The AEP Ohio **employee** most involved in the administration of CAP is the CAP Program Manager. The AEP Ohio CAP Program Manager is responsible for day-to-day program management responsibilities for the utility, including communication with the program implementer. The role of the Program Manager has not changed significantly over the course of 2013.

1.1.3 Roles of the Implementation Contractor

AEP Ohio has contracted with Ohio Partners for Affordable Energy (OPAE) to deliver the Community Assistance Program. OPAE has partnered with numerous local community-based action agencies to conduct weatherization services and energy efficient measure installations. Most of the agencies receive

their training from the Ohio Weatherization Training Center. OPAE monitors the agencies' compliance with insurance liability and compliance with federal law.

1.1.4 Measures and Incentives

The program objective is to reduce energy use for residential low-income customers by installing a range of cost-effective weatherization upgrades and energy efficiency measures in eligible dwellings. CAP provides direct installation services of numerous measures. Each of the over 30 community-based agencies may employ a different approach to deliver the program, which can influence the measures installed.

1.2 Evaluation Objectives

This evaluation report covers the CAP element of the AEP Ohio's residential energy efficiency and peak demand reduction (EE/PDR) portfolio. The goals of the program evaluation are to analyze the energy and demand savings (impacts) claimed by the program and to review program processes to ensure that the program is reaching the intended audience with quality and consistently delivered service.

1.2.1. Research Questions

This evaluation sought to answer the following key research questions.

1.2.2. Impact Questions

- 1. Were the impacts reported by the program achieved?
- 2. What were the realization rates? (Defined as evaluation *ex post* savings divided by program-reported (*ex ante*) savings.)
- 3. What are the benefits and costs and cost effectiveness of this program?

The 2013 evaluation provides AEP Ohio with combined quantitative results for these impact questions.

1.2.3. Process Questions

- 1. Is the program administration running as expected?
- 2. Are there any problems with delivery?
- 3. Are program tracking systems adequate? Are they consistently maintained? Do they contain all data required to support program tracking and evaluation?
- 4. How can the program be improved?

2. Evaluation Methods

This section describes the analytic methods and data collection activities implemented as part of the 2013 evaluation of CAP, including the data sources and sample designs used as the foundation for the data collection activities and analysis.

2.1 Overview of Approach

To meet the objectives of this evaluation, Navigant undertook the following activities:

- 1. **Development of Evaluation Questions.** Key evaluation questions were established from the development of the 2013 evaluation plan with AEP Ohio and a review of the key outcomes of the 2012 program evaluation.
- 2. Tracking Data Review. The program tracking data collected by OPAE were reviewed.
- 3. **Primary Data Collection.** Three primary data collection efforts were conducted in support of this evaluation: 1) in-depth interviews with program staff, 2) on-site field verification surveys, and 3) community-based agency telephone surveys.
- 4. **Methods Used to Analyze Impact Data.** Program savings were audited using the AEP Ohio program tracking data, the participant surveys and the Draft Ohio TRM. A review of program algorithms and the tracking system were completed to verify measure eligibility and determine the correct application of demand savings. A billing analysis was also conducted to estimate the energy savings of CAP (these results are in the appendices).
- 5. **Methods Used to Analyze Process Data.** The effectiveness of the program processes was assessed by analyzing program tracking data, and in-depth interview data.

Table 2-1 summarizes data collection activities, along with the details regarding the sampling and timing.

Data Collection Type	Targeted Population	Sample Frame	Sample Design	Sample Size	Timing
Tracking Data Analysis	All Program Participants	Tracking Database	-	All	February 2014
In-depth Telephone Interview	AEP Ohio Program Coordinator	Contact from AEP Ohio	Program Coordinator	1	March 2014
In-depth Telephone Interview	Implementation Contractor	Contact from OPAE	Program Implementer	1	March 2014
On-Site Field Surveys	Program Participants	Tracking Database	Random Sample of Program Participants	66	February 2014
Community-Based Agencies Telephone Surveys	Program Participants	Tracking Database	Random Sample of Program Participants	6	January 2014

Table 2-1. Summary of Data Collection Activities

2.2 On-Site Verifications

Navigant conducted on-site field verification visits in a sample of 66 projects during the month of February 2014. The on-site survey sample is a stratified random sample from the population of program participants in the 2013 tracking database at the site-level. The sample targets confidence and precision of 90%/10% and was stratified to ensure that the sample properly reflects the true population's impacts and installation rates.

Once on site, Navigant field technicians toured the home to inspect and record the type and quantity of measures installed and compared these against the corresponding information in the program tracking database, which informed the evaluation's installation rate. Where discrepancies were identified in the type or quantity of measures, the field engineer attempted to gather information from the participant regarding the reason(s) for such discrepancies. Information gathered on site was recorded for subsequent analysis and reporting.

2.3 Tracking System Review

The evaluation team performed an independent verification of the program tracking database to determine the appropriate level of input and the existence of outliers, missing values, and potentially missing variables. The purpose of the tracking system review was to ensure these systems gathered the data required to support future evaluations and to allow program managers to monitor key aspects of program performance at regular intervals.

2.4 Engineering Algorithm Review

Navigant conducted a review of measure savings algorithms and underlying assumptions for each measure compared to Draft Ohio TRM algorithms⁵. Navigant also recalculated energy and demand savings for each measure in the tracking database to ensure that the algorithms were applied correctly.

2.5 Billing Analysis

The evaluation team also implemented a billing analysis of CAP, which is discussed in detail in Appendix A.

2.6 Program Management Interviews

Table 2-2 lists the data collection activities conducted for the evaluation. In-depth interviews with program staff members were conducted by telephone in March 2014. Each interview lasted approximately an hour and covered program design and implementation.

Data Collection Type	Targeted Population	Sample Frame	Sample Design	Sample Size	Timing
In-Depth Telephone Interviews	AEP Ohio Program Staff	Contacts from AEP Ohio	CAP Program Manager	1	March 2014
	Staff of Program Implementer	Contact from OPAE	Program Manager	1	March 2014

Table 2-2. Data Collection Activities

The questions were primarily focused on these topics:

- » Program Goals and Objectives
- » Program Design and Participation
- » Program Tracking
- » Quality Assurance and Quality Control (QA/QC)
- » Staffing and Communication

Consistent with standard market research procedure, the confidentiality of each person interviewed was guaranteed, and comments are not attributed to any one individual; rather the evaluation focuses on trends and issues that arose from a variety of perspectives.

⁵ State of Ohio Energy Efficiency Technical Reference Manual 2010, accessed at: http://amppartners.org/pdf/TRM_Appendix_E_2011.pdf.

2.7 Community-Based Agency Interviews

In-depth interviews were conducted with six participating community based agencies to engage those most intimately involved with the delivery of CAP. The final list of interview candidates was developed based on a review of the program database. The key objectives of the interviews were to develop an understanding of the community-based agencies' perspectives on the market in which the program operates and to gather feedback on the program structure and processes. Community-based agency interviews were conducted via telephone. The majority of questions were opened ended to facilitate open discussion of the topics.

2.8 Program Material Review

Navigant reviewed all program materials provided by AEP Ohio to date and conducted a review of best practices for implementing residential low income programs. A summary list of program materials reviewed to date for this report follows:

- » Program tracking data
- » Program impact algorithms and assumptions
- » Program implementation plans

3. Program Level Results

3.1 Impact Evaluation

This section provides a detailed description of audited impact findings for the 2013 CAP.

3.1.1 Program Impact Results

Navigant used engineering algorithms to verify energy and demand savings for the Community Assistance Program. The results were applied to all projects in the database to determine program total *ex-post* savings.

Table 3-1 shows the program goals, *ex ante* and *ex post* savings estimates for energy and peak demand savings, as well as the realization rates for the 2013 Community Assistance Program. Navigant used engineering algorithms to calculate the energy and demand savings. CAP reported *ex ante* 16,743 MWh of energy savings and 1.47 MW of demand savings in 2013. The verified (*ex post*) energy and demand savings for 2013 were 14,799 MWh and 1.27 MW. *Ex post* energy and demand savings (MWh) exceeded program energy savings goals of 12,930 MWh and 1.23 MW, as shown in Table 3-1. The realization rates were 88 percent for MWh and 86 percent for peak kW.

Table 3-1. Savings Estimates for 2013 Community Assistance Program

	2013 Program Goals	<i>Ex-Ante</i> Savings (a)	<i>Ex-Post</i> Savings (b)	Realization Rate RR = (b) / (a)	Percent of Goal
Energy Savings (MWh)	12,390	16,743	14,799	88%	119%
Demand Savings (MW)	1.23	1.47	1.27	86%	103%

Program Goals from: AEP Ohio Volume 1: 2012 to 2014 Energy Efficiency/Peak Demand Reduction (EE/PDR) Action Plan, November 29, 2011.

3.1.7 Audited Savings Evaluation (Algorithm Review)

Navigant conducted a review of measure savings recorded in the tracking system to verify that the algorithms matched the Draft Ohio TRM and were correctly applied for each project. The evaluation team independently calculated energy savings for each measure in the database using the *ex ante* calculation methods based on the Draft Ohio TRM.

Navigant's algorithm review found that the energy and demand savings algorithms have been constructed properly. Navigant's algorithm review found that in most cases, the tracking system was using the average deemed value for per unit savings, rather than using the Draft Ohio TRM equation that uses several of the different fields in the tracking system to calculate the savings. AEP Ohio's use of average deemed values is reasonable at this time since many of the detailed measure fields in the tracking system were empty or had erroneous data.

3.1.3 Tracking Systems

Program year 2013 was the first full year that the new online tracking system was used for CAP. The new database tracking format is a significant improvement over previous tracking databases, both in terms of format and content. The tracking system is well designed to capture the necessary parameters for an accurate savings estimate. However, the process of correcting inaccurate entries by adding a subsequent entry with a negative quantity has created issues with the tracking data. Ideally, there would only be one record for each job in the tracking data to avoid errors in the timing of a measure's installation of the quantity of a measure installed.

3.1.5 Measure In-Service Rates

The evaluation team conducted 66 on-site visits to participant's homes to verify if the measures were installed as claimed in the tracking database. Table 3-2 displays the in-service rates per measure verified by the evaluation team's on-site visits. Except for CFLs, all the in-service rates improved upon or stayed at 100 percent compared to program year 2012. OPAE stated during the in-depth telephone interview that they stressed proper installation in meetings with the community-based agencies. The EM&V team calculated verified savings using the installation rates found in the on-sites. During the in-depth interviews, the agencies confirmed that OPAE reiterated proper installation methods.

Measure	Number of Claimed Units	Number of Verified Installed Units	Installation Rate
CFLs	1,201	950	79%
Low-Flow Showerhead	24	24	100%
Faucet Aerator	44	29	66%
Refrigerators	30	28	93%
Freezer	12	12	100%
Hot Water heater wrap	3	3	100%

Table 3-2. On-Site Verified Measure Installation Rates

3.1.6 Per-measure Savings

The evaluation team adjusted AEP Ohio's energy and demand savings estimates based on the installation rates per measure from the on-site verification visits. Table 3-3 presents the energy and demand savings for each measure.

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Measure	<i>Ex-Ante</i> number of units	<i>Ex-Post</i> number of units ^(a)	Total <i>Ex-Ante</i> Energy Savings (MWh)	Total <i>Ex-Post</i> Energy Savings (MWh)	Total <i>Ex-Ante</i> Demand Savings (MW)	Total <i>Ex-Post</i> Demand Savings (MW)	Realization Rate ^(b)
Air Sealing (per home retrofitted)	220	220	365	365	0.005	0.005	1.00
Attic insulation (per home retrofitted)	187	187	10	10	0.025	0.025	1.00
CFLs	170,973	135,069	6,721	5,310	0.782	0.618	0.79
Duct Sealing (per home retrofitted)	55	55	8	8	0.007	0.007	1.00
Faucet Aerators	3,529	2,329	97	64	0.012	0.008	0.66
Freezer Replacement	1,639	1,639	1,713	1,713	0.029	0.029	1.00
Freezer retirement	19	19	24	24	0.004	0.004	1.00
Heat Pump	19	19	4	4	0.002	0.002	1.00
Pipe Insulation (per ft of pipe wrap)	4,454	4,454	71	71	0.008	0.008	1.00
Refrigerator Replacement	7,332	7,332	7,156	6,655	0.477	0.444	0.93
Refrigerator Retirement	21	21	29	29	0.004	0.004	1.00
Low- Flow Showerhead	2,747	2,747	160	160	0.074	0.074	1.00
Wall Insulation (per _home retrofitted)	41	41	3	3	0.003	0.003	1.00
Water Heater replacement	55	55	19	19	0.001	0.001	1.00
Water Heater Wrap	278	278	21	21	0.002	0.002	1.00
Smart Strips	3,271	3,271	268	268	0	0	1.00
Central Air Conditioner	1	1	0	0	0.000	0.000	1.00
Duct insulation	12	12	1	1	0.001	0.001	1.00
Foundation insulation	45	45	3	3	0.002	0.002	1.00
Mobile Home shell improvement	442	442	32	32	0.029	0.029	1.00
Water Heater _temperature setback	63	63	9	9	0	0	1.00
Remove space heater	20	20	29	29	0	0	1.00
Sump pump replacement	4	4	1	1	0	0	1.00
Replace well pump	2	2	0	0	0	0	1.00
TOTAL			16,743	14,799	1.467	1.266	

Table 3-3. Audited Savings Totals by Measure

^(a)The Number of Audited Units column reflects the measure in-service rates from Navigant's on-site visits. ^(b)Realization Rates are the same for energy and demand savings as they are due to measure in-service rates.

Figure 3-1and Figure 3-2 are graphic representations of the energy and demand savings by measure for CAP.







Figure 3-2. Percentage of Demand Savings by Measure

3.2 Process Evaluation

The purpose of the process evaluation is to identify possible program improvements in the administration of the program by AEP Ohio, OPAE, and community based agencies.

3.2.1 Community-Based Agency Satisfaction and Input

A Navigant team member attended the OPAE annual conference where many of the community-based agencies have representative that attend the event. Also, six CAP community based agencies conducted an in-depth phone interviews with a Navigant staff member. Navigant took these opportunities to investigate the satisfaction and concerns of the community-based agencies.

Community-based agency satisfaction is very high with CAP. In 2012, the program transitioned to an online data entry system. From Navigant's telephone interviews the data entry system has been well received by the community-based agencies. The agencies frequently express the desire to have one common data entry system for all the programs they are enrolled in. The agencies typically work with several different programs at the federal, state and utility level. Most of these programs have different data entry systems which the agencies find cumbersome. Due to the different entities implementing different programs it is unlikely that a common data entry system will emerge in the near future.

Community-based agencies expressed high satisfaction with CAP during the in-depth phone interviews; specifically satisfaction was high regarding AEP Ohio's ability to complete application payments in a timely manner.

Navigant also conducted telephone interviews with community-based agencies in 2012. During those interviews the agencies had expressed initially being anxious about the 70 cents per kWh threshold. At the time of the 2012 interviews, the agencies had been implementing the new cost per kWh for several months and had found that they could meet the target. During the telephone interviews for program year 2013, the agencies expressed apprehension over the new cost per kWh hour that is being implemented for the 2014 program year. The agencies voiced concerns about being able to meet the new targets.

3.2.2 CFL Quantities and Location

In 2013, the average number of CFLs installed in participating homes was over 18. Navigant on-site visits verified that the bulbs are being placed in what are deemed to be high use areas as discussed in more detail below. However, it is unlikely that the high quantities of bulbs being installed in homes are all high use bulbs.

Navigant's on-site visits also documented the location of the installed CFLs to ensure the blubs were being installed in high use areas. Overall, the majority of the CFLs are being installed in rooms that are designated as high use areas by the Department of Energy. Seventy-four percent of the claimed installed bulbs were found in high use areas kitchens, living rooms, bedrooms, bathrooms, and outdoors, as designated in blue in Figure 3-3. However, a number of light bulbs are still being found in not installed and in boxes at the participant's home. This may be due to be a combination of participants removing the bulbs and the community-based agencies leaving bulbs for the participants to install when their current bulbs fail.

The other locations where the CFLs are being installed may be high use areas for the home, depending on the layout of the home and function of the room. Halls and dining rooms can have high use bulbs depending on where the occupant spends a majority of their time. If the basement has an occupied room that could also be a high use area.



Figure 3-3. CFL Location

Cost Effectiveness Review

This section addresses the cost effectiveness of the Community Assistance Program. Cost effectiveness is assessed through the use of the Total Resource Cost (TRC) test. Table 3-5 summarizes the unique inputs used in the TRC test.

Table 3-5. Inputs to Cost-Effectiveness	Model for AEP O	hio CAP Program
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Item	
Measure Life	13
Households	11,453
Ex-post Annual Energy Savings (MWh)	16,083
Ex-post Coincident Peak Savings (MW)	1,470
Third Party Implementation Costs	1,919,749
Utility Administration Costs	1,148,213
Utility Incentive Costs	9,671,513
Participant Contribution to Incremental Measure Cost (Cost of efficiency measures – incentive payment)	0

Based on these inputs, the TRC ratio is 0.6. Therefore, the program does not pass the TRC test. Table 3-6 summarizes the results of the cost-effectiveness tests. Results are presented for the Total Resource Cost test, the Ratepayer Impact Measure Test, and the Utility Cost Test.

Tabl	e 3-6.	Cost	Effecti	veness	Results	for	the	CAP	Prog	gram

Test Results for NRNC	Benefit/Cost Ratio
Total Resource Cost	0.6
Participant Cost Test	N/A
Ratepayer Impact Measure	0.3
Utility Cost Test	0.6

At this time, additional benefits related to reduction of greenhouse gas emissions have not been quantified in the calculation of the TRC. These additional benefits would increase the given TRC benefit/cost ratio.

4. Conclusions and Recommendations

4.1 Key Impact Findings and Recommendations

Navigant used engineering algorithms to verify the energy and demand savings for the Community Assistance Program. The program reported *ex ante* 16,743 MWh of energy savings and 1.46 MW of demand savings in 2013. The verified (*ex post*) energy and demand savings for 2013 were 14,799 MWh and 1.27 MW. *Ex post* energy and demand savings (MWh) exceeded the program energy savings goals of 12,390 MWh and 1.23 MW, as shown in Table 4-1. The realization rates were 88 percent for MWh and 86 percent for peak kW.

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Table 4-1. Savings Estimates for 2013 Community Assistance Program

In 2013, the average number of CFLs installed in participating homes was over 18. Our on-site visits verified that the bulbs are being place in what are deemed to be high use areas as discussed in more detail below. However, it is unlikely that the high quantities of bulbs being installed in homes are all high use bulbs.

» **Impact Recommendation #1:** AEP Ohio should work with OPAE to develop a protocol for CFL installation that directs that CFLs be installed in areas where the participant claims it is a high use area.

AEP Oho uses deemed per-unit average values in the TRM saving algorithms. The tracking system can hold more detailed measure information that would allow a more accurate estimate of savings than using average values. . However, many of the more detailed measure fields in the tracking system are often empty or have incorrect data.

» **Impact Recommendation #2:** Program staff should improve the quality of the data in the tracking system and then use the measure details from the tracking system to estimate savings.

4.2 Key Process Findings and Recommendations

The objectives of the process evaluation were to develop an understanding of the final program design and implementation strategies, as well as to document program processes and tracking efforts, and to identify and recommend potential program improvements. The data collection approach for the process evaluation was in-depth interviews with AEP Ohio program staff, the program administrator, program implementers, and community based agencies. On-site visits gathered information on the community based agencies' performance.

This was the first full year that the new online tracking system was used. There is an extensive amount of useful information that is gathered in the tracking system. Many of the fields were left empty or entered incorrectly.

Process Recommendation #1: Due to the newness of the tracking system and the amount of data gathered, it may require multiple data entry instruction sessions for all parties to become proficient in using the system. OPAE should follow-up with the community-based agencies on correct data entry methods. Data entry instructions for 2014 should be modified to focus on data entry areas where common problems were found, such as missing information in certain fields.

The majority of the installed CFLs are being installed in high use areas. However, Navigant's on-site visits have found that some CFLs provided through the program are not installed and are in boxes. It is likely that the CFLs are in boxes are due to participants removing these and the community-based agencies leaving these with the participant to install at a later date.

- » **Process Recommendation #2:** To address the issues of participants removing installed CFLs and agencies leaving blubs with the participant, several actions can be taken.
 - 5) Follow the ENERGY STAR guidelines for installing the CFLs in the proper location for occupant satisfaction.⁶
 - 6) Educate the participant about the energy savings of a CFL.⁷
 - 7) Ask the participant if they want the CFLs.
 - 8) For those CFLs that are not being installed by the community-based agencies, OPAE should remind the agencies that this is a direct install program where all bulbs claimed must be installed in the participant's home.

The majority of CFLs distributed by CAP are being installed in high use areas as designated by the Department of Energy.⁸ Some CFLs are being installed in rooms that are not designated as high use areas by the Department of Energy, but still could be high use areas.

» Process Recommendation #3: The community-based agencies should continue to use a combination of their judgment and the occupants input to decide if an area is high use and warrants a CFL replacement.

The community-based agencies expressed apprehension over the revised cost per kWh savings threshold that is being implemented for the 2014 program year. The community-based agencies are unsure that they will be able to meet the new targets.

» **Process Recommendation** #4: Continue to monitor the cost per kWh savings threshold to ensure that it is a reasonable goal that will encourage a successful program.

⁶ http://www.drmediaserver.com/CFLGuide/index.html

⁷ https://www.energystar.gov/index.cfm?c=cfls.pr_cfls_savings

⁸ http://www.energystar.gov/ia/partners/manuf_res/CFL_PRG_FINAL.pdf

Appendix A. Billing Analysis

Appendix A describes additional details of the billing analysis for the 2013 evaluation of the AEP Ohio Community Assistance Program.

Based on a billing analysis, the evaluation team estimates an energy realization rate of 29 percent. That is, *ex post* savings are equal to 29 percent of *ex ante* savings reported in the tracking database. The 90% confidence interval around this estimate is 25 to 34 percent. This corresponds to average annual savings of 729 kWh per participant, representing a 5.1 percent reduction in participant energy usage due to the Community Assistance Program. The 90% confidence interval around this estimate is 618 kWh to 840 kWh per account, with a relative precision of 15%. The relative precision reflects variation in the billing data. The regression model includes all participants with viable data. A larger program population or longer post-program period would likely reduce (tighten) the relative precision.

A.1 Billing analysis results

The evaluation team conducted a regression analysis using monthly billing data from 18,372 participants, including 6,192 in 2011, 5,762 in 2012, and 6,418 in 2013. The regression model takes advantage of the differential timing of program enrollment to identify program savings. The model essentially takes the perspective that the best comparison group for participants consists of those customers that enroll in the program in a later period. Pre- and post-installation periods are determined on a project-by-project basis. The use of a fixed effects modeling approach accounts for customer-specific characteristics that do not change over time, such as square footage of the home.

The evaluation team estimates a realization rate of 29 percent. That is, *ex post* savings are equal to 29 percent of *ex ante* savings reported in the tracking database. The 90% confidence interval around this estimate is 25 to 34 percent. This corresponds to average annual program savings of 729 kWh per participant, representing a 5.1 percent reduction in participant energy usage due to the Community Assistance Program. The 90% confidence interval around this estimate is 618 kWh to 840 kWh per account, with a relative precision of 15%. The relative precision reflects variation in the billing data. The regression model includes all participants with viable data. A larger program population or longer post-program period would likely reduce (tighten) the relative precision.

Navigant was unable to estimate a Statistically Adjusted Engineering (SAE) regression model as stated in the 2013 evaluation plan, due to limited post-installation billing data for customers with *ex ante* savings estimates in the tracking data. The SAE regression model requires *ex ante* savings estimates for each participant and 12 months of post-installation billing data. This information was available only for participants that enrolled in the second half of 2012. Using customers from 2013 in an SAE model would result in inaccurate impact estimates due to the fact that the *ex ante* savings estimates are annual savings that are not attributed to the months corresponding to the available post-install billing data. The impact estimates of a SAE model would significantly underestimate the impacts if the 2013 customers were included in the model. Therefore, only customers from late 2012 could be used for a SAE model and there is not sufficient information to estimate a SAE model with only those customers.

A.2 Tracking Data

The evaluation team utilized the 2011, 2012, and 2013 tracking databases provided by AEP Ohio staff. Several years of participant data were used for pre and post energy usage comparison and to construct comparison groups for the regression analysis. The 2011 and early 2012 tracking data were provided in the form of monthly spreadsheets for each community based agency. The late 2012 and 2013 tracking data were provided in SAS datasets. The new tracking database format (corresponding to the late 2012 and 2013 tracking data) is a significant improvement over previous tracking databases, both in terms of format and content. Key data fields in the late 2012 and 2013 tracking database included the account number (used to merge the billing and tracking data), dates indicating when the work was being done (home audit completion date and job finished date), and measure category and code. Additional fields present in the late 2012 and 2013 tracking database (estimated kW and kWh savings) could be used in estimating a Statistically Adjusted Engineering analysis. The 2011 and early 2012 databases lacked dates indicating when the work was being done, a consistent measure description field, and *ex ante* savings estimates.

A.3 Billing Data

The evaluation team utilized monthly billing data for the regression analysis, provided by AEP Ohio staff in SAS format. The data included monthly billing data spanning January 2009 through January 2014 for 2011, 2012, and 2013 participants. Key data fields included the account number (used to merge the billing and tracking data), weather station, dates of billing period, read code, and usage amount.

A.4 Weather Data

The evaluation team combined weather data with the billing data for the regression analysis. AEP Ohio staff provided daily weather data in SAS format. The data included heating and cooling degree days for 12 weather stations in the AEP Ohio service territory and spanned January 2000 (or earlier) through January 2014. Daily heating and cooling degree days were summed to calculate the degree days unique to each customer bill.

A.5 Data Cleaning

The 2011 and early 2012 tracking databases lacked key pieces of information necessary for a SAE analysis, including dates indicating when the project work was being done and a consistent measure description field. Lacking work start and end dates, Navigant assumed the work was completed during the month of the tracking spreadsheet in which the project was listed. For example, if a project was listed in the January 2012 tracking spreadsheet, Navigant assumed the project work began on January 1, 2012 and ended on January 31, 2012. The lack of precise work start and end dates affects the determination of the pre- and post- period for each project, which in turn affects the estimate of program savings. Lacking a consistent measure description field, Navigant had to manually assign inconsistent measure names (for example, misspelled words, extra characters, quantities included in the measure name) to a measure category, a tedious and time-consuming process.

The 2011 and early 2012 tracking databases also lacked the deemed savings estimates for each participant. As a result, Navigant was only able to estimate a Statistically Adjusted Engineering (SAE) regression model using customers that had participated during late 2012 and 2013. This greatly limited the number of customers with 12 months of post-installation billing data and deemed savings estimates. It is important to have at least 12 months of post-installation billing data for a SAE model since the deemed savings estimates are annual savings. Estimating a SAE model for customers with less than 12 months of post-installation rates for many measures. As a result, Navigant was not able to estimate a SAE model for 2013. It is likely that there will be enough post-installation data at the conclusion of 2014 to produce valid impact estimates using a SAE model. Instead, a billing analysis was conducted in a similar manner to the 2012 CAP impact evaluation using a fixed effects regression model and variables for the impact of various measure groups. The measure groups are described in Table A-1.

Measure Category	Measures Included					
	CFLs					
Lighting	Fixtures					
	Outdoor lighting					
	Refrigerators					
Refrigerators	Refrigerator removal					
	Freezers					
Freezers	Freezer removal					
	A-R-C insulation	Attic insulation	Closable foundation vents			
Shell Measures	Roof repair	Blower door sealing	Vapor retarder			
	Wall insulation	Air sealing	Mobile home belly/window/roof measures			
	Heat pump	Duct sealing	Foundation vents			
HVAC	Air conditioner	Duct insulation				
	Thermostats	Other heating measures				
	Aerators	Pipe wrap				
Water	Showerheads	Water heater wrap				
	Pipe insulation	Water heater replacement				
	Well pump replacement	Customer education				
Other	Smart strips					
	Sump pump replacement					

Table A-1. Measure Groups Used in Billing Analysis

Source: Navigant analysis

Navigant received billing and tracking data for 25,207 participants in 2011, 2012, and 2013. Navigant excluded accounts from the analysis if any of the criteria listed in Table A-2 were met.

Table A-2. Premise Exclusion Criteria

Exclusion Criteria	Number of Customers
Original Dataset, less:	25,974
No billing data for 2013	1,056
All bills were estimated	2
Premise with usage greater than 50,000 kWh during the pre-program year	104
Less than 6 months of billing data before installation	2,680
Less than 3 months of billing data after installation	3,760
Customers included in the analysis	18,372

Source: Navigant analysis

Navigant excluded observations from the analysis if any of the following criteria were met:

- » The observation occurred during the period that the work was being done (between the *workscheduleddate* and *workcompleteddate*)
- » The observation had average daily usage greater than 300 kWh
- » The billing record was a duplicate

Navigant summed billing records with the same start or end dates, but different usage values, into a single billing record.⁹ Finally, Navigant combined estimated bills (those with read codes equal to E, EF, ET, H, HF, J, M, MF, MI, and SR) with the following bill with an actual reading. Combined bill periods longer than 70 days in duration were excluded from the analysis.

A.6 Regression Analysis

Navigant estimated a fixed effects regression model in which later participants in the program serve as controls for participants that enter earlier. The regression model takes advantage of the differential timing of program enrollment to identify program savings. The model essentially takes the perspective that the best comparison group for participants consists of those customers that enroll in the program in a later period. The use of fixed effects controls for customer-specific characteristics that do not change over time, such as square footage of the premise.

To account for the seasonality of savings, Navigant interacted seasonal binary variables with the postinstallation variable for each measure group. Seasonal binary variables allow energy usage and program

⁹ Multiple billing records for a given time period can result from presence of outside lights, amongst other reasons.

savings to vary by season. These variables are sufficiently flexible to capture the effects of changes in weather and other factors that change by season. The regression equation is given by:

Equation A-1. Seasonality of Savings Regression Equation

$$\begin{aligned} ADU_{it} &= \alpha_i + \sum_{s=1}^{20} \beta_s * Season_{st} + \sum_{s=8}^{20} \gamma_s * Season_{st} * PostLighting_{it} \\ &+ \sum_{s=8}^{20} \delta_s * Season_{st} * PostRefrigerator_{it} + \sum_{s=8}^{20} \omega_s * Season_{st} * PostFreezer_{it} \\ &+ \sum_{s=8}^{20} \tau_s * Season_{st} * PostShellMeasures_{it} + \sum_{s=8}^{20} \rho_s * Season_{st} * PostHotWater_{it} \\ &+ \sum_{s=8}^{20} \eta_s * Season_{st} * PostHVAC_{it} + \sum_{s=8}^{20} \phi_s * Season_{st} * PostOther_{it} + \epsilon_{it} \end{aligned}$$

Where *i* indicates the participant, *t* indicates the bill period, *s* indicates the season, and

ADU _{it}	= Average daily usage (kWh) for participant <i>i</i> in period <i>t</i>
α _i	= The constant term ("fixed effect") for participant <i>i</i>
Season _{st}	= A binary variable taking a value of 1 if period <i>t</i> is in season <i>s</i> , where <i>s</i> equals 1 to 20. The sixteen seasons include winter 2009 (s=1) and summer 2009 (s=2) to winter 2014(s=20). Spring 2009 is the reference season because this is the first complete season of the analysis period, and therefore the spring 2009 binary variable is not included in the model.
PostLighting _{it}	= A binary variable taking a value of 1 if customer <i>i</i> received a lighting measure prior to period <i>t</i>
PostRefrigerator _{it}	= A binary variable taking a value of 1 if customer <i>i</i> received a refrigerator measure prior to period <i>t</i>
PostFreezer _{it}	= A binary variable taking a value of 1 if customer <i>i</i> received a freezer measure prior to period <i>t</i>
PostShell _{it}	= A binary variable taking a value of 1 if customer <i>i</i> received a shell measure prior to period <i>t</i>
PostHotWater _{it}	= A binary variable taking a value of 1 if customer <i>i</i> received a hot water measure prior to period <i>t</i>

<i>PostHVAC_{it}</i>	= A binary variable taking a value of 1 if customer <i>i</i> received a HVAC measure prior to period <i>t</i>
PostOther _{it}	= A binary variable taking a value of 1 if customer <i>i</i> received a measure in the "other" group prior to period <i>t</i>
ϵ_{it}	= The model error for participant <i>i</i> in period <i>t</i> . Standard errors are clustered to account for heteroskedasticity and autocorrelation at the participant level.
$\beta_s, \gamma_s, \delta_s, \omega_s, \tau_s, \rho_s, \eta_s, \phi_s$	= Model parameters

Seasons are defined by the following cut-off dates:

Winter	December 21 – March 20
Spring	March 21 – June 20
Summer	June 21 – September 20
Fall	September 21 – December 20

The parameters on the seasonal variables capture the change in energy consumption for the customers who have not yet participated in the program. The parameters on the interactions between the seasonal variables and the post variable capture the incremental seasonal change in energy consumption for the customers who have participated in the program. Said differently, the parameters on the interaction terms capture the difference in energy consumption between customers who have participated in the program and those who have not yet participated in the program. This difference represents the direct impact of the Community Assistance Program and is captured by the γ_s parameters.

Use of participant-specific *ex ante* savings estimates is useful when there is significant variation in *ex ante* savings amongst participants; such is the case with CAP. Participants received a variety of measures, ranging from aerators to heat pumps. Lacking *ex ante* savings estimates, Navigant accounted for some of the variation in expected savings by creating seven measure categories. However, even within a measure category there is significant variation in the expected savings amount across customers. For example, the water heating category includes aerators (*ex ante* savings estimate of 19 kWh) and water heater replacement (*ex ante* savings estimate of 351 kWh). The parameter estimates from Equation 1 capture the average savings amongst participants that received measures within each category.

Most participants received measures from multiple categories, which further complicates the modeling of savings. Lighting measures, water heating measures, and refrigerators were often jointly installed. When participants receive measures from multiple categories, the regression model implicitly parses savings between the appropriate categories. If a measure is seldom installed by itself, the model may have difficulties with allocating the appropriate amount of savings to the measure. The model may over- or under-estimate the amount of savings for a particular measure category. However, the total amount of savings across all measure categories is accurate.

Ex post savings estimates for lighting measures, refrigerators, and freezers are all much lower than *ex ante* savings estimates, with realization rates for these measure categories below 50 percent. Conversely, *ex post* savings estimates for shell, HVAC, water, and other measures exceeded the *ex ante* savings, with realization rates greater than 100 percent. Because lighting measures and refrigerators account for 85 percent of *ex ante* program savings, the overall program realization rate is dominated by those measures.

Note that the *ex post* savings estimates for participants that received new refrigerators or freezers are much smaller than the *ex ante* savings estimates (976 kWh and 956 kWh, respectively). The late 2012 and 2013 tracking database contained an indicator of whether the old unit was removed. The data indicate that for 5.9 percent of all refrigerator and freezer installations, the old unit was not removed. Participants who received a new refrigerator but did not remove their old unit will have increased usage (negative savings), which reduces the average savings estimate for this measure group.

Parameter estimates are given in Table A-3 Negative parameters for variables involving post indicate that usage decreased after program measures were installed. T-statistics greater than 1.65 indicate that the parameter is statistically significantly different from zero at the 90% confidence level.

Variable	Coefficient	Standard Error	T- Statistic	Variable	Coefficient	Standard Error	T- Statistic
Winter 2009	14.622	0.248	59.00	Spring 2013 * Post * Freezer	-1.331	0.325	-4.09
Summer 2009	-0.809	0.163	-4.98	Summer 2013 * Post * Freezer	-0.549	0.455	-1.21
Fall 2009	-1.267	0.108	-11.75	Fall 2013 * Post * Freezer	-1.058	0.288	-3.68
Winter 2010	14.731	0.234	63.01	Winter 2014 * Post * Freezer	2.422	0.882	2.75
Spring 2010	-2.391	0.101	-23.68	Winter 2011 * Post * Shell	-1.748	2.864	-0.61
Summer 2010	4.198	0.184	22.86	Spring 2011 * Post * Shell	-1.724	1.445	-1.19
Fall 2010	-1.220	0.119	-10.23	Summer 2011 * Post * Shell	-1.356	1.015	-1.34
Winter 2011	14.824	0.210	70.64	Fall 2011 * Post * Shell	-2.915	0.509	-5.72
Spring 2011	-0.064	0.113	-0.57	Winter 2012 * Post * Shell	-1.427	0.762	-1.87
Summer 2011	3.547	0.189	18.81	Spring 2012 * Post * Shell	-2.325	0.465	-5.00
Fall 2011	-1.430	0.138	-10.33	Summer 2012 * Post * Shell	-1.239	0.728	-1.70

Table A-3. Regression Model Parameter Estimates

Variable	Coefficient	Standard Error	T- Statistic	Variable	Coefficient	Standard Error	T- Statistic
Winter 2012	10.792	0.200	53.95	Fall 2012 * Post * Shell	-3.093	0.420	-7.36
Spring 2012	-2.658	0.145	-18.36	Winter 2013 * Post * Shell	-1.826	0.737	-2.48
Summer 2012	4.159	0.216	19.24	Spring 2013 * Post * Shell	-2.616	0.403	-6.49
Fall 2012	0.500	0.153	3.27	Summer 2013 * Post * Shell	-1.587	0.585	-2.71
Winter 2013	15.019	0.304	49.45	Fall 2013 * Post * Shell	-4.134	0.402	-10.28
Spring 2013	1.635	0.177	9.24	Winter 2014 * Post * Shell	0.293	0.942	0.31
Summer 2013	1.975	0.354	5.57	Spring 2011 * Post * HVAC	-5.447	1.959	-2.78
Fall 2013	0.399	0.344	1.16	Summer 2011 * Post * HVAC	-5.789	0.709	-8.16
Winter 2014	10.945	0.830	13.18	Fall 2011 * Post * HVAC	-1.066	0.357	-2.99
Winter 2011 * Post * Lighting	-0.237	2.817	-0.08	Winter 2012 * Post * HVAC	2.535	0.578	4.38
Spring 2011 * Post * Lighting	-1.470	0.533	-2.76	Spring 2012 * Post * HVAC	-1.963	0.355	-5.53
Summer 2011 * Post * Lighting	1.084	0.540	2.01	Summer 2012 * Post * HVAC	-5.457	0.539	-10.13
Fall 2011 * Post * Lighting	0.281	0.262	1.07	Fall 2012 * Post * HVAC	-1.664	0.363	-4.58
Winter 2012 * Post * Lighting	-2.186	0.447	-4.89	Winter 2013 * Post * HVAC	1.933	0.704	2.75
Spring 2012 * Post * Lighting	0.082	0.241	0.34	Spring 2013 * Post * HVAC	-1.099	0.365	-3.01
Summer 2012 * Post * Lighting	-0.010	0.395	-0.02	Summer 2013 * Post * HVAC	-4.426	0.522	-8.48
Fall 2012 * Post *Lighting	-0.417	0.217	-1.92	Fall 2013 * Post * HVAC	-1.229	0.406	-3.02
Winter 2013 * Post * Lighting	-3.114	0.457	-6.81	Winter 2014 * Post * HVAC	5.677	0.987	5.75
Spring 2013 * Post * Lighting	-1.481	0.208	-7.11	Winter 2011 * Post * Water	-15.636	3.957	-3.95
Summer 2013 * Post * Lighting	0.421	0.387	1.09	Spring 2011 * Post * Water	-1.233	0.739	-1.67
Fall 2013 * Post *Lighting	0.126	0.328	0.39	Summer 2011 * Post * Water	-2.653	0.648	-4.09
Winter 2014 * Post * Lighting	2.292	0.795	2.88	Fall 2011 * Post * Water	-0.925	0.284	-3.26

Variable	Coefficient	Standard Error	T- Statistic	Variable	Coefficient	Standard Error	T- Statistic
Winter 2011 * Post * Refrigerator	-8.547	2.695	-3.17	Winter 2012 * Post * Water	0.736	0.468	1.57
Spring 2011 * Post * Refrigerator	-1.183	0.603	-1.96	Spring 2012 * Post * Water	-1.027	0.253	-4.05
Summer 2011 * Post * Refrigerator	0.775	0.523	1.48	Summer 2012 * Post * Water	-3.238	0.410	-7.90
Fall 2011 * Post * Refrigerator	0.455	0.242	1.88	Fall 2012 * Post * Water	-0.124	0.224	-0.56
Winter 2012 * Post * Refrigerator	-2.624	0.402	-6.53	Winter 2013 * Post * Water	3.018	0.454	6.65
Spring 2012 * Post * Refrigerator	0.474	0.225	2.11	Spring 2013 * Post * Water	-0.399	0.199	-2.01
Summer 2012 * Post * Refrigerator	0.840	0.357	2.36	Summer 2013 * Post * Water	-5.026	0.293	-17.13
Fall 2012 * Post * Refrigerator	-0.195	0.202	-0.96	Fall 2013 * Post * Water	-0.336	0.190	-1.77
Winter 2013 * Post * Refrigerator	-2.213	0.408	-5.43	Winter 2014 * Post * Water	7.386	0.530	13.93
Spring 2013 * Post * Refrigerator	-0.770	0.182	-4.24	Winter 2011 * Post * Other	3.319	4.395	0.76
Summer 2013 * Post * Refrigerator	-0.629	0.276	-2.28	Spring 2011 * Post * Other	-0.488	1.486	-0.33
Fall 2013 * Post * Refrigerator	-0.133	0.182	-0.73	Summer 2011 * Post * Other	-1.146	2.028	-0.56
Winter 2014 * Post * Refrigerator	-0.311	0.509	-0.61	Fall 2011 * Post * Other	-0.869	0.872	-1.00
Winter 2011 * Post * Freezer	-0.722	5.118	-0.14	Winter 2012 * Post * Other	-0.365	1.158	-0.32
Spring 2011 * Post * Freezer	-4.283	1.610	-2.66	Spring 2012 * Post * Other	-1.730	0.633	-2.73
Summer 2011 * Post * Freezer	-2.011	1.573	-1.28	Summer 2012 * Post * Other	-1.356	0.889	-1.52
Fall 2011 * Post * Freezer	-1.258	0.618	-2.03	Fall 2012 * Post * Other	-0.365	0.347	-1.05
Winter 2012 * Post * Freezer	1.142	0.969	1.18	Winter 2013 * Post * Other	-0.090	0.679	-0.13
Spring 2012 * Post * Freezer	-2.418	0.486	-4.98	Spring 2013 * Post * Other	0.040	0.295	0.14
Summer 2012 * Post * Freezer	-0.921	0.748	-1.23	Summer 2013 * Post * Other	-0.493	0.408	-1.21
Fall 2012 * Post * Freezer	-0.895	0.391	-2.29	Fall 2013 * Post * Other	0.076	0.262	0.29
Winter 2013 * Post * Freezer	2.421	0.837	2.89	Winter 2014 * Post * Other	3.301	0.716	4.61

Source: Navigant analysis
4) Size

5) Energy Star?

Appendix B. On-Site Visit Form

The following guides were used to conduct the in-depth surveys.

AEP Ohio In-Home Energy Program Participant Survey (Audit/Assessment Recipients)

In-Home Energy Program On-Site Verification Form					
Field Staff Name:			Date:		
			Time In:		
Site ID:			Time Out:		
Customer Name:			Total Time:		
			Travel Time		
Phone Number:			(hrs):		
Stroot Addross:			(milos):		
Sheet Address.			(IIIIes).		
City:			Zip Code:		
Section 1: Refrigerator					
1) Refrigerator replacement			Notes		
2) Refrigerator replacement Verified					
3) Location of freezer (T,B,S)					
4) Size					
5) Model Number					
6) Energy Star?					
Castian 2. Frances					
Section 2: Freezer					
1) Freezer replacement			Notes		
2) Freezer replacement Verified					
3) Type of Freezer (Chest, upright)					

Section 3: CFLs

1) Number Received During Audit	Notes
2) Number Installed During Audit (ask homeowner)	
3) Number Removed (after initial installation)	
4) Number Visually Verified	
5) Installation Location (Primary/Secondary)	

For CFLs Visually Verified (fill out the following for each bulb verified)

Location (ente							
1) Kitchen	6) Closet						
2) Living	Basement	Quantity	Wattago	(Pin Based / Screw Based)			
3) Bedroom	8) Garage	Quantity	wallage				
4) Bathroom	9) Outdoor			Daseuj			
5) Hall	10) Other						

Notes

Section 4: Attic Insulation - complete if insulation was installed

Attic Insulation Reported? Attic Insulation Verified?	Insulation Area Reported Insulation Area Verified
Insulation Type (enter number) 1) Fiberglass Batt 2) Fiberglass Blown 3) Cellulose Blown 4) Spray Foam 5) Other	
Depth Pre-Retrofit (if known)	
Depth of Insulation Added (in)	
Effectiveness (enter Number) 1) Good 2) Average 3) Poor	
Notes	

Section 5: Wall Insulation - verify with homeowner

Wall Insulation Reported? Homeowner able to confirm installation? (Yes / No)

Wall Insulation Visually Verified? (Y/N)

Insulation Type (if known)

Insulated Wall Area (sq. ft.)

Section 6: Envelope Air Sealing - Visual Inspection Air Sealing Reported? Homeowner able to confirm installation? (Yes / No)

Evidence of Sealing Verified? (Y/N)

Section 7: Showerheads

- 1) Number Received During Audit
- 2) Number Installed During Audit (ask homeowner)
- 3) Number Removed (after initial installation)
- 4) Number Visually Verified
- 5) Installation Location (Primary/Secondary)

Section 9: Aerators

- 1) Number Received During Audit
- 2) Number Installed During Audit (ask homeowner)
- 3) Number Removed (after initial installation)
- 4) Number Visually Verified
- 5) Number Installed in Kitchen
- 6) Number Installed in Bath

Notes		

Notes

Notes

Notes

Section 10: Pipe Insulation

- 1) Amount Received During Audit (ft)
- 2) Amount Installed During Audit (ask homeowner)
- 3) Amount Removed (after initial installation)
- 4) Amount Visually Verified

Section 11: Hot Water Heater Tank Wrap

HW Tank Wrap Reported?

HW Tank Wrap Visually Verified

Section 12: Miscellaneous vents and insulation

Number of Roof Vents reported

Number of Roof Vents Verified

Wall Foundation insulation (ft) Reported

Wall Foundation insulation (ft) Verified

Band Joint Insulation (ft) Reported

Band Joint Insulation (ft) Verified

Mobile Home Belly Patch Reported

Mobile Home Belly Patch Verified

Mobile Home Underneath Vapor Retarder Reported

Mobile Home Underneath Vapor Retarder Verified

Section 13: Replace Electric Water Heater Replaced Electric Water Heater Reported Replaced Electric Water Heater Verified Model Number CAPACITY GALLONS Type (Gas/Electric)

Notes

Section 14: Smart Strips Number Smart Strips Reported Number Smart Strips Verified Type Number of outlets

Notes
Notes

APPENDIX G

OHIO POWER COMPANY

ENERGY STAR® NEW HOMES PROGRAM

Program Year 2013 Evaluation Report

Prepared for: AEP Ohio



May 12, 2014

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Executive Summary

Program Summary

The purpose of the ENERGY STAR® New Homes Program is to: 1) increase market penetration of ENERGY STAR® qualified homes in AEP Ohio's service territory, and 2) to move builders to even higher levels of energy savings through additional prescriptive requirements that go beyond base ENERGY STAR® levels. The program recruits and educates participating builders and their trades on the benefits associated with ENERGY STAR® homes as well as building practices designed to improve upon baseline efficiency.

Key Impact Findings and Recommendations

Navigant used REM/Rate[™] building simulation modeling to verify energy and demand savings for the ENERGY STAR® New Homes Program as specified by the 2010 Ohio Technical Reference Manual¹. Navigant reviewed the User Defined Reference Home (UDRH) baseline inputs to ensure the energy characteristics of the UDRH matched the applicable 2006 IECC or 2009 IECC code. The annual energy and demand savings associated with each program home were calculated as the difference between the UDRH and program home simulation results for a sample of program homes. The sample of 1,948 homes composed 89% of the total program participants in 2013. The energy and demand realization rates from the sample were applied to the entire program savings to determine program total *ex post* savings.

The ENERGY STAR[®] Program reported *ex ante* 5,824 MWh of energy savings and 1.11 MW of demand savings in 2013. The *ex post* energy and demand savings for 2013 were 5,889 MWh and 1.14 MW. These savings exceeded the program goals of reducing energy usage by 1,544 MWh and peak demand by 0.38 MW, as shown in Table ES-1. The realization rates were 101 percent for energy savings and 103 percent for peak demand savings.

	2013 Program Goals	<i>Ex Ante</i> Savings (a)	Audited Savings (b)	Realization Rate RR = (b) / (a)	Percent of Goal
Energy Savings (MWh)	1,544	5,824	5,889	101%	381%
Demand Savings (MW)	0.38	1.11	1.14	103%	301%

Table ES-1. Overall Evaluation Results

¹ State of Ohio Energy Efficiency Technical Reference Manual. Prepared for the Public Utilities Commission of Ohio by Vermont Energy Investment Corporation, August 6, 2010.

Impact Findings and Recommendations

REM/Rate File Discrepancies. During the savings verification process, Navigant found 220 homes with energy savings discrepancies of 5 kWh or more from the reported values. In other words, using the same REM/Rate file, Navigant was unable to reproduce the reported savings values. Savings for the homes were both over-reported and under-reported. On the whole, these discrepancies did not have a large effect on overall program savings. Navigant investigated the source of some of these issues for a random sample of 11 homes with discrepancies, and found seven homes that had different savings values because the original savings were reported using a different version of REM (all different versions, 13.0, 14.0, 14.1, 14.2).

Impact Recommendation: The evaluation implications of the variability of modeled results due to REM/Rate version changes warrant further investigation prior to conducting the evaluation for program year 2014.

Key Process Findings and Recommendations

The process evaluation component of the AEP Ohio ENERGY STAR[®] New Homes Program assessed the effectiveness of the program operations and delivery. Navigant's process evaluation included in-depth interviews with program staff and participating builders and a review of program tracking systems, reports and marketing materials.

The process evaluation found that the program is well-run and compares favorably with similar programs across the country. Participation, energy savings, knowledge and awareness of energy efficiency, and participant satisfaction are increasing, while quality control issues and rebate processing times are decreasing. The program year 2012 evaluation found a need to reconcile MaGrann and AEP Ohio tracking procedures, ensure contractors are meeting program requirements, and reduce incentive processing times. This evaluation found that all of these issues have been addressed to some degree in 2013 and improvements were made in each area.

Process Findings and Recommendations

- 1. **Effective program administration.** Most aspects of program design, administration and delivery were unchanged in 2013 aside from changes to incentive designs. These changes were effective in maintaining program participation while maintaining low HERS scores (a lower score indicates better performance) and increasing energy savings.
- 2. **Incentive processing time.** Satisfaction with most program aspects was high, though lower satisfaction was reported again in 2013 for both the time required to certify a home and to receive an incentive. However, there was a noteworthy 34 day improvement in incentive processing time at the end of 2013. This improvement was a result of a concerted effort undertaken by MaGrann and AEP Ohio staff to speed processing times through pre-funding builder incentives. Builder satisfaction results from the survey may not reflect this improvement, as it occurred late in the year.

3. **Data tracking and reporting.** The MaGrann tracking system was found to be well organized and complete and all data needed for evaluation is being tracked. In 2012, Navigant found a significant discrepancy between the numbers of completed homes reported in AEP Ohio's tracking system (796) compared to the number reported in MaGrann's monthly reports (1138). This discrepancy was due to a disagreement over how to define a home as "complete." Tracking and reporting systems were aligned in 2013 to resolve this issue.

Process Recommendation #1: Enhancements to rebate and REM/File tracking. Since rebate processing improvements are a current focus of the program, Navigant recommends adding a field indicating when the rebate application is submitted and/or received by MaGrann. Navigant also recommends adding a unique identifier for each site that is contained both within the tracking database and the associated REM files in order to expedite matching of the REM files and tracking data, and to ensure that each rebated home has an associated REM file for quality assurance and evaluation.

4. **Meeting program requirements:** Quality assurance/quality control (QA/QC) processes remain effective, though opportunities for improvement exist, as some homes were found to be non-compliant with some program requirements.

Process Recommendation #2: Ensure training and outreach offer effective guidance on meeting program requirements. The evaluation team found a significant reduction in the number of homes with non-compliance issues over 2012. Builders are becoming more familiar with program requirements and QA/QC processes appear to be catching and correcting most compliance issues. The program should continue to ensure that training and outreach efforts are informed by monitoring areas of noncompliance and providing builders detailed guidance on how to meet program requirements.

5. **Market Penetration.** Participation in the ENERGY STAR® New Homes Program in 2013 was significantly above program forecasts. However, in 2013 only 21 percent of program homes achieved ENERGY STAR® Certification. The major challenge for the program in 2013 continued to be dealing with the transition to the more stringent ENERGY STAR® Version 3. The Energy Path participation option is designed to be a short-term alternative to ENERGY STAR®. In an October 2013 meeting, builders and raters indicated that builders are still "change averse" since they experienced very low margins during the "slim times" of the economic downturn. Now, as the construction market revitalizes, builders are working to keep their materials and practices as consistent as possible to increase their margins and volume.

ENERGY STAR[®] certification may be difficult to encourage, with the costs of ENERGY STAR[®] compliance perceived as specific and quantifiable, while many of the benefits are considered to be intangible future values, such as potential sales, marketing assistance from the national program, and builder brand recognition.

Process Recommendation #3a: Work to increase penetration of ENERGY STAR® certified homes. Consider efforts to encourage builders currently building Energy Path homes to build more homes at the ENERGY STAR® level. If helpful, offer builders data on the average incremental cost of achieving certification to counter the idea that they are dramatically more expensive. Training realtors and other market players on the features and benefits of ENERGY STAR® homes could also

increase homebuyer awareness and demand for program homes, leading to higher market penetration.

Recommendation #3b: Increase the geographic scope of the program. Navigant's geographic market penetration analysis indicated that there are a significant number of new homes being constructed throughout AEP Ohio's service territory, particularly in the southeast and northeast portions of the state. At the same time, program participation is low or nonexistent in these high-construction areas. Navigant recommends increasing training, marketing, and outreach efforts in these areas in order to further increase program participation in 2014.

1 Introduction

This section begins with a summary of various aspects of the program implementation strategy and marketing.

1.1 Program Description

The purpose of the ENERGY STAR[®] New Homes Program is to 1) increase market penetration of ENERGY STAR[®] certified homes in AEP Ohio's service territory, and 2) to move builders to even higher levels of energy savings through additional prescriptive requirements that go beyond base ENERGY STAR[®] levels. The program recruits and educates participating builders and their trades on the benefits associated with ENERGY STAR[®] homes as well as building practices designed to improve upon baseline efficiency.

Program approved builders are provided with financial incentives to meet and exceed ENERGY STAR[®] building performance standards and to go beyond those levels by applying additional prescriptive requirements. A less stringent performance level ("Energy Path") is also offered that is designed to retain contractor participation while supporting a transition to the more rigorous ENERGY STAR[®] Version 3 standard.

The program targets all builders in the AEP Ohio service territory. Builders who participate in the program receive cash-back incentives designed to reimburse up to 30 percent of the average cost to upgrade and certify each home. In addition, builders are provided with training on marketing ENERGY STAR® homes to customers, ENERGY STAR® building standards, and building practices designed to meet these standards. Homes become certified at different efficiency levels through a home energy rating system (HERS) rating process, carried out by HERS raters who inspect homes during construction at the pre-drywall phase and upon completion.

1.2 Implementation Strategy

1.2.1 Program Delivery Mechanisms and Marketing Strategy

The delivery strategy for AEP Ohio's ENERGY STAR[®] New Homes Program focuses on: 1) offering education, financial incentives, and cooperative advertising efforts to participating home builders; 2) offering technical and sales training to home builders and HERS raters; and 3) educating the general public and homebuyers on the benefits of ENERGY STAR[®] construction.

Key elements of the implementation strategy include:

- » Builder and rater recruitment, outreach, and orientation, including home builder associations, professional associations, and other trade groups
- » Rater or rating company enrollment (Raters must show evidence of certification by a Residential Energy Services Network [RESNET]-accredited rating provider.)
- » Registration and tracking of committed homes, including all pertinent site data and contact information

- » Review, approval, and tracking of incentive applications for completed sites, including all necessary supporting documentation (such as rating files and rater invoices)
- » Incentive processing, including fund management, check issuance, reconciliation, and reporting
- » Marketing and collaterals development and deployment (consumer and builder targeted)
- » Participant communications and update meetings
- » Education sessions for builders, raters, and the broader construction community
- » A technical and procedural quality assurance (QA) monitoring program for both field and rating activities
- » Goal tracking, progress reporting, budgeting, and accrual processes

The program's marketing strategy focuses on builder outreach, recruitment, and orientation. Marketing efforts in 2013 focused on face-to-face meetings with builders through events and one-on-one meetings between program staff and selected building companies. The program marketing staff and consultants also worked on revising the program brand and developing brochures for an energy efficiency construction loan product.

1.2.2 Role of AEP Ohio Staff

The AEP Ohio staff person that oversees program administration is the Energy Efficiency Coordinator. The Energy Efficiency Coordinator is responsible for day-to-day program management for AEP Ohio, including weekly communication with the program implementer, program tracking and reporting, and assisting with development of program marketing materials. The program is delivered and managed primarily by the staff of MaGrann Associates, an implementation contractor.

1.2.3 Roles of the Implementation Contractor

MaGrann Associates (MaGrann) implements the ENERGY STAR® New Homes Program. MaGrann is directly responsible for day-to-day operations of the program, which includes:

- » Delivery of marketing and outreach efforts to encourage builder and rater participation
- » Coordinating training and events for builders and raters
- » Processing of applications, incentives, and project completion forms
- » Program data tracking and reporting, which includes progress toward goals and participant databases
- » Providing quality assurance activities and reporting to ensure program compliance

1.3 *Participation Levels and Incentives*

Builders are expected to meet one of two performance levels, which are detailed in Table 1-3. Each program level is based on specific technical requirements targeted to advance specific construction practices in the AEP Ohio service territory. Various levels of participation are determined primarily by the homes' performance as measured by the HERS rating process, which is carried out by HERS raters who inspect homes throughout the building process and upon completion.

Table 1-1 presents a summary of each performance level offered through the program in 2013.	
Table 1-1. Technical Requirement for Program Homes	

Technical Requirement	Energy Path	ENERGY STAR
ENERGY STAR [®] certified	-	Х
Maximum HERS rating	70	70
ENERGY STAR [®] Central A/C or Heat Pump	-	Х
ENERGY STAR [®] Central Heat	Х	Х
Duct air leakage tested	Х	Х
HVAC installation compliant with program checklists	Х	Х
Maximum 5.0 ACH50 building envelope air leakage	Х	Х
ENERGY STAR [®] lighting (percent of total)	80%	80%
All ENERGY STAR [®] appliances if supplied by builder	Х	Х

The program also collaborates with Columbia Gas to offer a consistent program offering across both territories. Incentive amounts are based on service territory, with reduced incentive amounts paid by AEP Ohio for homes heated by gas. Builders are required to submit an application to either utility, with incentives split by the utilities on the back-end. Incentive amounts were reduced and simplified on July 31st of the 2013 program year. Table 1-3 presents incentive amounts based on HERS score and home type from January 1 to July 30, 2013 and Table 1-3 presents incentive amounts from July 31 to December 31, 2013.

Table 1-2. AEP Ohio ENERGY STAR® New Homes Participation Levels and Incentives1/1/2013-7/31/2013

	HERS Score Incentive	80-75	75-70	70-65	65-60	60-55	55-50	50-0
Columbia	ENERGY STAR® Homes (Single-Family)	\$425	\$500	\$625	\$1,000	\$1,125	\$1,375	\$1,750
Ohio	Energy Path Homes (Single- Family)	\$175	\$250	\$375	\$750	\$875	\$1,125	\$1,500
AEP Ohio	ENERGY STAR® Homes (Single-Family)	\$425	\$500	\$625	\$1,000	\$1,125	\$1,375	\$1,750
	Energy Path Homes (Single- Family)	\$175	\$250	\$375	\$750	\$875	\$1,125	\$1,500
Columbia	ENERGY STAR® Homes (Single-Family)	\$850	\$1,000	\$1,250	\$2,000	\$2,250	\$2,750	\$3,500
Gas/AEP	Energy Path Homes (Single- Family)	\$350	\$500	\$750	\$1,500	\$1,750	\$2,250	\$3,000
Multi-Single Family Homes			75% per ι	unit of sing	le-family ir	ncentives (above)	
	Multifamily Homes		(Custom in	centive per	r project		

Table 1-3. AEP Ohio ENERGY STAR® New Homes Participation Levels and Incentives
8/01/2013-12/31/2013

	HERS Score Incentive	70-61	60-51	50-0
Columbia Gas of Ohio	ENERGY STAR® Homes (Single- Family)	\$575	\$1,225	\$1,625
	Energy Path Homes (Single-Family)	\$450	\$1,110	\$1,500
AEP Ohio	ENERGY STAR [®] Homes (Single- Family)	\$425	\$525	\$875
	Energy Path Homes (Single-Family)	\$300	\$400	\$750
Columbia Gas/AEP	ENERGY STAR [®] Homes (Single- Family)	\$1,000	\$1,750	\$2,500
Energy Path Homes (Single-Family)		\$750	\$1,500	\$2,250
Multi-Single Family Homes	75% per unit of single-family incentives (above)			
Multifamily Homes	Custom incentive per project			

Note: All-electric homes also received incentives equal to the combined AEP Ohio/Columbia Gas of Ohio incentive.

1.4 Program Theory

The theory underlying the program design is that builders must be engaged and trained in new construction techniques and technologies that significantly improve the home's energy performance in order to increase the efficiency level of new housing stock. Since most builders typically do not concern themselves with building operating costs and are focused on the costs of construction, the program simultaneously tries to build consumer awareness of the value of energy-efficient homes to help drive demand for these products. Since the program theory and logic have not changed since 2012, a new logic model was not created for 2013. The reader is instead referred to the 2012 evaluation report. ²

1.5 Evaluation Objectives

The three major objectives of this evaluation are to: (1) quantify energy and summer peak demand savings impacts from the program during 2013; (2) determine key process-related program strengths and weaknesses to identify ways in which the program can be improved and; (3) determine program cost-effectiveness.

1.6 Evaluation Methods

Navigant conducted the following activities to collect the information necessary to achieve these evaluation objectives:

- 1. A program documentation review
- 2. In-depth interviews with AEP Ohio staff and program implementation contractor staff
- 3. Tracking system review
- 4. Telephone surveys of participant builders
- 5. Building simulation modeling

² Appendix E Docket 13-1182 AEP Ohio Portfolio Status Report for 2012

1.7 Evaluation Questions

1.7.1 Impact Questions

- 1. What are the annual energy (kWh) and peak demand (kW) savings induced by the program?
- 2. What were the realization rates? (Defined as evaluation-verified (*ex post*) savings divided by program-reported (*ex ante*) savings.)
- 3. What are the benefits and costs attributable to the program?

1.7.2 Process Questions

1.7.2.1 Marketing and Participation

- 1. Are the marketing efforts sufficient to meet current and future program participation goals?
- 2. How do participating builders become aware of the program? What marketing strategies could be used to boost program awareness?
- 3. Is the program outreach to participating builders effective in increasing awareness of the program opportunities?
 - a. What is the format of the outreach?
 - b. How often does the outreach occur?
 - c. Are the outreach messages clear and actionable?

1.7.2.2 *Program Characteristics and Barriers*

- 1. How do participants perceive the incentives and costs related to this program?
 - a. Are builders sufficiently satisfied with the program incentives to sustain participation goals?
 - b. Are there particular program characteristics that could be changed to improve builder satisfaction while maintaining program effectiveness?
- 2. Is there an increased awareness by builders and subcontractors of key efficiency and quality issues?
- 3. What are the key barriers to participation in the program for eligible builders who do not participate, and how can these be addressed by the program?

1.7.2.3 Market Progress

- 1. What is the program's current progress toward market penetration goals, including the number of ENERGY STAR[®] homes certified (and initiated) and the number of builders participating in the program?
- 2. What are key factors contributing to and/or limiting further penetration of the ENERGY STAR[®] Homes program?
- 3. What is the geographic distribution of program participants, and which areas of the state provide the greatest opportunity for program expansion?

1.7.2.4 Administration and Delivery

- 1. Has the program as implemented changed from 2012? If so, how, why, and was this an advantageous change?
- 2. Is program administration being documented and program tracking being conducted in a way that makes the program evaluable?
- 3. Is the program efficient and well managed? How are problems resolved?
- 4. Have there been any changes to verification procedures for the program?
- 5. What are the opportunities for program improvement?
- 6. Have the goals to significantly reduce rebate processing time over 2012 been achieved? Are there further opportunities for efficiencies in this process?

1.7.3 Reporting

1. Has the reporting process changed from 2012? If so, how, why, and was this an advantageous change?

2 Evaluation Methods

This section describes the analytic methods and data collection activities implemented as part of the 2013 evaluation of the ENERGY STAR[®] New Homes Program, including an overview of data collection activities and analysis.

2.1 Overview of Approach

To meet the objectives of this evaluation, the evaluation team undertook the following activities:

- 1. **Develop Evaluation Questions**. Key evaluation questions were established from the development of the 2013 evaluation plan with AEP Ohio staff and a review of the key outcomes of the 2012 program evaluation.
- 2. Tracking Data Review. The program tracking data collected by MaGrann were reviewed.
- 3. **Review of New Program Documentation**. Reviewed any program documentation that differed from 2012 (e.g., new marketing materials).
- 4. **Primary Data Collection**. Primary data collection was performed through interviews with program staff, implementers, and telephone surveys with participating builders.
- 5. **Methods Used to Analyze Impact Data**. Key impact parameters for ENERGY STAR[®] new homes were extracted from program REM/Rate files, tracking data, and secondary data sources. These parameters were used to verify building performance requirements and re-calculate energy and demand savings.
- 6. **Methods Used to Analyze Process Data**. The effectiveness of the program processes was assessed by analyzing program tracking data, in-depth interview data, and participant survey data.

2.2 Data Collection Methods

To determine answers for the key research questions in the evaluation, the evaluation team conducted a series of primary data collection activities. Qualitative and quantitative data were collected through indepth interviews with program staff and through telephone surveys with program participant builders who completed homes through the program in 2013.

Program staff members were interviewed by telephone in August, 2013. Each interview lasted roughly an hour and covered program design and implementation, marketing and promotion, and perceived barriers to participation. Regular communications were also maintained with the AEP Program Coordinator on a monthly basis through brief check-in calls from July, 2013 to March, 2014. Table 2-1 provides a summary of the data collection activities conducted to support the process evaluation.

A telephone survey of ten program builders was conducted in March, 2014. The telephone survey addressed process related research objectives including marketing and promotion, customer satisfaction and suggestions for program improvement.

Data Collection Type	Targeted Population	Sample Frame	Sample Design	Sample Size	Timing
In Danth Talanhona	AEP Ohio Program Staff	Dhio Contacts New Homes Pr n Staff from AEP Ohio Coordinate		1	August 2013
Interviews	Staff of Program Implementer	Contacts from MaGrann Associates	Program Manager, Program Director	2	August 2013
Monthly Check-In Calls	AEP Ohio Program Staff	Contacts from AEP Ohio	New Homes Program Coordinator	9	July 2012 - Mar 2014
Participant Telephone Surveys	Participating Builders	Tracking Database	Random Sample of Program Participants	7	March 2014

Table 2-1. Data Collection Activities

2.3 Tracking Data Review

Navigant conducted a review of program data in the program tracking system to assess their accuracy and effectiveness for use in recording, tracking, and reporting the processes and impacts of the program. This review included an assessment of the incentive processing timeframes, a review of the project data for outliers and missing information, and an assessment of the data collected on incentive applications and recorded in the tracking systems. The tracking review also included additional assessments of the data, including:

- » Analysis of the key characteristics (e.g., size, equipment specifications, HERS rating, etc.) of homes participating in the program
- » Analysis of REM/Rate files submitted by Raters for completed homes

Program tracking data and REM/Rate file extracts were used to review key impact parameters, including home size, HVAC and envelope specifications, lighting and appliances, etc. The program tracking system and individual project data were closely reviewed to determine discrepancies, outliers and missing values.

2.4 Audited Savings Evaluation

The Navigant team verified savings reported from participating homes by completing a thorough engineering review of claimed savings calculated for each project using the REM/Rate[™] building simulation model. Navigant audited savings through the following steps:

- 1. Reviewed baseline model characteristics against TRM specifications and applicable 2006 IECC or 2009 IECC codes to verify that assumptions are appropriate and have been correctly applied.
- 2. Analyzed REM/Rate files and supporting documentation submitted for a sample of participating projects to verify that homes were built to program specifications.
- 3. Calculated savings for each record in the tracking system that could be matched to its corresponding REM/Rate file, per the Ohio TRM, compared to AEP Ohio's claimed savings.

The annual energy and demand savings associated with each program home was calculated as the difference between the UDRH and program home simulation results within a sample of program homes. The sample of 1,948 homes composed 89% of the total program participants in 2013. The energy and demand realization rates from the sample were applied to the entire program savings to determine program total *ex post* savings.

2.5 **Program Material Review and Secondary Research**

The evaluation team reviewed all program materials provided by MaGrann to date. A summary list of program materials reviewed for this report includes:

- » Program tracking data
- » Program marketing materials/collateral
- » AEP Ohio websites
- » Program design and implementation plans
- » Industry best practices

3 Detailed Evaluation Findings

This section presents detailed findings from the evaluation of the ENERGY STAR[®] New Homes Program.

3.1 Impact Evaluation Observations

3.1.1 Summary of Impact Findings

The *ex ante* energy and demand savings for 2013 were 5,824 MWh and 1.11 MW. These savings exceeded the program goals of reducing energy usage by 3,201 MWh and peak demand by 1.07 MW.

3.1.2 *Ex Ante* Energy Savings

Table 3-1 summarizes total unadjusted energy savings from the tracking system as well as the average energy savings per home.

		0, 0	
	EPATH	ESTAR	Total
Average Savings/Unit (kWh)	2,592	3,026	2,667
Number of Units	1,808	376	2,184
Ex Ante Energy Savings (MWh)	4,686	1,138	5,824

Table 3-1. Total Ex Ante Energy Savings

3.1.3 Audited Ex Post Energy Savings

Table 3-2 shows the results of the modeling procedures discussed in Section 2.7 to compute the energy savings estimates for each participation level. These estimates were then aggregated to determine the total audited energy savings.

Table 3-2. Ex Post Energy Savings

	EPATH	ESTAR	Total
Average Savings / Unit (kWh)	2,678	3,037	2,738
Number of Units	1,808	376	2,184
Ex Post Energy Savings (MWh)	4,738	1,150	5,889

3.1.4 Ex Ante Demand Savings

Table 3-3 summarizes total *ex ante* demand savings from the tracking system as well as the average demand savings per home.

	EPATH	ESTAR	Total
Average Savings / Unit (kW)	0.50	0.56	0.50
Number of Units	1,808	376	2,184
Ex Ante Energy Savings (MW)	0.90	0.21	1.11

3.1.5 Audited Ex Post Demand Savings

Table 3-4 shows the results of the modeling procedures discussed in Section 2.7 to compute the *ex post* coincident demand savings estimates for each participation level. These per-home demand savings were then aggregated to determine the total audited demand savings.

			0
	EPATH	ESTAR	Total
Average Savings / Unit (kW)	0.51	0.58	0.52
Number of Units	1,808	376	2,184
Ex Post Energy Savings (MW)	0.93	0.22	1.14

Table 3-4. Ex Post Coincident Demand Savings

3.1.6 Realization Rates

AEP Ohio's ENERGY STAR[®] New Homes Program reports *ex ante* values in the tracking data. Table 3-5 shows the realization rates for the 2013. The realization rates were 101 percent for energy savings and 103 percent for peak demand savings.

Table 3-5. 2013 Realization Rates

2013 Ex Ante		2013 Ex Post			
Claimed Savings		Audited Savings		Realizati	on Rates
MWh	MW	MWh	MW	MWh	MW
5,824	1.11	5,889	1.14	101%	103%

During the savings verification process, Navigant found 220 homes with energy savings discrepancies of 5 kWh or more from the reported values. In other words, using the same REM/Rate file, Navigant was unable to reproduce the reported savings values. Savings for the homes were both over-reported and under-reported. On the whole, these discrepancies did not have a large effect on overall program

savings. Navigant investigated the source of some of these issues for a random sample of 11 homes with discrepancies, and found three explanations:

- » Seven homes had different savings values because the original savings were reported using a different version of REM (all different versions, 13.0, 14.0, 14.1, 14.2). Navigant used the latest REM/Rate version (14.4) for savings verification.
- » Three homes had savings calculated from an incorrect UDRH that did not match either the 2006 IECC or 2009 IECC UDRH in use for AEP Ohio's program.
- » One home was a tracking database transcription error, between MaGrann's Vision tracking database and the AEP Ohio tracking data. This error may have been a result of MaGrann submitting a correction to the reported savings after AEP Ohio submitted the rebate to the builder.

The majority of these issues are associated with nuances concerning the use of the REM/Rate software program. The evaluation implications of the variability of modeled results due to REM/Rate version changes warrants further investigation prior to conducting the evaluation for program year 2014.

3.2 Process Evaluation Findings

This section presents detailed findings of the process evaluation of the ENERGY STAR[®] New Homes Program. Data sources for the process evaluation included participant telephone surveys and in-depth interviews with program staff, including the AEP Ohio Consumer Programs Coordinator, and both the MaGrann Program Manager and Operations Manager.

3.2.1 Participant Satisfaction

Seven participating ENERGY STAR[®] New Homes program builders were interviewed to determine their satisfaction with various program aspects. Participants were asked to rate their satisfaction on a scale of 1 to 5 where 1 – "Not at all satisfied" and 5 – "Extremely satisfied."

Table 3-6 illustrates that satisfaction with most program aspects was high, though lower satisfaction was reported again in 2013 for both the time required to certify a home and to receive an incentive. There was a noteworthy decrease in satisfaction with the incentive amounts as compared to 2012. In some instances, survey respondents emphasized that the paperwork can be cumbersome and suggested using Excel based forms for storing information about the homes. Builders were highly satisfied with the raters and the program overall. On being asked what information they would like to see in the newsletter, participants responded saying that they would like to see information regarding changes to the program ahead of time in the newsletter. Two respondents said that they don't really read the newsletter.

Table 3-6. Mean Satisfaction Scores

Program Aspect	Satisfaction Rating (Scale of 1 to 5)
	Mean

Overall experience with the ENERGY STAR® Homes program	4.3
Raters that qualify your homes with the ENERGY STAR® label and a HERS rating	4.4
Site Submittal & Incentive Application Process	4.0
Overall satisfaction with the ENERGY STAR® New Homes Newsletter	3.9
Time Required to Certify a Home	3.6
Incentive Amounts for ENERGY STAR® Homes	2.8
Incentive Amounts for Energy PATH Homes	3.0
Time to Receive Incentive	3.0

Builders were also asked to indicate what they believe are the key benefits to participating in the program, see Figure 3-1. Incentives were reported by all respondents as being a key program benefit. Respondents also reported benefits to low-income homes, providing families with a quality home and marketing and training opportunities, as benefits. Respondents were allowed to provide more than one response.



Figure 3-1. Benefits of Participating (n=7)

3.2.2 Program Resources and Training

A high level of satisfaction was reported for interactions with program staff, with five of seven builders reporting "very satisfied", and the remainder reporting "satisfied." Table 3-7 illustrates that builders were very satisfied with the program staff and the feedback they received from the HERS raters working with the program and agreed that the HERS raters provide a valuable service in ensuring the quality of the program. Builders were also satisfied with the training offered by the program. Respondents were asked about the kind of additional training they would like to receive in 2014. Most respondents did not feel the need for additional training though one respondent said that additional training regarding

HVAC and duct sizing would be useful. Another respondent mentioned that a little more information about the training itself will also be useful to prepare better for the training. Table 3-7. Mean Satisfaction Scores

Program Aspect	Satisfaction Rating (Scale of 1 to 5)	
	Mean	
Trainings offered by the Program	4.2	
Quality control inspection process	3.7	
Feedback you received from HERS raters working with the program	4.7	
Interaction with program staff	4.4	

3.2.3 Construction Activity and Costs

Participating builders were asked several questions relating to their current construction activities as well as the requirements for building ENERGY STAR[®] homes. Table 3-8 illustrates that the number of ENERGY STAR[®] and ENERGY PATH homes built by surveyed participants varied significantly, from builders who built fewer than ten homes, to those who built over 100.

Number of Homes	Number of Respondents (ENERGY STAR®) homes)	Number of Respondents (ENERGY PATH homes)
None	1	4
1 to 10	0	2
10 to 50	5	0
50 to 100	1	0
over 100	0	1

Table 3-8. Number of ENERGY STAR® and ENERGY PATH New Homes Built in 2012-2013

Builders were asked to report several building statistics related to all the homes built by their company in 2013. Table 3-9 shows that more than 80 percent of all the homes built by respondents in 2013 received ENERGY STAR® or ENERGY PATH certification through the program. Only one percent of homes built by respondents were reported to have not met program standards. None of ENERGY STAR® homes and one percent of Energy Path homes met the standards but did not receive an incentive, according to the builders surveyed. Four of the seven respondents indicated that they do not build ENERGY STAR® homes outside of the AEP Ohio program.

Builder Participation	Percent of all Homes Built by Company in 2013
Homes which received incentives through ENERGY STAR® Labeled Homes Program	83%
Energy Path certified homes that received incentives through the program	97%
Homes that met ENERGY STAR [®] standards but did not receive an incentive	0%
Homes that met Energy Path standards but did not receive an incentive	1%
Homes that did not meet program standards	1%

Table 3-9. Participating Builders Home Statistics

There was a noteworthy range among builders about the additional cost of building an ENERGY STAR® home, which was reported to be between \$600 and \$4,000. Out of seven builders, two builders reported that these costs have decreased significantly in the last few years, two indicated that costs have increased somewhat, two indicated that costs have stayed the same, and one indicated that costs have increased significantly. When asked what they would attribute this change to, respondents noted extra steps taken by subcontractors to meet the standards, additional check-list requirements for ENERGY STAR® Version 3, rising costs of energy efficient products, and more non-program homes installing energy efficient measures. Table 3-11 shows the range of incremental costs indicated by participants about various measures to meet the ENERGY STAR® specifications. For most measures, a number of respondents indicated that the incremental cost is above \$1,500.

Number of Respondents	Incremental Cost of Air sealing of home	Incremental Cost of duct system	Incremental Cost of insulating walls	Incremental Cost of insulating the ceiling
Between \$0 and \$500	2	2	2	2
Between \$500 and \$1,000	3	1	0	2
Between \$1,000 and \$1,500	0	1	1	0
Above \$1,500	2	3	4	3

Table 3-10. Builder-Reported Incremental Cost of Measures

3.2.4 Company Demographics

Survey respondents were asked several questions about their company demographics. These responses are summarized in Table 3-11.

Table 3-11. Participating Builders Home Statistics	
Neurolean	

	Number of Respondents
Number of general contractors working for firm	
1 to 10	4
30 to 40	1
50 to 100	1
Number of trades work for firm full time	
0	3
1 to 10	4
Company Annual Revenue	
Less than \$250,000	2
Between \$500,000 and \$1,000,000	3
Above \$1,000,000	5
Business Structure	
A nationally affiliated organization	2
Privately owned and local at one location	4
Privately owned and at several locations	3
Non-profit organization	1

3.2.5 Program Participation

Participation in the ENERGY STAR® New Homes Program in 2013 was significantly above program forecasts. The program reported 2,195 building projects in 2013, of which 2,184 were completed. Of these 2,184 completed homes; 327 were enrolled in 2011, 604 in 2012 and the remaining 1,253 in 2013. New home enrollments reported in 2013 doubled over reports from the previous year (1,058 in 2012), and the number of completions tripled over reports from 2012 (796 in 2012). The program currently has 45 builders registered to participate in the program, 36 of which completed homes in 2013.

Figure 3-2 shows the geographic distribution of program participants.

Figure 3-2. Number of Participating Homes by County



3.2.6 Implementation Challenges

The major challenge for the program in 2013 continued to be dealing with the transition to the more stringent ENERGY STAR® Version 3. Insights collected from builders and raters during an October 2013 meeting indicated that, from a cost perspective, the duct sealing and fresh air ventilation requirements are the most difficult for builders to comply with.

Specifically, ENERGY STAR[®] Version 3 requires not just a duct leakage to outside test, but a total duct leakage test. It is common practice in the Ohio market to use an interior building cavity in lieu of a return duct. In this case, although air from the duct system rarely leaks to the outside, the total leakage of the system can be above ENERGY STAR[®] threshold requirements. Several builders claim that a fully-ducted return system adds significant construction costs, though this is a contentious issue. Others claim that, when constructed using the proper order of operations, installing a fully ducted system only incurs a slight materials cost increase.

Feedback from builders indicated that installation of primary mechanical ventilation is not an issue for ENERGY STAR[®] compliance. However, the fresh air and ventilation requirements are difficult to comply with regarding bathroom fans. ENERGY STAR[®] requires that all bathroom fans vent to the outside,

which some builders contend is an added cost of approximately \$300 per fan, depending on where the bathroom is located.

The Energy Path participation option is designed to be a short-term alternative to ENERGY STAR. ENERGY STAR[®] certifications did drop off dramatically in 2012 with the introduction of Version 3 requirements, though greater participation in the Energy Path option succeeded in retaining builder participation. Builders attempting ENERGY STAR[®] certification are in favor of using Energy Path as a "safety net" in case they are unable to meet one or more of the stringent ENERGY STAR[®] requirements.

In 2013, the large majority of program homes qualified using the Energy Path option. In the October 2013 meeting, builders and raters indicated that builders are still "change averse" since they had very low margins during the "slim times" of the economic downturn. Now, as the construction market revitalizes, builders are working to keep their materials and practices as consistent as possible to increase their margins and volume. Furthermore, ENERGY STAR® Version 3 certification is difficult to encourage, since the costs of ENERGY STAR® compliance is specific and quantifiable, yet many of the benefits are intangible future values such as increased sales, marketing assistance from the national program, and builder brand recognition.

Some builders indicated that branding their company as "100% ENERGY STAR" runs the risk of dissatisfying customers if for some reason the builder fails to meet the Version 3 requirements. During a builder/rater meeting in October 2013, builders/raters expressed difficulty with advertising ENERGY STAR® certification or HERS score out of fear that customers will compare HERS within a development and complain to a builder if their HERS is lower than a neighbor, yet bills are higher. Builders do not want to be held accountable for customer energy costs. Furthermore, the total duct leakage testing requirements are difficult for builders to meet, and difficult to repair after the test, since a duct test must be performed after most of the duct surface is inaccessible (especially in a typical two story home).

In 2013, 21 percent of program homes were certified ENERGY STAR[®] Version 3. Market penetration of ENERGY STAR[®] homes may be improved through the following:

- » Encouraging builders currently building Energy Path homes to build more homes at the ENERGY STAR[®] Version 3 level.
- » Training realtors and other market players on the features and benefits of ENERGY STAR[®] homes to increase homebuyer awareness and demand for program homes.

3.2.7 Marketing and Promotion

Marketing to Homebuilders

As in 2012, the program was marketed to homebuilders primarily through outreach efforts at industry meetings, trade shows and direct communications with builders. The program was also marketed through e-mail and website advertisements. In order to encourage participation in the program, AEP Ohio offered training and education initiatives for home builders. In 2013, AEP Ohio offered 15 separate training events, with 142 total attendees.

A review of the marketing materials created for the homebuilders industry found these are effective in sharing the main benefits of program participation. Materials are clear and informative without being overwhelming or onerous. Salient benefits that are clearly communicated include: how to qualify for incentives, incentive levels, and the non-incentive benefits of program participation (free training, more referrals, fewer callbacks, etc.). Marketing efforts in 2013 included a continuation of the homebuilder newsletter, a professional ENERGY STAR® New Homes newsletter intended to increase builder awareness of the program and enhance the builders' relationship with Columbia Gas of Ohio and AEP Ohio. In 2013, this program received a national award as "Partner of the Year", which is prominently advertised in the newsletter to increase program credibility. The newsletter serves to update builders on upcoming training and social events, clarify new program requirements, highlight achievements of specific builders participating in the program, and reinforce the training materials with brief articles related to specific aspects of energy efficient homebuilding. As such, the newsletter is a particularly effective method for advertising the non-incentive benefits of program participation, and should be a central focus of marketing efforts in subsequent years as the incentive levels decrease.

Marketing to Prospective Homeowners

Marketing materials directed to prospective homeowners clearly outline the process for homebuyers to participate in the program. The "Beyond Acceptable, More Like Exceptional" marketing campaign does an excellent job of delivering a simple motivational statement to a prospective homebuyer. The campaign highlights the program on a measure-by-measure basis with messages that appeal to homebuyers' core considerations (comfort, safety, and savings). Table 3-12 shows that the trend in builders' activity levels in marketing and promoting of ENERGY STAR® homes over the past few years has increased significantly.

	Number of Respondents (ENERGY STAR [®] Marketing)
Increased significantly	1
Increased somewhat	2
Stayed the same	3
Decreased somewhat	0
Decreased significantly	0

Table 3-12. Change in Level of Participation in Marketing and Promotion over 2012

Table 3-13 illustrates the importance of building and marketing ENERGY STAR[®] and Energy Path certified homes for builders. As seen in the table, for most respondents it is very important to build and market these homes.

Building and Marketing Energy Star/Energy Path certified homes	Number of Respondents (ENERGY STAR® homes)	Number of Respondents (ENERGY PATH homes)
Very important	4	1
Neither important or unimportant	1	1
Not too important	1	1
Not at all important	0	0

Table 3-13. Importance of Building and Marketing ENERGY STAR/Energy Path certified homes

Table 3-14 shows that most participants reported that buyers are neutral about their awareness and interest in ENERGY STAR[®] and Energy Path certifications.

Table 3-14. Increase in Awareness and/or Interest in Buying Certified Homes

Builder Response	ENERGY STAR [®] certified home	Energy Path certified home
Yes	2	1
No	2	2

Most participating builders also believed that more support in marketing would not help them sell their ENERGY STAR® or Energy Path homes, as shown in Table 3.15 below. Literature handouts for clients and brochures for builders were the suggestions from the few builders who reported that additional marketing materials would help them sell these homes.

Table 3-15. Need for Additional Marketing Support to Aid Sale of Certified Homes

Builder Response	ENERGY STAR [®] certified home	Energy Path certified home
Yes	2	1
No	4	2

During a builder/rater meeting in October 2013, builders expressed the opinion that a bill guarantee would be a valued sales tool for builders to offer to potential ENERGY STAR® Homes buyers. Builders expressed that, as the program matures, participation should be consumer driven and primarily marketed to the homebuyers rather than the builder community. The EPA is also focusing national marketing support for the ENERGY STAR® Homes programs toward potential homebuyers, and AEP could leverage these national program marketing resources at little additional cost. This would help

expedite the transition from a supply side (builder-oriented) marketing strategy to a demand side (homebuyer-oriented) strategy.

3.2.8 Market Progress

Due to recommendations in Navigant's 2012 evaluation report, MaGrann reported market penetration of the program in 2013 in two ways. The first analysis compares the number of new building permits issued by county to the number of incentive payments issued. The second analysis compares data provided by AEP Ohio on new meters installed in single family new construction with the number of incentive payments issued. Navigant recommends using new meter set data to measure the program's market penetration for two reasons. First, the issuance of a building permit does not necessarily mean that a home will be constructed on that site anytime in the near future. Second, defining the market as the number of permits issued in counties served by AEP Ohio overestimates the size of the total market, because jurisdictional boundaries do not precisely match AEP Ohio's service territory.

Table 3-16 presents a comparison of program market penetration between 2012 and 2013. Both program volume and, market penetration as the percentage of AEP Ohio new meters increased in 2013. As the housing market accelerates, many of the new homes in Ohio are AEP Ohio customers, which presents an opportunity for the program to continue to increase participation volume in 2014.

Description	2013
Number of new projects completed	2,184*
Number of new meters installed in new single family homes	6,865
Market penetration of the ENERGY STAR® New Homes Program	32%

Table 3-16. Market Penetration Based on Projects Completed in 2013

*This value includes 520 program homes that were built in 2012, but not "completed" until 2013 as defined by the tracking database.

Table 3-16 presents a comparison of program market penetration between 2012 and 2013. The number of homes completed in 2013 has been revised in this analysis to account for 520 homes that were built in 2012 but not "completed" (incentive paid) until 2013. These homes were included retro-actively in the 2012 market penetration for the sake of comparing new ENERGY STAR[®] certified meters installed in 2013 compared to new non-certified meters installed in 2013. While program volume increased in 2013, so did the number of new meters installed, resulting in a decrease in overall market penetration in 2013. As the housing market accelerates, many of the new homes in Ohio are AEP Ohio customers, which presents an opportunity for the program to continue to increase participation volume in 2014.
Description	2012	2013
Number of new homes built	1,316*	1,664**
Number of new meters installed in new single family homes	4,106	6,865
Market penetration of the ENERGY STAR [®] New Homes Program	32%	24%

*This is a revised program participation number for 2012 to include those homes built in 2012 but "completed" (incentives paid) in 2013.

**YTD 2013 program participation as the difference between the number of units in the tracking database (2,184) and the number of REM files denoted as 2012 participants with incentives paid in 2013 (520).

Navigant examined market penetration rates by region, in order to identify geographies where the program can potentially target future marketing efforts. Figure 3-3 shows market opportunity by county, defined as the difference between the number of AEP Ohio new meter sets and the number of program participants.





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It is clear from the geographic analysis of program participation that the program is highly focused on a select few counties in central Ohio. However, Figure 3-3 indicates that there are a significant number of new homes being constructed throughout AEP Ohio's service territory, particularly in the southeast and northeast portions of the state. Navigant recommends increasing training, marketing, and outreach efforts in these areas in order to further increase program participation in 2014.

3.2.9 Application and Payment Processing

The application and incentive payment processes remained consistent in 2013. Builders submit a digital PDF Site Submittal Form for each project, which is entered upon receipt by MaGrann into their Vision tracking system. Once the HERS rater completes the final inspection of the home, the bottom portion of the form ("Incentive Application") is completed and sent to MaGrann, along with the final REM/Rate file. Once the forms have been reviewed and approved by program staff and utility representatives, the incentive is processed and sent to the builder within four to six weeks. Key data needed for evaluation and monitoring program performance are being tracked and reported. The site submittal forms are clear and concise, and data submitted is reviewed at several different levels.

Incentive Processing Time

Navigant completed a review of the incentive processing times entered into the incentive tracking dataset. Table 3-18 breaks down the time period between project completion and incentive payment by showing the cumulative number of days between project completion, application approval and incentive payment over time. The overall average duration between the project completion dates and incentive application approval was 80 days, ranging from five to 585 days. Once incentive forms were approved, the average duration for incentive payment was 42 days, ranging from six to 237 days. The average duration between project completion and incentive payment was therefore 122 days, which is an improvement over the previous year's average cycle time of 156 days. Only one-third of the total processing time is due to payment processing after an application is approved. The application receipt date was not included as a field in the tracking system, which would likely further clarify if delays are on the AEP Ohio end (with QA/QC of technical requirements and application approval) or on the builder end (delays in submitting applications after projects are complete).

As in 2012, the participant builder survey conducted by Navigant identified incentive processing time as the program area most in need of improvement from the builders' perspective. Participants were found to be satisfied with the incentive application process, but were dissatisfied with the time it took to receive incentive payments, which received a satisfaction score of 3 out of 5.

Time	Project Completion to Application Approval	Application Approval to Payment	Project Completion to Payment
Days	80	42	122
Weeks	11.5	6	17.5

Table 3-18. Incentive Processing Time (Average Days)

There was a noteworthy 34 day improvement in incentive processing time relative to 2012 processing times. This improvement was a result of a concerted effort undertaken by MaGrann and AEP Ohio staff to speed processing times, to address concerns brought up by builders during process evaluation interviews for program year 2012. MaGrann reported reduced the incentive processing time by focusing on three steps: 1) home certified date to application received, 2) application received to application approved, and 3) application approved to check issued as shown in Table 3-19. These steps do not exactly parallel the categories in the AEP Ohio tracking database, and the number of days reported are the average of both AEP and COH combined. As such, Navigant was unable to verify these numbers reported by MaGrann, yet they appear roughly consistent with the evaluation results from 2012 and the tracking data from 2013.

Period	Certified Date to Application Received	Application Received to Application Approval	Application Approved to Payment Issued	Total Application Processing Time
2012 Average	85	24	57	166
2013 Average	52	25	47	124
Oct/Nov 2013	43	18	13	74

Table 3-19. Breakdown of Incentive Processing Steps

In order to improve the first step in the process, the MaGrann administrative team developed a noncompliance letter to send to raters if there are issues with program qualifications. This resulted in clearer documentation and fewer errors. To improve the second step, the MaGrann administrative team dedicated and trained a person to qualify the homes and calculate the rebates. Quality Assurance selects specific homes for review and the administrative team completes step two for the homes not selected for QA. For step three, the AEP Ohio and Columbia Gas pre-funded incentive pools and quick replenishment allowed the MaGrann team to distribute incentive checks twice per month, significantly decreasing the time required for this step in the process during the latter part of 2013.

3.2.10 Quality Assurance/Quality Control

Quality Assurance/Quality Control (QA/QC) processes are well established and remain unchanged from 2012. The program has a strong base of Raters with several years of experience working with builders through the program. As a result, the number of quality control incidents has steadily decreased.

In support of our review of QA/QC procedures, Navigant cross-checked project data from REM/Rate files and the tracking system against the program requirements at each participation level and found that the tracking system and REM/Rate files were in good order. Most program technical requirements were met by all projects, though a few projects did not meet all the technical requirements for the various participation levels. Table 3-20 summarizes 2013 projects that did not meet some technical requirements.

Energy Path Technical Requirements	Navigant Observations
Minimum AFUE 92 Gas Furnace	1 project did not meet requirement
Minimum 8.5 HSPF Heat Pump	2 projects did not meet requirement
HERS Score Within Maximum Requirement	1 project did not meet requirement
Duct leakage of less than 6 CFM $_{25}$ to outside per 100 sqft	11 projects do not meet this requirement
Maximum 5.0 ACH50 building envelope air leakage 27 projects did not meet requ	
Energy Path Technical Requirements	Navigant Observations
Version 3 HVAC Contractor Checklist	435 projects did not meet requirement
Water Management Builder Checklist	30 projects did not meet requirement

Table 3-20. Review of ENERGY STAR® New Homes Technical Requirements

The majority of the unmet requirements above are related to the completion of checklists. Navigant acknowledges that the technical requirements of the checklists may have been met, yet the completion of the checklist was not tracked through REM files, incentive applications, or other means.

Navigant also performed an in-person check of the QA/QC procedures during a "ride along" with MaGrann quality assurance staff. Since the HERS providers perform QC according to RESNET protocol, the MaGrann QA/QC process is an extra layer of verification, performed on at least 5 percent of participating homes. In 2013, MaGrann performed QA/QC field reviews on 8.2 percent of homes, and desk reviews on 7.2 percent of homes. Table 3-21 indicates the discrepancies discovered by review type, as reported by MaGrann.

Table 3-21: Discrepancies Uncovered as a Result of QA/QC Procedures

Results	File	Field
Consistent with program standards	104	136
Minor inconsistencies	18	1
Significant inconsistencies	3	1
Program requirement(s) not met	2	0
Consistency Rate	96.1%	98.6%

The following "typical" problems were reported by MaGrann staff during the field verification ridealong. In the case that the issue discovered on site does not affect the HERS index of the home, it is not reported as an inconsistency.

- Insulation grade discrepancies
- Lack of smooth FSK paper implemented as an air barrier
- Visual duct issues such as an unsealed panned return
- Failure of duct test results
- Some mistakes of ceiling and square footage not matching, which usually happens when the plan includes a "bump out" or additional room above a garage

Overall, the QA/QC process is comprehensive and inspects a sufficient number of participating homes. The high consistency rates indicate that builders understand and conform to program requirements.

3.2.11 Tracking and Reporting

There were no major changes to the data tracking processes for the ENERGY STAR® New Homes Program in 2013. MaGrann requires that all projects submit incentive application forms and REM/Rate files to determine energy savings and verify ENERGY STAR® compliance. Key tracking data is entered into MaGrann's Vision database which stores documentation of building and program specifications, application data and incentive data.

A final end-of-year data extract was provided in support of this evaluation by AEP Ohio in February of 2014. This data was exported from the Vision tracking system and contained 138 fields and 2,184 unique project entries. REM/Rate files for each project were reviewed by the Navigant team for missing information, outliers and compliance with program requirements. Navigant was able to match 1,948 REM/Rate files to the records in the tracking database for the purpose of savings verification. The tracking system was found to be well organized and complete and all data needed for evaluation is being tracked. However, as mentioned above, since rebate processing is a strong focus of the program, Navigant recommends adding a field indicating when the application for rebates is submitted and/or received by MaGrann.

Navigant also recommends adding a unique identifier for each site that is contained both within the tracking database and the associated REM files in order to expedite matching of the REM files and tracking data and ensure that each rebated home has an associated REM file. The tracking system currently includes a unique identifier for each project ("ProjectID"), though this identifier is not included in the actual REM/Rate file. For evaluation purposes, data from the REM/Rate file (home characteristics) is exported to a spreadsheet to verify that program requirements were met. Currently, each home's REM/Rate file extract must be manually matched to its' tracking system entry, using the site address. However, the site address often differs between the REM/Rate file and the tracking system so the evaluators are never able to match all files. If the ProjectID were included in both the tracking system and the actual REM file, a simple lookup would match the REM/Rate extracts with their corresponding tracking system entry allowing evaluators to quickly and easily verify program requirements for all homes.

Detailed monthly reports are prepared by MaGrann, which are clear, comprehensive, and delivered in a timely fashion. The monthly report provides a well-organized summary narrative of program activities conducted during the month. The report contains data required by program staff to monitor program progress and make course corrections, if necessary.

Concerns over discrepancies between the monthly reports and the Vision database that arose in 2012 have mostly been resolved. For 2013, Navigant found that there were 2,184 projects reported in the Vision tracking database, and 2,195 projects reported in MaGrann's December monthly report. Since MaGrann and AEP Ohio have reconciled their definitions of a "complete project" since 2012, this slight discrepancy in 2013 is likely due to delays of input of data into the tracking system.

4 Conclusions and Recommendations

This section highlights the findings and recommendations from the impact and process evaluation of the ENERGY STAR[®] New Homes Program.

4.1 Impact Findings

Navigant used REM/Rate[™] building simulation modeling to verify energy and demand savings for the ENERGY STAR® New Homes Program as specified by the 2010 Ohio Technical Reference Manual³. Navigant reviewed the User Defined Reference Home (UDRH) baseline inputs to ensure the energy characteristics of the UDRH matched applicable 2006 IECC or 2009 IECC codes when the home was constructed. The annual energy and demand savings associated with each program home was calculated as the difference between the UDRH and program home simulation results for a sample of program homes. The sample of 1,948 homes composed 89% of the total program participants in 2013. The energy and demand realization rates from the sample were applied to the entire program savings to determine program total *ex post* savings.

The ENERGY STAR[®] Program reported *ex ante* 5,824 MWh of energy savings and 1.11 MW of demand savings in 2013. The *ex post* energy and demand savings for 2013 were 5,889 MWh and 1.14 MW. These savings exceeded the program goals as shown in Table 4-1. The realization rates were 101 percent for energy savings and 103 percent for peak demand savings.

	2013 Program Goals	<i>Ex Ante</i> Savings (a)	Audited Savings (b)	Realization Rate RR = (b) / (a)	Percent of Goal
Energy Savings (MWh)	1,544	5,824	5,889	101%	381%
Demand Savings (MW)	0.38	1.11	1.14	103%	303%

Table 4-1. Overall Evaluation Results

Impact Findings and Recommendations

REM/Rate File Discrepancies. During the savings verification process, Navigant found 220 homes with energy savings discrepancies of 5 kWh or more from the reported values. In other words, using the same REM/Rate file, Navigant was unable to reproduce the reported savings values. Savings for the homes were both over-reported and under-reported. On the whole, these discrepancies did not have a large effect on overall program savings. Navigant investigated the source of some of these issues for a random sample of 11 homes with discrepancies, and found seven homes that had different savings values

³ *State of Ohio Energy Efficiency Technical Reference Manual.* Prepared for the Public Utilities Commission of Ohio by Vermont Energy Investment Corporation, August 6, 2010.

because the original savings were reported using a different version of REM (all different versions, 13.0, 14.0, 14.1, 14.2).

Impact Recommendation: The evaluation implications of the variability of modeled results due to REM/Rate version changes warrant further investigation prior to conducting the evaluation for program year 2014.

4.2 Cost-Effectiveness Review

This section addresses the cost effectiveness of the ENERGY STAR® New Homes Program. Cost effectiveness is assessed through the use of the Total Resource Cost (TRC) test. Table 4-2 summarizes the unique inputs used in the TRC test.

Item	Value
Average Measure Life	25
Units	2,184
Annual Energy Savings (MWh)	5,889
Coincident Peak Savings (MW)	1.14
Third Party Implementation Costs	\$882,486
Utility Administration Costs	\$304,210
Utility Incentive Costs	\$1,561,650
Participant Contribution to Incremental Measure Costs	\$3,902,401

Table 4-2. Inputs to Cost-Effectiveness Model for ENERGY STAR® New Homes Program

Based on these inputs, the TRC ratio is 1.1. Table 4-3 summarizes the results of the cost-effectiveness tests. Results are presented for the Total Resource Cost test, the Participant Cost Test, the Ratepayer Impact Measure Test, and the Utility Cost Test.

Table 4-3. Cost Effectiveness Results for the ENERGY STAR® New Homes Program

Test Results	
Total Resource Cost	1.1
Participant Cost Test	1.9
Ratepayer Impact Measure	0.5
Utility Cost Test	2.0

4.3 Process Evaluation Findings

The process evaluation component of the AEP Ohio ENERGY STAR[®] New Homes Program assessed the effectiveness of the program operations and delivery. Navigant's process evaluation included in-depth interviews with program staff and participating builders and a review of program tracking systems, reports and marketing materials.

The process evaluation found that the program is well-run and compares favorably with similar programs across the country. Participation, energy savings, knowledge and awareness of energy

efficiency, and participant satisfaction are increasing, while quality control issues and rebate processing times are decreasing. The program year 2012 evaluation found a need to reconcile MaGrann and AEP Ohio tracking procedures, ensure contractors are meeting program requirements, and reduce incentive processing times. This evaluation found that all of these issues have been addressed to some degree in 2013 and improvements were made in each area.

Process Findings and Recommendations

- 6. **Effective program administration.** Most aspects of program design, administration and delivery were unchanged in 2013 aside from changes to incentive designs. These changes were effective in maintaining program participation while maintaining low HERS scores (a lower score indicates better performance) and increasing energy savings.
- 7. **Incentive processing time.** Satisfaction with most program aspects was high, though lower satisfaction was reported again in 2013 for both the time required to certify a home and to receive an incentive. However, there was a noteworthy 34 day improvement in incentive processing time at the end of 2013. This improvement was a result of a concerted effort undertaken by MaGrann and AEP Ohio staff to speed processing times through pre-funding builder incentives. Builder satisfaction results from the survey may not reflect this improvement, as it occurred late in the year.
- 8. Data tracking and reporting. The MaGrann tracking system was found to be well organized and complete and all data needed for evaluation is being tracked. In 2012, Navigant found a significant discrepancy between the numbers of completed homes reported in AEP Ohio's tracking system (796) compared to the number reported in MaGrann's monthly reports (1138). This discrepancy was due to a disagreement over how to define a home as "complete." Tracking and reporting systems were aligned in 2013 to resolve this issue.

Process Recommendation #1: Enhancements to rebate and REM/File tracking. Since rebate processing improvements are a current focus of the program, Navigant recommends adding a field indicating when the rebate application is submitted and/or received by MaGrann. Navigant also recommends adding a unique identifier for each site that is contained both within the tracking database and the associated REM files in order to expedite matching of the REM files and tracking data, and to ensure that each rebated home has an associated REM file for quality assurance and evaluation.

 Meeting program requirements: Quality assurance/quality control (QA/QC) processes remain effective, though opportunities for improvement exist, as some homes were found to be noncompliant with some program requirements.

Process Recommendation #2: Ensure training and outreach offer effective guidance on meeting program requirements. The evaluation team found a significant reduction in the number of homes with non-compliance issues over 2012. Builders are becoming more familiar with program requirements and QA/QC processes appear to be catching and correcting most compliance issues. The program should continue to ensure that training and outreach efforts are informed by monitoring areas of non-compliance and providing builders detailed guidance on how to meet program requirements.

10. **Market Penetration.** Participation in the ENERGY STAR® New Homes Program in 2013 was significantly above program forecasts. However, in 2013 only 21 percent of program homes achieved ENERGY STAR® Certification. The major challenge for the program in 2013 continued to be dealing with the transition to the more stringent ENERGY STAR® Version 3. The Energy Path participation option is designed to be a short-term alternative to ENERGY STAR®. In an October 2013 meeting, builders and raters indicated that builders are still "change averse" since they experienced very low margins during the "slim times" of the economic downturn. Now, as the construction market revitalizes, builders are working to keep their materials and practices as consistent as possible to increase their margins and volume.

ENERGY STAR[®] certification may be difficult to encourage, with the costs of ENERGY STAR[®] compliance perceived as specific and quantifiable, while many of the benefits are considered to be intangible future values, such as potential sales, marketing assistance from the national program, and builder brand recognition.

Process Recommendation #3a: Work to increase penetration of ENERGY STAR® certified homes. Consider efforts to encourage builders currently building Energy Path homes to build more homes at the ENERGY STAR® level. If helpful, offer builders data on the average incremental cost of achieving certification to counter the idea that they are dramatically more expensive. Training realtors and other market players on the features and benefits of ENERGY STAR® homes could also increase homebuyer awareness and demand for program homes, leading to higher market penetration.

Recommendation #3b: Increase the geographic scope of the program. Navigant's geographic market penetration analysis indicated that there are a significant number of new homes being constructed throughout AEP Ohio's service territory, particularly in the southeast and northeast portions of the state. At the same time, program participation is low or nonexistent in these high-construction areas. Navigant recommends increasing training, marketing, and outreach efforts in these areas in order to further increase program participation in 2014.

Appendix A Data Collection Instruments

AEP Ohio ENERGY STAR New Homes Program Builder Participant Survey

INT. Hello my name is ______ with Blackstone Consulting and I'm calling on behalf of AEP Ohio. I understand that in 2013 you participated in the ENERGY STAR New Homes Program. As follow up, we'd like to ask you a few questions about this program. Could I speak to someone who is familiar with this program?

IF ASKED/NEEDED:

- Re-emphasize this is a survey, not a sales call.
- Responses are completely confidential.
- Depending on your responses, the survey will take about 15 minutes to complete.

Screener

- S1. Did your company participate in AEP Ohio's ENERGY STAR New Homes program during 2013?
 - a. YES [CONTINUE]
 - b. NO [THANK AND TERMINATE]
 - c. REFUSED [THANK AND TERMINATE]
 - d. DON'T KNOW [ASK FOR A PERSON WHO IS FAMILIAR WITH THE PROGRAM AND BEGIN WITH INTRO. IF NO ONE AT THE COMPANY IS FAMILIAR WITH THE PROGRAM, THANK AND TERMINATE.]

ENERGY STAR Homes Activity

INT. I'd like to ask you about your company's recent ENERGY STAR new homes construction activity in Ohio.

How many ENERGY STAR Certified homes did your company build in 2013 in AEP Ohio's service area?

- a. Numeric open end
- b. Don't know
- c. Refused

How many ENERGY PATH homes did your company build in 2013 in AEP Ohio's service area?

- a. Numeric open end
- b. Don't know
- c. Refused

Now I'd like you to think about all the homes your company built in 2013 in AEP Ohio's service area. What percent of these homes were:

a. ENERGY STAR certified homes that received incentives through the program?

- b. ENERGY PATH certified homes that received incentives through the program?
- c. Homes that met ENERGY STAR standards but did not receive an incentive?
- d. Homes that met ENERGY PATH standards but did not receive an incentive (not including those that met ENERGY STAR standards)?
- e. Homes that did not meet program standards?

[ASK IF Q1>0]

Do you build ENERGY STAR Certified homes outside of the AEP Ohio New Homes program?

- a. Yes
- b. No
- c. Refused
- d. Don't know

[If Q.4 = Yes]

Q.4a. About what percent of your ENERGY STAR construction occurs through the AEP Ohio program? [OPEN END]

- a. Numeric open end
- b. Don't know
- c. Refused

Program Awareness/Acceptance

How did you first hear about AEP Ohio's ENERGY STAR New Homes program? [DO NOT READ LIST. ENTER ALL THAT APPLY.]

- a. Trade show
- b. Website
- c. Email
- d. Mail
- e. Coworker/professional colleague
- f. Professional networking event
- g. Utility company (general) including implementation contractor ?
- h. Other [RECORD OPEN END]
- i. Refused
- j. Don't know

Which resource most heavily influenced your decision to participate? [READ LIST]

[INSERT ANSWERS FROM Q5. SINGLE PUNCH.]

What have been the key benefits of participating in the program? [DO NOT READ LIST. ENTER ALL THAT APPLY.]

- a. Technical assistance
- b. Incentives to pay for energy efficiency upgrades
- c. Increased business (general)
- d. Increased business specific to energy efficiency
- e. Marketing opportunities through AEP Ohio
- f. Recognition as an energy efficient builder
- g. Increased profits
- h. Reduced liability
- i. Increased company recognition/association with ENERGY STAR
- j. No benefits
- k. Other, specify [RECORD OPEN END]
- I. Refused
- m. Don't know

[IF Q7 HAS MORE THAN ONE ANSWER, ASK Q8, ELSE AUTO FILL.]

Which benefit do you see as the highest value to your organization?

[INSERT ANSWERS FROM Q7]

[ASK IF Q2>0]

Thinking about your overall experience with the ENERGY STAR New Homes program, on a scale of 1 to 5, where 1 is Very Dissatisfied, and 5 is Very Satisfied, please rate your overall satisfaction with the program. [INSERT SCALE]

[ASK IF Q9 < 3]

Q9a. Why did you not give your experience with the overall program a higher rating? [OPEN END]

Now thinking about the raters that qualify your homes with the ENERGY STAR label and a HERS rating, on a scale of 1 to 5, where 1 is Very Dissatisfied, and 5 is Very Satisfied, please rate your overall satisfaction with the ENERGY STAR raters who inspected your homes. [INSERT SCALE]

[ASK IF Q10 < 3]

Q10a. Why did you not give your satisfaction with the ENERGY STAR raters a higher rating? [OPEN END]

On a scale of 1 to 5, where 1 is Very Dissatisfied, and 5 is Very Satisfied, please rate your overall satisfaction with the ENERGY STAR New Homes Newsletter. [INSERT SCALE]

[ASK IF Q11 < 4]

In your opinion, how could the ENERGY STAR New Homes Newsletter be improved? [OPEN ENDED]

Program Changes

INT. Now I would like to ask you some questions about changes to program requirements and incentive levels.

What effect has the change in incentives had on the number of program homes you are building?

- 1. Decreased significantly
- 2. Decreased somewhat
- 3. Stayed the same
- 4. Increased somewhat
- 5. Increased significantly
- 6. Don't know
- 7. Refused

What has been the biggest hurdle or complication, if any, resulting from separating AEP program incentives from Columbia Gas program incentives? [OPEN END]

What effect has the separation from Columbia Gas had on the number of program homes you are building?

- 1. Decreased significantly
- 2. Decreased somewhat
- 3. Stayed the same
- 4. Increased somewhat
- 5. Increased significantly
- 6. Don't know
- 7. Refused

Has the number of ENERGY STAR certified homes you built in 2013 changed? If so, how?

- a. More homes certified
- b. Fewer homes certified
- c. I stopped certifying ENERGY STAR homes
- d. Same number of homes certified compared to 2012
- e. Refused
- f. Don't know

Will the number of ENERGY STAR certified homes you expect to build in 2014 change? If so, how?

- a. More homes will be certified
- b. Fewer homes will be certified
- c. I will stop certifying ENERGY STAR homes
- d. Same number of homes will be certified
- e. Refused
- f. Don't know

Regarding the new checklists associated with ENERGY STAR Version 3.0, on a scale of 1 to 5 where 1 is Do Not Understand and 5 is Completely Understand, please rate how well you understand each of the following checklists or requirements: [MATRIX] [INSERT DK + REF]

[RANDOMIZE THE LIST]

- a. Thermal Enclosure System Rater Checklist
- b. HVAC System Quality Installation Contractor Checklist
- c. HVAC System Quality Installation Rater Checklist
- d. Water Management System Builder Checklist
- e. Total Duct Leakage Requirements

ENERGY STAR Rebate Payment and Certification Process

Ask for responses on a scale where 1 is Very Dissatisfied, and 5 is Very Satisfied. If necessary, clarify with the following increments: very satisfied, satisfied, neither satisfied nor dissatisfied, dissatisfied, very dissatisfied. If the response is dissatisfied, ask why they were dissatisfied and record as an open-ended response.

[ASK IF Q1>0]

On a scale of 1 to 5, where 1 is Very Dissatisfied, and 5 is Very Satisfied, please rate your overall satisfaction with the rebate amounts for the ENERGY STAR Homes. [INSERT SCALE]

[ASK IF Q2>0]

On a scale of 1 to 5, where 1 is Very Dissatisfied, and 5 is Very Satisfied, please rate your overall satisfaction with the rebate amounts for the ENERGY PATH Homes. [INSERT SCALE]

[ASK IF Q1 or Q2 > 0]

- On a scale of 1 to 5, where 1 is Very Dissatisfied, and 5 is Very Satisfied, please rate your overall satisfaction with the time it takes to receive rebates for the program. [INSERT SCALE]
- On a scale of 1 to 5, where 1 is Very Dissatisfied, and 5 is Very Satisfied, please rate your overall satisfaction with the Site Submittal and Incentive Application process. [INSERT SCALE]

[ASK IF Q22 < 3]

Q22a. Why did you not give a higher rating? [OPEN END]

On a scale of 1 to 5, where 1 is Very Dissatisfied, and 5 is Very Satisfied, please rate your overall satisfaction with the time it takes to certify a home through the program. [INSERT SCALE]

Utility Resources and Training

On a scale of 1 to 5, where 1 is Very Dissatisfied and 5 is Very Satisfied, how satisfied were you with the program manager and/or any other program staff you worked with or had contact with while participating in the program? [INSERT SCALE]

Q24a. [ASK IF Q24=1 OR 2] Why were you dissatisfied with the program manager and/or any other program staff you worked with or had contact with? [OPEN END]

Have you ever participated or attended any of the trainings offered though the ENERGY STAR New Homes Program?

- a. Yes
- b. No
- c. Refused
- d. Don't know

[ASK IF Q25 = a, OTHERWISE SKIP TO Q27]

On a scale of 1 to 5, where 1 is Very Dissatisfied and 5 is Very Satisfied, how satisfied were you with the trainings offered through the ENERGY STAR New Homes Program? [INSERT SCALE]

What additional training, if any, would you like to receive in 2014? [OPEN END]

Would you be interested in attending a training on sales or marketing of ENERGY STAR New Homes to potential buyers?

- a. Yes
- b. No
- c. Refused
- d. Don't know
- e. Other [RECORD OPEN END]
- On a scale of 1 to 5, where 1 is Very Dissatisfied and 5 is Very Satisfied, how satisfied were you with the quality assurance and quality control inspection process conducted through the ENERGY STAR New Homes Program? [INSERT SCALE]
- On a scale of 1 to 5, where 1 is Not at all Helpful and 5 is Very Helpful, how helpful was the feedback you received from HERS raters working with the ENERGY STAR New Homes Program? [INSERT SCALE]
- Do you think that HERS raters provide a valuable service in ensuring the quality of ENERGY STAR New Homes? [OPEN END]

a. Yes

- b. No
- c. Refused
- d. Don't know
- e. Other [RECORD OPEN END]

ENERGY STAR Marketing

[ASK IF Q1>0, otherwise skip to next section]

During the last few years, has your marketing and promotion of ENERGY STAR New homes:

- 1. Decreased significantly
- 2. Decreased somewhat
- 3. Stayed the same
- 4. Increased somewhat
- 5. Increased significantly
- 6. Don't know
- 7. Refused

How important, or valuable, is it to you to build ENERGY STAR homes and be able to market them as ENERGY STAR-certified homes in the current housing market?

- 1. Not at all important
- 2. Not too important
- 3. Neither important or unimportant
- 4. Somewhat important
- 5. Very important
- 6. Don't know
- 7. Refused

Are homebuyers showing more awareness of and/or interest in energy efficiency?

- a. Yes
- b. No
- c. Somewhat
- d. Refused
- e. Don't know

Are homebuyers showing more awareness of and/or interest in buying an ENERGY STAR certified home?

- f. Yes
- g. No
- h. Somewhat
- i. Refused

j. Don't know

Do you think additional marketing support would help you sell your ENERGY STAR homes?

- k. Yes
- l. No
- m. Refused
- n. Don't know

Q36a. [ASK IF Q36=YES] Can you think of some examples?

ENERGY PATH Marketing

[ASK IF Q2>0, otherwise skip to next section]

On a scale of 1 to 5, how important, or valuable is it to you to build ENERGY PATH homes and be able to market them as ENERGY PATH-certified homes in the current housing market?

- 1. Not at all important
- 2. Not too important
- 3. Neither important or unimportant
- 4. Somewhat important
- 5. Very important
- 6. Don't know
- 7. Refused

Are homebuyers showing recognition of and/or interest in ENERGY PATH Homes?

- a. Yes
- b. No
- c. Somewhat
- d. Refused
- e. Don't know

Do you think additional marketing support would help you sell your ENERGY PATH homes?

- o. Yes
- p. No
- q. Refused
- r. Don't know

Q39a. [ASK IF Q39=YES] Can you think of some examples?

Construction Activity and Cost

INT. Now I'd like to ask you about any recent home construction activity that you may have had. For the following questions, please consider the incremental cost of constructing a typical two-story ENERGY STAR Version 3 home with roughly 2,400 square feet of conditioned floor area and an unconditioned basement. Again, the incremental cost is, on average, about how much more or less it costs to build an ENERGY STAR Labeled Home versus a standard efficiency code-compliant home. When estimating this incremental cost, please account for both additional costs, such as the use of energy efficient materials and equipment, and possible cost savings resulting from the need for smaller-sized heating or cooling equipment, since the house is tighter and better insulated.

Would you say the incremental cost of air sealing the home to meet ENERGY STAR specifications of at least 4.0 air changes per hour is... [SINGLE PUNCH]

- a. Negative. It is less costly to air seal an ENERGY STAR home than a code-compliant home.
- b. Between \$0 and \$500
- c. Between \$500 and \$1,000
- d. Between \$1,000 and \$1,500
- e. Above \$1,500
- f. REFUSED
- g. DON'T KNOW

Would you say the incremental cost of sealing the duct system to meet ENERGY STAR specifications is...[SINGLE PUNCH]. If needed, clarify that ENERGY STAR specifications are very little leakage to outside, or approximately 190 CFM of leakage for a 2,400 square foot home]

- a. Negative. It is less costly to duct seal an ENERGY STAR home than a code-compliant home.
- b. Between \$0 and \$100
- c. Between \$100 and \$200
- d. Between \$200 and \$300
- e. Above \$300
- f. REFUSED
- g. DON'T KNOW

Would you say the incremental cost of insulating the walls to meet ENERGY STAR specifications of at least R-19 Grade 1 installation is... [SINGLE PUNCH]

- a. Negative. It is less costly to insulate walls of an ENERGY STAR home than a code-compliant home.
- b. Between \$0 and \$100
- c. Between \$100 and \$200
- d. Between \$200 and \$300
- e. Above \$300
- f. REFUSED
- g. DON'T KNOW

Would you say the incremental cost of insulating the ceiling to meet ENERGY STAR specifications of at least R-42 Grade 1 installation is... [SINGLE PUNCH]

- a. Negative. It is less costly to insulate walls of an ENERGY STAR home than a code-compliant home.
- b. Between \$0 and \$100
- c. Between \$100 and \$200
- d. Between \$200 and \$300
- e. Above \$300
- f. REFUSED
- g. DON'T KNOW

On average, about how much more or less would you say it cost to build an ENERGY STAR Labeled Home versus a standard efficiency code compliant home?

- s. \$_____
- t. DON'T KNOW
- u. REFUSED

How do you think this incremental cost of an ENERGY STAR home, compared to a standard code home, has changed in the last few years? Would you say it has . . .?

- 1. Decreased significantly
- 2. Decreased somewhat
- 3. Stayed the same
- 4. Increased somewhat
- 5. Increased significantly
- 6. DON'T KNOW
- 7. REFUSED

[ASK Q.46 IF Q.45 = a, b, d or e]

To what do you attribute this change? [DO NOT READ. CHECK ALL THAT APPLY.]

[IF INCREASE: REASONS 1–6, 11, 12 AND 13 SHOULD SHOW ON THE SCREEN.]

[IF DECREASE: REASONS 7–11, 12 AND 13 SHOULD SHOW ON THE SCREEN.]

- 1. People willing to pay more up front for the ENERGY STAR label
- 2. Extra steps that subcontractors have to complete to meet standards
- 3. Additional checklist requirements for ENERGY STAR Version 3
- 4. Demand for more energy efficiency products driving price up
- 5. The cost for energy-efficient features has increased
- 6. Program requirements have increased
- 7. Code rising toward the ENERGY STAR standard

- 8. Increased builder experience is decreasing building labor costs
- 9. More ENERGY STAR homes available
- 10. More products on market, greater availability, lower incremental prices
- 11. More non-program homes have energy-efficient items installed
- 12. Other (specify): _____
- 13. Don't know
- 14. Refused

Demographics

INT. Now I have just a few categorization questions to ask and we'll be finished.

How many licensed general contractors work for your firm? [OPEN END]

How many trades work for your firm full time? [OPEN END]

Would you say your company's annual revenue was... [SINGLE PUNCH]

- a. Less than \$250,000
- b. Between \$250,000 and \$500,000
- c. Between \$500,000 and \$1,000,000
- d. Between \$1,000,000 and \$3,000,000
- e. Above \$3,000,000
- f. REFUSED
- g. DON'T KNOW

What specialties and trades do you employ full time (non-subcontractors)? [MULTIPUNCH]

- a. Construction (general)
- b. Electricians
- c. Plumbers
- d. HVAC technicians
- e. Energy efficiency technicians
- f. Other, specify
- g. NONE
- h. REFUSED
- i. DON'T KNOW

How is your business structured? Are you a... [SINGLE PUNCH]

- a. A nationally affiliated organization
- b. Privately owned and local at one location
- c. Privately owned and at several locations
- d. Other, specify
- e. REFUSED
- f. DON'T KNOW

Do you perform any commercial sector work? [SINGLE PUNCH]

- a. YES
- b. NO
- c. REFUSED
- d. DON'T' KNOW

[If Q52 = Yes] What percent of your total work is commercial? [NUMBER OPEN END]

- a. Numeric open end
- b. Don't know
- c. Refused

[DO NOT READ: INTERVIEWER RECORD ANY INFORMATION RESPONDENT VOLUNTEERS ABOUT THE PROGRAM THAT WAS NOT CAPTURED DURING THE INTERVIEW HERE]

Closing

Those are all the questions I have for you! I'd like to thank you for your time and participation today.

APPENDIX H

HOME ENERGY REPORTS PROGRAM:

2013 Program Year Evaluation Report

Prepared for: AEP Ohio



May 13, 2014

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Executive Summary

This document summarizes the 2013 evaluation of AEP Ohio's Home Energy Reports (HER) Program. The program has been running since August 2010, making the 2013 program year the third full year in which the program has been in operation. This report is the third annual impact evaluation of the program. It includes estimates of electric energy savings, demand savings, participant¹ engagement and satisfaction findings, and recommendations based on the impact and process evaluations conducted by Navigant.

Program Overview

Classified as an "indirect feedback" program², the HER Program helps residential participants reduce electricity usage by encouraging them to alter their habits of electricity use by providing positive reinforcement behavior modification. Through program year 2013, participants are enrolled on an optout basis in the energy efficiency service operated and delivered by Opower Inc., the program implementation contractor. Participants were randomly selected for program enrollment from three AEP Ohio customer groups, including:

- » Higher-than-average electricity users (*abbreviated as* HU for high use customer). HU program participants include the original group of customers enrolled in 2010 as well as two additional groups enrolled in 2011 and 2013.
- » Low-income households, enrolled in a State of Ohio program called Percentage of Income Payment Plan (PIPP). PIPP program participants include a single group of customers enrolled in 2010.
- » Customer residences equipped with Advanced Metering Infrastructure (*abbreviated as* AMI). AMI program participants include the original group of customers enrolled in 2010 as well as a small additional group enrolled in 2011.

The Home Energy Report Program provides participants with a written report that is received separately from their normal utility bills. An example of a Home Energy Report is shown in Appendix B. The report consists of a single page front and back containing:

- » A bar chart comparing last month's electricity costs for the participant with two groups of similar homes
- » A line graph comparing monthly electric use for each of the previous 12 months for the participant and for two groups of similar homes

¹ Definitions of AEP Ohio customers vs. HER participants: (i) "Participants" are those customers who received the HER and are included in the HER analysis; (ii) "Control Group" or "non-participants" refers to customers within each of the three groups who did not receive HER reports and were selected as the control group for the analysis; and (iii) "Customer" refers generally to all AEP Ohio customers (HER participants, non-participants and all other customers). ² "The State of the Utility Bill" by Ben Foster and Elana Alschuler, ACEEE Report Number B111, November 11, 2011.

- » A bar chart that shows the participant whether they are using more or less electricity than during the comparable season last year
- » Bulleted lists of simple actions the participant can take to reduce electricity usage
- » An estimate of the savings the customer may see on the electricity bill if a specific action is taken

Access to participant information and more tailored tips is also available through an Internet web portal available to the participant even after opting-out of the mailed reports.

Evaluation Objectives

This evaluation addresses the following objectives:

- » Quantify energy savings attributable to the HER Program
- » Test for differences in energy savings among participant subgroups
- » Measure participant engagement with the HERs
- » Further understand the manner in which the HER Program generates energy saving
- » Measure customers satisfaction with the HERs and AEP Ohio
- » Estimate program cost effectiveness
- » Recommend changes that would improve the program

Evaluation Methods

Impact Evaluation

For the impact evaluation, Navigant used a linear fixed effects regression (LFER) model to estimate program savings. The LFER model combines both cross-sectional and time series data in a panel dataset. The data consists of billing data both before program enrollment and for program year 2013 under evaluation, for both treatment (program) households receiving the Home Energy Reports and control households that do not receive the reports. The program evaluation utilizes a randomized controlled trial (RCT) experimental design: households are randomly allocated to the control and treatment groups. The RCT design eliminates the issue of selection bias that complicates the evaluation of many behavioral programs. The basic LFER model casts the average daily energy use as a function of a household-specific constant term, a variable indicating whether the observation is in the pre- or post-program period, and a variable indicating whether the household is a treatment (program) household or a control household.

Process Evaluation

For the process evaluation, Navigant surveyed a random sample of 378 program participants regarding their level of program engagement, actions taken in response to the Home Energy Reports, and satisfaction with the reports and with AEP Ohio. The evaluation team also surveyed a group of 131 non-participant customers (controls) and compared the participants to the controls to see whether the actions of participants differ from non-participant customers. The participant and non-participant samples included customers from three sub groups: 1) high energy users (HU), 2) low income (PIPP) customers, and 3) customers within the AEP Ohio's AMI program. Navigant compared responses from these customer groups to identify any differences in program engagement, actions taken, and/or satisfaction

levels. A subcontractor to the evaluation team conducted the telephone surveys. Navigant also drew upon the program year 2012 process evaluation and input from AEP Ohio to develop the research objectives, survey guides, and analysis process.

Data Collection Type	Targeted Population	Sample Design	Sample Size	Timing
Billing Data	Participant and control customers	N/A	Attempted program census	Feb 2014 – Apr 2014
In-depth interview	AEP Ohio Program Coordinator	Continued contact as needed	1	Aug 2013 – Apr 2014
CATI Surveys	Participant and control customers	Random sample of subgroups. Conducted by Blackstone Survey Group	Participants = 378 Control = 131	Mar 2014 – Apr 2014

Table ES-1. Data Collection Activities for Impact and Process Analysis

Key Findings and Recommendations

Impact Results

The Home Energy Report Program reported (*ex ante*) 62,585 MWh of energy savings and 8,132 kW of demand savings in 2013. The verified (*ex post*) energy and demand savings for 2013 for the HU and PIPP customers combined were 61,857 MWh and 8,041 kW respectively. A comparison of *ex ante* and *ex post* HER Program savings are shown in Table ES-2.

Table ES-2. 2013 Overall Evaluation Results

	2013 Program Goals	Ex Ante Savings (a)	Ex Post Savings (b)	Realization Rate RR = (b) / (a)	Percent of Goal
Energy Savings (MWh)	40,586	62,585	61,857	0.99	152%
Demand Savings (MW)	5,412	8,132	8,041	0.99	148%

Source: Navigant analysis of customer billing data provided by AEP Ohio.

AEP Ohio EE/PDR 2013 Performance Report 12-31-2013 Final.

Savings from AMI customers are not included in the above *ex ante* and *ex post* calculations because these savings are not counted toward the HER Program savings goals. Navigant estimated that the AMI customer group provided an additional 8,321 MWh energy savings and 1,082 kW of peak demand savings. Across all three customer groups (HU, PIPP, and AMI customers combined), Navigant estimates that the HER Program saved 70,178 MWh and 9,123 kW during the 2013 program year. The energy savings estimate corresponds to 1.43 percent of customer bills on average.

» All High-use customers accounted for a total of 58,979 MWh of energy savings, corresponding to 7,667 kW of peak demand savings. Approximately 9,082 MWh and 1,181 of peak demand

savings came from HU customers who were enrolled in the HER Program during the 2013 program year. HU customers represent 81% of the total participants and 84% of the total savings.

- » Low-income customers accounted for 2,878 MWh of energy savings, corresponding to 374 kW of peak demand savings. They represent 5% of participants and 4% of savings.
- » AMI customers accounted for 8,321 MWh of energy savings, corresponding to 1,082 kW of peak demand savings. They represent 13% of participants and 12% of savings.

Detailed impact results for each customer group participating in the HER Program are provided in Table ES-3. In the table, HU customers are divided into three groups based upon when they were initially enrolled in the HER Program: Fall of 2010, Fall of 2011, or Spring of 2013. PIPP and LI customers are each analyzed as a single customer group.

	2010 HU	2011 HU	2013 HU	PIPP	AMI	TOTAL
Number of Participants (beginning of 2013)	106,174	18,993	125,901	15,270	40,590	306,928
Estimated Average Daily Household kWh Used	49.03	64.88	42.89	39.57	28.73	-
Estimated Percentage Savings	2.2%	1.9%	0.8%	1.3%	2.0%	
(standard error)	(0.1%)	(0.3%)	(0.1%)	(0.4%)	(0.3%)	-
Estimated Daily kWh Savings per participant	1.12	1.25	0.33	0.53	0.59	_
(standard error)	(0.07)	(0.18)	(0.05)	(0.16)	(0.09)	-
Estimated Annual kWh Savings per participant	409.6	457.9	70.0	195.1	214.7	
(standard error)	(24.3)	(64.8)	(10.6)	(57.7)	(32.8)	-
Estimated Total MWh Savings* (a)	43,149	8,588	8,251	2,928	8,463	71,379
(standard error)	(2,563)	(1,215)	(1,246)	(867)	(1,293)	(7,184)
Savings Counted in Other Programs (b)	726	145	139	49	142	1,201
Total Savings (MWh) = (a) – (b)	42,423	8,444	8,112	2,878	8,321	70,178
Total Savings (kW)†	5,515	1,098	1,055	374	1,082	9,123

Table ES-3. Estimated Program Savings by Participant Type

Source: Navigant analysis of customer billing data provided by AEP Ohio

* Aggregate savings values have been adjusted to account for customer move-outs throughout the program year and opt-outs † See the discussion below.

Note: All savings values are statistically significant at the 5% level.

As shown in Table ES-3, Navigant found that savings varied by customer group: participants with high energy use saved more energy than other customer groups on an absolute basis. On a relative basis, the savings from HU and AMI customers was comparable, while PIPP customers achieved a lower amount of estimated percentage savings on their utility bills. Though AMI customers saved only a small amount more than PIPP customers, they represented a significantly higher percentage reduction on their energy bills use due to the lower average household energy use of AMI customers. However, both groups

generated roughly half the savings of high use households on a per-participant, absolute basis, demonstrating that HU users are driving the savings from the HER Program.

HU customers who were enrolled in 2013 produced less than half the relative savings of HU customers enrolled in previous program years. The lower level of savings is expected because these customers began receiving Home Energy Reports in May of 2013, and it generally takes six to twelve months for savings to fully materialize after a customer begins receiving reports. Additionally, savings from HU customers enrolled in 2013 are only counted starting in June after the first Home Energy Reports have been delivered.

Importantly, savings differences among the groups are not necessarily due to the identifiers defining group membership. For instance, it cannot be concluded that receipt of an AMI meter causes HER Program savings to be low; factors correlated with group membership, such as levels of pre-enrollment energy use or other household characteristics, might explain the relationship.

Overall program savings were reduced by the savings generated by the increase in participation by HER Program customers in other AEP Ohio energy efficiency/peak demand reduction (EE/PDR) programs as compared to control customers. Navigant used a Difference-in-Difference (DID) calculation to determine the program savings that should be subtracted to account for the HER Program participant energy savings attributable to other AEP Ohio energy efficiency programs. The approach ensures that energy savings from another AEP Ohio EE/PDR program are not double counted in the HER Program. The results of this program uptake analysis are shown in Table ES-4.

	Appliance Recycling	Efficient Products	In-Home	Total
Difference-in-Differences (DID) Statistic	0.20%	0.25%	0.19%	-
Participation in Other Programs (Number of Participants)	574	715	548	1,837
Average Savings per Program Participant (kWh)	1,310	179	585	-
Total Savings (MWh)	752	128	321	1,201

Table ES-4. Estimate of Energy Savings Attributable to Participation in Other Programs

Source: Navigant analysis

The analysis determined that an estimated 1,201 MWh, or 1.66 percent, of the evaluated savings from the HER Program was already included in the savings calculated for other AEP EE/PDR programs.

Process Results

Overall, participants reported being satisfied with the Home Energy Reports; the majority (69%) of respondents reporting a positive level of satisfaction with the reports. This is an increase of eight percent over the prior year's evaluation. Navigant found that participation in the HER Program was correlated with a higher level of general customer satisfaction with AEP Ohio. About 67% of participants in the HER Program reported being satisfied with AEP Ohio overall, while non-participants reported having a

positive level of satisfaction 61 percent of the time. However, the difference in satisfaction between the two groups was not statistically significant.

Survey respondents generally remembered the Home Energy Reports and spent time reading them. A high percentage of participants at least skim the HERs (95%), while 58 percent report reading the HERs thoroughly. Additionally, the eighty-three percent of participant respondents who reported giving thought to their own energy use habits is statistically greater than the proportion of non-participants that reported the same (73%). Participants most often reported purchasing small energy efficiency devices such as efficient light bulbs, window film, or power strips, and they did so at a significantly higher rate than non-participants. However, there is a clear positive correlation between participation in the HER Program and higher rates of small energy efficiency measure purchases and consideration towards the manner in which the customer's household uses electricity.

The majority of respondents recalled the two main components of the Home Energy Reports, energy saving tips and the comparisons of energy use to similar households. However, a much larger proportion of respondents remember the comparisons (89%) than remember the tips (51%). Both of these percentages are lower than what was found in the prior year's evaluation where 94 percent of respondents recalled the comparisons and 60 percent the energy savings tips. As in past evaluation years, a greater proportion of respondents reported not believing the comparison of their household's energy use to other similar households (50% versus 48%). However, the proportion of households believing the comparison (48%) is higher than the proportion of 37 percent found the previous year, which is a significant improvement.

As expected, a small share of respondents reported being aware of the HER web site; nine percent of those who read the reports said they were aware of the web site, and two percent of all respondents reported visiting the web site.

Recommendations

- 1. Continue the HER Program as long as regularly reported electric savings remain cost-effective.
- 2. AEP Ohio should consider a persistence study to determine if a measure lifetime different than one year is appropriate for a Home Energy Report in the cost-effectiveness calculations. Alternatively, a review of existing studies and research could be performed to inform the appropriateness of the assumed measure life.
- 3. Participant survey responses suggest that some aspects of the Home Energy Reports may no longer be making as strong of an impression upon customers as in earlier program years. This may be a result of fatigue and is exemplified by the reduction in the proportion of participants that recall energy savings tips on the HERs or are aware of the website. A new format or redesign of the Home Energy Reports being sent may help to reengage existing customers.
- 4. Existing participants are largely unaware of the HER website. Very few participants reported having visited the web site. AEP Ohio and the implementer should consider marketing the web

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site more proactively, and should track web site traffic and use patterns to establish baselines, set goals and track progress towards those goals. Further ways of enticing customers to the web site should also be considered, such as a participation raffle, a contest among neighborhoods, or the development of a focus group to provide input on bolstering participant-program interaction through the website.
1 Introduction and Purpose of the Study

The purpose of the Home Energy Reports (HER) Program is to reduce the energy consumption of residential households through behavioral changes. Relevant energy habits include turning off appliances when power is not necessary, purchasing/installing low-cost energy efficiency measures, and participating in other AEP Ohio EE/PDR programs.

The goal of the HER Program is to determine whether providing customers with information on their energy usage and methods to manage that usage would lead to measurable changes in energy consumption. The program was launched in August 2010 with a mailing of the HER to more than 200,000 residential customers selected as participants. Additional participants (and corresponding controls) were added in November 2011 and Spring of 2013 to compensate for original participants that had opted-out of the program or moved out of AEP Ohio's service territory. The program provides participants with ongoing comparisons, tips, and encouragement that can produce energy savings, lower energy bills, and improve participant satisfaction.

Participants were randomly selected for program enrollment from three AEP Ohio customer groups, including:

- » Higher-than-average electricity users (*abbreviated as* HU for high use customer), living in singlefamily homes. A total of three cohorts of HU customers have been enrolled in the program. In 2010, 125,000 households were randomly selected for enrollment among customers that consume more than 21,000 kWh annually. An additional 20,000 households that met the same criterion were enrolled in 2011. In 2013, the criterion for enrollment as an HU participant was changed to include households that used a higher-than-average amount of electricity annually. AEP Ohio planned to add an additional 120,000 treatment households meeting this revised criterion in February of 2013.
- » Lower-income households, enrolled in a State of Ohio program called Percentage of Income Payment Plan (*abbreviated as* PIPP). To stay enrolled, all households must have a verified annual income at or below 150 percent of the Federal Poverty Level (FPL). The PIPP helps customers arrange affordable long-term payment agreements. The PIPP group enrolled in 2010 was initially 25,000 participants.
- » Customers utilizing Advanced Metering Infrastructure (*abbreviated as* AMI), all of which were located within the footprint of AEP Ohio's *Smart Grid Demonstration* Project. The AMI group originally contained 62,025 participants enrolled in 2010.

Table 1-1 shows the number of active treatment and control households in each program subgroup and cohort as of the beginning of the 2013 program year. Also included in the table are the counts of additional HU customers that were enrolled into the program in February of 2013 to replenish earlier participants that had opted out of the program or otherwise became inactive AEP Ohio customers. The savings from these customers are being evaluated for the first time in this report.

Customer Subgroup	Participants	Controls
High-use Customers	251,068	113,448
August 2010 Cohort	106,174	51,909
November 2011 Cohort	18,993	9,088
February 2013 Cohort	125,901	52,451
AMI Customers	40,590	11,641
August 2010 Cohort	35,761	11,641
2011 Cohort	4,829	0
Low-income Customers	15,270	13,914
Total	306,928	139,003

Table 1-1. Number of Program Participants and Non-Participants

Source: Navigant Analysis

1.1 Program Description

The purpose of the Home Energy Reports (HER) Program is to provide feedback to residential participants that will help them change energy use habits to save energy. Customers are encouraged to do this through the use of a personalized report delivered to participating households either bi-monthly or quarterly. The information included in the report shows the energy use pattern of the household relative to their peers and offers particular actions a participant can take to reduce their household's metered electricity usage. To implement this program, AEP Ohio contracted with Opower, Inc. to develop and distribute the reports.

The HER provides recipients with the following items:

- » A bar chart comparison of last month's electricity costs for the recipient and for two groups of similar homes
- » A line graph that compares monthly electric use for each of the previous 12 months for the recipient vs. two groups of about 100 similar homes
- » A bar chart that shows the recipient whether it is using more or less electricity than it did during the comparable season last year
- » A short bullet list of simple actions the household could take to reduce electricity usage
- » An estimate of the savings the customer may see on the electricity bill if a specific action is taken



Figure 1-1. Home Energy Report Program Engagement Flow

Source: Navigant

Participants are encouraged to actively manage their electricity use through the use of social norms. Figure 1-1 illustrates how participants likely engage with the HERs after receiving these in the mail. While each customer may respond differently, Figure 1-1 attempts to capture each possible set of reactions and opinions. For example, upon receipt of the reports a customer will either read these or not read these. Those who read the report will either read it thoroughly or "skim" it. Participants who read the reports will develop various levels of awareness and opinions about the information provided. Note that recipients do not have to have a specific level of awareness or type of opinion in order to take action. A customer could move from skimming the report to purchasing a small energy efficiency device without considering the report's tips relevant. The evaluation team aligned the customer surveys with Figure 1-1 to easily understand and communicate engagement trends. Section 3.2 discusses the survey results within this framework.

1.2 Evaluation Overview

This evaluation report presents the findings from the impact and process evaluations of the AEP Ohio Home Energy Reports Program for Program Year 2013. The primary goal of the impact evaluation is to quantify electric energy savings attributable to the HER Program. A secondary goal of the impact

analysis was to compare the savings generated among the various participant subgroups. These comparisons include HU, PIPP, and AMI participants.

The goal of the process evaluation was to measure participant engagement and satisfaction with the HERs and to further understand the manner in which the HER Program generates energy savings. Navigant conducted a telephone survey to gather data from participant and non-participant customers. To evaluate differences in responses between the various types of customers enrolled in the program, the evaluation team designed the sample to include customers from three sub groups: 1) high energy users (HU), 2) low income (PIPP) customers, and 3) customers within the AEP Ohio's AMI program.

Interviewers asked participants a series of questions about their level of engagement with the HERs, such as whether they received the reports and whether members of the household took specific actions after reading the reports. Participants were also asked to rate their level of satisfaction with the HERs and with AEP Ohio in general. To establish a comparison baseline for the analysis, interviewers asked non-participant customers comparable questions about actions people within the household took to save energy. Non-participants were also asked to rate their level of satisfaction with AEP Ohio.

2 Evaluation Methodology

The following section provides a detailed description of the evaluation methodologies and data used in the impact and process evaluations of AEP Ohio's Home Energy Report Program.

2.1 Description of the Data

2.1.1 Data Used in the Impact Evaluation

The impact analysis follows an attempted census approach, using data from all treatment and control households to estimate program savings. Navigant used monthly billing data from AEP Ohio's customer information system, spanning the period from December 2008 to January 2014. The billing data included a unique customer ID, the start and end dates of each bill cycle, and the quantity of energy consumed during the bill cycle. Navigant also received participant data from AEP Ohio, including information about when the customer first received an HER, the participant group the customer is in, and a list of customers that participated in other AEP Ohio programs to account for the possibility of double counted savings.

Participants meeting the following criteria were included in the analysis:

- » At least six months of pre-program billing data
- » At least six months of post-program billing data
- » Did not opt-out of the program

Figure 2-1 shows the number of program participants that opted-out in each month of the 2013 program year. By the end of December 2013, 1,311 households had opted-out of the Home Energy Report Program in 2013. Of these, 702 households were part of the HU replenishment group enrolled during 2013, while the other 609 households were already enrolled in the HER Program at the beginning of 2013. Including the replenishment group, this represents 0.43 percent of program year 2013 participants, which is consistent with what the HER Program has experienced in previous program years.



Figure 2-1. Frequency Distribution of Opt-Out Households, by Month and Cumulative Percentage

Source: Navigant Analysis

2.1.2 Data Used in the Process Evaluation

For the process evaluation, Navigant surveyed a random sample of 509 participant and non-participant customers, drawing from the sample frame used for the impact evaluation. The survey collected responses from 378 participants (HER recipients) and 131 non-participants (comparable customers who do not receive the HERs). The sampling frame was transferred to Navigant in accordance with strict customer privacy guidelines.

To evaluate differences in responses between the various types of customers enrolled in the program, the evaluation team designed the sample to include customers from three sub groups: 1) high energy users (HU), 2) low income (PIPP) customers, and 3) customers within AEP Ohio's AMI program. Table 2-1 includes the sample breakdown and number of completed surveys according within each sub-group.

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Sub-group	Description	Number Completed
HU Control	Non-Participant customers with high energy usage (HU)	50
HU Treatment	Participant customers with high energy usage (HU)	164
AMI Control	Non-Participant customers with interval electric metering through automated metering infrastructure (AMI)	41
AMI Treatment	Participant customers with interval electric metering through automated metering infrastructure (AMI)	122
PIPP Control	Non-Participant customers enrolled in the Percentage of Income Payment Program (PIPP) for low income households	40
PIPP Treatment	Participant customers enrolled in the Percentage of Income Payment Program (PIPP) for low income households	92
Total		509

Table 2-1. Sample Sub-group Description and Number of Completed Surveys

The surveys utilized a computer-assisted telephone interview (CATI) and were completed by a subcontractor to the evaluation team between the weeks of March 17, 2014 and April 7, 2014, about 43 months after AEP Ohio launched the program and 11 months since the previous Navigant survey. The survey questions covered several key topics to achieve the research objectives. Interviewers asked participant customers a series of questions about their level of engagement with the HERs, such as whether they received the reports and whether members of the household took specific actions after reading the reports. Participants were also asked to rate their level of satisfaction with the HERs and with AEP Ohio in general. To establish a comparison baseline for the analysis, interviewers asked non-participant customers comparable questions about actions people within the household took to save energy. Non-participants were also asked to rate their level of satisfaction with AEP Ohio. Appendix C includes the participant and non-participant survey guides for reference.

To identify changes in responses between this year's survey and the 2012 survey, Navigant included specific questions from the 2012 survey in this year's survey guide. While the 2013 sample intentionally did not include the households surveyed in 2012, the evaluation team designed both 2012 and 2013 samples to represent the same customer attributes; as a result, the team was able to make comparisons between 2012 and 2013 responses.

2.2 Comparability of Treatment and Control Group

When customers are enrolled in the Home Energy Report program, a randomized control trail (RCT) is utilized to assign perspective participants into treatment and control groups. In principle, this methodology of assignment results in comparable control and treatment groups, where the energy use of the control group can be used as a counterfactual to estimate the program savings of the participant group.

Navigant analyzed characteristics of treatment and control households within each customer group and cohort to determine whether they are balanced in the factors that affect energy use. For this comparison, three characteristics were reviewed to ascertain the comparability of the control households:

- The geographic distribution of customers within AEP service territory as indicated by the weather station assigned to each customer.
- > The propensity for treatment and control customers to participate in other AEP Ohio energy efficiency programs prior to their enrollment in the HER Program.
- Distribution of energy use within each month in the twelve month period prior to the enrollment of the participant households in the HER Program. Monthly levels of energy use were compared using the mean, 5th percentile, 25th percentile, 50th percentile, 75th percentile, and 95th percentile.

Navigant's position is that a comparison on the last item – the distribution of past energy use –subsumes all other relevant comparisons, because structural differences between a treatment and control group will be revealed by past energy use. Still, comparisons in other dimensions can be a useful check on the balance of the samples.

Figure 2-2 shows a summary of Navigant's analysis of the geographic distribution of the households used within the analysis of the HER Program. It shows the proportion of treatment and control households within each customer group and cohort assigned to each weather station within AEP Ohio service territory. The figure demonstrates that the geographic distribution of each of the four control groups is representative of the corresponding group of treatment households. The two AMI cohorts are not shown in Figure 2-2 because all of the treatment and control customers come from the Columbus (CMH) region, thus making the control group geographically representative of the treatment group.



Figure 2-2. Proportion of Customers from Each Region by Cohort

Source: Navigant Analysis

The primary comparison Navigant performed to assess the reasonableness of the control groups is to compare the energy used by households in the 12 months preceding enrollment of participating households in the HER Program. Navigant expanded upon the analysis performed in previous program years to compare the distribution of energy use in each month for treatment and control households rather than just the simple average of energy use in each month. Graphs showing the results of this comparison for all customer groups and cohorts are presented in Appendix C. Figure 2-3 shows a box-and-whisker graph comparing the monthly energy use for the 2013 cohort of HU customers, which are analyzed for the first time in this year's evaluation. In the graph, the blue diamonds represent the average monthly electricity use of households in each customer group, the red bars represent the range of energy use between the 25th and 75th percentile of households, and the lines (whiskers) show the range between the 5th and 95th percentile of households. As the following graph and the graphs in Appendix C show, Navigant found the average energy use and the distribution of energy use by month for control households in the pre-treatment period to be comparable to treatment households for all customer groups and cohorts except the initial AMI customer group.



Figure 2-3. Monthly Energy Use of Treatment and Control Households in 2013 HU Cohort

Source: Navigant Analysis

For the 2010 AMI group, Navigant found statistically significant differences in 7 out of the 12 months in the pre-program period. The months where differences were found were all during the heating season, from October 2009 until April of 2010. Figure C-4 shows that without accounting for electric heat, there are significant differences in the distribution of monthly electricity usage between treatment and control households. After consultation with the program implementer, Navigant determined that these deviations are due to different proportions of customers with electric heat in the treatment and control groups. As a result, data regarding the heating type of customers in the AMI treatment and control groups was provided by the program implementer and incorporated into the analysis. Navigant used this information to split AMI customers into two groups, those utilizing electric heat and those utilizing a different fuel source for heat. Electricity usage in the pre-program period was then compared separately for these two groups. When electric heat type was controlled for using this method, the vast majority of the differences in electricity usage between control and treatment households are eliminated. After accounting for electric heat there is no month in the 12 months before the program begins in which the average energy use for the two groups is statistically significant different at the 90% level. As discussed in the next section, this finding led Navigant to incorporate additional terms into the regression equation for AMI customers.

The last analysis that Navigant performed was to compare the proportion of treatment and control customers that participated in other AEP Ohio EE/PDR programs during the pre-program year. The comparison was performed to see if there is a possible difference in the tendency for treatment or control households to engage in energy efficient behaviors prior to the enrollment of treatment households in

the HER Program. Only the Appliance Recycling program existed during the year prior to the enrollment of the original HER Program participants in 2010. In the year prior to the enrollment of the 2013 HU cohort, the In Home Audit and Efficient Products programs were also active. Figure 2-4 shows the proportion of treatment and control customers across all customer groups and cohorts that were enrolled in these AEP Ohio programs during the pre-program year. None of the proportions are statistically different from each other, suggesting that propensity of treatment and control customers to engage in energy efficiency activities was similar at the time.





Source: Navigant Analysis

2.3 Analytical Methods

This section describes the analytical methods used as part of the impact and process evaluations. In general, the methodologies utilized are in accordance with recommendations from the SEE Action Network Working Group for evaluating behavior-based energy efficiency programs.³ Three different models are utilized in the impact evaluation to confirm the robustness of the estimated savings impacts.

2.3.1 Impact Evaluation Methods

The main methodological issue for the impact evaluation is to estimate the *counterfactual* energy use by households participating in the HER Program – that is, the energy that households *would have used in the absence of the program.* The program utilized a randomized controlled trial (RCT) experimental design,

³ "Evaluation, Measurement, and Verification (EM&V) of Residential Behavior-Based Energy Efficiency Programs: Issues and Recommendations" published by the State and Local Energy Efficiency Action Network in May 2012.

meaning that households were randomly allocated to the control and treatment groups. This eliminates the issue of selection bias that complicates the evaluation of many behavioral programs. The random assignment of households to the treatment and control groups means the control group should serve as a robust baseline against which the energy use of the treatment households can be compared to estimate savings from enrollment in the HER Program.

Estimates of program impacts are derived via linear fixed effects regression (LFER) analysis. The simplest version of an LFER model convenient for exposition is one in which average daily consumption of kWh by participant and non-participant *k* in bill *t*, denoted by ADC_{kt}, is a function of three terms:

- 1. the binary variable *Treatment*, taking a value of 0 if non-participant *k* is assigned to the control group, and 1 if participant *k* is assigned to the participant group
- 2. the binary variable *Post*^{*t*}, taking a value of 0 if bill *t* is before the participant's *program start date* and 1 if the bill is received on or after the program start date
- 3. the interaction between these variables, *Post*_t ·*Treatment*_k.

This is referred to as a one-way fixed effects model because it includes a household-specific fixed-effects term. Equation 1 formally⁴ presents the equation for this model.

Equation 1. One-Way Fixed Effects Regression Model

$$ADC_{kt} = \alpha_{0k} + \alpha_1 Post_t + \alpha_2 Participant_k \cdot Post_t + \varepsilon_{kt}$$

where,

$ADC_{kt} =$	The average daily use in kWh for participant or non-participant k
	during billing cycle <i>t</i> . This is the dependent variable in the model.
Postt =	A binary variable indicating whether bill cycle <i>t</i> is in the post-
	program period (taking a value of 1) or in the pre-program period
	(taking a value of 0).
Participant _k =	A binary variable indicating whether participant k is in the
	participant group (taking a value of 1) or in the non-participant
	group (taking a value of 0).
$\alpha_{0k} =$	The household-specific fixed effect (constant term) for household <i>k</i> .
	The fixed effect controls for all participant or non-participant-
	specific effects on energy consumption that do not change over
	time, such as the number of household members, the size of the
	dwelling, or a thermostat that is always set at a certain
	temperature.
$\alpha_1, \alpha_2 =$	Regression parameters corresponding to the independent variables.

⁴ This equation corresponds to Formula 1.1 in Appendix C of "Evaluation, Measurement, and Verification (EM&V) of Residential Behavior-Based Energy Efficiency Programs: Issues and Recommendations" published by the State and Local Energy Efficiency Action Network in May 2012.

Three observations about the model specification deserve comment.

First, the coefficient α_{0k} is the household-specific fixed-effect that implicitly captures *all* participantspecific and non-participant specific effects on electricity use that do not change over time, such as square footage of the dwelling, number of occupants, and indoor temperature preferences including those that are unobservable.

Second, α_1 captures the average effect *among non-participants* of being in the post-treatment period. In other words, it captures the effects of exogenous factors, such as economic conditions, that affect all non-participants in the program period but not in the pre-program period. For the AMI customer group, α_1 + α_3 captures this same value for customers that utilize electric heat.

Third, $\alpha_1 + \alpha_2$ captures the average effect *among participants* of being in the post-program period, and so the effect directly attributable to the Home Energy Reports program is captured by the coefficient α_2 . In other words, this coefficient captures the *difference-in-difference* in average daily kWh use between the participants and non-participants across the pre-program and treatment periods. Consequently the Difference-in-Differences (DID) statistic is considered the best indicator of program effects in a program evaluation. For the AMI customer group, $\alpha_2 + \alpha_4$ would be the corresponding DID statistic for those customers that have electric heat. Average annual savings for 2013 are generated by multiplying the annual estimate of household ADS by 365 days. *This estimate of average annual savings applies to households that remain in the program for the full year*.

For the analysis of the AMI group, two additional terms are added to account for the differing prevalence of electric heat in the treatment and control groups. Equation 2 formally presents the equation for this model.

Equation 2. One-Way Fixed Effects Regression Model (AMI Customer Group)

 $\begin{aligned} ADC_{kt} &= \alpha_{0k} + \alpha_1 Post_t + \alpha_2 Participant_k \cdot Post_t + \alpha_3 ElectricHeat_k \cdot Post_t \\ &+ \alpha_4 Participant_k \cdot ElectricHeat_k \cdot Post_t + \varepsilon_{kt} , \end{aligned}$

where,

$ElectricHeat_{k} =$	A binary variable indicating whether household k utilizes electric heat
	(taking a value of 1) or non-electric heat (taking a value of 0).

The preferred model for estimating savings – the model on which reported savings are based – expands on this model to include monthly fixed effects (monthly dummy variables) to account for the impact of general weather conditions that occur during each month as well as other time-specific impacts. This is

called a two-way fixed effects model. Letting γ_t denote the fixed effect for month *t*, the equation takes the form,⁵

Equation 3. Two-Way Fixed Effects Regression Model

 $ADC_{kt} = \alpha_{0k} + \alpha_1 Participant_k \cdot Post_t + \gamma_m SampleMonth_t + \varepsilon_{kt}$

For the AMI group, the equation is once again augmented to account for customer heating type, as shown in Equation 4.

Equation 4. Two-Way Fixed Effects Regression Model (AMI Customer Group)

 $\begin{aligned} ADC_{kt} &= \alpha_{0k} + \alpha_1 Participant_k \cdot Post_t + \alpha_2 ElectricHeat_k \cdot Post_t + \alpha_3 Participant_k \cdot ElectricHeat_k \cdot Post_t \\ &+ \gamma_m SampleMonth_t + \varepsilon_{kt} \end{aligned}$

The two-way fixed effects model is the preferred model used for reporting savings, and the one-way fixed effects model provides a good check on the robustness of results. Due to the experimental design of the program, the models should generate very similar results. A second model that can be used to check results uses the post-program observations only, and replaces the household fixed effect with the household's energy use in the same calendar month of the pre-program year to account for household-level variation in energy use. We refer to this model as the post-program regression (PPR) model. Formally, defining *Preconsumption*_{kt} as household *k*'s energy use in month *t*, the model takes the form,

Equation 5. Post-Program Regression Model with Monthly Fixed Effects

 $ADC_{kt} = \alpha_{ot} + \alpha_1 Preconsumption_{tk} + \alpha_2 Participant_k + \gamma_t + \varepsilon_{kt}$.

For the AMI group, the equation is once again augmented to account for customer heating type, and presented in Equation 6.

Equation 6. Post-Program Regression Model with Monthly Fixed Effects (AMI Customer Group)

 $ADC_{kt} = \alpha_{ot} + \alpha_{1}Preconsumption_{tk} + \alpha_{2}ElectricHeat_{k} + \alpha_{3}Participant_{k} + \alpha_{4}Participant_{k} \cdot ElectricHeat_{k} + \varepsilon_{kt} \gamma_{t} + \varepsilon_{kt} .$

Of the participants and non-participants included in the analysis, 18,586 moved out during the study period. These participants and non-participants were omitted from the regression analysis to estimate program effects, but were included in the estimate of total program savings. Move-out dates were provided to Navigant by AEP Ohio. Navigant assumed that until a participant moves out, their program savings are equal to savings over the same period for participants that remain in the program for the entire study period.

⁵ This equation is a variation on Formula 1.3 in Appendix C of "Evaluation, Measurement, and Verification (EM&V) of Residential Behavior-Based Energy Efficiency Programs: Issues and Recommendations" published by the State and Local Energy Efficiency Action Network in May 2012.

One of the ways in which Home Energy Reports encourage participants to reduce energy consumption is by channeling them into other energy efficiency programs offered by AEP Ohio, notably the Appliance Recycling, Efficient Products, and In-Home Energy programs. Navigant investigated the effect of the HER Program on increasing participation in these three programs in order to account for the possibility of double counted savings. Of these three programs, only the Appliance Recycling Program existed prior to the start of the HER Program, and thus appears in the pre-program billing data. For each customer group and cohort, Navigant compared the change in the rate of participation for the treatment group and the control group in the pre-program year and the 2013 program year via the Difference-in-Differences (DID) statistic:

DID = (Treatment: Pre/Post change in # of participants as % of total HER participants) – (Control: Pre/Post change in # of participants as % of total control households)

Navigant then multiplied the DID statistic by the number of treatment households to get the change in uptake for each of the three other AEP Ohio programs due to the HER Program. The change in participation in the other programs was then multiplied by the average participant savings for each program to estimate the total savings that is already accounted for in the savings estimates for the other AEP Ohio programs.

2.3.2 Process Analysis Methods

Navigant weighted the participant survey results based on each subgroup's proportion of the overall program population, so that results presented here accurately represent the opinions of all participants in the program. Weighting is necessary because some subgroups were oversampled or undersampled relative to their proportional representation in the program in order to generate meaningful results at the subgroup level. As shown in Table 2-2, HU participants represent 82 percent of all program participants, but only 43 percent of the completed surveys. Thus, responses from the HU Treatment subgroup are weighted more heavily when analyzing survey results for the entire participant population.

Survey Subgroup	Sample Size	Sample %	Population	Population %	Weight
HU Treatment	145	42.9%	251,068	81.8%	1.91
AMI Treatment	109	32.2%	40,590	13.2%	0.41
PIPP Treatment	84	24.9%	15,270	5.0%	0.20

Table 2-2. Participant Weighting Scheme – General

Source: Navigant

Note: Weight = Population percentage divided by Sample percentage.

Additionally, Navigant developed a second weighting scheme to apply to the analysis of participant engagement. An additional 58 program participants were initially contacted by interviewers but these surveys were not completed due to a) a respondent's inability to recall receiving the HER (40 respondents), or b) no one in the respondent's household read the reports (18 respondents). Navigant included these responses in order to accurately capture program recall and engagement how. Table 2-3

shows these additional weights, which were applied only to calculate percentages in Sections 3.2.1.1 and 3.2.1.2, as well as for percentages shown in Figure 3-1.

Survey Subgroup	Sample Size	Sample %	Population	Population %	Weight
HU Treatment	164	43.4%	251,068	81.8%	1.89
AMI Treatment	122	32.3%	40,590	13.2%	0.41
PIPP Treatment	92	24.3%	15,270	5.0%	0.20

Table 2-3. Participant Weighting Scheme – All Respondents

Source: Navigant

Note: Weight = Population percentage divided by Sample percentage. Sample size includes respondents whose interviews were terminated prior to completion because they either a) did not recall receiving the HERs, or b) no one in their household read the reports. These weights were used only to calculate percentages in Sections 3.2.1.1 and 3.2.1.2, as well as for percentages shown in Figure 3-1.

Navigant developed weights for the non-participant survey results in a similar manner.

Table 2-4. Non-Participant Weighting Scheme

Survey Subgroup	Sample Size	Sample %	Population	Population %	Weight
HU Control	50	38.2%	113,448	81.6%	2.14
AMI Control	41	31.3%	11,641	8.4%	0.27
PIPP Control	40	30.5%	13,914	10.0%	0.33

Source: Navigant

Note: Weight = Population % divided by Sample %.

When looking at the results of one subgroup individually, or comparing one subgroup against another subgroup (e.g., PIPP Treatment vs. PIPP Control), no weighting is necessary because the proportion of the sample and the proportion of the subgroup's population are identical (both 100%).

Navigant used SPSS software to create survey response tabulations and to identify statistical correlations across various data points. The evaluation team reviewed overall response frequencies for survey questions related to participant engagement, participant/non-participant satisfaction, and participant/non-participant actions taken. Navigant also tested for statistically significant differences between strata combinations. Using this information, the evaluation team conducted additional analysis in Excel to identify and quantify process-related findings. Table 2-5 summarizes the SPSS cross tabulations Navigant investigated.

Report Category	Strata Combinations	Purpose
Participant Response Frequencies	- All Participants	Identify engagement trends within each enrollment group, and overall.
Treatment vs. Control Group Comparison	 All AMI Treatment vs. AMI Control All HU Treatment vs. HU Control PIP Treatment vs. PIP Control 	Identify differences between responses from participants and non-participants.

Table 2-5. SPSS Cross Tabulation Outcomes

Source: Navigant

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3 Detailed Evaluation Results

3.1 Impact Results

The Home Energy Report Program reported 62,585 MWh of energy savings and 8,132 kW of demand savings in 2013. The verified *(ex post)* energy and demand savings for 2013 for the HU and PIPP customers combined were 61,857 MWh and 8,041 kW respectively. A comparison of *ex ante* and *ex post* HER Program savings are shown in Table 3-1.

Table 3-1. 2013 Overall Evaluation Results

	2013 Program Goals	Ex Ante Savings (a)	Ex Post Savings (b)	Realization Rate RR = (b) / (a)	Percent of Goal
Energy Savings (MWh)	40,586	62,585	61,857	0.99	152%
Demand Savings (kW)	5,412	8,132	8,041	0.99	148%

Source: Navigant Analysis.

AEP Ohio EE/PDR 2013 Performance Report 12-31-2013Final.

Savings from AMI customers are not included in the above *ex ante* and *ex post* calculations because these savings are not claimed by AEP Ohio. Navigant estimated that the AMI customer group provided an additional 8,321 MWh energy savings and 1,082 kW of peak demand savings. Across all three customer groups (HU, PIPP, and AMI customers combined), Navigant estimates that the HER Program saved 70,178 MWh and 9,123 kW during the 2013 program year. The energy savings estimate corresponds to 1.43% of customer bills on average. Navigant's estimate of *ex post* savings is net of a Difference-in-Differences (DID) analysis performed by Navigant that determined 1,201 MWh and 156 kW of estimated savings that are likely already counted in other AEP Ohio EE/PDR programs. The total savings estimate pro-rates savings for customers that moved out or otherwise became inactive during the program year. All estimates are statistically significant at the 5 percent confidence level and presented in further detail below.

3.1.1 Results by Participant Type

Table 3-2 presents the estimated program savings using the two-way fixed effects model described in Equations 3 and 4 within each subgroup as well as the number of customers to which the savings estimates were applied.

	2010 HU	2011 HU	2013 HU	PIPP	AMI	TOTAL
Number of Participants (beginning of 2013)	106,174	18,993	125,901	15,270	40,590	306,928
2013 Opt-outs	291	90	702	52	176	1,311
2013 Move-outs	1,056	297	14,821	417	1,995	18,586
Average Daily Household kWh Used	49.03	64.88	42.89	39.57	28.73	-
Estimated Daily kWh Savings per participant (standard error)	1.12 (0.07)	1.25 (0.18)	0.33 (0.05)	0.53 (0.16)	0.59 (0.09)	-
Estimated Annual kWh Savings per participant (standard error)	409.6 (24.3)	457.9 (64.8)	70.0 (10.6)	195.1 (57.7)	214.7 (32.8)	-
Estimated Percentage Savings (standard error)	2.2% (0.1%)	1.9% (0.3%)	0.8% (0.1%)	1.3% (0.4%)	2.0% (0.3%)	-
Estimated Total MWh Savings* (a) (standard error)	43,149 (2,563)	8,588 (1,215)	8,251 (1,246)	2,928 (867)	8,463 (1,293)	71,379 (7,184)
Savings Counted in Other Programs (b)	726	145	139	49	142	1,201
Total Savings (MWh) = (a) – (b) Total Savings (kW)†	42,423 5,515	8,444 1,098	8,112 1,055	2,878 374	8,321 1,082	70,178 9,123

Table 3-2. Estimated Program Savings by Participant Group Using Equations 3 and 4

Source: Navigant Analysis

* Aggregate savings values have been adjusted to account for customer move-outs throughout the program year and opt-outs Note: All values are statistically significant at the 5% level.

[†] The billing analysis model described in this report cannot be directly utilized for the estimation of demand savings. In order to properly determine demand savings using this method, intraday customer billing data would be needed. In the absence of such data, Navigant applied the ratio of kW to MWh savings from the program plan to the estimate of energy savings produced by the program analysis.

As shown in Table 3-2, Navigant found that savings varied by customer group: participants with high energy use saved more energy than other customer groups on an absolute basis. On a relative basis, the savings from HU and AMI customers were comparable, while PIPP customers achieved a lower amount of estimated percentage savings on their utility bills. Though AMI customers saved only a small amount more than PIPP customers, this represented a significantly higher percentage reduction on their energy bills use due to the lower average household energy use of AMI customers. However, both groups generated roughly half the savings of high use households on a per-participant, absolute basis, demonstrating that HU users are driving the savings from the HER Program.

HU customers who enrolled in 2013 produced less than half the savings of HU customers enrolled in previous program years. The lower level of savings is expected because these customers began receiving Home Energy Reports in May of 2013, and it generally takes 6-12 months for savings to fully materialize after a customer begins receiving reports. Additionally, savings from HU customers enrolled in 2013 are only counted starting in June after the first Home Energy Reports have been delivered.

Importantly, savings differences among the groups are not necessarily due to the identifiers defining group membership. For instance, it cannot be concluded that receipt of an AMI meter causes HER Program savings to be low; factors correlated with group membership, such as levels of pre-enrollment energy use or other household characteristics, might explain the relationship.

Navigant also ran a separate analysis using the one-way fixed effects model shown in Equations 1 and 2. The model incorporates monthly fixed effects that implicitly account for temporal factors that do not vary across customers, such as weather and economic conditions. Navigant also ran an analysis using the preconsumption model shown in Equations 5 and 6. The intent of these comparisons was to see if there is any discernible difference between savings estimates using the various model specifications. A graphical comparison of the results from the two models is shown in Figure 3-1. In the graph, the blue diamonds represent the estimated per participant savings, while the red bars depict the uncertainty band surrounding the estimate. The uncertainty band represents the 90 percent confidence interval based on the savings estimate and standard error shown in Appendix A.



Figure 3-1. Comparison of Estimated Savings Values Using Both Models

Source: Navigant Analysis

* Aggregate savings values have been adjusted to account for customer move-outs throughout the program year and participation in other programs offered by AEP Ohio

Note: All values are statistically significant at the 5% level.

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The graph shows that the estimated savings values produced by each model for each customer group and cohort are statistically comparable. In each instance, the estimated savings value produced by one model lies within the uncertainty band produced by the other models. The combination of the analyses using the one-way fixed effects model, the two-way fixed effects model, and the PPR model shows that the savings estimates are robust for all customer groups.

Enrollment in Other AEP Ohio Programs 3.1.2

Navigant utilized the Difference in Difference (DID) statistic to estimate the savings captured in the billing analysis for the HER Program that is already accounted for in the savings estimate for three other AEP Ohio programs: Appliance Recycling, Efficient Products, and In Home Audit. The inputs to and results of the DID calculation are presented in Table 3-3.

	Appliance Recycling	Efficient Products	In-Home Energy
# of HER Treatment Households (Beginning of 2013)	280,557	280,557	280,557
# of Participants, Pre-Period	3,406	2,698	717
# of Participants, 2013	5,763	8,346	3,393
Change in Participants (#)	2,357	5,648	2,676
Change in Participants (%)	0.84%	2.01%	0.95%
# of HER Control Households (Beginning of 2013)	128,692	128,692	128,692
# of Participants, Pre-Period	1,490	1,164	322
# of Participants, 2013	2,308	3,427	1,298
Change in Participants (#)	818	2,263	976
Change in Participants (%)	0.64%	1.76%	0.76%
DID Statistic (%)	0.20%	0.25%	0.19%
Change in Program Participation due to HER Program (# of Participants)	574	715	548

Table 3-3. Change in Program Uptake due to HER Program

Source: Navigant Analysis

The resulting change in program participation due to the HER Program can be multiplied by average savings per participant in the Appliance Recycling, Efficient Products, and In-Home Energy programs to estimate the total amount of savings that is double counted. Table 3-5 shows this calculation.

	Appliance Recycling	Efficient Products	In-Home	Total
Difference-in-Differences (DID) Statistic	0.20%	0.25%	0.19%	-
Participation in Other Programs (# of Participants)	574	715	548	1,837
Average Savings per Program Participant (kWh)	1,310	179	585	-
Total Savings (MWh)	752	128	321	1,201
Source: Navigant Analysis				

Table 3-4. Estimate of Energy Savings Attributable to Participation in Other Programs

3.2 Process Results

This section addresses the process evaluation of the 2013 Home Energy Report Program year. Two main topic areas were included in the evaluation: Participant Engagement and Customer Satisfaction.

3.2.1 Participant Engagement

"Engagement" includes a participant's interactions with the Home Energy Reports and actions taken to reduce energy use based on tips in the report. As mentioned in Section 1.1, each customer may engage differently with the HERs. For example, upon receiving a report, a customer will either read it or not read it. Those that read the report will do so with varying degrees of thoroughness and develop different levels of awareness and opinions about the information provided. Navigant asked survey respondents a series of questions to understand how AEP Ohio customers engage with the HERs. Figure 3-2 presents the proportion of participant survey responses to each of these engagement questions.



Figure 3-2. Participant Survey Respondent Engagement Results

Source: Navigant Participant Survey 2013 Program Year Evaluation

Confidential and Proprietary Home Energy Reports Program Program Year 2013 Evaluation Report

Each set of boxes in Figure 3-2 represents a question and two possible responses. The small boxes within each larger box show the valid percentage of respondents who selected the option for that question (for example, of the 146 respondents that recalled the tips given in their Home Energy Report, 66 percent considered the tips relevant to their household). The number in the bottom right corner of each box shows the overall percentage of respondents who selected that option for the question at hand (for example, 28 percent of all respondents considered the tips relevant to their household). The sections that follow align with each of Figure 3-2's tiers: Recall and Reading Habits, Awareness of Opinions and Information, and Actions Taken.

3.2.1.1 Recall and Reading Habits

Many survey respondents indicated that the Home Energy Reports are memorable and that they spend time reading them thoroughly. A majority (89%) of surveyed participants remembers receiving the HERs, and of those who did recall receiving the report 96 percent indicated that someone in their home reads the report. When asked how much time they spend reading the HERs, the majority (61%) reported reading the HERs thoroughly.⁶ This is a slight decrease from findings of the previous year, where 73 percent of participants reported reading the HERs thoroughly. Even so, these high response rates imply that the HERs continue to be memorable and effective in getting the customer's attention, the first step towards achieving the program goals.

3.2.1.2 Awareness and Opinions of Information

The majority (89%) of respondents recalled the comparisons of their energy use to similar households, while only half (51%) of respondents could recall the energy saving tips included in the HERs, down from 60 percent in the previous year. However, of those that recalled the tips, a majority (66%) consider the tips to be relevant to their household. As in past evaluation years, respondents reported a low level of confidence in the accuracy of the comparison to similar households. Only 48 percent of those that recall the comparisons reported believing their accuracy, though this is up 37 percent who reported believing the comparisons in the previous year. The change indicates that participants are increasingly trusting of these comparisons. Most respondents who reported not believing the comparisons described their household's circumstances as unique, thus making comparison challenging.

Respondent awareness of the HER website is lower than last year; only nine percent of those that read the reports said that they were aware of the website. Of those nine percent, only 15 percent reported visiting the website, equal to two percent of respondents overall. This represents a decrease over the previous year's evaluation, which found that 18 percent of respondents were aware of the HER website and five percent overall had visited the site. It is important to note that awareness of and interaction with this portion of the program has gone down since the program launched the site. This may be due to participant fatigue regarding the information conveyed in the HERs or the layout of the reports.

⁶ Navigant asked respondents to describe how much time they spend on average reviewing the report and used prompts as necessary. For analysis, Navigant considered selections above "more than two minutes" as reading the HERs "thoroughly" and selections of two minutes or less as "skimming" the HERs.

Of the respondents who said they have visited the website, an equal number reported being "somewhat satisfied" as those who reported being "somewhat dissatisfied" (39% each). Nine percent of respondents indicated they were "very satisfied" with the website, equal to 0.1 percent of respondents overall. No respondents indicated that they were "very dissatisfied" with the website. A single respondent indicated that their dissatisfaction stemmed from being unable to determine the reason why their house is less efficient than their neighbors.

3.2.1.3 Actions Taken

The Home Energy Report Program's ultimate goal is to encourage recipients to alter the way they use energy in their homes through behavioral change. Thus, a participant's engagement will ideally include taking action on a variety of energy saving tips. Examples of possible outcomes include discussions about saving energy with household members; purchasing energy efficient devices, electronics or appliances; and changing ongoing habits related to using energy in the household. It is important to note that the information presented here does not confirm that HER recipients purchased these devices *because of* the reports. Rather, this analysis establishes what respondents reported happening at a certain point in time, i.e., after receiving the HERs.

Navigant asked each participant and non-participant respondent whether anyone in their household took a series of actions "within the last 12 months". The "Actions Taken" tier in Figure 3-2 highlights the results of this series among participant respondents. Figure 3-3 compares the types of actions reported by participant and non-participant survey respondents.



Figure 3-3. Types of Actions Taken by Respondents "Within the Last 12 Months"

Source: Navigant Participant and Non-Participant Surveys, 2013 Program Year Evaluation – QE8 Note: Participant n = 320, Non-Participant n = 131.

*Difference is statistically significant at the 90% confidence level.

The responses imply that participants most often give thought to their own energy use and purchase small energy efficiency devices, and that they do so at a significantly higher rate than non-participants. The majority (83%) of respondents who read the HERs reported giving thought to their own energy use habits within the last 12 months, compared to 73 percent of non-participants. Participants also reported purchasing small energy efficiency devices at a significantly higher rate than non-participants. A high percentage (82%) of participants stated that they have purchased a small energy efficiency device, such as efficient light bulbs, window film, or power strips within the last 12 months compared to roughly 73 percent of non-participants. These results do not necessarily establish that participants took these actions more frequently because of the HERs. However, there is a clear positive correlation between participation in the program and thinking about energy use and making small energy efficient purchases. The survey results also show evidence that HER participants are more likely to perform other energy savings actions, such as discussing energy use habits within the household or changing their energy use habits. However, the differences between participants and non-participants for these answers were not statistically significant.

Navigant asked each respondent who reported making an energy efficient purchase within the past 12 months to describe the purchase(s) in detail. Figure 3-4 presents the percent of respondents that reported each type of energy efficiency purchase.



Figure 3-4. Percent of Respondents Reporting Each Type of Energy Efficient Purchase

Source: Navigant Participant and Non-Participant Surveys, 2013 Program Year Evaluation – QE9 Note: Participant n = 320, Non-Participant n = 131. Includes the top six most frequently reported purchases among participants, as well as all those with a statistically significant difference. Respondents may have reported more than one type of energy efficient purchase. Navigant aligned the response categories for these questions with the HER tips. *Difference is statistically significant at the 90% confidence level.

The responses imply that both participants and non-participants most often purchased energy efficient lighting products, and that participants do so at a significantly higher rate than non-participants (54% participants; 41% non-participants). Participant respondents also purchased energy efficient clothes washers, power strips, programmable thermostats, and microwaves at a statistically higher rate than non-participants (see Figure 3-3 for exact percentages). For the latter three products, non-participants did not report purchasing these items at all, implying that the HERs are addressing a lack of awareness of these products. Notably, non-participants reported purchasing energy efficient air conditioners at a statistically higher rate than participants (2% participants; 6% non-participants).

Overall, the average participant respondent that reported purchasing an efficient product purchased 1.7 energy efficient products, which is significantly higher than the average non-participant respondent, who purchased 1.2⁷ energy efficient products.

⁷ Navigant Analysis of Participant and Non-Participant Surveys, 2013 Program Year Evaluation – QE9

As with energy efficiency purchases, Navigant asked each respondent who reported changing their energy usage habits within the past 12 months to describe the change in detail. Figure 3-5 presents the percent of respondents that reported each type of habit change.





Source: Navigant Participant and Non-Participant Surveys, 2013 Program Year Evaluation – QE10 Note: Participant n = 320, Non-Participant n = 131. Includes the top six most frequently reported behavior changes among participants, as well as all those with a statistically significant difference. Respondents may have reported more than one type of energy efficient behavior change. Navigant aligned the response categories for these questions with the HER tips. *Difference is statistically significant at the 90% confidence level.

The responses imply that both participants and non-participants most often changed their behavior to use lighting more efficiently (42% participants; 43% non-participants). Participant respondents reported managing electronic devices efficiently, maintaining equipment to run efficiently, using window shades and drying clothes efficiently at a significantly higher rate than non-participants (see Figure 3-5 for exact percentages). For the latter two products, non-participants did not report changing this behavior at all, implying that the HERs are addressing a lack of awareness of these behaviors. Notably, non-participants reported programming their programmable thermostats at a statistically higher rate than participants (5% participants; 9% non-participants).

Overall, the average participant respondent that reported changing their behaviors changed 1.3 behaviors regarding energy efficiency, which is significantly higher than the average non-participant respondent, who changed 1.0⁸ behaviors regarding energy efficiency.

3.2.2 Customer Satisfaction

3.2.2.1 Satisfaction with the Home Energy Report

Navigant asked participants to rate their satisfaction with the information in the Home Energy Reports. Overall, participants reported being satisfied with the HERs; the majority (69%) of respondents reported a positive level of satisfaction. Thirteen percent of respondents report dissatisfaction with the information provided in the HERs. When asked to elaborate on their reasoning, many respondents indicated that they do not trust the accuracy of the reports or that they feel the information is not important. Several respondents stated that it was an invasion of privacy and that AEP Ohio should not care about energy use, as long as the bill is paid. Figure 3-6 summarizes the proportion of satisfaction ratings provided by all participants surveyed.

⁸ Navigant Analysis of Participant and Non-Participant Surveys, 2013 Program Year Evaluation – QE10



Figure 3-6 Participant Satisfaction with the Home Energy Reports

Source: Navigant Participant Survey, 2013 Program Year Evaluation – QSA3

Notes: Percent of all participant respondents; N=320; Colors indicate positive or negative feelings regarding HER Program: green = positive, yellow = neutral, red = negative.

3.2.2.2 Satisfaction with AEP Ohio

Navigant investigated whether there is a difference between Home Energy Report Program participant and non-participant satisfaction with AEP Ohio. The responses imply that the HER Program may have no impact on general customer satisfaction, as responses between the two groups are very similar. There did not appear to be a statistically significant difference in satisfaction between the two groups, however participants reported a slightly higher rate of satisfaction compared to non-participants. Sixty-seven percent of participants reported a positive level of satisfaction with AEP Ohio's efforts to help them save on their utility bills, compared to sixty one percent of non-participants. An equal percentage of participants and non-participants reported being dissatisfied with AEP Ohio. Figure 3-7 summarizes the proportion of satisfaction ratings provided by participants and non-participants.



Figure 3-7. Participant and Non-Participant Satisfaction with AEP Ohio

Source: Navigant Participant Survey, 2013 Program Year Evaluation – QSA1 Notes: Percent of all participant respondents; N=320; Percent of all non-participant respondents; N=131

3.2.2.3 Program Channeling

Navigant asked respondents if they had participated in any AEP Ohio energy efficiency programs for their home (not including the HER Program). The majority of respondents reported that they had not participated in any of these programs (89% of participants; 79% of non-participants). An important finding here is that participants were statistically more likely to report not having participated in another program as compared to non-participants (difference is statistically significant at the 90 percent confidence level). Figure 3-8 provides a summary of these results.



Figure 3-8. Respondent Participation in Other AEP Ohio Energy Efficiency Programs

Source: Navigant Participant and Non-Participant Surveys, 2013 Program Year Evaluation – QSA14 Note: Participant n = 320, Non-Participant n = 131.

Difference is statistically significant at the 90% confidence level.

Navigant asked respondents who had participated in a non-HER AEP Ohio energy efficiency program to share the name of that program. The most common response given by HER participant respondents is that they had participated in the Appliance Rebate Program (2.6%). Figure 3-9 provides a breakdown of all respondent answers.



Figure 3-9. Breakdown of Respondent Participation in Other AEP Ohio Energy Efficiency Programs

Source: Navigant Participant and Non-Participant Surveys, 2013 Program Year Evaluation – QSA15 Note: Participant n = 320, Non-Participant n = 131. Program mentions were classified as "unknown" by Navigant if the respondent's answer could potentially reference more than one program. *Difference is statistically significant at the 90% confidence level.

Navigant asked the participants who had participated in a non-HER AEP Ohio program whether they participated in the other program prior to receiving the HERs or after. The majority indicated that they participated in these programs before receiving their first report (46%), while 27 percent indicated that they participated after. A number of respondents (23%) could not recall the exact timeline of events.

To conclude the interview, Navigant asked respondents to share their opinions on the best way for AEP Ohio to reach customers about their energy efficiency programs. Figure 3-10 shows the most common responses given by respondents. Most respondents indicated that sending out a flier or mailer would be the best way to reach customers about program offerings, followed by calling people and including promotional information in customer bills. Many respondents stated that they did not know the best way for AEP Ohio to reach customers about their programs.



Figure 3-10. Respondent Suggestions for Effective Outreach from AEP Ohio

Source: Navigant Participant and Non-Participant Surveys, 2013 Program Year Evaluation – QSA17 Note: Participant n = 320, Non-Participant n = 131. Only the top seven responses are included in the graphic.

3.3 Cost Effectiveness Review

This section addresses the cost effectiveness of the 2013 Home Energy Report Program. Cost effectiveness is assessed through the use of the Total Resource Cost (TRC) test. The cost-effectiveness analysis does not include the impacts of the AMI participants. The AMI component is administered and charged to another internal organization. Table 3-5summarizes the unique inputs used in the TRC test.

Item	Value
Measure Life	1
Participants	260,538
Annual Energy Savings (MWh)	61,857
Coincident Peak Savings (kW)	8,041
Third Party Implementation Costs	2,132,000
Utility Administration Costs	261,710
Utility Incentive Costs	0
Participant Contribution to Incremental Measure Costs	\$0
Source: AEP Ohio Analysis	

Table 3-5. Inputs to Cost-Effectiveness Model for AEP HER Program

Based on these inputs, the TRC ratio for the AEP Ohio HER Program is 1.0, and the program is costeffective. Table 3-6 summarizes the results of the cost-effectiveness tests. Results are presented for the Participant test, the TRC test, the Ratepayer Impact Measure test, and the Utility Cost test.

Cost-Benefit Test	Result
Total Resource Cost	1.0
Participant Cost Test	N/A
Ratepayer Impact Measure	0.3
Utility Cost Test	1.0
Sourson AED Obio Apolycia	

Table 3-6. Cost-Effectiveness Results for the HER Program

Source: AEP Ohio Analysis

At this time, additional benefits related to reduction of greenhouse gas emissions have not been quantified in the calculation of the TRC. These additional benefits would increase the given TRC benefit/cost ratio.
4 Conclusions and Recommendations

4.1 Impact Evaluation

Navigant utilized methodologies in accordance with recommendations from the SEE Action Network Working Group for evaluating behavior-based energy efficiency programs in order to estimates HER Program savings.⁹ Three different models were utilized in the impact evaluation to confirm the robustness of the estimated savings impacts. All savings estimates were found to statistical significant at the 90 percent confidence level.

4.1.1 Key Findings

The Home Energy Report Program reported 62,585 MWh of energy savings and 8,132 kW of demand savings in 2013. The verified (*ex post*) energy and demand savings for 2013 for the HU and PIPP customers combined were 61,857 MWh and 8,041 kW respectively. AMI customers, not included in the above numbers because these savings are not counted toward the HER Program savings goals, are estimated to have provided an additional 8,321 MWh energy savings and 1,082 kW of peak demand savings. Across all three customer groups (HU, PIPP, and AMI customers combined), Navigant estimates that the HER Program saved 70,178 MWh and 9,123 kW during the 2013 program year. The energy savings estimate corresponds to 1.43 percent of customer bills on average, inclusive of participants enrolled during the 2013 program year.

Navigant's estimates of overall program savings were reduced by the savings generated by the increase in participation by HER Program customers in other AEP Ohio energy efficiency/peak demand reduction (EE/PDR) programs as compared to control customers. Navigant used a Difference-in-Differences (DID) analysis to determine that 1,201 MWh of estimated savings are likely already counted in other AEP Ohio EE/PDR programs. The total savings estimate pro-rated savings for customers that moved-out during the program year. All estimates are statistically significant at the five percent level and presented in further detail below.

Navigant found that savings varied by customer group: participants with high energy use saved more energy than other customer groups on an absolute basis. On a relative basis, the savings from HU and AMI customers was comparable, while PIPP customers achieved a lower amount of estimated percentage savings on their utility bills. Though AMI customers saved only a small amount more than PIPP customers, this represented a significantly higher percentage reduction on their energy bills use due to the lower average household energy use of AMI customers. However, both groups generated roughly half the savings of high use households on a per-participant, absolute basis, demonstrating that HU users are driving the overall savings from the HER Program.

⁹ "Evaluation, Measurement, and Verification (EM&V) of Residential Behavior-Based Energy Efficiency Programs: Issues and Recommendations" published by the State and Local Energy Efficiency Action Network in May 2012.

4.1.2 Impact Recommendations

- 1. Continue the HER Program as long as regularly reported electric savings remain cost-effective.
- 2. AEP Ohio should consider a persistence study to determine if a measure lifetime different than one year is appropriate for a Home Energy Report in the cost-effectiveness calculations. Alternatively, a review of existing studies and research could be performed to inform the appropriateness of the assumed measure life. Particular attention should be paid to how different measure life assumptions will impact the ongoing cost-effectiveness calculations for the HER Program.

4.2 Process Evaluation

4.2.1 Key Findings

Overall, participants reported being satisfied with the Home Energy Reports; the majority (69%) of respondents reporting a positive level of satisfaction with the reports. This is an increase over the prior year's evaluation of eight percent. Navigant found that participation in the HER Program was correlated with a higher level of general customer satisfaction with AEP Ohio. About 67% of participants in the HER Program reported being satisfied with AEP Ohio overall, while non-participants reported having a positive level of satisfaction 61 percent of the time. However, the difference in satisfaction between the two groups was not statistically significant.

Survey respondents indicated that the Home Energy Reports are memorable and that they spend time reading them. A high percentage of participants at least skim the HERs (95%), while 58 percent report reading the HERs thoroughly. The eighty-three percent of participant respondents who reported giving thought to their own energy use habits is statistically greater than the proportion of non-participants that reported the same (73%). Participants most often reported purchasing small energy efficiency devices, and they did so at a significantly higher rate than non-participants.

The majority of respondents recalled the two main components of the Home Energy Reports, energy saving tips and the comparisons of energy use to similar households. A much larger proportion of respondents remember the comparisons (89%) than remember the tips (51%). As in past evaluation years, a greater proportion of respondents reported not believing the comparison of their household's energy use to other similar households (50% versus 48%). However, the proportion of households believing the comparison (48%) is higher than the proportion of 37 percent found the previous year, which is a significant improvement.

4.2.2 Process Recommendations

1. Participant survey responses suggest that some aspects of the Home Energy Reports may no longer be making as strong of an impression upon customers as in earlier program years. This may be a result of fatigue and is exemplified by the reduction in the proportion of participants that recall energy savings tips on the HERs or are aware of the website. A new format or redesign of the Home Energy Reports being sent may help to reengage existing customers.

2. Existing participants are largely unaware of the HER web site. Very few participants reported having visited the web site. AEP Ohio and the implementer should consider marketing the web site more proactively, and should track web site traffic and use patterns to establish baselines, set goals and track progress towards those goals. Further ways of enticing customers to the web site should also be considered, such as a participation raffle, a contest among neighborhoods, or the development of a focus group to provide input on bolstering participant-program interaction through the website.

Appendix A Impact Evaluation Parameter Estimates

This appendix provides all parameter estimates and corresponding t-statistics that were included in the final model and savings calculations.

Customer Group	Parameter	Parameter Estimate	Standard Error	T-statistic
	Post*Treatment	-1.122	0.067	-16.84
	Month 1	-9.674	0.063	-153.89
	Month 2	-8.752	0.072	-122
	Month 3	-2.372	0.084	-28.21
	Month 4	16.520	0.115	143.62
	Month 5	20.756	0.127	163.42
	Month 6	16.379	0.118	138.25
	Month 7	-3.250	0.083	-39.08
	Month 8	-12.652	0.067	-189.28
	Month 9	-9.471	0.062	-153.75
	Month 10	3.387	0.065	52.21
	Month 11	10.829	0.069	157.07
HU 2010	Month 41	9.912	0.129	76.91
	Month 42	8.503	0.128	66.46
	Month 43	1.535	0.112	13.75
	Month 44	-12.186	0.088	-138.88
	Month 45	-13.272	0.079	-167.64
	Month 46	-5.085	0.081	-62.44
	Month 47	0.425	0.083	5.15
	Month 48	-5.112	0.081	-63.01
	Month 49	-11.468	0.082	-139.36
	Month 50	-14.403	0.087	-165.42
	Month 51	-3.181	0.107	-29.81
	Month 52	8.208	0.143	57.42
	Post*Treatment	-1.255	0.177	-7.07
	Month 15	4.850	1.429	3.39
HU 2011	Month 16	18.054	0.385	46.84
	Month 17	20.361	0.389	52.4

Table A-1. Parameter Estimates Resulting from Equations 3 and 4

-

Customer Group	Parameter	Parameter Estimate	Standard Error	T-statistic
	Month 18	7.525	0.369	20.4
	Month 19	-12.160	0.347	-35
	Month 20	-29.112	0.347	-83.88
	Month 21	-32.632	0.374	-87.26
	Month 22	-26.030	0.405	-64.2
	Month 23	-14.447	0.421	-34.35
	Month 24	-21.888	0.409	-53.47
	Month 25	-36.362	0.387	-93.92
	Month 26	-35.062	0.361	-97.15
LILI 2011	Month 41	5.129	0.320	16.04
HU 2011	Month 42	3.464	0.309	11.2
	Month 43	-8.374	0.293	-28.59
	Month 44	-32.129	0.308	-104.38
	Month 45	-37.983	0.348	-109.29
	Month 46	-30.619	0.380	-80.65
	Month 47	-25.173	0.387	-64.99
	Month 48	-30.994	0.378	-82.06
	Month 49	-37.455	0.370	-101.14
	Month 50	-37.336	0.337	-110.91
	Month 51	-17.321	0.311	-55.66
	Post*Treatment	-0.327	0.049	-6.62
	Month 32	-19.834	0.138	-144.19
	Month 33	-16.753	0.138	-120.97
	Month 34	-7.979	0.152	-52.5
	Month 35	-1.553	0.152	-10.24
	Month 36	-8.014	0.147	-54.57
	Month 37	-18.003	0.140	-128.26
HU 2013	Month 38	-18.266	0.130	-140.28
	Month 39	-9.376	0.126	-74.6
	Month 40	-2.132	0.125	-17.05
	Month 41	2.798	0.127	21.98
	Month 44	-17.700	0.118	-150.36
	Month 45	-19.323	0.129	-149.57
	Month 46	-12.406	0.138	-89.78
	Month 47	-7.384	0.142	-52.07

Customer Group	Parameter	Parameter Estimate	Standard Error	T-statistic
	Month 48	-12.367	0.139	-89.17
	Month 49	-17.573	0.137	-128.16
HU 2013	Month 50	-19.680	0.127	-154.84
	Month 51	-9.554	0.119	-80.22
	Post*Treatment	-0.496	0.0920	-6.15
	Post*ElectricHeat*Treatment	-0.327	0.214	-1.53
	Month 1	-5.718	0.099	-57.87
	Month 2	-7.996	0.099	-81.08
	Month 3	-7.107	0.104	-68.59
	Month 4	0.516	0.117	4.41
	Month 5	3.600	0.131	27.48
	Month 6	2.695	0.133	20.23
	Month 7	-4.815	0.107	-44.8
	Month 8	-9.466	0.098	-96.8
	Month 9	-6.950	0.093	-74.53
	Month 10	3.265	0.095	34.35
	Month 11	8.773	0.097	90.54
	Month 15	-9.033	0.959	-9.41
AMI	Month 16	3.152	0.392	8.05
	Month 17	4.363	0.374	11.66
	Month 18	1.591	0.322	4.94
	Month 19	-4.357	0.240	-18.19
	Month 20	-8.085	0.227	-35.68
	Month 21	-8.405	0.222	-37.79
	Month 22	-3.197	0.253	-12.62
	Month 23	4.335	0.284	15.25
	Month 24	1.320	0.319	4.14
	Month 25	-7.574	0.269	-28.12
	Month 26	-10.390	0.215	-48.38
	Month 27	-7.143	0.264	-27.1
	Month 28	-6.214	0.189	-32.85
	Month 41	-0.158	0.146	-1.08
	Month 42	-0.270	0.151	-1.79
	Month 43	-3.432	0.139	-24.76
	Month 44	-8.450	0.125	-67.7

Customer Group	Parameter	Parameter Estimate	Standard Error	T-statistic
	Month 45	-7.177	0.123	-58.48
	Month 46	-1.125	0.126	-8.91
	Month 47	3.325	0.129	25.71
0.041	Month 48	-0.441	0.127	-3.47
Alvii	Month 49	-4.840	0.127	-38.21
	Month 50	-9.255	0.126	-73.36
	Month 51	-5.251	0.135	-38.91
	Month 52	0.726	0.184	3.95
	Post*Treatment	-0.534	0.158	-3.38
	Month 1	-5.653	0.112	-50.62
	Month 2	-2.362	0.131	-18.02
	Month 3	2.073	0.149	13.89
	Month 4	14.124	0.204	69.22
	Month 5	17.126	0.216	79.4
	Month 6	15.502	0.208	74.59
	Month 7	1.752	0.143	12.24
	Month 8	-5.482	0.118	-46.58
	Month 9	-5.201	0.110	-47.42
	Month 10	2.808	0.114	24.72
DIDD	Month 11	7.849	0.121	64.96
FIFF	Month 41	16.398	0.267	61.36
	Month 42	16.034	0.269	59.54
	Month 43	10.376	0.230	45.07
	Month 44	-1.939	0.171	-11.37
	Month 45	-5.127	0.156	-32.92
	Month 46	-0.196	0.166	-1.18
	Month 47	3.977	0.171	23.25
	Month 48	-0.075	0.167	-0.45
	Month 49	-3.522	0.165	-21.34
	Month 50	-3.655	0.172	-21.29
	Month 51	7.582	0.228	33.28
	Month 52	16.413	0.339	48.35

Source: Navigant Analysis

NAVIGANT

Appendix B Sample Home Energy Report

Below is an example of a Home Energy Report sent to participating AEP Ohio customers.

Figure B-1. Example of AEP Ohio Home Energy Report Home Energy Report gridSMART" Account number: Report period: 04/01/11 - 05/31/11 IP OHIO We are pleased to provide you periodic, personalized Home Energy Reports as part of an AEP Ohio gridSMART® initiative. These reports are designed to provide you more information to make informed energy choices to help you save energy and money. If you have any questions about these reports or would like to no longer receive them, you can contact us at (800) 277-2177 or gridSMARTOhioReports@aep.com. Update your home information at: gridSMARTOhio.com/go/reports Last 2 Months Household Comparison You used 30% LESS electricity than efficient similar homes. How you're doing: YOUR HOME 658 kWh* GREAT CC Efficient 936 Similar Homes Booa (L) Similar Homes 1,364 More than everage * kWh: A 100-Watt bulb burning for 10 hours uses 1 kilowatt-hour. Similar Homes: Approximately 100 Efficient Similar Homes: The Is your home compared correctly? occupied, nearby homes (avg 0.09 miles most efficient 20 percent of similar Tell us more about your home: homes awav) gridSMARTOhio.com/go/reports Last 12 Months Household Comparison You used 50% LESS electricity than similar homes. This saves you about \$591 per year. < 2010 2011 > 1,200 900 KWh 600 300 JL 1.N AUG SP OCT NOV DEC .IAN FFB MAR APR MAY Your Home Similar Homes / Ethcient Similar Homes

Turn over for savings -----

Confidential and Proprietary Home Energy Reports Program Program Year 2013 Evaluation Report



Action Steps | Personalized tips chosen for you based on your energy use and housing profile

Quick Fix

Something you can do right now

Raise your thermostat setting By setting your thermostat appropriately in the summer, you can stay cool and save energy. You can save 3-5% on cooling costs for each degree you increase the temperature.

Set the thermostat to 78°F or higher when you are awake and home, and use fans to stay comfortable.

When you leave home, change the thermostat to an energy saving level — a 10°F adjustment is a good rule of thumb.



Great Investment A big idea for big savings

Choose an efficient room air conditioner In the summer, air conditioning can account for a significant portion of your home's energy bill.

When you decide to replace your old room air conditioner, invest in an efficient, ENERGY STAR® qualified unit to lower your cooling costs.

We're offering a \$25 mail-in rebate when you recycle your old, working room air conditioner and purchase an ENERGY STAR qualified model May 1, 2011 through August 31, 2011.

\$20 PER YEAR

Quick Fix Something you can do right now

Keep out the sun's heat Sunlight passing through windows can heat up your home and make your air conditioner work extra hard.

Keep blinds or draperies closed on sunny days to block this heat. You can also purchase and install shade screens, which are another affordable and effective way to keep out the sun's heat.

Blocking sunlight from entering your home will help you stay comfortable and save on cooling costs.

SAVE UP TO \$10 PER YEAR

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 Government or any agency thereof. The views and opiniers of authors appreciated herein do not necessarily state or reflect these of the United States Government or any agency thereof.

Appendix C Verification of Control Group

The graphs that follow present the distribution of energy use in the pre-program period for treatment and control households in each customer group and cohort. In the graphs, the blue diamonds represent the average monthly electricity use of households in each customer group, the red bars represent the range of energy use between the 25th and 75th percentile of households, and the lines (whiskers) show the range between the 5th and 95th percentile of households.







Figure C-2. Monthly Energy Use of Treatment and Control Households in 2011 HU Cohort



Figure C-3. Monthly Energy Use of Treatment and Control Households in 2013 HU Cohort



Figure C-4. Monthly Energy Use of Treatment and Control Households in 2010 AMI Cohort



Figure C-5. Monthly Energy Use of Treatment and Control Households in 2010 PIPP Cohort

Appendix D Data Collection Instruments

The following guides were used to conduct the in-depth surveys with participants and control group non-participants.

D.1 AEP OHIO Home Energy Report Program Participant Survey for 2013 Program Year Evaluation

Interviewer Instructions and Notes

- 1. The purpose of the introductory script and associated questions is to identify the person within the contact household that is responsible for opening and handling the mail the household receives from AEP Ohio.
- 2. We also want to ensure that we are talking to the appropriate household to maintain confidence in our strata. If the household is no longer affiliated with the contact in the contact list, please terminate the call and note the reason for the termination.
- 3. Ohio's older customers may use the names of previous companies prior to merger. AEP Ohio used to be called "Ohio Power" or "Columbus Southern Power" or "Columbus Southern Electric."
- 4. AEP stands for American Electric Power.

Title	<u>Code</u>	Page Number
Introduction & Screener	S	2
Home Energy Report Engagement	E	4
Satisfaction	SA	9
Demographics	D	12

Introduction & Screener

Hello, may I speak with [CONTACT NAME]?

I'm ______ of the Blackstone Group, calling on behalf of AEP Ohio. I have a few questions about mailings you may have received from AEP Ohio. Your feedback is important and will help AEP Ohio fine tune the information it sends you. We are only gathering information and I will not attempt to sell you anything. We will keep your name and opinions confidential and the survey will only take a few minutes.

[ASK TO SPEAK TO CONTACT NAME. IF NOT AVAILABLE, ASK TO SPEAK WITH ADULT THAT OPENS THE

MAIL]: Okay, can I please speak with an adult who handles the mail from your electric utility company,

AEP Ohio? This might include the electric bill, letters about your account, and information about energy efficiency.

S1. **[IF CONTACT NAME ANSWERS CONFIRM THEIR RELATIONSHIP TO PROGRAM]:** Are you the person in the household who handles the mail from your electric utility company, AEP Ohio? This might include the electric bill, letters about your account, and information about energy efficiency. **[DO NOT READ LIST]**

- 1. Yes [CONTINUE]
- 2. No [ASK FOR PERSON WHO READS MAIL]: "Is the person who does read the mail from AEP Ohio available?" [IF NOT AVAILABLE, SCHEDULE CALLBACK]
- 98. Don't know **[THANK AND TERMINATE]**
- 99. Refused [THANK AND TERMINATE]

[SCHEDULE A CALLBACK IF PERSON IS NOT AVAILABLE]: "Okay, I can call back. Is there a good time to reach that person?"

S2. Are you willing to participate?

- 1. Yes [CONTINUE]
- 2. Some other time [RECORD DATE AND TIME TO RESCHEDULE A CALL BACK]
- 3. No [THANK AND TERMINATE]
- 98. Don't know **[THANK AND TERMINATE]**
- 99. Refused [THANK AND TERMINATE]

S3. Great, thank-you. Just one more question before we get started with the survey. Are you talking to me on a mobile phone or a landline?

- 1. Landline [SKIP TO NEXT SECTION]
- 2. Mobile phone [CONTINUE TO S4]
- 99. Refused [CONTINUE TO S4]

[IF S3 = 2 or 99]

S4. Are you in a safe place where you can talk for a few minutes?

- 1. Yes [CONTINUE TO NEXT SECTION]
- 2. No [SCHEDULE CALLBACK]: "When is a good time for me to call you back?"
- 98. Don't know [SCHEDULE CALLBACK]: "When is a good time for me to call you back?"
- 99. Refused [SCHEDULE CALLBACK]: "When is a good time for me to call you back?"

Home Energy Report Engagement

Thank-you for agreeing to speak with me. We are helping AEP Ohio determine the value of the mail it sends to you -- in addition to your monthly bill. Your advice will be extremely helpful.

E1. Do you recall whether your household receives a report in the mail that describes your home's energy use? [DO NOT READ LIST] [NOTE: THE REPORTS ARE DIFFERENT FROM THE UTILITY BILL; IF RESPONDENT IS NOT CLEAR ABOUT WHETHER THEY RECEIVE THE REPORTS PROMPT WITH DESCRIPTION OF REPORT]: "The reports are different from your utility bill. They come in a different envelope, are printed on one piece of paper, and include charts and graphs about your energy use."

- 1. Yes
- 2. No, we do not receive the reports [THANK AND TERMINATE]
- 98. Don't know [THANK AND TERMINATE]
- 99. Refused [THANK AND TERMINATE]

E2. Thanks for confirming that you have been receiving the Home Energy Reports. Can you tell me if anyone in your household reads the reports? [DO NOT READ LIST]

- 1. I personally read them
- 2. I personally read them and others in my household look at them
- I do not read them, only others in my household look at them [ASK FOR PERSON WHO LOOKS AT THEM: "Is the person who does read the report available?" [IF NOT AVAILABLE, RECORD NAME AND SCHEDULE CALLBACK]
- 4. No one reads them. We toss them out. [SKIP TO E3]
- 97. Other [SPECIFY]
- 98. Don't know [THANK AND TERMINATE]
- 99. Refused [THANK AND TERMINATE]

[IF E2 = 4]

E3. Please tell me why no one in your household reads the reports. **[RECORD VERBATIM] [THANK AND TERMINATE]**

E4. Roughly how much time do you spend on average reviewing the report? [DO NOT READ LIST]

- 1. More than 20 minutes
- 2. More than 10 minutes
- 3. More than 5 minutes
- 4. More than 2 minutes
- 5. Two minutes or less
- 97. Other [SPECIFY]
- 98. Don't know
- 99. Refused

E5. The Home Energy Reports suggest actions you can take to save energy. Do you recall any specific suggestions from your reports? **[DO NOT READ LIST]**

- 1. Yes, [SPECIFY WHICH, OPEN END]: "Which specific suggestions do you recall?"
- 2. No [SKIP TO E8]
- 97. Other [SPECIFY]
- 99. Refused

E6. On average, do you find the suggestions relevant to you and your household?

- 1. Yes [SKIP TO E8]
- 2. No [CONTINUE TO E7]
- 97. Other [SKIP TO E8]
- 99. Refused [SKIP TO E8]

E7. Why do you feel the suggestions are not relevant to you and your household? [OPEN ENDED]

E8. I'm going to read a list of things that you may have done after receiving the Home Energy Reports. Please tell me if you, or anyone in your household, have done any of these things within the last 12 months. **[CHECK BOXES]**

	Yes	No	Don't	Refused
	(1)	(2)	Know (98)	(99)
a. Have you given thought to your own energy use habits				
over the last 12 months?				
b. Have you discussed ideas about how to save energy				
within your household within the last 12 months?				
c. Have you discussed ideas about how to save energy				
with others outside of your household (i.e., co-workers,				
neighbors, and friends) within the last 12 months?				
d. Have you purchased energy efficient appliances, such				
as water heaters, air conditioners, or programmable				
thermostats, within the last 12 months? [IF YES, READ				
E9.]				
e. Have you purchased energy efficient electronic				
equipment, such as computers or televisions, within the				

last 12 months? [IF YES, READ E9.]		
f. Have you purchased any small energy efficiency		
devices, such as efficient light bulbs, window film, or		
power strips, within the last 12 months? [IF YES, READ		
E9.]		
g. Within the last 12 months, have you changed any of		
your habits related to how often or how long you use		
lighting and/or electronics in your home? [IF YES, READ		
E10.]		
h. Within the last 12 months, have you changed any of		
your habits related to the amount of heating, cooling,		
and/or hot water you use in your home? [IF YES, READ		
E10.]		

[IF E8d. OR E8e. OR E8f. = YES]

E9. What energy efficient purchases do you recall making within the past 12 months? [DO NOT READ LIST, CHECK ALL THAT APPLY]

- 1. Air conditioner (i.e., window unit, central air, room air conditioner, ductless air conditioner)
- 2. Clothes dryer
- 3. Clothes washer
- 4. Dehumidifier
- 5. Dishwasher
- 6. Electronics (i.e., television, laptop, desktop computer, home office equipment)
- 7. Fans (i.e., whole-house fan, attic fan, solar attic fan, box fans, ceiling fans)
- 8. Heat pump (for heating or cooling home; i.e., a "regular" heat pump, geothermal heat pump, or ductless heat pump)
- 9. Insulation in attic and/or walls of home
- 10. Lighting and/or occupancy sensors (i.e., CFLs, a.k.a. the "spiral light bulbs", LED lights, outdoor solar lights, dimming lights, motion sensors, occupancy sensors)
- 11. Pool equipment (i.e., heater, pool pump, variable speed pool pump)
- 12. Refrigerator and/or freezer
- 13. Programmable thermostat
- 14. Water heater (i.e., "regular" water heater, solar water heater, geothermal water heater, drain water heat recovery system, heat pump water heater, tankless water heater)
- 15. Windows (i.e., double pane, storm windows, strategically placed new windows, window film)
- 16. Window film
- 97. Other [SPECIFY]
- 99. Refused

[IF E8g. OR E8h. = YES]

E10. What did you do to change the way you use energy within the past year? [DO NOT READ LIST, CHECK ALL THAT APPLY]

- 1. Adjust manual thermostat to heat and cool efficiently (i.e., raise thermostat setting during warm weather to reduce cooling, lower thermostat setting during cool weather to reduce heating)
- 2. Program programmable thermostat to heat and cool efficiently (i.e., program to reduce heating and/or cooling when away from home or asleep
- 3. Dry clothes efficiently (i.e., hang clothes to air dry, run the clothes dryer with a full load)
- 4. Wash clothes efficiently (i.e., use cold water, run the washer with a full load)
- 5. Use lighting efficiently (i.e., turn off lights when not in use, use task lighting rather than overhead lights for things like reading and cooking)
- 6. Manage electronic devices efficiently (i.e., unplug electronics when not in use, use power strips and turn them off when not in use, use power save modes on computers, adjust settings to energy efficient settings, shut down computer at night, unplug chargers when not in use)
- 7. Maintain equipment to run efficiently (i.e., replace furnace/heater and AC filters, clean refrigerator coils, clear areas around heating and cooling vents, keep AC unit clear of debris)
- 8. Use window shades (i.e., to let heat from sun in on cold days, and/or keep heat from sun out on warm days)
- 9. Take shorter showers
- 10. Seal leaks and drafts (i.e., leaky doors, windows, refrigerator seals, fireplaces, air ducts, air conditioner units, outlets and light switches)
- 11. Insulate water heater and/or pipes (i.e., install a water heater blanket, insulate water pipes)
- 12. Run dishwasher efficiently (i.e., run on full loads, air dry, avoid using special settings)
- 97. Other [SPECIFY]
- 99. Refused

E11. How motivational do you find the information contained in the reports? Would you describe the reports as: very motivating, somewhat motivating, neither motivating nor demotivating, somewhat demotivating, or very demotivating?

- 1. Very motivating
- 2. Somewhat motivating
- 3. Neither motivating nor demotivating
- 4. Somewhat demotivating
- 5. Very demotivating
- 98. Don't know
- 99. Refused

E12. The Home Energy Report provides information about how your home's electricity use compared to that of a group of homes that are similar in size to yours. Do you recall this section of the Home Energy Report? **[DO NOT READ LIST]**

1. Yes

- 2. No [SKIP TO NEXT SECTION]
- 98. Don't know [SKIP TO NEXT SECTION]
- 99. Refused

[IF E12 = YES]

E13. Do you have confidence in the report's comparisons—in other words, do you believe that your household is being accurately compared with similar homes? [DO NOT READ LIST]

- 1. Yes
- 2. No
- 97. Other [SPECIFY]
- 98. Don't know
- 99. Refused

[IF E13 = NO]

E14. Why do you think your household is not being accurately compared with similar homes? [OPEN END]

Satisfaction

SA1. Thinking broadly, how satisfied are you with AEP Ohio's efforts to help you save on your energy bills? Would you say you are Very Satisfied, Somewhat Satisfied, Neither Satisfied nor Dissatisfied, Somewhat Dissatisfied, or Very Dissatisfied?

- 1. Very satisfied
- 2. Somewhat satisfied
- 3. Neither satisfied nor dissatisfied
- 4. Somewhat dissatisfied
- 5. Very dissatisfied
- 98. Don't know
- 99. Refused

[IF SA1 > 3]

SA2. Why did you give that rating?

[OPEN END]

SA3. How satisfied are you with the information provided in the reports? Would you say you are Very Satisfied, Somewhat Satisfied, Neither Satisfied nor Dissatisfied, Somewhat Dissatisfied, or Very Dissatisfied?

1. Very satisfied

- 2. Somewhat satisfied
- 3. Neither satisfied nor dissatisfied
- 4. Somewhat dissatisfied
- 5. Very dissatisfied
- 98. Don't know
- 99. Refused

[IF SA3 > 3]

SA4. You mentioned you were not satisfied with the information provided in the reports. Why did you give this rating?

[OPEN END]

SA5. What do you recall being the most useful piece of information in the Home Energy Reports? [DO NOT READ, ALLOW MULTIPLE UP TO TWO]

- 1. The comparison of my home's energy use to similar homes
- 2. The customer testimonials (i.e., success stories about other people saving energy by acting on the tips provided in the reports
- 3. The energy saving tips
- 4. It's all useful
- 97. Other [SPECIFY]
- 98. Don't know
- 99. Refused

SA6. Are you currently aware that you are able to get Home Energy Reports electronically?

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

[IF SA6= 1]

SA7. Have you signed up to receive your Home Energy Reports electronically?

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

[IF SA7 = NO]

SA8. Why have you chosen to not receive your Home Energy Reports electronically?

[OPEN END]

SA9. AEP Ohio offers a website that gives more details on your personalized Home Energy Report. This website is not the same as AEP Ohio's general website. It only offers information to complement the Home Energy Reports. Were you aware of this energy report website before this survey?

- 1. Yes
- 2. No [SKIP TO SA14]
- 98. Don't know
- 99. Refused

[IF SA9 = 1]

SA10. How did you first learn about the Home Energy Report website?

[OPEN END]

SA11. Have you or someone else in your household visited the Home Energy Report website?

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

[IF SA11 = 1]

SA12. How satisfied are you with the Home Energy Report website? Would you say you are Very Satisfied, Somewhat Satisfied, Neither Satisfied nor Dissatisfied, Somewhat Dissatisfied, or Very Dissatisfied?

- 1. Very satisfied
- 2. Somewhat satisfied
- 3. Neither satisfied nor dissatisfied
- 4. Somewhat dissatisfied
- 5. Very dissatisfied
- 98. Don't know
- 99. Refused

[IF SA12 > 3]

SA13. Why did you give that rating?

[OPEN END]

SA14. Have you participated in any other AEP Ohio energy efficiency programs for your home?

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

NAVIGANT

99. Refused

SA15. [If SA14=1] Which other programs have you participated in?

[OPEN END]

SA16. [If SA14=1] Did you participate in this/these programs before or after you received the Home Energy Reports?

- 1. Before
- 2. After
- 97. Other [SPECIFY]
- 98. Don't know
- 99. Refused

SA17. AEP Ohio wishes to reach more customers about their energy efficiency programs. How do you suggest that AEP Ohio reach customers like yourself?

[OPEN ENDED]

98. Don't know 99. Refused

Demographics

D1. How many people live in your household year-round?

[OPEN ENDED]

98. Don't know 99. Refused

D2. Do you own or rent your home? [DO NOT READ LIST. ENTER ONE RESPONSE.]

- 1. Own
- 2. Rent
- 98. DON'T KNOW
- 99. REFUSED
- D3. How many years have you lived in your current residence?

[NUMERIC OPEN END]

- 98. DON'T KNOW
- 99. REFUSED



Thank you for taking time to help with our survey and the helpful information you provided. Have a great day/evening. **[TERMINATE]**

D.2 AEP OHIO Home Energy Report Program Non-Participant Survey for 2013 Program Year Evaluation

Interviewer Instructions and Notes

- 5. The purpose of the introductory script and associated questions is to identify the person within the contact household that is responsible for opening and handling the mail the household receives from AEP Ohio.
- 6. Ohio's older customers may use the names of previous companies prior to merger. AEP Ohio used to be called "Ohio Power" or "Columbus Southern Power" or "Columbus Southern Electric."
- 7. AEP stands for American Electric Power.

<u>Title</u>	<u>Code</u>	<u>Page Number</u>
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Introduction & Screener

Hello, may I speak with [CONTACT NAME]?

I'm ______ of the Blackstone Group, calling on behalf of AEP Ohio. I have a few questions about mailings you may have received from AEP Ohio. Your feedback is important and will help AEP Ohio fine tune the information it sends you. We are only gathering information and I will not attempt to sell you anything. We will keep your name and opinions confidential and the survey will only take a few minutes.

[ASK TO SPEAK TO CONTACT NAME. IF NOT AVAILABLE, ASK TO SPEAK WITH ADULT

THAT OPENS THE MAIL]: Okay, can I please speak with an adult who handles the mail from your electric utility company, AEP Ohio? This might include the electric bill, letters about your account, and information about energy efficiency.

S1. **[IF CONTACT NAME ANSWERS CONFIRM THEIR RELATIONSHIP TO PROGRAM]:** Are you the person in the household who handles the mail from your electric utility company, AEP Ohio? This might include the electric bill, letters about your account, and information about energy efficiency. **[DO NOT READ LIST]**

- 1. Yes [CONTINUE]
- 2. No **[ASK FOR PERSON WHO READS MAIL]**: "Is the person who does read the mail from AEP Ohio available?" **[IF NOT AVAILABLE, SCHEDULE CALLBACK]**

98. Don't know [THANK AND TERMINATE]

99. Refused [THANK AND TERMINATE]

[SCHEDULE A CALLBACK IF PERSON IS NOT AVAILABLE]: "Okay, I can call back. Is there a good time to reach that person?"

S2. Are you willing to participate?

- 4. Yes [CONTINUE]
- 5. Some other time [RECORD DATE AND TIME TO RESCHEDULE A CALL BACK]
- 6. No [THANK AND TERMINATE]
- 98. Don't know [THANK AND TERMINATE]
- 99. Refused [THANK AND TERMINATE]

S3. Great, thank-you. Just one more question before we get started with the survey. Are you talking to me on a mobile phone or a landline?

- 3. Landline [SKIP TO NEXT SECTION]
- 4. Mobile phone [CONTINUE TO S4]
- 99. Refused [CONTINUE TO S4]

[IF S3 = 2 or 99]

S4. Are you in a safe place where you can talk for a few minutes?

- 3. Yes [CONTINUE TO NEXT SECTION]
- 4. No **[SCHEDULE CALLBACK]**: "When is a good time for me to call you back?"
- 98. Don't know [SCHEDULE CALLBACK]: "When is a good time for me to call you back?"
- 99. Refused [SCHEDULE CALLBACK]: "When is a good time for me to call you back?"

Energy Efficiency Actions

E8. I'm going to read a list of things that you may have done in the past 12 months. Please tell me if you, or anyone in your household, have done any of these things within the last 12 months. **[CHECK BOXES]**

	Yes	No	Don't	Refused
	(1)	(2)	Know (98)	(99)
a. Have you given thought to your own energy use habits				
over the last 12 months?				
b. Have you discussed ideas about how to save energy				
within your household within the last 12 months?				
c. Have you discussed ideas about how to save energy				
with others outside of your household (i.e., co-workers,				
neighbors, and friends) within the last 12 months?				
d. Have you purchased energy efficient appliances, such				
as water heaters, air conditioners, or programmable				
thermostats, within the last 12 months? [IF YES, READ				
E9.]				
e. Have you purchased energy efficient electronic				
equipment, such as computers or televisions, within the				
last 12 months? [IF YES, READ E9.]				
f. Have you purchased any small energy efficiency				
devices, such as efficient light bulbs, window film, or				
power strips, within the last 12 months? [IF YES, READ				
E9.]				
g. Within the last 12 months, have you changed any of				
your habits related to how often or how long you use				
lighting and/or electronics in your home? [IF YES, READ				
E10.]				
h. Within the last 12 months, have you changed any of				
your habits related to the amount of heating, cooling,				
and/or hot water you use in your home? [IF YES, READ				
E10.]				

[IF E8d. OR E8e. OR E8f. = YES]

E9. What energy efficient purchases do you recall making within the past 12 months? **[DO NOT READ LIST, CHECK ALL THAT APPLY]**

- 17. Air conditioner (i.e., window unit, central air, room air conditioner, ductless air conditioner)
- 18. Clothes dryer
- 19. Clothes washer
- 20. Dehumidifier

- 21. Dishwasher
- 22. Electronics (i.e., television, laptop, desktop computer, home office equipment)
- 23. Fans (i.e., whole-house fan, attic fan, solar attic fan, box fans, ceiling fans)
- 24. Heat pump (for heating or cooling home; i.e., a "regular" heat pump, geothermal heat pump, or ductless heat pump)
- 25. Insulation in attic and/or walls of home
- 26. Lighting and/or occupancy sensors (i.e., CFLs, a.k.a. the "spiral light bulbs", LED lights, outdoor solar lights, dimming lights, motion sensors, occupancy sensors)
- 27. Pool equipment (i.e., heater, pool pump, variable speed pool pump)
- 28. Refrigerator and/or freezer
- 29. Programmable thermostat
- 30. Water heater (i.e., "regular" water heater, solar water heater, geothermal water heater, drain water heat recovery system, heat pump water heater, tankless water heater)
- 31. Windows (i.e., double pane, storm windows, strategically placed new windows, window film)
- 32. Window film
- 97. Other [SPECIFY]
- 99. Refused

[IF E8g. OR E8h. = YES]

E10. What did you do to change the way you use energy within the past year? [DO NOT READ LIST, CHECK ALL THAT APPLY]

- 13. Adjust manual thermostat to heat and cool efficiently (i.e., raise thermostat setting during warm weather to reduce cooling, lower thermostat setting during cool weather to reduce heating)
- 14. Program programmable thermostat to heat and cool efficiently (i.e., program to reduce heating and/or cooling when away from home or asleep
- 15. Dry clothes efficiently (i.e., hang clothes to air dry, run the clothes dryer with a full load)
- 16. Wash clothes efficiently (i.e., use cold water, run the washer with a full load)
- 17. Use lighting efficiently (i.e., turn off lights when not in use, use task lighting rather than overhead lights for things like reading and cooking)
- 18. Manage electronic devices efficiently (i.e., unplug electronics when not in use, use power strips and turn them off when not in use, use power save modes on computers, adjust settings to energy efficient settings, shut down computer at night, unplug chargers when not in use)
- 19. Maintain equipment to run efficiently (i.e., replace furnace/heater and AC filters, clean refrigerator coils, clear areas around heating and cooling vents, keep AC unit clear of debris)
- 20. Use window shades (i.e., to let heat from sun in on cold days, and/or keep heat from sun out on warm days)
- 21. Take shorter showers
- 22. Seal leaks and drafts (i.e., leaky doors, windows, refrigerator seals, fireplaces, air ducts, air conditioner units, outlets and light switches)
- 23. Insulate water heater and/or pipes (i.e., install a water heater blanket, insulate water pipes)
- 24. Run dishwasher efficiently (i.e., run on full loads, air dry, avoid using special settings)

97. Other [SPECIFY]

99. Refused

Satisfaction

SA1. Thinking broadly, how satisfied are you with AEP Ohio's efforts to help you save on your energy bills? Would you say you are Very Satisfied, Somewhat Satisfied, Neither Satisfied nor Dissatisfied, Somewhat Dissatisfied, or Very Dissatisfied?

1	Very satisfied
2	Somewhat satisfied
3	Neither satisfied nor dissatisfied
4	Somewhat dissatisfied
5	Very dissatisfied
98	Don't know
99	Refused

[IF SA1 > 3]

SA2. Why did you give that rating? [OPEN END]

SA14. Have you participated in any AEP Ohio energy efficiency programs for your home?

- 3. Yes
- 4. No
- 98. Don't know
- 99. Refused

SA15. [If SA14=1] Which programs have you participated in?

[OPEN END]

SA17. AEP Ohio wishes to reach more customers about their energy efficiency programs. How do you suggest that AEP Ohio reach customers like yourself?

[OPEN ENDED]

98. Don't know 99. Refused

Demographics

D1. How many people live in your household year-round?

[OPEN ENDED] 98. Don't know 99. Refused

NAVIGANT

D2. Do you own or rent your home? [DO NOT READ LIST. ENTER ONE RESPONSE.]

- 3. Own
- 4. Rent
- 98. DON'T KNOW
- 99. REFUSED

D3. How many years have you lived in your current residence?

[NUMERIC OPEN END]

- 98. DON'T KNOW
- 99. REFUSED

Thank you for taking time to help with our survey and the helpful information you provided. Have a great day/evening. **[TERMINATE]**

APPENDIX I

Prescriptive Program: Program Year 2013 Evaluation Report

Prepared for: AEP Ohio



May 12, 2014

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Other 00 Thank you much for taking the time in assisting us with this avaluation. Your	contribution is a
Thank you very much jor taking the time in assisting us with this evaluation. Tour	<i>contribution is u</i>
We might follow-up with you by phone later if additional questions arise.	
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Executive Summary

The Prescriptive Program offers incentives to business customers who install eligible high-efficiency electric equipment. The program provides a streamlined incentive application and quality control process intended to facilitate ease of participation for customers interested in installing efficient technologies from a pre-qualified list. DNV GL Services, Inc. (implementation contractor) delivers the program on behalf of AEP Ohio. In addition, AEP Ohio initiated a small scale distributor based pilot lighting program in late 2013. Energy savings from this pilot program are included in this analysis.

Program Participation

As shown in Table ES-1, the 2013 Prescriptive Program paid incentives on 2,575 projects constituting 120,082 MWh of *ex ante* reported annual energy savings. The vast majority of installed measures were lighting measures, as shown in Figure ES-1.

Table ES-1. 2013 Prescriptive Program Projects, Measures, and Reported Savings

Metric	Reported Value ¹
Number of Projects	2,575
Annual Energy Savings (MWh)	120,082
Electric Peak Demand Savings (kW)	25,300

¹ Reported savings totals include savings from the Mid-Stream Lighting pilot program (991 MWh and 200 kW). *Source: Evaluation Analysis of 2013 AEP Ohio Tracking Data*



Figure ES-1. Percentage of Measures Installed by Measure Category

Source: Evaluation Analysis of 2013 AEP Ohio Tracking Data

Data Collection Activities

Table ES-2 provides a summary of 2013 data collection activities for the Prescriptive Program impact and process evaluations.

Evaluation Effort	Data Collection	Targeted Population	Sampling Unit	Sample Design	Sample Size	Timing
Impact and Process	Collection of Program Tracking Data	Prescriptive projects paid in 2013	Project	NA	NA	May 2013 to April 2014
	To Joseffe	AEP Ohio Program Staff	Contact from AEP Ohio	NA	2	November
Process In-depth Interviews		Prescriptive Program implementation staff	Contact from implementation contractor	NA	1	2013 to December 2013
Process	CATI Surveys	Prescriptive Program participants	Unique contact from tracking database	Random	255	March 2014 to April 2014
Impact	Project Technical Reviews	Prescriptive projects paid in 2013	Project	Random sampling using stratified ratio estimation	40	July 2013 to March 2014
Impact	On-site Verification Only	Prescriptive projects paid in 2013	Project	Random subset of the large stratum of the technical review sample	7	January 2014 to March 2014
Impact	On-site Metering and Verification	Prescriptive Lighting projects paid in Q1 and Q2 2013	Project	Random subset of lighting projects from technical review sample	18	July 2013 to August 2013

Table ES-2. Data Collection Activities for 2013 Prescriptive Evaluation

Source: Evaluation Activities Conducted from May 2013 Through April 2014

Key Evaluation Findings and Recommendations

Key Impact Findings and Recommendations

As shown in Table ES-3, the impact evaluation verified 112 percent of the *ex ante* reported energy savings and 93 percent of the *ex ante* reported peak demand savings. The relative precision at the two-tailed 90 percent confidence interval was \pm 6.7 percent for energy and \pm 7.2 percent for demand. Overall, the implementation contractor is adequately estimating the savings resulting from the Prescriptive Program.

Metric	2013 Program Goals	Ex Ante (a)	Ex Post (b)	Realization Rate RR = (b)/(a)	Overall Relative Precision at 90% Confidence	Percent of Goal
Annual Energy Savings (MWh)	215,629	120,130	134,675	1.12	6.74%	62%
Coincident Peak Reduction (MW)	35.9	25.3	23.5	0.93	7.20%	65%

Table ES-3. 2013 Program Goals, Ex Post Savings and Realization Rates

Source: AEP Ohio VOLUME 1: 2012 TO 2014 Energy efficiency/Peak Demand Reduction (EE/PDR) Action Plan, November 29, 2011; Evaluation Data Collection and Analysis as Described in Appendix A

Other key impact findings and recommendations include:

1. In 2013, (Navigant discovered a greater discrepancy between the *ex ante* savings reported in the database and the *ex post* savings, as compared to 2012 where the difference was negligible. The discrepancy was due to an error in the lighting calculation spreadsheet.

Impact Recommendation #1: Navigant recommends that the implementation contractor review its lighting analysis template to ensure savings are being calculated as intended based on what is stated in the implementation contractor's 2013 Workpapers.

2. The implementation contractor has addressed the occupancy sensor recommendation that Navigant discussed in the 2012 Deemed Savings Review. In 2013, based on Navigant's review of the reported savings, the implementation contractor recalculated a majority of the savings for occupancy sensors based on Navigant's recommendations.

Impact Recommendation #2: Navigant recommends that the implementation contractor update the occupancy sensor documentation in the implementation contractor's 2013 workpapers with the revised approach.

3. In 2013, the implementation contractor updated the source of the lighting HVAC interactive effects from the values used in the Database for Energy Efficient Resources (DEER) 2008 to the values used in Version 2.0 of the Illinois Technical Reference Manual (TRM). Navigant supported this change for 2013.

Impact Recommendation #3: Navigant recommends that AEP Ohio consider developing AEP Ohio service area specific HVAC interactive factors for use in 2014 and beyond. Navigant recommends that AEP Ohio either a) Repurpose Navigant's existing methodology for creating well-documented, Ohio-specific sets of models (*primary recommendation*), or b) Update the existing set of eQUEST models used in the Illinois TRM with Ohio-specific inputs and assumptions (*secondary recommendation*).

4. The evaluation team made a series of lighting recommendations in the 2012 Deemed Savings Review including: 1) removing Magnetic Standard ballasts from the T12 baseline assumptions; 2) updating

the fixture wattage assumption for high performance/reduced wattage (HP/RW) measures; and 3) closely examining the ballast factors of fixtures submitted under the HP/RW measure.

Impact Recommendation #4: Navigant's recommendations from the 2012 Deemed Savings Review still apply, since the implementation contractor did not adjust the wattage assumptions between 2012 and 2013.

Key Process Findings and Recommendations

As shown in Figure ES-2, approximately three-fourths of program participants (76%) were *very satisfied* with the AEP Ohio Prescriptive Program. Overall, 96 percent of survey participants reported that they were very or somewhat satisfied with the Prescriptive Program.



Figure ES-2. Satisfaction with the Prescriptive Program

Source: 2013 Participant Survey. Base N=255

Other key process findings and recommendations include:

1. Of the 48% of the survey respondents who completed the final application themselves, 79 percent said they were satisfied with the application process, indicating about one in five participants who were <u>not</u> satisfied with the application process.

Process Recommendation #1: Only 10% of all survey respondents both completed the application and are unhappy with the application process. Navigant suggests that no action needs to be taken at this time.

2. Many of the previous evaluation recommendations have led to program improvements, including more email communications with customers, more case studies, and the decision to place the application online. The high levels of satisfaction with the program, and the finding that six out of

ten survey respondents did not suggest improvements to the program, suggests that most of the prior major issues identified (excluding the application process) have been reduced to minor issues.

Process Recommendation: Navigant suggests that AEP Ohio and the implementation contractor continue working with Solution Providers, developing new case studies and targeted messages, as well as offering a bonus for Solution Providers that exceed targets. Consider keeping funding levels for blitz marketing, collateral development, Solution Provider bonuses and advertisement purchases stable. When a program reaches a certain level of success, utilities are frequently tempted to reduce funding and the program never reaches its full potential.

Survey respondents were most likely to prefer to be contacted by direct mail (22%) and bill inserts (18%).

Process Recommendation #4: Encourage Solution Providers to use the direct mail collateral materials that can be co-branded.

Though over 90 percent of participants that received program marketing material were satisfied or very satisfied with it, participants' most common recommendation for improving the program was greater publicity and marketing for the program. Participants also noted a lack of awareness about the program as the second most likely reason other companies such as theirs aren't participating in the program.

Process Recommendation #5: Explore the possibility of leveraging and incenting former participants to promote the program to peer businesses. Satisfied prior participants are good case studies for other businesses in similar sectors, and word of mouth is an extremely effective way of increasing program participation.

Solution Providers were by far the most common source of initial information about the program to participants, followed by word of mouth, and AEP Ohio account managers. Solution Providers were also most influential in identifying and influencing participation opportunities.

Process Recommendation #6: Navigant recommends that AEP Ohio continue to identify opportunities to leverage the role of Solution Providers in bringing participants to the program. AEP Ohio currently benefits from gathering Solution Provider input on how to improve the program. AEP Ohio should continue its semi-annual Solution provider meetings.

1. Introduction

This section covers the Prescriptive Program element of the AEP Ohio business energy efficiency and peak demand reduction programs.

1.1 Program Description

The Prescriptive Program offers incentives to nonresidential customers who install eligible highefficiency electric equipment. The program provides a streamlined incentive application and quality control process intended to facilitate ease of participation for customers interested in installing efficient technologies from a pre-qualified list.

The Prescriptive Program is marketed, administered, and delivered as a single program by AEP Ohio. The program is managed by an implementation contractor (the IC), DNV GL Services, Inc. (DNV GL), in coordination with AEP Ohio.

1.2 Key Program Elements

The goals of the 2013 Prescriptive Program are to exceed the MWh targets in AEP Ohio's EE/PDR Plan at or below the program budget, improve customer satisfaction with the program, increase outreach to customers, and internally involve more customer service staff in promoting the program to assigned customers. The following provides a summary of critical program elements:

Incentive Limits. Project incentives cannot exceed 50 percent of the total project cost.

Pre-Approval Applications. Pre-approval allows participants to reserve funding, and to know their approved incentive amount before embarking on their project. A pre-approval application is <u>required</u> for select Prescriptive measures, including new T8/T5 fixtures, delamping, lighting controls, Energy Management Systems (EMS), and others.

Pre-Inspection. Pre-inspections provide AEP Ohio with the opportunity to verify the existing conditions at the site. These site visits are performed as defined by quality assurance procedures based on the type of measures that the participant submits for pre-approval.

Reservation. The program reserves the project funds once the pre-inspection report and/or initial project review is approved. Projects that come in after funds are fully reserved are placed on a waiting list. In the event that a project is not completed within 90 days of the reservation and an extension has not been requested and granted, the project may be cancelled. Prior to cancellation, AEP Ohio will follow-up with the customer to work out an extension or confirm that the project should be cancelled.

Final Applications. Final applications must be submitted within 60 days of project completion and include the appropriate back-up documentation to verify the project is complete and meets the program requirements. The IC reviews final applications for eligibility and completeness.

Final Inspection. The IC performs final inspections as defined by quality assurance/quality control (QA/QC) procedures to verify the measures installed.

Incentive Payment. Once the implementation contractor accepts a project for payment, incentives are processed and delivered. The IC target for incentive payment delivery is 30 days.

1.3 Prescriptive Program 2013 Participation Summary

The evaluation team analyzed data extracted from AEP Ohio's tracking system on January 14, 2014.¹ As shown in Table 1-1, the 2013 Prescriptive Program paid incentives on 2,575 projects constituting 120,082 MWh of *ex ante* reported annual energy savings. The vast majority of installed measures were Lighting measures, as shown in Figure 1-1.

Table 1-1. 2013 Prescriptive Program Projects and Reported Savings

Metric	Reported Value ¹
Number of Projects	2,575
Annual Energy Savings (MWh)	120,082
Electric Peak Demand Savings (kW)	25,300

¹ Reported savings totals include savings from the Mid-Stream Lighting pilot program (991 MWh and 200 kW).

Source: Evaluation Analysis of 2013 AEP Ohio Tracking Data



Figure 1-1. Percentage of Measures Installed by Measure Category

Source: Evaluation Analysis of 2013 AEP Ohio Tracking Data

¹ The evaluation team incorporated the savings from the mid-stream pilot program in April 2014 as well as an update to the extract on May 7, 2014. The savings published in this report reflect both updates.

As shown in Figure 1-2 and Figure 1-3, there was a major increase in savings from light-emitting diode (LED) measures and a decrease in savings from T8 measures in 2013 compared to 2012.



Figure 1-2. Comparison of Energy Savings from Top Measures Subcategories in 2012 and 2013

Source: 2012 - 2013 AEP Ohio Tracking Data





Source: 2012 - 2013 AEP Ohio Tracking Data

1.4 Savings Terminology

This section defines the terminology used to describe the savings values at each stage of the evaluation:

- *Ex ante* savings Savings reported by AEP Ohio
- *Audited* savings Savings recalculated by Navigant using the algorithms specified in the workpapers and the inputs provided in the data extract from AEP Ohio. Audited savings should equal *ex ante* savings if the algorithms were applied correctly by the implementation contractor.
- *Engineering adjusted* savings Savings recalculated by Navigant using the Navigant-adjusted algorithms and inputs where applicable, based on the results of the deemed savings review.
- *Ex post* savings final verified savings taking into account findings from all steps, including the technical review of project files and site visits for a sample of projects.

2. Methodology

The evaluation team conducted impact and process evaluation activities for the Prescriptive Program following the methodologies outlined below.

2.1 Impact Evaluation Methodology

2.1.1 Overview of Impact Evaluation Approach

The purpose of the impact evaluation is to determine 2013 evaluation-verified (*ex post*) energy and demand savings. The evaluation followed a multi-step approach as outlined below:

- 1. **Tracking System Review**. The evaluation team reviewed the data tracking system to summarize program participation, and to identify the sectors and measures contributing the majority of savings.
- 2. **Deemed Savings Review**. The evaluation team conducted a technical review and adjustment of algorithms and inputs documented in the implementation contractor's 2013 Workpapers.
- 3. **Sample Design**. The team designed and selected a stratified, random sample of participants to verify program-level impacts with 10 percent relative precision at the 90 percent confidence interval.
- 4. **Technical Review of Project Documentation**. Navigant engineers reviewed project-specific documentation for the sampled projects and adjusted the savings as appropriate.
- 5. **On-Site Data Collection and Analysis**. The evaluation team conducted on-site data collection and analysis at a subset of sampled data points to collect more robust data for targeted measures and sectors.
- 6. **Program Savings Analysis**. The evaluation team combined the results from the evaluation tasks described above to determine program-level energy and demand impacts.

Figure 2-1 illustrates the impact evaluation task flow.





2.1.2 Tracking System Review

In the first step of the impact evaluation, Navigant reviewed the data tracking system provided by AEP Ohio. The evaluation team identified key tracking fields, including project number, participant name and contact information, project status, building type, measure type, and savings. Next, the team summarized the tracking system data to identify the sectors and measures contributing the majority of savings. The high-savings measures were targeted during the review of deemed savings parameters, and the savings summary assisted the sample design.

2.1.3 Deemed Savings Review

The review of deemed savings parameters included four essential parts:

- 1. Assessment of measures for review
- 2. Assessment of key changes between the implementation contractor's 2012 Workpapers and 2013 Workpapers
- 3. Recalculation of *ex ante* savings for reviewed measures
- 4. Review of the lighting HVAC interactive effects

The following sections provide an overview of the Deemed Savings Review task.

2.1.3.1 Assessment of Measures for Review

In the first part, Navigant used the output from the Tracking System Review task to determine the measures to be included in the deemed savings review. Since lighting measures make up 89 percent of the installed measures and 86 percent of the energy savings, Navigant restricted the list to lighting only, which was also Navigant's focus for the deemed savings review in 2012 due to a similar trend in savings. See 5.2 A.2 for additional information regarding Navigant's assessment of measures for review.

2.1.3.2 Assessment of Key Changes between the implementation contractor's 2012 Workpapers and 2013 Workpapers

Navigant compared the deemed savings values for lighting measures in the 2012 Workpapers and 2013 Workpapers to determine key changes between the workpapers. Based on Navigant's review, there were no major changes to the deemed savings values for lighting measures in 2013, with the exception of the HVAC interactive effects. As a result, Navigant's recommendations in the 2012 Deemed Savings Review still apply, with the exception of lighting HVAC interactive effects. Navigant's primary recommendations from the 2012 Deemed Savings Review were to update the wattages for T12 baseline measures, adjust the wattages for high performance and reduced wattage measures, update the deemed savings for occupancy sensors, and update the hours of use and coincidence factors from DEER 2008 to DEER 2011.

2.1.3.3 Recalculation of Ex Ante Savings

In the final part of the Deemed Savings Review, Navigant recalculated the *ex ante* savings for the measures included in the review twice—once using the algorithms and inputs specified by theimplementation contractor's Workpapers, and once using Navigant's engineering adjusted savings from the Deemed Savings Review. This exercise resulted in two databases of savings:

- 1. *"Audited Savings"* database: savings for the majority of measures recalculated using the implementation contractor's Workpapers inputs and assumptions.
- 2. **Navigant's** *"Engineering Adjusted Savings"* **database**: savings for the majority of measures recalculated using Navigant's improved inputs from the Deemed Savings Review.

The engineering adjusted savings database was used as the basis of comparison for the verified savings from the sampled projects. A more detailed description of the program savings analysis, including the use of the audited savings database and the engineering adjusted savings database, is provided in Section 3.2.3 and Section 3.2.4.

2.1.3.4 Review of the Lighting HVAC Interactive Effects

The primary change that implementation contractor made to lighting measures between the 2012 Workpapers and the 2013 Workpapers was to the HVAC interactive effects.² In the 2012 Workpapers, the HVAC interactive effects came from DEER 2008, and in the 2013 Workpapers the values come from the Illinois TRM. Since the HVAC interactive effects impact 89 percent of the measures in the tracking database, Navigant conducted a thorough analysis to determine how the HVAC interactive effects in the Illinois TRM were calculated. Navigant's review of the HVAC interactive effects consisted of three parts:

1. Determine how the HVAC interactive effects in the Illinois TRM were calculated and what methodology was used.

² It is important to note that the source of the lighting hours of use and coincidence factors did not change between the 2012 Workpapers and the 2013 Workpapers, which is why Navigant's recommendations in the 2012 Deemed Savings Review still apply in 2013. The values used in Appendix A come from DEER 2008 and Navigant recommends that the implementation contractor update these values with the more current DEER 2012 values.

- 2. Execute the same methodology to determine if Navigant could obtain the values used in the Illinois TRM.
- 3. Provide recommendations to AEP Ohio and the implementation contractor based on recalculating the HVAC interactive effects.

2.1.4 Impact Evaluation Sample Design

In addition to the Deemed Savings Review and adjustment of *ex ante* savings, the evaluation team sampled a portion of projects from the *ex ante* database to verify savings using more robust methods, including a technical review of project documentation (described in Section 2.1.5) and on-site data collection and analysis (described in Section 2.1.6). The sample design used stratified ratio estimation to reduce the number of sample points required to meet the precision targets, thus providing accurate results at reduced overall cost.

The sample frame for the 2013 evaluation included only those projects reported as paid during Program Year 2013.³ The sample sizes within each stratum were calculated to provide 10 percent relative precision at the two-tailed 90 percent confidence interval (90/10) for Prescriptive program annual energy (kWh) and peak demand (kW) savings.⁴ Table 2-1 shows the strata definitions, the number of projects within each stratum, and the calculated sample sizes.

Stratum Number	Stratum Name	Lower kWh Threshold	Lower kW Threshold	Sample Frame Projects	Sample Size
1	Large	325,000	70	95	11
2	Medium	100,000	205	281	15
3	Small	7,500	1.5	1,234	14
Total*				1,610	40

Table 2-1. Strata Definitions and Sample Sizes

* Projects that do not meet the lower kWh and kW thresholds were not eligible for sampling due to their small savings and the low value of information they would provide.

Source: Evaluation Analysis of 2013 AEP Ohio Tracking Data

³ This pool of participants includes many who started participation in prior years, but did not complete all participation requirements and receive the incentive payment until 2013.

⁴ The Navigant team analyzed sample results from the 2012 evaluation to determine an appropriate starting point for the coefficient of variation (CV) on the <u>ratio</u> of verified to *ex ante* savings. The final CVs used in the sample design were 0.40 for both energy and demand.

Finally, Navigant selected the samples within each stratum randomly.⁵ Table 2-2 shows the final sample claimed savings that were evaluated as a percentage of the sample frame.

		MWh Savings			kW Savings		
Stratum Number	Stratum Name	Sample Frame (SF)	Sample	% of SF	Sample Frame (SF)	Sample	% of SF
1	Large	41,739,395	4,085,159	10%	9,096	892	10%
2	Medium	37,822,819	2,339,581	6%	7,846	468	6%
3	Small	33,520,244	363,164	1%	6,703	82	1%
Total or Ov	erall Value	113,082,458	6,787,904	6%	23,645	1,442	6%

Table 2-2. Savings by Strata

Source: Evaluation Analysis of 2013 AEP Ohio Tracking Data

For further detail on the impact evaluation sample design see Appendix A.

2.1.4 Technical Review of Project Documentation

Navigant requested the project-specific documentation for each of the 40 sampled projects from theimplementation contractor, and conducted a detailed technical review of each. The assessment included a review of the tracking databases, customer applications, invoices, and equipment specifications. Adjustments were made to project-specific savings wherever project documentation clearly showed different values from the database, or where obvious calculation mistakes were present. Navigant also used the adjusted inputs from Deemed Savings Review task in the project-specific analysis.

2.1.5 On-Site Data Collection and Analysis

Navigant conducted on-site data collection and analysis for a subset of projects selected from the technical review sample. A project-specific measurement and verification (M&V) plan was developed for each sampled project. These plans detailed the reported measures and operating characteristics, as well as the data collection plan for the project. The M&V plans all followed a common template, but the data collection tasks within each were custom-designed to target any key uncertainties in the reported savings analysis. The default on-site M&V tasks included:

⁵ The sample was compared to the sample frame in a few key categories, including Building Type, Measure Category, and broad geographic area, to ensure that the sample was sufficiently representative of the sample frame. If a selected sample was found to be misrepresentative of the population, the entire sample was discarded and a new one was randomly selected.

1. Visual verification of measure installation and operation

Verification of reported measure quantities

Verification of measure nameplate data, including manufacturer and model number, capacity (watts, Btu/h, tons, etc.), and efficiency

Verification of measure operating characteristics, including the schedule of operation, annual operating hours, and loading

Verification of the appropriate baseline technology

In addition, data loggers were installed on the lighting measures for a subset of projects. The data loggers measured either current (amps) at the electrical panel for a significant portion of the lighting load, or lighting time-of-use (on/off timestamp) for a sample of lighting circuits. Navigant analyzed the logger data for each site to calculate operating hours and coincidence factors for the lighting measures. All of the data collected in the field was summarized and converted into algorithm inputs.

2.1.6 Program Savings Analysis

In the final step of the impact evaluation, Navigant combined the outputs from all previous steps to determine program-level verified energy and demand savings. The team calculated the ratios between the project-specific verified savings for the sampled projects to the *adjusted savings* from Navigant's adjusted savings database. This critical step serves to improve the overall precision of the sample results by *first* improving the denominator (i.e., savings against which we compare sample results) used in the ratio estimation technique.⁶

The sample results for each stratum were then extrapolated to the population of program participants for that stratum using the adjusted savings database. The extrapolation procedure followed the structure specified by the sample design, and it used stratified ratio estimation to determine program-level verified (i.e., realized) savings. Finally, the program-level realized savings was compared to the *ex ante* program savings to determine the Prescriptive program realization rate. Figure 2-2 shows the program savings analysis process in graphical form.

⁶ The project-specific ratios between sample-verified and *adjusted* savings will be better (i.e., closer to 1.0) than the ratios between sample-verified and *ex ante* savings. This improved and tighter distribution of sample ratios results in better precision when extrapolated to the population of program participants.



Figure 2-2. Program Savings Analysis Process

2.2 Process Evaluation Methodology

2.2.1 Overview of Process Evaluation Approach

The purpose of the process evaluation is to assess the effect of the structure and implementation of the program on its performance and on customer satisfaction. The evaluation team's process efforts provide insights and recommendations to support the continued success of the Prescriptive Program.

Central to the process evaluation for the Prescriptive Program were interviews with AEP Ohio program managers and with staff of the implementation contractor, as well as review of relevant program tracking databases, documents, and other materials to understand how the program has evolved from the previous year. In addition, the evaluation team conducted a Computer Assisted Telephone Interview (CATI) survey with participating customers to better understand customer satisfaction and perceptions related to the program.

2.2.2 Interview and Survey Design

The evaluation team used a senior staff member to conduct in-depth qualitative interviews. Senior staff were flexible in their approach to the discussion, allowing the respondent to talk about his/her experience or perspective while still shaping the discussion toward the most important, relevant and necessary information. The team conducted the interviews by telephone in order to complete the interviews quickly and to be flexible to the respondents' schedule.

Interview guides were developed to be open-ended and allow for a free-flowing discussion between interviewer and respondent, and real time interviewing flexibility. The evaluation team took detailed notes during each in-depth interview and/or taped the discussion to ensure thorough documentation.

2.2.3 Program and Implementer Staff Interviews

Several in-depth staff interviews were conducted as part of this evaluation. Two of these interviews were conducted with AEP Ohio Business Program Manager and the Prescriptive Program Coordinator. One interview was conducted with members of the implementation contractor implementation staff. These

interviews were completed in November 2013. The interviews with the AEP Program staff focused on program processes, the goals of the program, how the program was implemented and the perceived effectiveness of the program. The interviews with the implementation staff explored the implementation of the program in more detail and also covered areas of data tracking and quality assurance. The interview guide used for these interviews is included in Appendix B.

2.2.4 CATI Telephone Survey of Program Participants

A CATI survey targeted a population of 1,031 unique customer contact names drawn from the Prescriptive Program February 19, 2014 tracking system extract. The survey finished with 255 completed interviews from the Prescriptive Program participants. This survey focused on questions to estimate the program impacts and to support the process evaluation. All CATI interviews were completed in March or early April 2014.

The evaluation team collected data to support the process evaluation, including questions concerning program design and implementation, program marketing and awareness, customer satisfaction, and business demographics. The survey instrument used for the participant surveys is included in Appendix C.

2.2.5 Process Evaluation Sample Design

The sampling approach for the participant surveys followed a random sample design. Navigant's analysis of the program database showed a population of 1,031 unique customer contact names with paid projects for the 2013 Prescriptive Program.⁷ The targeted number of completes was calculated to support the analysis of survey responses that are statistically valid at a 95 percent confidence interval with a relative precision of 5 percent (95/5), assuming a coefficient of variation (CV) of 0.5.

⁷ This analysis was conducted on a data extract from February 19, 2014

2.3 Summary of Data Collection Activities

Figure 2-3 provides a summary of 2013 data collection activities for the Prescriptive Program impact and process evaluations.

Evaluation Effort	Data Collection	Targeted Population	Sampling Unit	Sample Design	Sample Size	Timing
Impact and Process	Collection of Program Tracking Data	Prescriptive projects paid in 2013	Project	NA	NA	Jan 2013 to December 2013
	In doubh	AEP Ohio Program Staff	Contact from AEP Ohio	NA	2	November
Process In-depth Interviews	Prescriptive Program implementation staff	Contact from implementation contractor	NA	1	2013 to December 2013	
Process	CATI Surveys	Prescriptive Program participants	Unique contact from tracking database	Random	255	March 2014 to April 2014
Impact	Project Technical Reviews	Prescriptive projects paid in 2013	Project	Random sampling using stratified ratio estimation	40	July 2013 to February 2014
Impact	On-site Verification Only	Prescriptive projects paid in 2013	Project	Random subset of the large stratum of the technical review sample	7	January 2014 to February 2014
Impact	On-site Metering and Verification	Prescriptive Lighting projects paid in Q1 and Q2 2013	Project	Random subset of lighting projects from technical review sample	18	July 2013 to August 2013

Figure 2-3. Data Collection Activities for 2013 Prescriptive

Source: Evaluation Activities Conducted from January 2013 Through April 2014

3. Impact Evaluation Results

The results of the impact evaluation are presented in the following parts:

- 1. Findings from the Deemed Savings Review
- 2. Findings from the Technical Review and On-Site Data Collection
- 3. Program savings analysis
- 4. Cost effectiveness

Section 3.1 through Section 3.4 explains each part in more detail.

3.1 Findings from Deemed Savings Review

The review of deemed savings parameters included four major outputs:

- 1. Adjusted per-unit savings values for the reviewed measures
- 2. Audited savings analysis
- 3. Engineering adjustment savings analysis
- 4. Review of HVAC interactive effects

Figure 3-1 shows a summary comparison of the *ex ante* reported, the *audited* savings, and Navigant's *engineering adjusted* savings through the Deemed Savings Review at the program level. Overall, Navigant's adjustments from the Deemed Savings Review served to increase the energy savings by 7.1 percent and decrease the demand savings by 1.1 percent.

As shown in Figure 3-1, there is a significant difference between the *ex ante* reported and *audited* savings. The primary driver for this trend is likely due to an error in the calculator spreadsheet used to compute the savings for lighting measures. The savings are calculated based on a lookup of the measure and building type selected in the tool. Navigant found that the values listed in the lighting tool did not align with the deemed savings values in the implementation contractor's Workpapers. This is likely what is causing the significant difference between the *ex ante* and the *audited* savings.

There is a slight difference between the *audited* savings and Navigant's *engineering adjusted* savings. This negligible difference reflects changes that the implementation contractor made to the deemed savings values for lighting measures in the 2013 Workpapers to align closely with the recommended changes from Navigant's 2012 Deemed Savings Review.⁸

⁸ In the 2012 Deemed Savings Review of lighting measures, Navigant recommended changes to occupancy sensors and HVAC interactive effects that had significant impact on the *ex ante* reported savings. In 2013 the implementation



Figure 3-1. Comparison of Ex Ante Reported, Audited and Navigant's Engineering Adjusted Savings

Source: Evaluation Data Collection and Analysis as Described in Appendix A

See Appendix A for more detail on the findings from the Deemed Savings Review.

contractor addressed both of these issues by recalculating the savings for a majority of the occupancy sensor measures with Navigant's recommended method and by updating the HVAC interactive effects with values from the Illinois TRM.

3.2 Technical Review and On-Site Data Collection

Navigant conducted a technical review of project documentation for a total of 40 selected projects. Navigant also completed 20 on-site metering and verification visits at a subset of the projects sampled for technical review. Figure 3-2 shows the sample disposition by stratum.





Source: Evaluation Data Collection and Analysis as Described in Appendix A

3.3 Program Savings Analysis

Navigant combined the results of the Deemed Savings Review with the results of the Technical Review and On-Site Data Collection for the sampled projects to determine program-level verified energy and demand savings. In the first step, Navigant extrapolated the sample results to the population of program participants using the *engineering adjusted* savings database to determine the overall *ex post* savings via ratio estimation. In this analysis, the ratio estimator is <u>not</u> the same as the realization rate. The realization rate provides the ratio between the *ex post* savings and the *ex ante* savings. The interim ratio estimation step, in which the *ex post* savings for the sample are first compared to the *engineering adjusted* savings yields improved relative precision over that achieved using the *ex ante* savings database.⁹

⁹ For more discussion, see Section 2.1.6.

Table 3-2 shows the ratio estimators and relative precision at the two-tailed 90 percent confidence interval for energy and demand savings. Overall, the relative precision on the sample results was \pm 6.7 percent for energy and \pm 7.2 percent for demand.

		Energy Sav	ings Statistics	Demand Savings Statistics		
Stratum Number	Stratum Name	Ratio Estimator	Relative Precision @ 90% Conf. Int.	Ratio Estimator	Relative Precision @ 90% Conf. Int.	
1	Large	1.17	15.1%	0.99	8.6%	
2	Medium	1.07	7.2%	0.99	7.9%	
3	Small	0.89	10.2%	0.96	19.9%	
Overall Va	lue	1.05	6.7%	0.98	7.2%	

Table 3-1. Energy and Demand Ratio Estimators and Relative Precision

Source: Evaluation analysis of tracking data and sample results

As shown in Table 3-3, the impact evaluation verified 112 percent of the reported energy savings and 93 percent of the reported demand savings. The relative precision at the two-tailed 90 percent confidence interval is the same as that on the ratio estimator: \pm 6.7 percent for energy and \pm 7.2 percent for demand.

Table 3-2. Ex Post Savings and Realization Rates

Metric	Energy Savings (MWh)	Demand Savings (kW)
<i>Ex ante</i> Savings [A]	120,130	25,300
Engineering Adjusted Savings [B]	128,559	24,005
Ratio Estimator [RE]	1.05	0.98
Ex post Savings [C = B * RE]	134,675	23,533
Realization Rate [RR = C / A]	1.12	0.93
Relative Precision @ 90% Conf. Int.	6.7%	7.2%

Source: Evaluation Analysis of Tracking Data and Sample Results

AEP Ohio achieved 62 percent and 65 percent of the 2013 program goals for energy savings and demand demand reduction, respectively, as shown in Table 3-4.

Metric	2013 Program Goals	Ex ante (a)	Ex post (b)	Realization Rate RR = (b)/(a)	Overall Relative Precision at 90% Confidence	Percent of Goal
Annual Energy Savings (MWh)	215,629	120,130	134,675	1.12	6.74%	62%
Coincident Peak Reduction (MW)	35.9	25.3	23.5	0.93	7.20%	65%

Table 3-3: 2013 Program Goals, Ex Post Savings and Realization Rates

Source: AEP Ohio VOLUME 1: 2012 TO 2014 Energy efficiency/Peak Demand Reduction (EE/PDR) Action Plan, November 29, 2011; Evaluation Data Collection and Analysis as Described in Appendix A

3.4 Cost Effectiveness

This section addresses the cost effectiveness of the Prescriptive Program. Cost effectiveness is assessed through the use of the Total Resource Cost (TRC) test. Table 3-5 summarizes the unique inputs used in the TRC test.

Value Item Average Measure Life 10 2,575 Projects Annual Energy Savings (MWh) 134,675 23,533 Coincident Peak Savings (kW) \$ 4,022,233 Third Party Implementation Costs \$ 1,464,923 Utility Administration Costs \$ 9,045,757 **Utility Incentive Costs** \$ 43,680,014 Incremental Measure Costs

Table 3-4. Inputs to Cost-Effectiveness Model for Prescriptive Program

Based on these inputs, the TRC ratio is 1.3. Therefore, the program passes the TRC test. Table 3-6 summarizes the results of the cost-effectiveness tests. Results are presented for the Total Resource Cost test, the Ratepayer Impact Measure Test, and the Utility Cost Test.

Test Results for Prescriptive	Ratio
Total Resource Cost	1.3
Participant Cost Test	2.3
Ratepayer Impact Measure	0.6
Utility Cost Test	4.5

Table 3-5. Cost Effectiveness Results for the Prescriptive Program

At this time, additional benefits related to reduction of greenhouse gas emissions have not been quantified in the calculation of the TRC. These additional benefits would increase the given TRC benefit/cost ratio.

4. Process Evaluation Reports

The evaluation team engaged four implementation contractors and program staff and 255 program participants to explore the issues that were foremost in their minds regarding the Prescriptive Program. Program managers for both AEP Ohio and the implementation contractor provided ideas for the evaluation.

4.1 Findings from the Interviews of Program Staff

Navigant conducted in-depth interviews with AEP Ohio and the implementation contractor program managers and implementation staff in October and November, 2013. According to the program staff, the most important goals of the Prescriptive program are to:

1. Meet the energy and demand savings targets set for 2013

Improve customer satisfaction by helping customers become more energy efficient

Help customers generate as many jobs as possible through the installation of energy efficient equipment

4.1.1 Changes in Program Staff for 2013

The AEP Ohio Program Coordinator manages the program and works closely with the implementation contractor to implement a program that will reach its planning goals. The implementation contractor Program Manager implements the program with AEP Ohio. In 2013, AEP Ohio hired a new staff member to work with Solution Providers.

The implementation contractor made significant changes to its engineering staff in 2013 with the loss of two senior engineers leading to slow engineering review times, even though engineering team staff was added in August. In the end, the implementation contractor processed more applications than in previous years and in October, 2013, is on track to meet the 346 GWh goal set for 2013, according to the Program Manager. With the addition of new outreach staff, the implementer believes its staff is stronger than in the past.

4.1.2 Utilizing the Solution Providers

Both AEP Ohio and the implementation contractor have worked diligently to engage Solution Providers, to leverage them more effectively in marketing the program, and to bring more Solution Providers into the program. The seminars continue to be well-attended.

According to program managers, Solution Providers have become more knowledgeable and more engaged in the programs in the past couple of years. Implementation staff stated that their relationship with the trade ally network has matured, and that AEP Ohio has built up a comfortable level of trust with the trade ally community. Since the program is contractor driven, the Solution Providers play a critical role in its success. The implementer contractor can steer customers toward the program, but it does not have as large a role in direct program delivery as the Solution Providers. The Solution Providers that understand the program can promote it and encourage their customers to participate.

Solution Provider Participation

In 2013 AEP Ohio continued doing the same types of activities as in 2012. They provided customer education through email and newspaper ads; both the implementation contractor and AEP Ohio were focused on trade ally relations. They continued the trade ally bonus in 2013 to encourage timely submission of applications.

4.1.3 Marketing and Promotion

AEP Ohio's main message to their customers was that energy efficient equipment will make their companies more viable and strengthen their business position in the marketplace; incentives, they said, are provided as the "icing on the cake." AEP Ohio's goal was to change the business culture by making customers more mindful of energy efficiency. However, the largest barrier to program participation exists in successfully communicating the existence and the value of the program to customers.

AEP Ohio and the implementation contractor continued to hold seminars for industrial and commercial customers, and provided on-site information and training in 2013. They targeted health care, commercial food service, and education customers with sector specific collateral materials and case studies. Marketing and promotion dollars were also allocated for one-on-one marketing through direct mail, local business magazines, e-mails, customer service opportunities, conferences, expos, and AEP Ohio sponsored events. AEP Ohio continues to expand outreach to trade allies and professional groups, as well as reaching more customers through webinars.

The program coordinator reported that AEP Ohio made a significant outreach to large customers through AEP account representatives in 2013. Account representatives worked jointly with the AEP Ohio Community Affairs Department to market to municipalities and communities. Program staff attended different trade shows such as the Annual Ohio Township Trustees meeting and received a number of applications from a presentation to the trustees. AEP Ohio and the implementation contractor staff are looking for other community organizations to partner with.

AEP Ohio created a special campaign for Energy Awareness Month (October) and provided a special bonus for Solution Providers for getting an application in for processing in October. The program reached out to customers with an email newsletter, sent out individual emails, and the AEP Ohio account representatives made phone calls to their larger customers. AEP Ohio created a summertime special for K-12 schools to encourage program participation. The offer requested that customers apply for project pre-review before the end of August and that they complete the application before the end of September. Results will be available in the 2014 report.

4.1.4 Application Process

The application has been a barrier for program participation, especially for smaller customers. According to the interviewees, many processing delays are caused by data errors when the contractor or customer provides applications with incorrect or missing information. In 2013, delays were also caused by backup in processing because of a lack of engineering resources. This situation has been helped by hiring replacement personnel.

According to the implementer's program manager, the best way of preventing processing congestion is to encourage customers and Solution Providers to complete their applications earlier in the year and to complete the projects in a timely manner once they apply for the incentive as they did in 2012 and 2013. The goal from the implementer's perspective is a steady volume of work. One change they will continue to implement is no end-of-year bonuses. The implementation contractor also provided Solution Providers with a bonus for timely submissions of applications.

4.1.5 Web Site

The AEP Ohio web site has become an important tool in the marketing and implementation of the business programs. The web site includes several case studies, and other collateral materials such as fact sheets, program descriptions, lists of qualifying equipment, and a list of Solution Providers. Navigant's review of the AEP Ohio web site revealed some improvements to the placement of the web link to Business Programs.

4.1.6 Program Delivery

AEP Ohio and implementation contractor instituted fewer changes in program delivery for 2013. The implementation contractor, along with AEP Ohio account management were matched with specific Solution Providers and spent more time in 2013 interacting with them to keep them involved in the programs. The program is always looking for ways to keep market actors involved with the program. AEP Ohio held webinars for customers or Solution Providers on lighting, HVAC, VSD, and explanations on how to complete the application.

AEP Ohio fielded a pilot with distributors in 2013 through a mid stream program with incentives to distributors for four or five measures. One of the purposes was to educate distributors on the importance of energy efficient equipment. The customer can upgrade their purchase at the counter.

AEP Ohio fielded a pilot with distributors in 2013 through a mid-stream program with incentives to distributors for four or five measures. One of the purposes of the pilot was to educate distributors on the potential of energy efficient equipment in the market. The customer could upgrade their purchase at the counter.

4.1.7 Program Strengths

According to program staff, the strengths of the Prescriptive Program include:

- » The program has provided the means for some contractors to expand their businesses and hire more staff
- » Low and mid-level participating contractors are encouraged to do more
- » It is a multi-faceted program

4.1.8 Barriers to Participation

AEP Ohio and the implementation contractor staff agreed that barriers to the programs include:

- » Lack of capital; some customers want to make upgrades and improvements, but may not have the capital available to do so
- » Lack of customer awareness
- » Too many measures may confuse the customer
- » Lack of customer understanding about energy efficiency technologies
- » Connecting with the decision maker. Inability to get the word to everyone that needs it. Small customers still don't know what the programs are about.

4.2 Findings from the Participant Surveys

This section presents Navigant's detailed findings from the Prescriptive Program participant surveys.

4.2.1 Profile of Participating Survey Respondents

The quantitative telephone survey started with 1,029 unique customer names. The evaluation team completed surveys with 255 program participants; 47 (10%) of those contacted for the survey (451) declined to complete the survey. The team could not make contact with the remaining potential respondents due to (a) repeated calls with no answer, (b) reaching an answering machine, or (c) potential respondents screening the incoming phone calls.

As shown in Figure 4-1, the Prescriptive Program was attractive to customers of many business types. As in last year, the most common business type in 2013 was retail and services, accounting for 17 percent of the survey participants. Non-profit or religious institutions and municipal buildings were the other two most common survey participant types.

Excluded from the figure are business types representing less than 3 percent of Prescriptive Program participants such as automotive (2%), office (2%), grocery (2), medical (2%), hotel/motel (1%) and warehouses (1%).



Figure 4-1. Business Types

Source: 2013 Participant Survey. N=255

4.2.2 Influencing the Project Decision

As shown in Figure 4-2, contractors were the top source of initial information about the program to participants (44%). Friends, colleagues, word of mouth (15%) and AEP Ohio account manager communications (13%) were the other two top sources of initial information about the program. Contractors appear to be the most important outreach component to customers on behalf of the program.

Not shown in Figure 4-2 are those sources mentioned by less than 3 percent of survey respondents. These sources include a workshop or kickoff event (2%), an AEP Ohio contractor (1%), email (1%) and a newsletter (1%).





Source: 2013 Participant Survey. N=254

4.2.3 Identifying the Opportunity and Influencing the Project Decision

Figure 4-3, survey respondents reported that the contractor played an the most important role in identifying the opportunity and influencing the energy efficiency project planning. The respondent mentioned himself as the next most important decision maker. Other parties, such as the owner, Board of Directors, distributors, and the AEP Ohio account representatives remain less influential in both aspects of the decision making process.





Source: 2013 Participant Survey. Multiple Responses Accepted; Base N=255

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4.2.4 Importance of Various Factors in Influencing Participation

As shown in Figure 4-4, payback on investment (90%), availability of the program incentive (89%), recommendation from a vendor or contractor that helped the participant choose their equipment (76%), and the condition or age of equipment (75%) were the most likely four criteria that participants judged to be important in their consideration to participate in the program.

Figure 4-4. Importance of Various Factors in Influencing Participation (% of participants scoring 6 or higher on 0-10 importance scale)



Source: 2013 Participant Survey. N=233-255

4.2.5 Reasons for Program Participation

As shown in Figure 4-5, the most cited reasons for participating in the Prescriptive Program were to save energy (45% of respondents), to receive the incentives (39%), to upgrade old, obsolete fixtures (36%), and to save money on electric bills (34%). A few survey respondents also participated fund additional energy efficiency projects (5%).

Other reasons for participating in the program were mentioned by fewer respondents. For instance, fewer than three percent mentioned they participated to help protect the environment, to follow a recommendation by their contractor or because of prior participation in similar programs (not shown).



Figure 4-5. Reasons for Program Participation [Multiple Response]

Source: 2013 Participant Survey. Multiple Responses Accepted; Base N=255
4.2.6 Benefits of Program Participation

Figure 4-6 shows the most commonly mentioned benefits of the program were energy savings (47% of respondents), that it was good for the environment (43%), and lower maintenance costs (28%). Prescriptive Program participants reported less benefit from the financial impact of the program in 2013 (rebate/incentive 12%; bill savings/cost savings (10%).



Figure 4-6. Major Benefits of Program Participation

Source: 2013 Participant Survey. Multiple Responses Accepted; Base N=254

4.2.7 Overall Satisfaction with the Program and with AEP Ohio

As shown in Figure 4-7, approximately three-fourths of program participants (76%) were *very satisfied* with the AEP Ohio Prescriptive Program, the same amount as in 2012. Another 20 percent were *somewhat satisfied* with the program. The remaining four percent were less than satisfied with the program.





Respondents were also asked to share their satisfaction with AEP Ohio. As shown in Table 4-8, The answers for this question ranged from 0 for 'very dissatisfied' to 10 for *very satisfied*. About 39 percent of respondents indicated they were *very satisfied* with AEP Ohio. Considering only those who scored AEP Ohio an 8, 9, or 10 on the 0 to 10 scale, over 80 percent reported they were *satisfied* with the utility. Sixty-three percent of Prescriptive Program participants planned to participate in the program again (not shown).

Source: 2013 Participant Survey. Base N=255



Figure 4-8. Satisfaction with AEP Ohio

Furthermore, Figure 4-9 shows that about 56 percent of participants noticed a change in their energy bills since installing the equipment, while 17 percent did not, and another 27 percent did not know. About 84 percent of those that reported noticing a reduction in their energy bill reported that the change was about what they expected (not shown).



Figure 4-9. Noticed Lower Energy Bill Since Installing New Energy Efficiency Equipment

Source: 2013 Participant Survey. Base N=255

Source: 2013 Participant Survey. Base N=255

4.2.8 Satisfaction with Specific Program Attributes

For five of the seven program attributes included in the survey, 90 percent or more of the survey respondents said they were satisfied (as measured by a 7+ rating on the 0 to 10 satisfaction scale) as shown in Figure 4-10. These program attributes included:

- Post-installation inspection (asked only of those that had an inspection) (96%)
- The energy efficiency level requirements to participate (95%)
- The energy efficiency measures (94%)
- Staff communications (asked only of those that had communications with AEP and program staff) (94%)
- Timeliness of the incentive (91%)

Program participants reported less satisfaction with the amount of the incentive (85%) and the application process (79%).



Figure 4-10. Satisfaction with Program Attributes

Source: 2013 Participant Survey. N=77-228

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4.2.9 Preferred Method of Contact

Figure 4-11, survey respondents most frequently preferred to be contacted by direct mail (22%), bill inserts (18%), email (18%), and direct contact by AEP representatives (18%). The relative importance of emails has gone down from 37% in 2012 to 18 percent in 2013 though it remains one of the more commonly cited preferred contact methods. Other methods mentioned include TV, Radio, Newspaper Ads (13%), Other (13%), Internet Web Sites (7%), Seminars (7%), through informing contractors (6%), and trade shows, conferences, and organizations (3%).



Figure 4-11. Preferred Method of Contact [Multiple Response]

Source: 2013 Participant Survey. Multiple Responses Accepted; Base N=174

About 73 percent of participants received program marketing material, and 92 percent of those that received the material (not shown) either thought it was somewhat useful or very useful, as shown in Figure 4-12.





The reasons most often cited by participating customers for companies like theirs not participating in the program were financial (42% of respondents). About 32 percent of respondents indicated lack of awareness as another top reason why other companies do not participate. About 18 percent of respondents (cumulatively) also indicated a lack of resources to complete the paperwork or that participation may be too time consuming prevented companies like theirs from participating. These results are shown in Figure 4-13.

Source: 2013 Participant Survey. N=255



Figure 4-13. Reasons Why "Companies Like Mine" Do Not Participate [Multiple Response]

Source: 2013 Participant Survey. Multiple Responses Accepted; Base N=229

4.2.10 Drawbacks to the Program

Figure 4-14, 69 percent of survey respondents reported no drawbacks to the Prescriptive Program. Program respondents reported that the largest drawback to the program was the cost of the equipment (9%). Other top reported drawbacks include the paperwork is too burdensome (8%), other (6%), and the time commitment for the program (4%).



Figure 4-14. Drawbacks to the Program [Multiple Response]

Source: 2013 Participant Survey. Multiple responses accepted; Base N=247

4.2.11 Participant Suggestions for Improving the Program

As shown in Figure 4-15, about 36 percent of respondents had no recommendations for improving the program. For those that did have suggestions, the most cited were greater publicity and more marketing (20% of respondents), higher incentives (18%), other (17%), and less or less confusing paperwork (11%).





Source: 2013 Participant Survey. Multiple Responses Accepted; Base N=205

5. Key Findings and Recommendations

This section presents the key findings and recommendations from the 2013 Prescriptive Program impact and process evaluations.

5.1 Key Impact Findings and Recommendations

- 1. The 2013 realization rates (defined as *ex post* savings / *ex ante* savings) are 1.12 for energy savings and 0.93 for demand savings. The relative precision at the two-tailed 90 percent confidence interval was \pm 6.7 percent for energy and \pm 7.2 percent for demand. Overall, the implementation contractor continues to do a good job estimating the savings resulting from the Prescriptive Program.
- 2. Lighting continues to dominate the program with 86 percent of the reported energy savings and 90 percent of the reported demand savings. The largest non-lighting end-uses were VFDs and HVAC.
- 3. In 2013, Navigant discovered a greater discrepancy between the *ex ante* savings reported in the database and the *ex post* savings, as compared to 2012 where the difference was negligible. The discrepancy was due to an error in the lighting calculation spreadsheet.

Impact Recommendation: Navigant recommends that the implementation contractor reviews their lighting analysis template to ensure that the savings are being calculated as intended based on what is stated in Workpapers.

4. The implementation contractor has addressed the occupancy sensor recommendation that Navigant discussed in the 2012 Deemed Savings Review. Based on Navigant's review of the reported savings, the implementation contractor recalculated a majority of the savings for occupancy sensors based on Navigant's recommendations.

Impact Recommendation: Navigant recommends that the implementation contractor update the occupancy sensor documentation in Workpapers with the revised approach.

5. In 2013, the implementation contractor updated the source of the lighting HVAC interactive effects from the values used in DEER 2008 to the values used in Version 2.0 of the Illinois TRM. Navigant supported this change for 2013.

Impact Recommendation: Navigant recommends that AEP Ohio consider developing AEP Ohio service area specific HVAC interactive factors for use in 2014 and beyond. Navigant recommends that AEP Ohio either **a**) repurpose Navigant's existing methodology for creating well-documented, Ohio-specific sets of models (*primary recommendation*) or **b**) update the existing set of eQUEST models used in the Illinois TRM with Ohio-specific inputs and assumptions (*secondary recommendation*).

6. The evaluation team made a series of recommendations in the 2012 Deemed Savings Review regarding topics such as: 1) removing Magnetic Standard ballasts from the T12 baseline assumptions, 2) updating the fixture wattage assumption for HP/RW measures, and 3) closely examining the ballast factors of fixtures submitted under the HP/RW measure.

Impact Recommendation: Navigant's recommendations from the 2012 Deemed Savings Review still apply, since the implementation contractor did not adjust the wattage assumptions between 2012 and 2013.

7. Navigant found instances of slight variations in the text used for the same measure description, which suggests that the measure descriptions in the tracking database are not completely standardized. Further, there is no unique identifier at the measure level, which increases the risk of error during data processing.¹⁰

Impact Recommendation: Navigant recommends that the implementation contractor add a field to the tracking database for "measure code" to represent a unique measure identifier. This small change would save a data-processing step and reduce the risk for error in assigning measure names.

5.2 Key Process Findings and Recommendations

- 1. Prescriptive program participants continued to be satisfied with the Prescriptive Program and with AEP Ohio. Over 90 percent said they are either somewhat or very satisfied with the program (96%) and the utility (94%).
- 2. Satisfaction with specific attributes of the program was generally high, ranging from 79 percent for the application process to 96 percent for the inspection. 85% were satisfied with the amount of the incentives. Only 79 percent of those who completed the application themselves said they were satisfied with the process, indicating one in five participants was not satisfied with the application process.

Process Recommendation: The best way to increase satisfaction with customers would be to simplify the application process, to the extent possible.

3. Of the 48% of the survey respondents who completed the final application themselves, 79 percent said they were satisfied with the application process, indicating about one in five participants who were not satisfied with the application process.

Process Recommendation #1: Only 10% of all survey respondents both completed the application and are unhappy with the application process. Navigant suggests this group may be those who are difficult to please.

4. Survey respondents were most likely to prefer to be contacted by direct mail (22%) and bill inserts (18%).

¹⁰ For example, "Interior 2-ft T8 Lamp and Ballast T12 Base" vs "Interior 2-ft T8 Lamp and Ballast w T12 Base."

Process Recommendation: Encourage Solution Providers to use the direct mail collateral materials that can be co-branded to increase the visibility of the Prescriptive Program and to increase the legitimacy of the Solution Provider.

5. Though over 90 percent of participants that received program marketing material were satisfied or very satisfied with it, participants' most common recommendation for improving the program was greater publicity and marketing for the program. Participants also noted a lack of awareness about the program as the second most likely reason other companies such as theirs aren't participating in the program.

Process Recommendation: Explore the possibility of leveraging and incenting former participants to promote the program to peer businesses. Satisfied prior participants are good case studies for other businesses in similar sectors and word of mouth is an extremely effective way of increasing program participation. Word of mouth is listed second in Figure 4-2 as the most common way to hear about the program.

6. Solution Providers were by far the most common source of initial information about the program to participants, followed by word of mouth, and AEP Ohio account managers. Solution Providers were also most influential in identifying and influencing participation opportunities.

Process Recommendation: Navigant recommends that AEP Ohio continue to identify opportunities to leverage the role of Solution Providers in bringing participants to the program. AEP Ohio currently benefits from gathering Solution Provider input on how to improve the program. AEP Ohio should continue its semi-annual Solution provider meetings.

Appendix A. Impact Evaluation

A.1 Impact Evaluation Sample Design

The savings summaries from the Tracking System Review task revealed the top 77 percent of projects based on individual project savings accounted for more than 98 percent of the program's energy and demand savings (see Figure A-1).



Figure A-1. Cumulative Percentage of Savings vs. Cumulative Percentage of Projects

Source: Evaluation Analysis of 2013 AEP Ohio Tracking Data

The team subsequently set thresholds of 7,500 kWh/project and 1.5 kW/project. If a project met neither of these criteria, it was removed from the sample frame. This key step increases the sampling efficiency, since the cost of evaluating these small savings projects exceeds the value of the information gleaned from them. As shown in

Figure A-2, this task resulted in a final sample frame representing more than 98 percent of the savings with 77 percent of the projects.¹¹



Figure A-2. Percentage of Population Reported Projects and Savings in Sample Frame

Source: Evaluation Analysis of 2013 AEP Ohio Tracking Data

Navigant also defined the sample strata by magnitude of reported savings. Stratifying by project size reduces the overall number of required sample points by taking advantage of the concentrations of savings when relatively few projects contribute to a large fraction of total impacts.

¹¹ Ultimately, the percentage of projects meeting <u>either</u> the kWh or kW criteria (77%) is greater than the percentage of projects meeting just the kWh or just the kW criteria (72 % and 65%, respectively).

A.2 Deemed Savings Review

Assessment of Measures for Review

Figure A-3. Percent of Measures and Savings by Measure Category¹



Source: Evaluation Analysis of 2013 AEP Ohio Tracking Data

¹ The program also reported a handful of measures in the categories of Compressors, Miscellaneous, Food Service, Agriculture, Motor, Ice Maker, and Whole Building (not shown), but these accounted for a negligible portion of the savings.

Further examination showed that a moderate subset of lighting measures constituted the majority of lighting savings, and Navigant focused its efforts on these measures. In the final analysis, as shown in Figure A-4, the review of deemed savings parameters covered 87 percent of the installed measures and 85 percent of the energy savings.





Source: Evaluation Analysis of 2013 AEP Ohio Tracking Data

Adjustments to Per-Unit Savings Values

Navigant focused its Deemed Savings Review on lighting measures, which made up a majority of the reported savings in 2013. The implementation contractor did not make any changes to the deemed coincidence factors and hours of use between 2012 and 2013, and Navigant's recommendations from the 2012 Deemed Savings Review remain unaddressed. A majority of the lighting coincidence factors and hours of use in the implementation contractor's Workpapers come from DEER 2008. Navigant recommends that these values be updated to reflect the changes in DEER 2011. In 2013, the implementation contractor updated its lighting HVAC interactive effects from the values used in DEER 2008 to the values that are used in the Illinois TRM, which Navigant agrees with and therefore also used in the Deemed Savings Review.

As part of the 2012 Deemed Savings Review, Navigant reviewed 75 of the 107 deemed lighting measures in Workpapers which, in 2013, make up 85 percent of the reported energy savings and 90 percent of the demand savings. In addition to adjusting the lighting coincidence factors, hours of use, and HVAC interactive effects, Navigant also made a few measure-specific adjustments as noted below:

- 1. **T12 Baseline**: adjustments to baseline wattage assumption for measures with a T12 lamp/ballast baseline
- 2. **HP/RW**: adjustments to the energy efficient wattage assumption for the high performance and reduced wattage T8 measures
- 3. Controls: adjustments to lighting controls savings factors
- 4. Other: minor adjustments to other measures with a smaller overall impact

The adjustments made are no different from the adjustments made through the 2012 Deemed Savings Review. With the exception of controls, the implementation contractor did not make any changes between the 2012 Workpapers and 2013 Workpapers that affected Navigant's recommended changes from the 2012 Deemed Savings Review. Additional information can be found in Navigant's 2012 Deemed Savings Review¹².

Calculation of the Audited Savings

As described in Section 2.1.3, Navigant recalculated the *ex ante* savings for 87 percent (5,347 of 6,169 rows in the data base) of the reported Prescriptive measure installations using theimplementation contractor's Workpapers inputs (the "Audited" savings).¹³ For the remaining 13 percent of records that could not easily be recalculated, Navigant used the *ex ante* reported savings as a proxy for the *audited* savings value.

This exercise yielded a few intriguing results. Navigant hypothesized that the sum of the *audited* savings (i.e., those recalculated using the implementation contractor's *stated* methods and inputs) would equal the sum of the *ex ante* (i.e., database *reported*) savings. Instead, Navigant found a difference between the reported and recalculated savings. The audited savings were 7.1 percent higher than the reported energy savings and 1.1 percent lower than the reported demand savings. This means that the implementation contractor under-reported on the energy savings and over-reported on the demand savings.

Navigant discussed this finding with the implementation contractor and found that the discrepancy is due to an error in the calculator that the implementation contractor used to compute the deemed savings for lighting measures. The savings are calculated based on a lookup of the measure and building type selected in the tool. In order to simplify the lookup, the implementation contractor has the deemed savings values listed for each measure assuming the "Miscellaneous" building type, which is the average of the deemed savings values across all of the building types, and uses a multiplier based on how far away the deemed savings value for the selected building type is from the Miscellaneous building type

¹² AEP12- Deemed Savings Review_061313.docx

¹³ The implementation contractor's methodology for determining savings from lighting measures is to multiply the per-unit savings value from Appendix A by the operating hours and energy HVAC interactive effects (for energy), or the coincidence factor and demand HVAC interactive effects (for demand). The operating hours, coincidence factors, and HVAC interactive effects are all indexed by building type and measure category (CFL, non-CFL, and exit sign). Navigant leveraged this well-documented design to recalculate savings using the same method.

(i.e., the average). Navigant found that the values listed in the lighting tool did not align with the deemed savings values in the implementation contractor's Workpapers for the Miscellaneous building type. Navigant believes this is the primary source for the discrepancy between the *ex ante* savings and the audited savings.

and provide a comparison of the *ex ante* reported savings and the audited savings. The black line signifies when the database value equals the audited savings value, i.e., when the deemed savings values in the implementation contractor's Workpapers align with what is in the database. The data points above the line signify when the implementation contractor under-reported on the savings and the data points below the line signify when the implementation contractor over-reported on the savings.

As seen in Figure A-5, the implementation contractor significantly under-reported on the energy savings. The error affects all building types, but affected the Restaurant, Medical-Hospital, Assembly, and Government building types the most. Approximately 48 percent of the measures for these building types had a percent difference of 10 percent or greater from what was reported in the database¹⁴. The most common measures that were under-reported by more than 10 percent include Interior New T8/T5 Fluorescent Fixtures, Interior Non-Standard LED or Induction Equipment, and Interior Specialty CFL: GU-24 locking base, PAR, dimmable, or 3-way. Approximately 41 percent of the lighting measures that Navigant recalculated had a percent difference greater than 10 percent from the reported energy savings in the database¹⁵.



Figure A-5. Comparison of Ex Ante Reported (x-axis) and Audited(y-axis) Energy Savings

Source: Navigant's 2013 Deemed Savings Review

¹⁴ This includes both lighting and non-lighting measures.

¹⁵ This percentage is only based on the 5,357 lighting measures that Navigant recalculated.

As seen in Figure A-6, the implementation contractor slightly over-reported on demand savings. The error affects all building types, but affected the Unconditioned Warehouse building type the most. Approximately 74 percent of the measures for this building type had a difference of 10 percent or greater from what was reported in the database¹⁶. The most common measures that were over-reported include Interior Occupancy Sensors and Interior New T5/T8 Fluorescent Fixtures. Approximately 10 percent of the lighting measures that Navigant recalculated had a difference greater than 10 percent from the reported demand savings in the database¹⁷.

The cluster of data points in the bottom left of the graph represents changes that the implementation contractor made to the calculation of Occupancy Sensors savings according to Navigant's suggestions in the 2012 Deemed Savings Review. The measures in this cluster have 0 percent difference from Navigant's engineering adjusted savings. While this is a positive finding, Navigant suggests that the implementation contractor calculate the savings for all occupancy sensors in 2014 using the same method in order to ensure consistency. In addition, the implementation contractor's Workpapers should be updated to reflect the deemed savings values being applied.



Figure A-6. Comparison of *Ex Ante* Reported (x-axis) and Audited (y-axis) Demand Savings

Source: Navigant's 2013 Deemed Savings Review

Calculation of Navigant's Engineering Adjusted Savings

Navigant also recalculated the *ex ante* savings using Navigant's engineering adjusted per-unit savings values as described above. This exercise was completed on the exact same set of measures (87% of the

¹⁶ The next closest building type was Miscellaneous, which had 12 percent of the measures with a percent difference greater than 10 percent from what was reported in the database.

¹⁷¹⁷ This percentage is only based on the 5,357 lighting measures that Navigant recalculated of the 6,619 rows in the database.

total) as the audited savings calculations, and the remaining 13 percent of measures used the *ex ante* reported values as a proxy for the adjusted savings values.

and below show a comparison between the *ex ante* Reported savings (x-axis) and engineering adjusted savings (y-axis) for energy and demand. The data points below the line mean that Navigant's engineering adjustments resulted in a decrease in the savings, and the data points above the line resulted in an increase in the savings.

As seen in Figure A-7, Navigant's engineering adjusted savings for energy are higher than what the implementation contractor reported in the database. The primary drivers for this trend are the wattage adjustments for the following measures: Interior HP T8 - 4-ft Lamp and Ballast with T12 Base (Including U Tube) and Interior RW T8 - 4-ft. Lamp and Ballast with T12 Base (Including U Tube).





Source: Navigant's 2013 Deemed Savings Review

As seen in Figure A-8, Navigant's engineering adjusted savings resulted in a decrease in the demand savings as compared to those reported in the database. The primary drivers for this trend are the wattage adjustments for the following measures: Interior 2-ft T8 Lamp and Ballast T12 Base, Interior 1L 8-ft T12 to 2L 4-ft RW T8 Retrofit, and Interior 1L 8-ft T12 to 2L 4-ft HP T8 Retrofit.

Figure A-8. Comparison of *Ex Ante* Reported (x-axis) and Engineering Adjusted (y-axis) Demand Savings



Source: Navigant's 2013 Deemed Savings Review

Findings from Deemed Savings Review: HVAC Interactive Effects

Review of HVAC Interactive Effects

In the 2012 Deemed Savings Review, Navigant had recommended that, at a minimum, the implementation contractor update the lighting HVAC interactive effects to the values in the California DEER 2011. In 2013, the implementation contractor changed the source of the lighting HVAC interactive effects in Workpapers from DEER 2008 to the Illinois TRM¹⁸. The Illinois TRM uses lighting HVAC interactive effects based off of eQUEST models using Illinois weather profiles. Since the values chosen for lighting HVAC interactive effects impact both demand and energy savings, Navigant decided to investigate how the values in the Illinois TRM were calculated.

Illinois TRM Approach for Calculating HVAC Interactive Effects

The Illinois TRM uses an average of five weather zones in Illinois to calculate energy and demand HVAC interactive effects indexed by building type. In some instances, an average of multiple building types is used in order to come up with the values used in the Illinois TRM. Navigant's review of TMY3 climate data for Chicago, Illinois and Columbus, Ohio indicate that key climate characteristics (such as

¹⁸ The values in the 2013 Workpapers are from Version 2.0 of the Illinois TRM, which was effective June 7th, 2013. Illinois recently published Version 3.0, which was effective February 14th, 2014. <u>http://www.ilsag.info/technical-reference-manual.html</u>

heating and cooling degree days and humidity) between the two cities are similar, with Columbus being the slightly more temperate city. Elevation and latitude are also comparable between Chicago and Columbus.

The Illinois TRM values are more closely aligned to the Ohio climate than the California-specific values from DEER 2008, but AEP Ohio service-area specific HVAC interactive effects should be developed and used moving forward to provide the most accurate deemed savings values possible. The eQUEST models used in the Illinois TRM have not been updated since the first iteration of the TRM; therefore, it would be beneficial to update the models with AEP Ohio service-area specific inputs from previous data collection efforts (baseline studies, evaluations etc.). See Appendix A for additional information regarding the Illinois TRM approach for calculating HVAC interactive effects, as well as Navigant's concerns with the implementation contractor using the Illinois TRM.

The energy and demand HVAC interactive effects in the Illinois TRM are based on the following algorithm:

Equation A-1: Standard Equation Used in Illinois TRM to Calculate HVAC Interactive Effects

 $Interactive \ Effect = \frac{Building \ Usage_{Prototype}-Building \ Usage_{LPD \ Measure}}{Lighting \ Usage_{Prototype}-Lighting \ Usage_{LPD}}$

For each building type in the Illinois TRM there are two models: the prototype (baseline) and the LPD Measure (efficient case), which assumes a 20 percent reduction in lighting power density from the baseline case. Each of the models are then run with the five Illinois weather zones and the energy and demand interactive effects are calculated for each of the weather zones using the equation above. In order to calculate the overall interactive effect for each building type a simple average of the five weather zones is used, with the exception of when there are faulty outputs from the models and those values are thrown out. In multiple instances, the outputs from eQUEST resulted in HVAC interactive effects with negative values or values less than one and therefore they were left out of the simple average.

The energy interactive effects are calculated using the hourly output file from eQUEST, which lists the hourly energy usage for each end use for the entire year. The building usage is based off of a sum of the "Total End-Use" energy for the entire year and the lighting usage is based off of the sum of the "Lighting End-Use" energy for the entire year. The demand interactive effects are based off of the "Report: PS-E Energy End-Use Summary for all Electric Meters" from eQUEST. The building usage and the light usage are based off of the day with the maximum kW, which doesn't necessarily fall during the peak demand period.

Concerns in Using Illinois TRM

Navigant reviewed both the building models and the assumptions used to generate the Illinois TRM HVAC interactive effects, as well as implementation contractor's application of those values. In general, the HVAC interactive effects developed for the Illinois TRM and applied to the 2013 implementation contractor's Workpapers are consistent with standard practice, with a few exceptions as noted below.

- 1. The Illinois TRM modeled all building types (except for hotel/motel guest rooms) with gas heat; therefore the HVAC interactive effect only recognizes the cooling season savings and not the heating season penalty. For systems with electric heat this penalty should be taken into consideration. Version 3.0 of the Illinois TRM takes into account these penalties.
- 2. The HVAC interactive effects for the building types in the Illinois TRM are a simple average of the outputs from the five weather zones in Illinois. However, some of the models had erroneous outputs and thus were not included. For example, the eQUEST model for the Illinois TRM building type High School had negative energy HVAC interactive effects for four of the five weather zones so the value in the TRM is based off of one weather zone.
- 3. The mapping of the eQUEST model building types to the building types in the Illinois TRM and Appendix A are not always an accurate approximation. For example, the Grocery building type in the Illinois TRM is based off of the outputs from the Convenience Store eQUEST model.
- 4. The demand HVAC interactive effect in Table 3 of the 2013 Workpapers for "Education— Secondary School" is based off of the Illinois TRM building type "High School/Middle School," which has a likely erroneous demand HVAC interactive effect value of 0.74. Per the mapping in Workpapers, the building type "Education—Secondary School" is averaged with "Education – Primary School" for the building type "School" and it is likely an underestimation of the savings.
- 5. The demand HVAC interactive effects in the Illinois TRM are based on the day during the year with the maximum demand usage, which is not consistent with the peak demand period.

A.3 Findings from Technical Review and Onsite Data Collection

Figure A-9 and Figure A-10 show the *ex ante* and *ex post* savings of each sampled project for energy and demand savings, respectively. The data points above the diagonal line represent projects with realization rates greater than one, while data points below the line represent those with realization rates less than one.

Navigant's metering of the incentivized lighting fixtures frequently revealed higher hours of use in total and during the peak period than assumed in the reported savings calculation, which caused an increase in both energy and demand savings. As shown in , the majority of projects had realization rates close to one. The largest project had a particularly high energy realization rate, which was due to a major increase in the verified baseline operating hours compared to the deemed hours.



Figure A-9. Comparison of *Ex Ante* and *Ex Post* Energy Savings

Source: Navigant Analysis



Figure A-10. Comparison of *Ex Ante* and *Ex Post* Demand Savings

Figure A-11 shows the relative impact of various discrepancies on the overall savings estimates. Positive changes represent an increase in verified savings compared to the reported savings, while negative changes represent a decrease. Each discrepancy category is defined as follows:

Source: Navigant Analysis

- » Logger Data A change in the annual operating hours and coincidence factor based on logger data
- » **Building Type** A change in the building type used to describe the site, resulting in different annual operating hours, coincidence factor, and HVAC interaction factors
- » **Fixture Wattage** A change in the fixture wattage of one or more fixture types, resulting in a change in the Δ Watts
- » **Interaction Factor** A change in the HVAC interaction factors assumed, specifically in cases where a space was found to be unconditioned and the HVAC IFs were changed to equal one
- » **Fixture Quantity** A change in the fixture quantity, resulting in a change in the Δ Watts
- » HOU (Reported) A change in the annual operating hours based on the customer interview for verification-only site visits (no metering performed)

The primary impacts on realization rate for both energy and demand are the metered hours of use from logger data and the customer-reported hours of use. The logger data revealed that actual lighting usage was higher on average than the deemed estimates for annual operating hours, resulting in an increase in energy savings. At the same time, the logger data also showed that actual coincidence factors were in some cases much lower than assumed. The impact of the customer-reported hours of use category was driven primarily by two large projects for which the customers reported much higher hours than the deemed hours, resulting in higher verified energy and demand savings.



Figure A-11. Relative Impact of Different Drivers on Verified Savings

Source: Evaluation Data Collection and Analysis

A.4 Programs Savings Analysis

Figure A-12 presents the comparison of *ex ante* savings to audited, engineering adjusted, and *ex post* savings.



Figure A-12. Comparison of *Ex Post* to *Ex Ante* Savings

Source: Evaluation Analysis of Tracking Data and Sample Results

Figure A-13 shows the relative effect of each impact evaluation task on the overall *ex post* savings analysis. The greatest impacts came as a result of the *audited* savings calculations, which increased the *ex ante* energy savings by 7.1 percent and decreased the *ex ante* demand savings by 8.1 percent.¹⁹





Source: Evaluation Analysis of Tracking Data and Sample Results

¹ *The component parts representing each impact evaluation task will not be strictly additive to the overall impact, since each task builds upon the output of the previous task.*

¹⁹ The impact on the audited savings arose from an error in the lighting calculation spreadsheet. See Section 3.2.3 for a more detailed explanation.

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Appendix B. In-Depth Interview Instrument

AEP-Ohio Evaluation for Prescriptive Programs

Program Staff and Implementer In-Depth Interview Guide

February 1, 2013

Name of Interviewee:		Date:	
Title:	Company:		

[Note to Reviewer] The Interview Guide is a tool to guide process evaluation interviews with utility staff and implementation contractors. The guide helps to ensure the interviews include questions concerning the most important issues being investigated in this study. Follow-up questions are a normal part of these types of interviews. Therefore, there will be sets of questions that will be more fully explored with some individuals than with others. The depth of the exploration with any particular respondent will be guided by the role that individual played in the program's design and operation, i.e., where they have significant experiences for meaningful responses. The interviews will be audio taped and transcribed.

Hi, may I please speak with [NAME]? My name is _____ and I'm calling from Navigant Consulting, we are part of the team hired to conduct an evaluation of AEP-Ohio's gridSmart Business Energy Efficiency programs. We're conducting interviews with program managers and key staff in order to improve our understanding of AEP-Ohio's programs. At this time we are interested in asking you some questions about the Commercial & Industrial Custom programs. The questions will only take about an hour. Is this a good time to talk? [IF NOT, SCHEDULE A CALL BACK.]

[READ FOR IMPLEMENTER ONLY] Ok, great. I would like to talk to you about your involvement in the prescriptive program.

NOTE: DO NOT ASK CROSSED OUT QUESTIONS

Roles and Protocols

1. Has your role changed over time and if so, how?

- 2. Last year we talked about the roles of implementation contractor, AEP OHIO staff and the solution providers. Do you think there have been any substantial changes in the roles and people assigned to these programs in the past year compared to the previous program year? If so, what were they?
- 3. Do you feel information between you and the implementers is shared in a timely manner? If not, what can be done to improve this situation?

Prescriptive Program Only

4. Do we need to account for other measures (HVAC, Refrig, VSDs) in the survey besides lighting because right now it is a lighting survey?

Overall Goals and Objectives

- 5. Did you meet the goals of the program in 2013?
- 6. Other goals and objectives?
- According to these metrics, are the program(s) on track to meet or have they met 2013 goals? [If necessary, probe for number of rebate applications, energy savings realized.] Why or why not?

Program Theory

ASK OF ALL

8. In your *own words, what are the market barriers addressed by the program(s), the program* intervention strategies to address these barriers, and the program delivery steps? (We are looking for cause-effect relationships between proposed intervention and actions taken for all steps in the chain of program delivery steps.)

Marketing and Promotion

- 9. Please describe the program marketing campaign in your own words.
- 10. Do you have a written marketing plan?

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- 11. Do you plan to expand marketing to professional groups in 2014 or keep it at about the same level?
- 12. Do the marketing and promotional efforts address all measure end-use categories (i.e., lighting, HVAC, refrigeration, motors, VSDs)? If not, why not?
- 13. It is important to the success of the program that the trade ally network program be effectively marketed and fully implemented. Does the trade ally network have a significant role in the Prescriptive Program?
- 14. Was marketing to the trade ally network successful in 2013? How many trade allies were added to the list? Do you want to add more trade allies to the list in 2014?
- 15. Do you think the level of marketing and promotion of the program(s) was appropriate in 2013 to meet program goals?
- 16. Do you think promotional efforts are successful?
- 17. Do you anticipate making any changes to marketing efforts for next year?

Communicating the Program

- 18. What improvements have been made during 2013 to improve program processes?
- 19. What do you think still needs to be changed going forward?

The Web Site

- 20. What role should the Web site play?
- 21. Have you increased the use of Web site to market the C&I Programs? What role should the web site play?
- 22. Are customers able to download forms or complete forms online? (I think this effort is underway)
- 23. What still needs improving on the web site, in your opinion?
- 24. Any other improvements in the marketing of the program?

Solution Providers

- 25. Do you have a sense of solution providers' overall satisfaction with their participation in the Prescriptive program this year?
- 26. Are solution providers meeting your expectations for the Prescriptive Program?
- 27. Did AEP OHIO offer more training in 2013 to help support solution providers marketing the program? Was there a SP bonus in 2013?
- 28. Have solution providers requested any other types of support/collateral, etc. If so, what have they requested and how are you responding to their requests?

Barriers to Program Participation

29. What do you think are the greatest barriers to customer participation?

Quality Assurance and Quality Control

30. In your opinion, what can be done to improve the QA/QC process?

Rebates/Incentives

- 31. Are you planning any changes to incentive levels for the next program year? If yes, what is the rationale behind the change?
- 32. Did you implement any changes for the 2013 program year? What changes were implemented?

Program Adjustments and Enhancements

- 33. Based on your experience with implementing the program and communicating with customers, how did interest in the program in 2013 compare to interest in 2012?
- 34. Are there any changes planned for the program offerings in Program Year 6 (e.g., program offerings, marketing approach, targets, incentive levels, etc)?

If so, please describe these additions or deletions.

- 35. Are there any other elements in design, structure, and/or operation that should be modified to make the program(s) work better?
- 36. If so, what would you recommend? Why do you think this change is needed?

Success and the Future of These Efforts

- 37. In your opinion, how successful is this program(s)?
- 38. What are the strengths?
- 39. What are the weaknesses?
- 40. Do you think the current economic conditions are affecting the program? If so, how?
- 41. How could the program be improved?

Other

Program Managers Only

42. Do you have any other comments or suggestions for us?

Thank you very much for taking the time in assisting us with this evaluation. Your contribution is a very important part of the process.

We might follow-up with you by phone later, if additional questions arise.

Appendix C. Participant Telephone Survey

AEP OHIO BUSINESS PROGRAMS – PRESCRIPTIVE REBATE PROGRAM PARTICIPANT SURVEY – Prescriptive PROJECTS Final February 26, 2014

INTRODUCTION

NOTE: Choose the largest measures for the survey.

Hello, this is ______ from Blackstone Group calling on behalf of AEP Ohio. This is not a sales call. May I please speak with <**ApplicationContactName**>?

Our records show that **<OrganizationName** > purchased energy efficient **<**MeasureCategory>, which was installed prior to **<PaymentRequestDate**> and received an incentive of **<TotalIncentiveFinal**> from AEP Ohio. We are calling to do a follow-up study about **<OrganizationName**>'s participation in this program, which is called the "AEP Ohio Prescriptive Program". I was told you are the person most knowledgeable about this project. Is this correct? [IF NOT, ASK TO BE TRANSFERRED TO MOST KNOWLEDGABLE PERSON OR RECORD NAME & NUMBER.] This survey will take about 20 minutes. Is now a good time? [If no, schedule call-back] [READ IF CONTACT=0]

Hello, this is ______ from Blackstone Group calling on behalf of AEP Ohio. I would like to speak with the person most knowledgeable about recent changes in <MeasureCategory> equipment for your firm at this location. [IF NEEDED] Our records show that <OrganizationName > purchased energy efficient <MeasureCategory>, which was installed prior to <PaymentRequestDate> and received an incentive of <TotalIncentiveFinal> from AEP Ohio. We are calling to do a follow-up study about <OrganizationName>'s participation in this program, which is called the "AEP Ohio Prescriptive Program". I was told you are the person most knowledgeable about this project. Is this correct? [IF NOT, ASK TO BE TRANSFERRED TO MOST KNOWLEDGABLE PERSON OR RECORD NAME & NUMBER.]

This survey will take about 20 minutes. Is now a good time? [If no, schedule call-back] SCREENING QUESTIONS

A1. Just to confirm, in 2013 did **<OrganizationName** > participate in AEP Ohio's Prescriptive Program at **<SERVICEADDRESS**>? (IF NEEDED: This is a program where your business received an incentive/rebate for installing one or more energy-efficient **<MeasureCategory1**> products or measures. You may have participated in the program with projects at more than one site. We are discussing only the facility at **<SERVICEADDRESS**>)

READ CODES 1-3

- 1 Yes, participated as described
- 2 Yes, participated but at another location
- 3 <u>No</u>, did <u>not</u> participate in program
- 97 OTHER, SPECIFY
- 98 DON'T KNOW
- 99 REFUSED

[SKIP A2 IF A1=1, 2]

A2. Is it possible that someone else dealt with the energy-efficient project < **MeasureCategory1**> installation?

DO NOT READ LIST

- 1 YES, SOMEONE ELSE DEALT WITH IT
- 2 NO
- 97 OTHER, SPECIFY

98 DON'T KNOW 99 REFUSED (IF CODED 2/97/98/99 – THANK AND TERMINATE) [IF A2=1, ASK TO BE TRANSFERRED TO THAT PERSON. IF NOT AVAILABLE, THANK AND TERMINATE. IF AVAILABLE, GO BACK TO A1]

[IF A1=2, 3, 97, 98, 99: THANK AND TERMINATE. RECORD DISPOSITION AS "COULD NOT CONFIRM PARTICIPATION".]

Before we begin, I want to emphasize that this survey will only be about the energy efficient **equipment** you installed and received an incentive for through the AEP Ohio Prescriptive Program at <SERVICEADDRESS> in 2013.

- SO How did you first hear about the AEP Ohio Prescriptive program? DO NOT READ LIST, SINGLE PUNCH
 - 1 AEP OHIO ACCOUNT MANAGER (PHONE/EMAIL/IN-PERSON)
 - 2. AEP OHIO WEBSITE
 - 3. WORKSHOP / KICKOFF EVENT
 - 4. CONTRACTOR/TRADE ALLY (PHONE/EMAIL/IN-PERSON)
 - 5. EMAIL
 - 6. FRIEND/COLLEAGUE/WORD OF MOUTH (PHONE/EMAIL/IN-PERSON)
 - 7. BILL INSERT
 - 8. WEBINAR
 - 9. SPEAKER/PRESENTATION AT AN EVENT
 - 10. QUESTLINE NEWSLETTER
 - 97. OTHER, SPECIFY
 - 98. DON'T KNOW
 - 99. REFUSED
- PL1 Who was the most influential in specifying the details of the energy efficient project you completed through the AEP Ohio Prescriptive Program?

[DO NOT READ CATEGORIES; SINGLE RESPONSE]

- 1. ME/RESPONDENT
- 2. CONTRACTOR
- 3. ENGINEER
- 4. ARCHITECT
- 5. MANUFACTURER
- 6. DISTRIBUTOR
- 7. OWNER
- 97. OTHER, SPECIFY
- 98. DON'T KNOW
- 99. REFUSED
- PL2 And who identified the opportunity for the AEP Ohio Prescriptive Program incentive? [DO NOT READ CATEGORIES; SINGLE RESPONSE]
 - 1. ME/RESPONDENT
 - 2. CONTRACTOR
 - 3. ENGINEER

- 4. ARCHITECT
- 5. MANUFACTURER
- 6. DISTRIBUTOR
- 7. AEP ACCOUNT MANAGER
- 8. OWNER/DEVELOPER
- 9. PROJECT MANAGER
- 97. OTHER, SPECIFY
- 98. DON'T KNOW
- 99. REFUSED
- S0a What were the primary reasons your company participated in the AEP Ohio Prescriptive Program? [DO NOT READ LIST; ACCEPT MULTIPLE RESPONSES]
 - 1. (BECAUSE OF THE INCENTIVES/TO SAVE MONEY ON EQUIPMENT PURCHASE)
 - 2. TO FUND ADDITIONAL ENERGY EFFICIENCY PROJECTS.
 - 2. (TO SAVE ENERGY)
 - 3. (TO SAVE MONEY ON ELECTRIC BILLS)
 - 4. (BECAUSE THE PROGRAM WAS SPONSORED BY A UTILITY)
 - 5. (TO HELP PROTECT THE ENVIRONMENT)
 - 6. (PREVIOUS EXPERIENCE WITH OTHER UTILITY PROGRAMS)
 - 7. (RECOMMENDED BY UTILITY ACCOUNT REPS)
 - 8. (RECOMMENDED BY CONTRACTORS)
 - 9. (PRIOR PARTICIPATION IN SIMILAR PROGRAMS)
 - 97. (OTHER, SPECIFY)
 - 98. (DON'T KNOW)
 - 99. (REFUSED)

IMPORTANCE OF PROGRAM

N3 Next, I'm going to ask you to rate the importance of the program as well as other factors that might have influenced your decision to implement the < **MeasureCategory1** >. Think of the degree of importance on a scale with equally spaced units from 0 to 10, where 0 means not at all important and 10 means extremely important. Now using this scale please rate the importance of each of the following in your decision to implement the energy efficient equipment at this time.

[FOR N3a-n, RECORD 0 TO 10; 96=NOT APPLICABLE; 98=DON'T KNOW; 99=REFUSED]

(If needed: How important in your DECISION to implement the project was...)

- N3a. The age or condition of the old equipment
- N3b. Availability of the PROGRAM incentive
- N3d. Recommendation from a vendor or contractor that helped you choose the equipment
- N3e. Previous experience with the <u>AEP Ohio's Energy Efficiency Rebates</u>
- N3f. Recommendation from an AEP Ohio program staff person
- N3h. Information from AEP Ohio Prescriptive Program or AEP Ohio marketing materials
- N3j. Standard practice in your business/industry
- N3k. Recommendation by an account manager of AEP Ohio
- N3I. Corporate policy or guidelines
- N3m. Payback on the investment

PROCESS MODULE

I'd now like to ask you a few general questions about your participation in the AEP Ohio Prescriptive program.

Program Processes and Satisfaction

S2a Did YOU fill out the final application for the project? DO NOT READ LIST, SINGLE PUNCH

- 1. Yes [continue]
- 2. No [skip to s2d]
- 8. Don't know
- 9. Refused

[ASK S2b IF S2a=1 ELSE SKIP TO S2d]

S2b How would you rate the process for submitting the final application? Please use a scale of 0 to 10 where 0 is "very difficult" and 10 is "very easy".
[SCALE 0-10; 98=DON'T KNOW, 99=REFUSED]

[ASK S2c IF S2b<4]

S2c Why did you rate it that way? [OPEN END]

[ASK S2d IF S2a=2]

S2d Who filled out the final application for the project?

READ LIST, SINGLE PUNCH

- 1. Someone else at the facility
- 2. Someone else at the company
- 3. Trade Ally
- 4. Contractor
- 97. OTHER, SPECIFY
- 98. DON'T KNOW
- 99. REFUSED

Marketing and Outreach

MK1b How useful were the program's marketing materials in providing information about the program? Would you say they were...?

READ LIST, SINGLE PUNCH

- 1. Very useful
- 2. Somewhat useful
- 3. Not very useful
- 4. Not at all useful
- 5. I did not receive any marketing materials
- 98. DON'T KNOW
- 99. REFUSED

[ASK MK1c IF MK1b=3, 4]

- MK1c What would have made the materials more useful to you?
 - 97. OPEN END
 - 98. DON'T KNOW
 - 99. REFUSED

MK2. AEP Ohio wishes to reach more customers about their energy efficiency programs. How do you suggest that AEP Ohio reach customers like yourself?

[OPEN ENDED]
98. DON'T KNOW 99. REFUSED

STATE-WIDE EVALUATOR NON-RESIDENTIAL PARTICIPATION PROCESS AND PROGRAM -SATISFACTION MODULE

I'd now like to ask you a few more general questions about your participation in the Prescriptive Rebate program. **E 1.** How satisfied were you with the energy efficiency level required to qualify for an incentive? Please use a scale from 0 to 10, where 0 is "not at all satisfied" and 10 is "completely satisfied"? [SCALE 0-10; 98=DON'T KNOW, 99=REFUSED]

E 2. [ASK IF E1<4) What would have made you more satisfied? RECORD VERBATIM

- 1. NOTHING
- 2. DON'T KNOW
- 3. REFUSED

(ASK IF E1>=4)

E2a. Why did you give that rating? 00. RECORD VERBATIM 98. DON'T KNOW 99. REFUSED

E 3. How satisfied were you with the amount of the incentive? (READ IF NECESSARY: Please use a scale from 0 to 10, where 0 is "not at all satisfied" and 10 is "completely satisfied"?) [SCALE 0-10; 98=DON'T KNOW, 99=REFUSED]

E 4. How satisfied were you with the energy efficient equipment offered by the program? (READ IF NECESSARY: Please use a scale from 0 to 10, where 0 is "not at all satisfied" and 10 is "completely satisfied"?) [SCALE 0-10; 98=DON'T KNOW, 99=REFUSED]

E 5. [ASK IF E4<4] What would have made you more satisfied with the energy efficient equipment?

RECORD VERBATIM 7. NOTHING 8. DON'T KNOW 9. REFUSED

E5a. (ASK IF E4>=4) Why did you give that rating?

RECORD VERBATIM 8. DON'T KNOW 9. REFUSED

E 6. In the course of participating in the AEP Ohio Energy Efficiency program, and other than sending in the incentive application, how often did you contact AEP Ohio or program staff with questions? (DON'T READ)

1	Never	Skip to E 10
2	Once	continue
3	2 or 3 times	continue
4	Four times or more	continue
98	DON'T KNOW	continue
99	REFUSED	continue

E 7. How did you contact them? [CHECK ALL THAT APPLY; AFTER EACH RESPONSE, ASK: Were there any other ways you contacted them?]

1	PHONE	continue
2	EMAIL OR FAX	continue
3	LETTER	continue
4	IN PERSON	continue
97	OTHER [OPEN END]	continue
98	DON'T KNOW	continue
99	REFUSED	continue

5.3

- **E 8.** And overall how satisfied were you with your communications with AEP Ohio and program staff? Please use a scale from 0 to 10, where 0 is "not at all satisfied" and 10 is "completely satisfied"? [SCALE 0-10; 98=DON'T KNOW, 99=REFUSED]
- E 9. [ASK IF E8<4] What would have made you more satisfied?

OPEN END_____ 7. NOTHING 8. DON'T KNOW 9. REFUSED (ASK IF E8>=4)

E9a. Why did you give that rating? OPEN END______ 8. DON'T KNOW 9. REFUSED

- E 10. From the time you had [MeasureCategory1] installed and submitted the application, about how many weeks did it take to receive your incentive? [INSERT NUMERIC OPEN END 0-200, 98 DON'T KNOW, 99 REFUSED]
- E 11. How satisfied were you with how long it took to receive the incentive? Please use a scale from 0 to 10, where 0 is "not at all satisfied" and 10 is "completely satisfied"? [SCALE 0-10; 98=DON'T KNOW, 99=REFUSED]

(ASK IF E11<4)
E11a. What would have made you more satisfied?
OPEN END______
7. NOTHING
8. DON'T KNOW
9. REFUSED

ASK IF E11>=4 E11B. Why did you give that rating? OPEN END______ 8. DON'T KNOW 9. REFUSED

E 12. Did AEP Ohio or its contractors conduct a post-installation inspection of the equipment you installed through the incentive Program?

5.4

1	Yes	CONTINUE
2	No	SKIP TO E.15
8	DON'T KNOW	SKIP TO E.15
9	REFUSED	SKIP TO E.15

- **E 13.** How satisfied were you with the inspection? Please use a scale from 0 to 10, where 0 is "not at all satisfied" and 10 is "completely satisfied"? [SCALE 0-10; 98=DON'T KNOW, 99=REFUSED]
- E 14. [ASK IF E13<4] What would have made you more satisfied with the inspection? RECORD VERBATIM
 7. NOTHING
 8. DON'T KNOW
 9. REFUSED
 [ASK IF E13>=4]
 E14A. Why did you give that rating?
 OPEN END_______
 8. DON'T KNOW
 9. REFUSED
- E 15. Have you noticed lower electricity bills since you installed your new energy efficient equipment?

1	YES	Continue
2	NO	E 17.
8	DON'T KNOW	Continue
9	REFUSED	Continue

E 16. Would you say your bill savings are...[READ LIST]

1	About what you expected	continue
2	More than you expected	Continue
3	Less than you expected	Continue
8	DON'T KNOW	Continue
9	REFUSED	Continue

E 17. If you were rating your overall satisfaction with the AEP Ohio Prescriptive Program, would you say you were Very Satisfied, Somewhat Satisfied, Neither Satisfied nor Dissatisfied, Somewhat Dissatisfied or Very Dissatisfied?

1	VERY SATISFIED	Continue
2	SOMEWHAT SATISFIED	Continue
3	NEITHER SATISFIED NOR DISSATISFIED	Continue
4	SOMEWHAT DISSATISFIED	Continue
5	VERY DISSATISFIED	Continue
8	DON'T KNOW	S11
9	REFUSED	S11

E 18. Why do you give it that rating?

RECORD VERBATIM 8. DON'T KNOW 9. REFUSED

- S11. On a scale of 0 to 10, where 0 is very dissatisfied and 10 is very satisfied, how would you rate your satisfaction with AEP Ohio overall?
 [SCALE 0-10; 96=not applicable, 98=Don't know, 99=Refused]
- E 19. Why do you give it that rating?

RECORD VERBATIM 8. DON'T KNOW 9. REFUSED

BENEFITS AND BARRIERS

- B1a What do you see as the main benefits to participating in the AEP Ohio Prescriptive Program?
 DO NOT READ LIST
 [MULTIPLE RESPONSE, UP TO 3]
 - 1. Energy savings
 - 2. Good for the environment
 - 3. Lower maintenance costs
 - 4. Better quality/new equipment
 - 5. Rebate/incentive
 - 6. No benefits
 - 97. Other, specify
 - 98. Don't know
 - 99. Refused
- **B1b** What do you see as the drawbacks to participating in the program? DO NOT READ LIST

[MULTIPLE RESPONSE, UP TO 3]

- 1. Paperwork too burdensome
- 2. Incentives not high enough/not worth the effort
- 3. Program is too complicated

- 4. Cost of equipment
- 5. No drawbacks
- 97. Other, specify
- 98. Don't know
- 99. Refused
- **B2** What do you think are the reasons companies like yours may not participate in this program? DO NOT READ LIST
 - [MULTIPLE RESPONSE, UP TO 3]
 - 1. Lack of awareness of the program
 - 2. Financial reasons
 - 3. Do not believe claims of energy savings
 - 3. None
 - 4. Not aware of savings/don't realize the savings
 - 97. Other, specify
 - 98. Don't know
 - 99. Refused

FEEDBACK AND RECOMMENDATIONS

- R1 Do you plan to participate in the program again in the future? DO NOT READ LIST, SINGLE PUNCH
 - 1. Yes
 - 2. No
 - 3. Maybe
 - 8. Don't know
 - 9. Refused
- R2 How would you improve the AEP Ohio Business Rebate Program? DO NOT READ LIST

[MULTIPLE RESPONSE, UP TO 4]

- 1. Higher incentives
- 2. More measures
- 3. Greater publicity
- 4. Contractor referral service
- 5. No recommendations
- 97. Other, specify
- 98. Don't know
- 99. Refused

FIRMOGRAPHICS

I only have a few general questions left.

- F1a What is <COMPANY>'s business sector? READ LIST IF NECESSARY. SINGLE PUNCH.
 - 1. K-12 school
 - 2. College
 - 3. Grocery
 - 4. Medical
 - 5. Hotel/motel
 - 6. Light industry
 - 7. Heavy industry
 - 8. Office
 - 9. Restaurant
 - 10. Retail/service
 - 11. Warehouse
 - 97. Other, specify
 - 98. Don't know
 - 99. Refused
- **F1b** And is the facility in which the energy efficiency equipment was installed in the same sector? DO NOT READ LIST, SINGLE PUNCH
 - 1. Yes [SKIP TO F2]
 - 2. No[SKIP TO F1C]
 - 8. Don't know[SKIP TO F2]
 - 9. Refused[SKIP TO F2]

[ASK F1c IF F1b=2]

- F1c What is the sector of the facility? READ LIST IF NECESSARY. SINGLE PUNCH.
 - 1. K-12 school
 - 2. College
 - 3. Grocery
 - 4. Medical
 - 5. Hotel/motel
 - 6. Light industry
 - 7. Heavy industry
 - 8. Office
 - 9. Restaurant
 - 10. Retail/service
 - 11. Warehouse
 - 97. Other, specify
 - 98. Don't know
 - 99. Refused

F2 Which of the following best describes the ownership of this facility? READ LIST, SINGLE PUNCH

- 1. <ORGANIZATIONNAME > owns and occupies this facility
- 2. CORGANIZATIONNAME> owns this facility but it is rented to someone else
- 3. <ORGANIZATIONNAME> rents this facility
- 8. DON'T KNOW
- 9. REFUSED

F3 Does <ORGANIZATIONNAME> pay the electric bill? DO NOT READ LIST, SINGLE PUNCH

- 1. YES
- 2. NO
- 8. (DON'T KNOW)
- 9. (REFUSED)

F4a How old is this facility? [NUMERIC OPEN END, 0 TO 150; 998=DON'T KNOW, 999=REFUSED]

[ASK F4b IF F4a=998]

- F4b Do you know the approximate age? Would you say it is...? READ LIST, SINGLE PUNCH
 - 1. Less than 2 years
 - 2. 2-4 years
 - 3. 5-9 years
 - 4. 10-19 years
 - 5. 20-29 years
 - 6. 30 or more years
 - 8. (DON'T KNOW)
 - 9. (REFUSED)
- F5a How many employees, full plus part-time, are employed at this facility? [NUMERIC OPEN END, 0 TO 2000; 9998=DON'T KNOW, 9999=REFUSED]

[ASK F5b IF F5a=9998]

- **F5b** Do you know the approximate number of employees? Would you say it is...? READ LIST, SINGLE PUNCH
 - 1. Less than 10
 - 2. 10-49
 - 3. 50-99
 - 4. 100-249
 - 5. 250-499
 - 6. 500 or more
 - 8. DON'T KNOW
 - 9. REFUSED
- F6 Which of the following best describes the facility? This facility is... READ LIST, SINGLE PUNCH
 - 1. <ORGANIZATIONNAME>'s only location
 - 2. One of several locations owned by <ORGANIZATIONNAME>
 - 3. The headquarters location of <ORGANZIATIONNAME> with several locations

Those are all the questions I have. Thank you and have a good day!

APPENDIX J

OHIO POWER COMPANY

Custom Program: Program Year 2013 Evaluation Report

Presented to AEP Ohio



May 13, 2014

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Executive Summary

This document presents a summary of the findings and results from the evaluation of the 2013 Custom Program implemented by AEP Ohio for the program year January 1, 2013 through December 31, 2013.¹ The Custom Program provides a streamlined incentive application and quality control process intended to facilitate ease of participation for non-residential customers interested in purchasing efficient technologies not included on the pre-qualified list of measures employed by the Prescriptive Program. Eligible equipment includes: equipment controls, variable speed air compressors, coil replacement, insulation, process efficiency improvements and other miscellaneous measure installations. Custom Program applications can also include prescriptive program measures that receive treatment as though they were submitted through the Prescriptive Program.

Program Participation

In 2013, the Custom Program paid incentives on 162 projects including 197 measures. Each project contained at least one Custom Measure which placed the project in the Custom Program. Applications could also contain prescriptive measures that were co-submitted and are also counted though the Custom Program. The prescriptive measures included in the Custom Program are evaluated as though these were submitted through the Prescriptive Program. Table ES-1 provides a summary of 2013 Custom Program reported results.

Metric	Custom	Prescriptive Co- Submitted	Custom Program Ex Ante Value
Number of Projects	162	13	162
Number of Measures ²	152	45	197
Annual Energy Savings (MWh)	59,260	963	60,222
Electric Peak Demand Savings (kW)	5,986.4	188.5	6,174.9

Table ES-1. 2013 Custom Program Projects, Measures, and Reported Savings

Source: Evaluation analysis of AEP Ohio tracking data from January 17, 2014

Measures submitted through the Custom Program reflect a broad variety of energy efficiency and conservation measures. Figure ES-1 shows program energy savings by end-use. A few industry-specific measures, grouped under "other", form the largest savings end-use (31%), followed by motors (30%), energy management systems (13%), compressed air (9%) and custom HVAC (7%) measures.

¹ 2013 participation is based on an implementation contractor payment mailed date between January 1, 2013 and December 31, 2013.

² The evaluation team counts measures from the number of records in the "Custom Measures" table of the tracking database. A measure record may include hundreds of lighting fixtures, a few injection molding machines or a single compressor, for example.



Figure ES-1. 2013 Custom Program Energy Savings by End-Use

Data Collection Activities

Table ES-2 provides a summary of 2013 data collection activities for the Custom Program impact and process evaluations.

Evaluation Effort	Data Collection	Targeted Population	Sampling Unit	Sample Design	Sample Size	Timing
Impact and Process	Collection of Program Tracking Data	Custom projects paid in 2013	Project	census	NA	Jan 2013 to April 2014
	In Just	AEP Ohio program Staff	Contact from AEP Ohio	NA	1	November, 2013
Process	In-depth Interviews	Custom program implementation staff	Contact from implementer	NA	4	
Process	CATI Surveys	Business unique program participants	Unique contact from tracking database	Census	52	March 2014 to April 2014
Impact	Project Technical Reviews	Custom projects paid in 2013	Project	Random sampling using stratified ratio estimation	19	March 2014 to April 2014
	On-site Verification	Sample of Technical Review Projects	Project	Key issue sites	3	March 2014 to April 2014

Table ES-2. Data Collection Activities for 2013 Custom Program Evaluation

Source: Evaluation activities conducted from July 2013 through April 2014

Key Evaluation Findings and Recommendations

Key Impact Findings and Recommendations

The impact results for the 2013 Custom Program are shown in Table ES-3 and Table ES-4.

Table ES-3. Savings Estimates for the 2013 Custom Program

	2013 Program Goals ¹	<i>Ex Ante</i> Savings (a)	<i>Ex Post</i> Savings ² (b)	Realization Rate RR = (b) / (a)	Percent of Goal
Energy Savings (MWh)	68,303	60,222	55,552	0.92	81%
Demand Savings (MW)	9.11	6.17	3.736	0.61	41%

Sources: ¹AEP Ohio Volume 1: 2012 TO 2014 Energy Efficiency/Peak Demand Reduction (EE/PDR) Action Plan, November 29, 2011. ²Evaluation analysis of AEP Ohio tracking data from January 17, 2014.

Metric	Energy Savings (MWh)	Demand Savings (MW)
Ex Ante Reported Savings	60,222	6.17
Ex Post Verified Savings	55,552	3.74
Realization Rate	0.92	0.61
Relative Precision @ 90% CI	14.2%	35.3%

Table ES-4. Savings Estimates for the 2013 Custom Program

1. **Finding:** The 2013 *ex post* savings fell short of goals. Lack of program participation seems to be the cause of this shortfall. Custom projects can take more than a year to complete, which can result in program activity initiated in one year with project completion in a subsequent year.

Impact Recommendation #1: Examine processes to emphasize measures and projects that could be submitted through a custom approach. Target market segments for case studies of successful projects to promote specific technology applications through the program, for example, promote compressed air projects to small and medium industrial customers, and promote high-efficiency pumping to biorefineries.

2. **Finding:** As in 2012 more than 40 percent of applications were submitted by a single company with multiple locations. This finding continues to suggest that many opportunities exist in this market segment.

Impact Recommendation #2: Consider methods for promoting similar successful projects among other customers in these segments without the infrastructure to conceive or initiate projects. Also, outreach to more entities is needed to sustain adequate participation to achieve program and sector goals.

3. **Finding:** Where billing analysis is the basis of *ex ante* savings (primarily for energy management system (EMS) projects), Navigant found a greater spread in realization rates, as there is greater uncertainty basing annual results on limited monthly data.

Impact Recommendation #3: Delay final project verification until at least six months of postinstallation billing data are available to perform the billing analysis, or pay a portion of the expected incentive based on preliminary analysis and true-up the incentive with analysis of more data.

Process Evaluation Findings and Recommendations

Satisfaction with the Custom Program

1. **Finding:** In 2013, satisfaction was very high with most aspects of the Custom Program. The lowest satisfaction level reported was with the time it took to receive the incentive, at 67 percent. Most customers (90%) plan to participate in the program again.

Process Recommendation #1: Although based on a small number of survey respondents, these results suggest the program delivery and contact worked well in 2013. The only area for improvement would be the incentive processing time. All other aspects of the program seem to be meeting customer expectations, as all the customers in the sample rated their satisfaction with the program an 8 or higher on the zero to ten point scale.

Program Growth

2. **Finding:** Solution Providers and some customers appeared to be comfortable with the application form. Few Custom Program participants complete their own application. Most have their Solution Provider complete the form for them. A larger proportion of Solution Providers understand the program form. As a group, Solution Providers have been more successful in submitting complete applications in a timely manner.

Process Recommendation #2: When the online form is functional, expectations for the introduction of the online form should be carefully managed internally and externally. Adequate training will be the key to the migration to the web-based application.

Changing the Solution Provider Relationship

3. **Finding:** Both AEP Ohio and the Implementation Contractor looked for ways to engage Solution Providers more deeply in the Custom Program in three ways. First, the Implementation Contractor asked Solution Providers and customers to meet collectively early in the application process to discuss program baseline data needs.

Finding: Second, AEP Ohio Program Coordinators met regularly with an active Solution Provider to discuss complicated custom projects. AEP Ohio and the implementer use these meetings to discuss the planned project and to correct erroneous assumptions made by the Solution Provider early in the process. In return, AEP Ohio was prepared to increase its level of support for the Solution Provider.

Finding: Third, the Implementation Contractor's outreach coordinator looked for ways to expand participation with larger Solution Providers.

Process Recommendation #3: AEP Ohio and the implementer should continue to look for methods of involving active Solution Providers into all the portfolio programs. This tactic works extremely well

for Solution Providers and customers participating in the Custom Program where the projects are complex.

Slowly Changing the Focus of the Custom Program

4. Finding: The focus of the Custom Program began to change from lighting toward variable speed drives and advanced lighting controls in 2013. For instance, the implementer reached out to individual Solution Providers via email and follow-up calls to remind them what the substantial variable frequency drive (VFD) rebate was in 2013.

Process Recommendation #4: In order to promote program participation and success, AEP Ohio and the program implementer must continue to drive new technologies that will benefit customers. AEP Ohio could look at measures like VFD that apply widely, or targeted measures, such as refrigerant controls, to deeply penetrate the market and drive savings and participation.

Impact of Reduction in Implementer Resources

5. **Finding:** One of the major Custom Program weaknesses in 2013 was the inability of the implementer to react more aggressively to its staff changes in order to prevent the Custom Program application processing pipeline from suffering a slowdown in productivity.

Process Recommendation #5: The implementer could develop a succession plan for senior engineers to prevent this type of bottleneck in the future.

Section 1. Introduction

This evaluation report chapter covers the Custom Program element of the AEP Ohio energy efficiency and peak demand reduction (EE/PDR) programs.

1.1 Program Description

The Custom Program offers incentives to non-residential customers who install eligible high-efficiency electric equipment not covered under the Prescriptive Program. The Program provides a streamlined incentive application and quality control process intended to facilitate ease of participation for customers interested in installing eligible efficient technologies.

The AEP Ohio Business Sector Programs - including Prescriptive, Custom, New Construction and Self-Direct - are marketed, administered, and delivered as an integrated program by AEP Ohio. The program is managed by an implementation contractor in coordination with AEP Ohio.

1.2 Key Program Elements

The goals of the 2013 Custom Program are to exceed the MWh targets in AEP Ohio's Energy Efficiency/Peak Demand Reduction (EE/PDR) Plan at or below the program budget, improve customer satisfaction with the program, increase outreach to customers, and internally involve more customer service staff in promoting the program to assigned customers. The following provides a summary of critical program elements.

Performance Incentive. Custom incentives are available based on the project's first year kilowatt-hour (kWh) savings. Table 1-1 presents the incentive parameters of the program.

Table	1-1.	Incent	ive F	'arame	ters

Energy Incentive	Incentive Cap
	50% of total incremental
	project cost (materials +
\$0.08 / kWh	external labor)

Incentive Limits. Project incentives cannot exceed 50 percent of the total incremental project cost. In addition to the above incremental project cost limit, incentive payment rates vary when a customer's calculated incentive exceeds the following tiers:

- Tier 1: <\$100,000 = 100% of eligible calculated incentive value
- Tier 2: \$100,001 \$300,000 = 50%
- Tier 3: \$300,001 \$500,000 = 25%
- Tier 4: \$500,001 + = 10%

Pre-Approval Applications. Pre-approval is required for all custom measures to determine qualification and reserve program funds for a project.

Pre-Inspection. Pre-inspections provide AEP Ohio with the opportunity to verify the existing conditions at the site. These site visits are performed as defined by quality assurance procedures based on the type of measures that the participant submits for pre-approval.

Reservation. The program reserves the project funds once the pre-inspection report and/or initial project review is approved. Projects that come in after funds are fully reserved are placed on a waiting list. In the event that a project is not completed within 90 days of the reservation and an extension has not been requested and granted, the project may be cancelled. Prior to cancellation, AEP Ohio will follow-up with the customer to work out an extension or confirm that the project should be cancelled.

Final Applications. Final applications must be submitted within 45 days of project completion and include the appropriate back-up documentation to verify the project is complete and meets the program requirements for the Solution Provider to receive 100% of the Solution Provider incentive. The implementer reviews final applications for eligibility and completeness.

Final Inspection. The implementer performs final inspections as defined by quality assurance/quality control (QA/QC) procedures to verify the measures installed.

Incentive Payment. Once the program accepts a project for payment, incentives are processed and delivered within 30 days.

Measures and Incentives for 2013

Eligible equipment includes HVAC measures such as VFDs and chillers, equipment controls, variable speed air compressors, process improvements, coil replacement and adding pipe insulation, and other miscellaneous measure installations. Most of these measure installations are "True Custom" measures, in the sense that simple deemed savings and/or simple-to-apply algorithms do not already exist for this heterogeneous segment of the program participant population. Lighting projects are also eligible for custom incentives when the hours of operation are exceptional and/or when non-standard equipment is installed.

Solution Provider Participation

AEP Ohio and the implementer launched a Solution Provider (trade ally) network of contractors in April 2010. This is a network of contractors that have been trained on the program, have applied to market the program, and are listed on the AEP Ohio web site as a registered contractor for the business sector programs.

2013 Custom Program Participation Summary

The evaluation team analyzed data delivered by AEP Ohio on January 17, 2014. As shown in Table 1-2, the 2013 Custom Program paid incentives on 162 projects constituting 60,222 MWh of *ex ante* reported annual energy savings. Only two percent of Custom Program savings are from Prescriptive Program measures submitted on the <u>same</u> application. Among the prescriptive measures co-submitted with Custom, almost 58 percent are lighting. The balance of prescriptive measure savings is split between air compressors and VFDs. The Custom Program demonstrates great measure diversity in terms of affected end-uses. The distribution of savings among end-uses is shown in Figure 1-1.

Table 1-2. 2013 Custom Program Projects, Measures, and Ex ante Savings

Metric	Custom	Prescriptive Co- Submitted	Custom Program Reported Value
Number of Projects	162	13	162
Number of Measures	152	45	197
Annual Energy Savings (MWh)	59,260	963	60,222
Electric Peak Demand Savings (MW)	5.99	0.19	6.17

Source: Evaluation analysis of AEP Ohio tracking data from January 17, 2014



Figure 1-1. 2013 Custom Program Energy Savings by End-Use

Source: Evaluation analysis of AEP Ohio tracking data from January 17, 2014

Figure 1-1 shows program energy savings by end-use with motors at 30 percent, and EMS at 13% percent. The "Other" category includes a couple very large process improvement projects (31%). Notable is lighting (3%) which comprises a smaller portion of the total³ as more lighting applications are covered in the Prescriptive Program.

Table 1-3 and Figure 1-2 provide a profile of 2013 Custom Program participation at the market segment level. Among 2013 Custom Program participants, two customers with multiple facilities were wellrepresented. A grocery store chain had projects at 76 sites and a school district had 14 projects. Combined, these two customers account for 56 percent of all Custom Program applications, but only five percent of program kWh savings.

³ Compared to prior program years' when lighting accounted for greater than 25 percent of the Custom Program savings.

Outside of these two customers, participation was highest within the Industrial and Manufacturing sector, which accounted for 71 percent of program reported energy savings and 81 percent of the reported demand savings. The School sector contributes another 15 percent of program energy savings. Relatively low penetration of any of these market segments suggests marketing opportunities.

Business Type	Project Count		ess Type Project Count <i>Ex Ante</i> Reported Savings, MWh		<i>Ex Ante</i> Reported Savings, kW	
Grocery	77	48%	435	1%	58.9	1%
Industrial/Manufacturing	41	25%	42,598	71%	5,021.4	81%
School	31	19%	9,144	15%	318.7	5%
College/University	1	1%	46	0%	5.2	0%
Government/Municipal	2	1%	1,344	2%	171.1	3%
Conditioned Warehouse	1	1%	1,596	3%	142.2	2%
Hotel/Motel	1	1%	13	0%	0.3	0%
Large Office	3	2%	3,205	5%	383.5	6%
Large Retail/Service	1	1%	163	0%	-	0%
Medical- Hospital	1	1%	631	1%	13.4	0%
Miscellaneous	3	2%	1,047	2%	60.2	1%
Total	162	100%	60,222	100%	6,174.9	100%

Table 1-3. 2013 Custom Program Participation by Business Type

Source: Evaluation analysis of tracking data from AEP Ohio database exports from January 17, 2014. Note: number may not sum due to rounding.



Figure 1-2. 2013 Custom Program Ex Ante MWh Savings by Business Type

Source: Evaluation analysis of tracking data from AEP Ohio database exports from January 17, 2014.

Figure 1-3 shows that five projects (three percent) account for 51 percent of program savings and sixteen projects (ten percent) encompass 75 percent of the savings. The 100 smallest projects comprise two percent of program savings.



Figure 1-3. 2013 Distribution of Savings by Project

Section 2. Methodology

For Custom Program participants, Navigant conducted impact and process evaluation activities using the methodologies outlined below.

2.1 Analytical Methods

Impact Evaluation Methods

The objective of this element of the impact evaluation is to verify or adjust the *ex ante* reported savings in the Custom Program tracking system. Savings verification is conducted through a multi-step approach:

- » Tracking System Savings Review, to identify potential adjustments to *ex ante* reported savings for measures due to outliers, missing information, or tracking system data entry or calculation errors. Evaluation adjustments identified through the Tracking System Savings review would have been made to all measures in the population where the adjustment was found to be applicable.
- » **Default Measure Savings Assessment**, to identify potential adjustments to *ex ante* reported savings for Custom measures where Navigant recommends an alternative default value for a specific measure or input to savings calculation.
- » Application Documentation Technical Review, to identify potential adjustments to *ex ante* reported savings for measures based on review of documentation, assumptions, and engineering analysis for a sample of projects. Sampling is discussed in Section 2.3.
- » **Other Adjustments to Savings**. Other adjustments to savings could include statistical or baseline adjustments to *ex post* savings.

The basis for AEP Ohio's *ex ante* reported savings depends upon multiple factors. Measures may be submitted for the Prescriptive Program through the Prescriptive Program application process. If measures do not meet Prescriptive Program criteria, these may then be proposed as Custom Program measures⁴. A single project may consist of both Prescriptive and Custom measures.

Reported savings for custom measures are based on project-specific calculations submitted by customers with project applications and verified by the implementer or custom calculations based on measured data and pre-installation and/or post-installation inspections performed by the implementer.

Documentation and Technical Review

Navigant conducted application Documentation and Technical Review on a sample of projects randomly selected according to protocol from the customer participant population. For each selected project, Navigant performed an in-depth review of project documentation to assess the engineering methods, parameters and assumptions used to generate the *ex ante* reported savings. When possible, measure quantities were verified by comparing these to invoices from contractors or suppliers. If a post-inspection

⁴ For example, custom lighting measures may include non-standard equipment or operating hours.

was carried out, measure quantities and specifications from the inspection were assumed to be correct. Where it was not possible to verify measure quantities from independent documents, it was assumed that the implementer quantities were correct.

For each custom measure in the sampled project, Navigant estimated *ex post* savings based on the review of project documentation and engineering analysis. *Ex post* adjustments to *ex ante* savings were based on building-specific information, invoices, additional billing history, specifications sheets and other documentation to the extent it was judged more representative of the project than *ex ante* or default measure savings assumptions. Prescriptive measures filed with Custom Program applications were treated as other Prescriptive Program measures. The Prescriptive Program realization rates for energy and demand were applied to all prescriptive measures.

Reasons for changes to *ex ante* reported savings could include the following:

- Hours of use
- Coincidence factor
- Space cooling HVAC interaction factor credit
- Baseline equipment specifications
- Post retrofit equipment specifications
- Additional post-installation data
- Other changes, such as analysis methodology

Engineering-based energy and demand reduction algorithms were followed to compute *ex post* savings.

On-site Data Collection

In the Custom Program evaluation plan, Navigant projected ten on-site inspections based on 280 estimated program participants, with sites selected from the application documentation review sample. Due to lower actual participation, Navigant conducted three on-site inspections. A major factor contributing to the low number of on-site inspections was the number of high-value sites that had extensive post-installation data in the project files. Of the 22 projects in the sample – 21 had post-installation inspections and/or post-installation data. In many cases, Navigant was able to supplement post-installation data without going on-site, since additional on-site research would not contribute much value for these sites.

A site-specific measurement and verification (M&V) plan was developed for each project scheduled for on-site data collection. Each plan explains the general impact approach, provides an analysis of the current inputs (based on the application and other available sources at that time), and identifies sources that will be used to verify data or obtain newly identified inputs for the *ex post* impact approach. For most projects, on-site sources include interviews that are completed at the time of the on-site visit, visual inspection of the systems, and equipment and spot measurements.

After all of the field data was collected, annual energy and demand impacts were developed based on the on-site data, monitoring data, application information, and, in some cases, billing or interval data. Each project engineering analysis was based on calibrated engineering models that made use of review and on-site gathered information.

NAVIGANT

Verification Results

Once the *ex post* impacts were developed for each project in the sample, the results were reviewed at the project-level by an experienced engineer familiar with the evaluation. Using *ex post* savings results, Navigant estimated an *ex post* realization rate (which is the ratio of the *ex post* savings to *ex ante* reported savings) for each stratum. The stratum-level realization rates were then applied to the population of *ex ante* reported savings by strata. The result is an *ex post* estimate of savings for the program.

Process Evaluation Methods

The purpose of the process evaluation is to assess the effect of the program structure and program implementation on program performance and customer satisfaction. The evaluation team's process efforts provide insights and recommendations to support the continued success of the Custom Program.

Central to the process evaluation for the Custom Program were interviews with AEP Ohio program managers and with staff of the implementation contractor, as well as review of relevant program tracking databases, documents, and other materials, to understand how the program has evolved from the previous year. In addition, the evaluation team conducted a Computer-Assisted Telephone Interview (CATI) survey with participating customers to better understand customer satisfaction and perceptions related to the program.

The evaluation team used senior staff members to conduct in-depth qualitative interviews. Interview guides were developed to be open-ended and allow for a free-flowing discussion between interviewer and respondent, and real time interviewing flexibility. The team developed guides which highlighted key issues, but did not require being read verbatim to offer the interviewer flexibility to delve deeply into pertinent issues based on the respondents' knowledge of and experience with the program.

The evaluation team took detailed notes during each in-depth interview and/or taped the discussion to ensure thorough documentation. For any quantitative questions, interviewers are trained to record and summarize responses to allow the evaluators to draw conclusions in the analysis.

2.2 Data Sources

The data collected for evaluation of the 2013 Custom Program was gathered during a number of activities including:

- » In-depth telephone interviews with AEP Ohio program coordinators and the implementation contractor (DNV GL Services Inc.)
- » A computer-assisted telephone interview (CATI) survey with participating customers
- » Tracking system data review
- » Documentation technical review of a sample of projects
- » On-site measurement and verification at customer sites for a subset of projects sampled from the application documentation technical review

Table 2-1 provides a summary of these data collection activities including the targeted population, the sample frame, and the time frame in which data collection occurred.

Data Collection	Targeted Population	Sample Frame	Sample Design	Sample Size	Timing	
Tracking Data Analysis	Custom Program projects approved for payment for 2013	AEP Ohio Tracking Database	-	All	May 2013 to April 2014	
AEP Ohio Program Staf In-depth		Contact from AEP Ohio	Business Programs Manager and Custom Program Manager2Janu to I		January 2014 to February	
Interviews	Custom Program Implementers	Contact from AEP Ohio	KEMA Program Implementation Staff	5	2014	
CATI Survey	Custom Program Participants	Tracking Database	Census of Custom Program Participants	N=52 Targeted = 26 Completed = 13	March 2014 to April 2014	
Application File Review	Tracking Database	Stratified Random Sample by Project- Level kWh	Stratified Random Sample by Project- Level kWh	19	December 2013 to April 2014	
On-site Verification	Application File Review Sample	Application File Review Sample	Key issue sites	3	March 2014 to April 2014	

Table 2-1. Data Collection Activities for 2013 Evaluation

Tracking Data

The Custom Program evaluation team was able to extract key program participation data from AEP Ohio's tracking database, which was provided in Excel spreadsheet format. The tracking data delivered for this evaluation was extracted from a program tracking database maintained by the implementer. Program samples for the CATI participating customer telephone sample were drawn from a January 17, 2014 extract.

The database extract spreadsheet includes a project level dataset with project total impacts, application submittal and status data, and internal approval information. Project data was linked by a unique project number to measure level records. Each project could have one or more linked measures of the same or different end-uses.

In general, the implementation contractor maintains quality and accurate data in the tracking system. Navigant did not identify any serious deficiencies, errors or patterns of missing data. The tracking system is adequate for planning all aspects of evaluation. AEP Ohio noted that incremental costs are missing for

40% of submitted measures. Absent incremental costs, AEP Ohio uses total measure cost for the benefit cost analysis which may lead to underestimating the program cost-effectiveness.

Project and Program Documentation

To support the engineering review, AEP Ohio provided project documentation in electronic format for each sampled project. Documentation included materials from the applicant (invoices, measure specification sheets, vendor proposals) and implementation contractor (calculation spreadsheets and verification photos and site reports). This documentation was provided by uploading to a secure file transfer site, as well as sent via a digital compact disk.

Navigant also reviewed program materials developed by implementer and AEP Ohio, including: two versions of the implementer technical reference manual documenting prescriptive savings (Appendix A of the program operations manual), application forms and checklists, and program materials available from the program web site.

Program and Implementer Staff Interviews

Navigant conducted two in-depth interviews with key program representatives as part of this evaluation. The AEP Ohio Custom Program Manager was interviewed solely about the Custom Program. The AEP Ohio Manager, Business Programs, and employees of the implementation contractor were interviewed for the Prescriptive and Custom Programs, combined. The telephone interviews were completed in November 2013. The interviews focused on program processes to better understand the goals of the program, how the program was implemented, the perceived effectiveness of the program, and future plans for improving the program.

Program Participant CATI Telephone Survey

Data were collected to support the process evaluation (such as questions concerning program design and implementation, program marketing and awareness, and customer satisfaction) and business demographics for the process component of the evaluation. Telephone surveys were attempted with a census of 2013 Custom Program participants. This CATI survey focused on estimating the program impacts and supporting the process evaluation. The questionnaire used for the survey is included in Appendix A.

2.3 Sampling Plan

Impact Sample

The sample design and selection process was conducted to target a relative precision of $\pm 10\%$ or better at a 90% level of confidence. The program-level *ex ante* reported savings data were analyzed by measure type, project size, and number of projects by individual companies to inform sample design. After analysis, the sample design selected for the Custom Program evaluation was stratified by project size. Project size is defined as the sum of all *ex ante* installed kWh within an individual project, as defined by unique project IDs assigned by AEP Ohio.

Projects were sorted from largest to smallest kWh savings and placed into strata, attempting to achieve a relatively even distribution of cumulative standard deviation in energy savings between strata and

minimize overall sample size. Stratum 1 equates to projects with the largest reported energy savings (greater than 3.0 GWh), Stratum 2 to medium-sized projects, and Stratum 3 to the smallest projects (less than 0.75 GWh). This approach resulted in a total sample of 18 projects to be selected for application documentation and engineering review. Navigant also identified two alternate sites in both strata 2 and strata 3 and sampled with certainty one of the grocery projects that was among 76 similar applications. In the end, Navigant sampled 73 percent of the reported program MWh savings. Table 2-2 provides a profile of the impact measurement and verification (M&V) sample in comparison with the populations within each stratum.

	Population S	Sample			
Sampling Strata	Number of Projects (N)	<i>Ex Ante</i> Savings, MWh	n	Ex Ante MWh	Sampled Percent of Population
Strata 1 large	4	28,326	4	28,326	100%
Strata 2 medium	12	16,272	10	12,939	80%
Strata 3 small	146	14,661	8	2,138	15%
Total or Overall Value	162	59,260	22	43,403	73%

Table 2-2. Profile of the Impact M&V Sample by Strata

Source: Evaluation analysis of program tracking data

Process Sample

The CATI survey targeted a population of 52 unique customer contact names with paid projects in the 2013 Custom Program, drawn from the January 17, 2014 tracking system extract. Many businesses submitted projects for multiple locations (e.g., chain stores) and listed a single contact person for all projects. These duplicates were removed from the call list.

Profile of Participating Customer Survey Respondents

Most of the business customers in the 2013 sample of Custom Program participants own their own facility (85 percent). The average age of their facilities is 49 years old with a range of less than one year to 100 years. The average size of the facility is about 245,000 square feet.

Over two-thirds of the businesses in our sample have more than one location (69 percent). The remaining businesses were evenly split between those that have only one location and those who were headquartered in Ohio (15 percent each).

The survey respondent sample can also be grouped by number of employees. Over 20 percent of respondents reported a workforce of 57 employees (23%) or less, or between 76 and 100 employees (23%). Almost 40 percent said they employed from 100 to over 500 employees (39%). A few respondents had over 500 employees.

Customers in the survey were involved in a broad range of businesses. The top three sectors in our sample were all from the industrial sector including: Industrial (Petroleum, Plastic, Rubber and

Chemicals) at 39 percent of the sample, Industrial (Mining, Metals, Stone, Glass, Concrete) and Industrial (Electronic and Machines) at 16 percent of the sample. The remaining sectors, Food Manufacturing, Agriculture, Other industrial, and College/Universities all represent 8 percent of the sample. The 2013 participants are more heavily weighted to industrial segments than in previous years.



Figure 2-1. Custom Participants Business Sectors

Section 3. Detailed Evaluation Findings

3.1 Impact Results

This section presents the results of the impact and process evaluations of the 2013 Custom Program.

Findings from the Impact Verification Task

Navigant estimated *ex post* program impacts based on application documentation review, on-site verification, and phone verification, following the methodology outlined in Section 3. Observations from the verification experience were that the implementation team and AEP Ohio have a quality control approach that appears sufficient to prevent inaccuracies, ensure that energy savings are realized, process applications in a fair and timely manner, and ensure that rebate payments are appropriate. Navigant found that many of the recommendations from the 2012 impact evaluation have been addressed in the 2013 program, as represented in Table 3-1.

2012 Recommendations	Status
Increase program savings by targeting a	The four largest projects submitted in 2013 comprise 47% of
for large gradients	The four largest projects submitted in 2015 comprise 47 % of
few large projects.	program savings and together total more savings than the
	entire 2012 Business Custom Program.
Leverage relationships with multi-site	One multi-site customer in 2013 completed 76 similar
customers to generate "clone" projects that	projects at 76 locations.
can be applied at many locations.	
Apply more rigorous review to savings	Fewer simulation-based estimates were used in 2013. More
estimates from vendors and based on	review and post-inspection and monitoring was found
simulations.	among 2013 projects.

Table 3-1. 2012 Recommendations and Status

Further refinements to these recommendations and 2013 Evaluation observations and recommendations are provided in Table 3-2.

2013 Issue/Observation	2013 Recommendation
Air Compressor efficiency (CFM/kW for example) is	Utilize typical performance curves (% power vs. %
most frequently reported at full flow at design	flow) for common compressor types when
conditions. Use of this factor at part-load can result	estimating input power based on measured air
in inaccurate savings estimates for common	flow.
compressor types.	
Some industrial efficiency measures also serve to	When measures result in increased capacity and
reduce a production bottleneck, thus production can	production, a split baseline should be used with
increase as a result of the project. Savings from	as-found conditions applied to prior production
increased production should be compared against	levels and a state-of-the-industry baseline applied
industry-typical new systems, not as-found systems.	to the incremental production increase.
Where billing comparison is used to calculate	The implementation contractor should finalize
savings, there were some instances where	savings for those projects based on billing
insufficient data were available for the post-	comparison only after sufficient post-installation
installation period. Additional post-installation data	data are available – at least six months for a single-
available for the evaluation were used to modify	site billing comparison.
project savings.	

Table 3-2. 2013 Impact Observations and Recommendations

Program Impact Parameter Estimates

The statistical method of separate ratio estimation was used for combining individual realization rates from the sample projects into an estimate of *ex post* energy savings for the population.⁵ In the case of a separate ratio estimator, a separate energy savings realization rate is calculated for each stratum and then combined. These steps are matched to the stratified random sampling method that was used to create the sample for the program⁶. The standard error was used to estimate the error bound around the estimate of *ex post* energy savings and demand reduction.

The realization rate (defined as *ex post* savings divided by *ex ante* reported savings) is 90 percent for energy savings, and 60.5 percent for demand reduction. In general, the project-level energy realization rates across strata were loosely grouped around 1.00. Exceptions were instances where billing analysis with additional data found very different savings, rare errors in calculations by the implementation contractor, and mis-applied baselines for projects that increase production. The low electric demand realization rate is driven by two large heavy industry projects. Substantial savings in these projects are not coincident with the peak demand process – electric arc furnace melting process, thus these savings do not contribute to peak reduction.

⁵ A full discussion of separate ratio estimation can be found in <u>Sampling: Design and Analysis</u>, Lohr, 2010 2nd Edition, pp. 144-145.

⁶ The Zone 1 Non-Lighting 1 stratum had only three projects, and only one of these was sampled. Rather than calculate a realization rate for this stratum separately, the evaluation team combined Zone 1 Non-Lighting projects into one stratum for the statistical extrapolation.



Program Impact Results

Based on the impact parameter estimates described in the previous section, Navigant estimated the *ex post* program impacts resulting from the 2013 Custom Program, as shown in Table 3-3. No further adjustments were made to *ex post* savings.

	<i>Ex-ante</i> Reported Savings		Ex post S	avings
Program	MWh	MW	MWh	MW
Total	60,222	6.17	55,552	3.736

Table 3-3. Savings Estimates for 2013 Custom Program

The Custom Program fell short of its 2013 goals of 68,303 MWh energy savings and 9.11 MW demand savings. Lower than expected participation in the Custom Program, as a proportion of the Business Programs offered by AEP Ohio, is the largest factor in goals attainment.

As requested by the statewide evaluator, Table 3-4 provides participation counts and *ex ante* savings estimates at the measure level. Due to the diverse measure types installed through the Custom Program, it is not practical to provide results by individual measure, so results were aggregated to measure end-use level. The verification sample was not designed based on end-use; therefore, Navigant does not report *ex post* savings at the measure end-use level.

Measure	Ex Ar Reported S		nte Savings
End-Use	Count	MWh	MW
Compressed Air	28	5,499	0.73
EMS	24	7,909	0.32
HVAC	14	4,342	0.19
Injection Molding	7	2,195	0.18
Lighting	16	1,710	0.15
Motors	12	17,757	2.04
Other	6	18,419	2.15
Process VSD	7	1,896	0.36
Refrigeration	7	187	0.02
Process Heat	76	306	0.04
Total	197	60,222	6.17

Table 3-4. 2013 Custom Program Participation and Savings by Measure End-Use

Source: Program tracking database, January 17, 2014. Measure participation is greater than program participants (162) because participants can install more than one measure of the same or different end-use for each application.

Number may not sum due to rounding.

3.2 Process Evaluation Results

AEP Ohio's 2013 Custom Program offers incentives designed to encourage implementation of energyefficiency measures including lighting, compressed air, motors, non-HVAC variable-speed drives, and other non-standard equipment.

The process evaluation of the AEP Ohio Custom Program focuses on the following researchable questions:

- Effectiveness of program implementation
- Effectiveness of program design and processes
- Customer and program partner experience and satisfaction with the program
- Opportunities for program improvement

The full list of research questions can be found in the 2013 Custom Program Evaluation Plan.

3.2.1 Program Implementation

Marketing and Outreach Practices

In 2013, AEP Ohio introduced or continued a number of methods to market all the business sector programs. Those most helpful in marketing the Custom Program include:

- » AEP Ohio continued with the Water/Waste Water Customer Group. The number of new projects was down in 2013, but the participants are from new organizations. AEP Ohio plans to expand the approach to other customer segments.
- » AEP Ohio continued to work with the industry organization Polymer Ohio. AEP Ohio made contact with this industry organization when it determined that much of the polymer industry is located in Ohio.
- » The implementer reached out to individual Solution Providers via email to market the variable speed drive (VSD) rebates. Both outreach personnel and engineers made follow-up calls to Solution Providers to remind them what the substantial VFD rebate was in 2013.
- » The Custom Program included advanced lighting controls that have the potential for saving 75 percent of kWh usage compared to conventional lighting without controls.
- » A modified bonus program for Solution Providers that required accurate and timely applications continued to be successful in 2013.
- » The Online Application planned for 2013 launch instead may launch in 2014.
3.2.2 Program Design and Processes

Solution Providers

The relationships among AEP Ohio, the implementer and Solution Providers are most critical to the success of the Custom Program. Solution Providers need to be able to maintain good relationships with large customers, while accurately explaining the requirements and benefits of the Custom Program. Solution Providers are responsible for enrolling customers in the program and making sure their expectations are in alignment with the program. Solution Providers often have the ability to influence upper management who control the budgets. AEP Ohio has taken a number of steps to increase the effectiveness of Solution Providers:

The Changing Solution Provider Relationship

- » AEP Ohio and the Implementation Contractor attended meetings with the Solution Provider and the customer early in the process, especially for complex projects. Program management has determined it is more fruitful to ensure that all parties understand the project early, and what information is needed about the baseline and the equipment, instead of addressing things in a piecemeal fashion later on.
- » In 2013 the AEP Ohio Program Coordinators were charged with a new outreach responsibility. Coordinators met with active Solution Providers on a regular basis to talk about the program and to discuss the more complicated custom projects. The discussions covered information flow, review status and obstacles to project progress. The meetings are regularly scheduled, very focused and organized. AEP Ohio and the implementer use these meetings to question and correct erroneous assumptions made by the Solution Provider early in the process. In return, AEP Ohio was prepared to increase its support. For instance, one Solution Provider was able to lease data loggers directly from the Implementation Contractor.
- » The Implementation Contractor's program outreach coordinator is looking for ways to expand participation with larger Solution Providers. For instance, one engineering company has 50-100 people on staff, but only three people marketing the Custom Program. The intent is to look to identify ways to influence this company to maximize its participation and to ensure all projects are coordinated with the implementer.
- » Many Solution Providers are focused on one technology, such as lighting or HVAC, and do not have experience in all technologies. This limits the ability to identify savings opportunities throughout the entire facility.
- » AEP Ohio offered a special bonus to Solution Providers to complete applications in October to help prevent the end of the year processing bubble.
- » The implementer plans to develop more case studies for Solution Providers. The goal is to get the right case study in the right Solution Provider's hands to influence the appropriate customer.
- » In a few cases, specific Solution Providers have come to AEP Ohio with ways to expand their program participation. One energy consulting company approached AEP Ohio about marketing

the VFD incentive in its customer newsletter. AEP Ohio would like to expand this type of relationship to other Solution Providers.

» Another Solution Provider developed a niche service to reduce program barriers for industrial customers who have production running 12 hours a day and don't have time to think about energy efficiency programs. The Solution Provider handled the application and all of the project details for a small proportion of the rebate. This service resolves criticism from prior years that claimed that the application process takes too long, is too complicated, and that customers don't have the time to complete it.

On-line Program Presence

- » AEP Ohio planned to reorganize the web site by market segments. Once the customer identifies their market segment, for instance grocery, they will be directed to a page that describes the efficiency opportunities for major technologies used in their segment. This is part of the goal to get rid of the terms "custom" and "prescriptive" programs. This change was implemented at the beginning of 2014⁷.
- » The online application is not yet implemented although it has been in development for a couple of years. Currently customers can complete the application online in a PDF file and then email it or print it for submittal. The implementer would prefer an online application that could facilitate populating its database without additional data entry and with fewer errors from transcribing applications. It is not clear 1) when the on-line application will be ready for all customers to use, or 2) the causes for roll-out delay.

Program Goals

At the time of the interviews, the implementer was more convinced than AEP Ohio was that program goals would be met in 2013. The issue was not how many GWh had been applied for by customers during the program year, but how many GWh would be left in the pipeline for next year, because the implementer was unable to have the projects reviewed and approved during 2013.

Portfolio Strengths

Interview subjects noted that one strength of the portfolio is that there is something for everybody, regardless of technology, building type or segment. These attributes of the program are recognized by the state, which acknowledges that AEP Ohio has created the best programs in Ohio.

Program Weaknesses

Due to the noted interaction with Solution Providers and customers, there is a greater time commitment on the program implementer. The implementer experienced staff changes in 2013 and was slow to respond to those changes. The result was a slower Custom Program application processing pipeline and a slowdown in productivity.

⁷ It is unclear what impact this change will have on the evaluation of the program.

2013 Program Changes

AEP Ohio did not change the Custom Program in 2013 except as previously noted.

3.3 Findings From the Participant Surveys

The evaluation team conducted participant surveys to explore issues that were foremost in importance with respect to the Custom Program. Program managers for both AEP Ohio and the implementers provided ideas to the evaluators for the participant survey. From a list of fifty-two unique customer contacts, the interviewers were able to engage 13 program participants. The reader should carefully interpret the results from only 13 program participants.

Program Participant Source of Information

The importance of the customer relationship with both the AEP Ohio account manager and the Solution Provider was clear from participant surveys. Figure 3-1 shows respondents indicated their AEP Ohio account manager was the first source of information about the program, accounting for about 30 percent of all responses. Contractors/trade allies were close behind with 23 percent of responses.



Figure 3-1. Source of Information about the Program (N=13)

As shown in Figure 3-2, 54 percent of respondents noted contractors/vendors and other Solution Providers as the party most responsible for completing the program application. Respondents themselves were primarily responsible 23 percent of the time, and implementer staff were reported at 15 percent.



Figure 3-2. Party Most Responsible for Completing Application (N=13)

As shown in Figure 3-3, 38 percent of respondents reported contractors/equipment vendor as the primary source of receiving the program application, followed by the Internet at 31 percent. AEP Ohio provided the application 23 percent of the time, while other consultants were reported by eight percent of respondents.



Figure 3-3. Means of Receiving Program Application (N=13)

As shown in Figure 3-4, thirty-eight percent of respondents indicated that they did not contact the utility or program staff outside of application submission. 'Two or three times' was the next most frequent response (31%), followed by four or more times (15%). Contact was typically initiated by phone (71%), followed by email/fax (29%).



Figure 3-4. How often was AEP Ohio or Program Staff Contacted with Questions? (N=13)

Program Incentives

As shown in Figure 3-5, customers reported that rebate processing can take up to 20 weeks. Forty-six percent of respondents indicated that their incentive payment took longer than 10 weeks to receive, 16 percent in less than six weeks, and 27 percent within 6 or 8 weeks.





Customer Satisfaction

Custom program survey participants were given an opportunity to rate the program across several metrics of customer satisfaction on a 0 (not at all satisfied) to 10 (completely satisfied) scale. Navigant defined satisfaction as the percentage of customers who rated their satisfaction level at 7 or higher on the 0 to 10 scale. As shown in Figure 3-6, one-hundred percent of respondents reported they were completely satisfied with the AEP Ohio Custom Program, with the program communication, the measures offered, and the post inspection. Ninety-two percent were satisfied with the efficiency level of measures, 85 percent were satisfied with the incentive level, and 67 percent with the time to receive the incentive.



Figure 3-6. 2013 Custom Survey Satisfaction Scores

The Importance of Payback and Standard Practice

Survey respondents were asked to rate the importance of a number of influences on their decision to participate in the Custom program on a scale of 0 (not at all important) to 10 (extremely important). Results displayed in Figure 3-7 below define importance as a rating of 7 or higher on the 0 to 10 scale. Payback on investment was reported by 100 percent of respondents as important, with availability of program incentives the second most important influence at 77 percent. Respondents indicated recommendations from AEP Ohio staff, AEP Ohio marketing materials, and corporate policies/guidelines were among the least likely factors to be considered 'important' influences on the program participation decision process.



Figure 3-7. 2013 Custom Survey: Importance of Program and Non-Program Influences (N=13)

With regard to the payback criteria used in the equipment investment decision making process, respondents indicated criteria may vary depending on the size of the project, though overall return on investment (ROI) was the most popular response (50%), followed by simple payback (20%), and 10 percent shares represented each of internal ROI, overall rate of return, and 'no method'.

As shown in Figure 3-8, respondents were also asked to define the cut-off point used before deciding to proceed with an investment. Thirty-eight percent of respondents reported three to five years, and 15 percent shares represented each of seven months to one year, one to two years, and over five years.



Figure 3-8. 2013 Custom Survey: Payback Criteria for Energy Efficient Projects (N=13)

Figure 3-9 shows respondents' perspective on the importance of the Custom Program vs. standard industry practice in deciding to install the efficient equipment incentivized by the program. Threequarters of respondents indicated the incentives were equally as important as standard industry practice, with 13 percent shares each representing the view that the program was somewhat less important or somewhat more important.



Figure 3-9. Importance of the Business Custom Program vs. Standard Industry Practice in Decision to Install Equipment (N=10)



Benefits to the Program

As shown in Figure 3-10, survey respondents' reported numerous benefits to participating in the Custom Program. Receiving a rebate/incentive was the most common response (62%), with utility bill savings (31%) listed as the second most popular factor. Up to three responses were permitted per respondent.





Multiple responses accepted, totals to not sum to 100%.

Over 90 percent of survey respondents planned to participate in the program again, with the exception of one uncertain respondent.

Over sixty percent of respondents indicated that they noticed lower electricity bills since installing the energy efficient equipment, and, as shown in Figure 3-11, 70 percent of those respondents indicated that the bill reductions were around their expectations, with 10 percent reporting savings above expectations. No respondents reported bill savings below expectations.



Figure 3-11. Have Bill Savings Met Expectations? (N=10)

Drawbacks to Custom Program Participation

Over half of the 13 survey respondents who answered the question did not mention any drawbacks to the program (46%). The major drawbacks mentioned by customers were:

- » Paperwork was too burdensome (5 mentions)
- » The process is time consuming (2 mentions)
- » The program is too complicated (1 mention)
- » The cost of the equipment (1 mention)
- » The long telephone surveys (1 mention)

Suggestions for Improving the Program

Slightly below 70 percent of the 13 survey respondents could not say how to improve the program. Participant ideas for improving the program included:

- » Higher incentives
- » More measures
- » Better communication/improve program information
- » Electronic applications

Firmographics of the Survey Participants

As shown in Figure 3-12, survey respondents were most likely to categorize their business as industrial, whether in the petroleum industry (39%), mining (16%), or electronics (16%) business.



Figure 3-12. Principal Business Activity (N=13)

Almost all (85%) of the survey respondents owned their building. Fifteen percent described their building as the only site for their company, 70 percent said the site was one of several locations, and 15 percent said the site was the company headquarters. The average age of the building was 49 years; the average size of the building was about 245,000 square feet.

The customers in the Custom Program are quite large as measured by the number of employees. Almost 40% reported between 100 and 500 employees and 15 percent reported more than 500 employees on site. Twenty three percent said they had either 75 to 100 employees or less than 75 employees at the site. These results are shown in Figure 3-13.



Figure 3-13. Number of Full Time Employees (N=13)

3.3 Cost Effectiveness Review

This section addresses the cost effectiveness of the 2013 Custom Program. Cost effectiveness is assessed through the use of the Total Resource Cost (TRC) test. Table 3-5 summarizes the unique inputs used in the TRC test.

Item	2013
Measure Life	17
Participants	162
Ex Post Annual Energy Savings (MWh)	55,552
Ex Post Coincident Peak Savings (kW)	3,736
Third Party Implementation Costs	1,368,471
Utility Administration Costs	547,694
Utility Incentive Costs	2,817,866
Incremental Measure Costs	26,238,067

Table 3-5. Inputs to Cost-Effectiveness Model for AEP Ohio Custom Program

A clarification on participant counts is worth noting regarding Table 3-5. For tracking purposes, AEP Ohio designates participants at the project level either as Custom Program or Prescriptive Program participants, even though a small number of participants have both custom and prescriptive measures in their project. The impact evaluation was conducted at the project-level, so all projects that had both custom *and* prescriptive measures were included in the Custom Program evaluation. The cost effectiveness analysis is based on evaluation *ex post* impacts. The data for "Participant Contribution to Incremental Measure Costs" were taken from the tracking system based on participant supplied project costs.

Based on these inputs, the TRC ratio is 1.3 and the program passes the TRC test for the program in its entirety. Table 3-6. Cost-Effectiveness Results for Custom Program summarizes the results of the cost effectiveness tests. Results are presented for the Total Resource Cost test, the Participant test, the Ratepayer Impact Measure test, and the Utility Cost test.

Test Results for Custom Program	2013
Total Resource Cost	1.3
Participant Cost Test	1.8
Ratepayer Impact Measure	0.7
Utility Cost Test	7.7

Table 3-6. Cost-Effectiveness Results for Custom Program

At this time, additional benefits related to reduction of greenhouse gas emissions have not been quantified in the calculation of the TRC. These additional benefits would increase the given TRC benefit/cost ratio.

Section 4. Evaluation Findings and Recommendations

4.1 Impact Evaluation Findings and Recommendations

1. **Finding:** The 2013 *ex post* savings fell short of goals. Lack of program participation seems to be the cause of this shortfall. Custom projects can take more than a year to complete, which can result in program activity initiated in one year with project completion in a subsequent year.

Impact Recommendation #1: Examine processes to emphasize measures and projects that could be submitted through a custom approach. Target market segments for case studies of successful projects to promote specific technology applications through the program, for example, promote compressed air projects to small and medium industrial customers, and promote high-efficiency pumping to biorefineries.

Metric	Energy Savings (MWh)	Demand Savings (MW)
Goal Savings	68,303	9.11
Ex Ante Reported Savings	60,222	6.17
Ex Post Verified Savings	55,552	3.74
Realization Rate	0.92	0.61
Relative Precision @ 90% CI	14.2%	35.3%

Table 4-1. Savings Estimates for the 2013 Custom Program

2. **Finding:** As in 2012 more than 40 percent of applications were submitted by a single retailer with multiple locations. This finding continues to suggest that many opportunities exist in this market segment.

Impact Recommendation #2: Consider methods for promoting similar successful projects among other customers in these segments without the infrastructure to conceive or initiate projects. Also, outreach to more entities is needed to sustain adequate participation to achieve program and sector goals.

3. **Finding:** The measure incremental cost is missing from more than 40% of submitted measures in the tracking database. Use of the alternative total measure cost in calculations may reduce the cost-effectiveness of the program and limit the programs influence to benefit customers

Impact Recommendation #3: Populate the incremental cost field in the database accurately for all measures to facilitate cost-effeteness testing

4. **Finding:** Where billing analysis is the basis of *ex ante* savings (primarily for energy management system (EMS) projects), Navigant found a greater spread in realization rates, as there is greater uncertainty basing annual results on limited monthly data.

Impact Recommendation #4: Delay final project verification until at least six months of postinstallation billing data are available to perform the billing analysis, or pay a portion of the expected incentive based on preliminary analysis and true-up the incentive with analysis of more data.

5. **Finding:** When measures increase capacity the program used post-implementation production as the baseline.

Impact Recommendation #5: Production increases due to capacity increases should use a split baseline – as-found for pre-implementation production, and industry new practice for incremental production increases.

6. **Finding:** Savings estimates for compressed air projects tend to use full flow design efficiencies. At part-load flow, input power is generally not proportional to the flow reduction.

Impact Recommendation #6: Use machine-specific or typical performance curves based on compressor type to develop part-load performance estimates. Most manufacturers will supply machine specific curves for the purposes of verification.

4.2 Process Evaluation Findings and Recommendations

Satisfaction with the Custom Program

1. **Finding:** In 2013, satisfaction was very high with most aspects of the Custom Program. The lowest satisfaction level reported was with the time it took to receive the incentive, at 67 percent. Most customers (90%) plan to participate in the program again.

Process Recommendation #1: Although based on a small number of survey respondents, these results suggest the program delivery and contact worked well in 2013. The only area for improvement would be the incentive processing time. All other aspects of the program seem to be meeting customer expectations, as all the customers in the sample rated their satisfaction with the program an 8 or higher on the 0 to 10 point scale.

Program Growth

2. **Finding:** Solution Providers and some customers appeared to be comfortable with the application form. Few Custom Program participants complete their own application. Most have their Solution Provider complete the form for them. A larger proportion of Solution Providers understand the program form. As a group, Solution Providers have been more successful in submitting complete applications in a timely manner.

Process Recommendation #2: When the online form is functional, expectations for the introduction of the online form should be carefully managed internally and externally. Adequate training will be the key to the migration to the web-based application.

Changing the Solution Provider Relationship

3. **Finding:** Both AEP Ohio and the Implementation Contractor looked for ways to engage Solution Providers more deeply in the Custom Program in three ways. First, the Implementation Contractor asked Solution Providers and customers to meet collectively early in the application process to discuss program baseline data needs.

Finding: Second, AEP Ohio Program Coordinators met regularly with an active Solution Provider to discuss complicated custom projects. AEP Ohio and the implementer use these meetings to discuss

the planned project and to correct erroneous assumptions made by the Solution Provider early in the process. In return, AEP Ohio was prepared to increase its level of support for the Solution Provider.

Finding: Third, the Implementation Contractor's outreach coordinator looked for ways to expand participation with larger Solution Providers.

Process Recommendation #3: AEP Ohio and the implementer should continue to look for methods of involving active Solution Providers into all the portfolio programs. This tactic works extremely well for Solution Providers and customers participating in the Custom Program where the projects are complex.

Slowly Changing the Focus of the Custom Program

4. Finding: The focus of the Custom Program began to change from lighting toward variable speed drives and advanced lighting controls in 2013. For instance, the implementer reached out to individual Solution Providers via email and follow-up calls to remind them what the substantial variable frequency drive (VFD) rebate was in 2013.

Process Recommendation #4: In order to promote program participation and success, AEP Ohio and the program implementer must continue to drive new technologies that will benefit customers. AEP Ohio could look at measures like VFD that apply widely, or targeted measures, such as refrigerant controls, to deeply penetrate the market and drive savings and participation.

Impact of Reduction in Implementer Resources

5. **Finding:** One of the major Custom Program weaknesses in 2013 was the inability of the implementer to react more aggressively to its staff changes in order to prevent the Custom Program application processing pipeline from suffering a slowdown in productivity.

Process Recommendation #5: The implementer could develop a succession plan for senior engineers to prevent this type of bottleneck in the future.

Appendix A. Participant Telephone Survey

2012 AEP OHIO BUSINESS PROGRAMS - CUSTOM PROGRAM PARTICIPANT SURVEY

Introduction

Note: Choose the largest <MEASURECATEGORY 1, 2, 3> (measure type: Lighting, HVAC, Motors, and Refrigeration). Ask about a maximum of three measures (ex: lighting, 100 HP Motor, Variable speed drive). MEASURECATEGORY

INTRODUCTION

[READ IF CONTACT=1]Hello, this is _____ from **Blackstone Group**, calling on behalf of AEP Ohio. This is not a sales call. May I please speak with **<APPLICATIONCONTACTNAME**>?

Our records show that **<ORGANIZATIONNAME>** purchased **<MEASURECATEGORY** 1f>, which was installed **<ActualProjectCompletionDate** > and received an incentive of **<PAYMENT AMOUNT>** from AEP Ohio. We are calling to do a follow-up study about **<ORGANIZATIONNAME**>'s participation in this program, which is called the AEP Ohio Business Custom Program. I was told you're the person most knowledgeable about this project. Is this correct? [IF NOT, ASK TO BE TRANSFERRED TO MOST KNOWLEDGABLE PERSON OR RECORD NAME & NUMBER.]

This survey will take about 30 minutes. Is now a good time? [If no, schedule call-back]

[READ IF CONTACT=0]

Hello, this is _____ from Blackstone Group calling on behalf of AEP Ohio. I would like to speak with the person most knowledgeable about recent changes in cooling, lighting or other energy-related equipment for your firm at this location.

[IF NEEDED] Our records show that **<ORGANIZATIONNAME**> purchased **< MEASURECATEGORY** 1>, which was installed **<ActualProjectCompletionDate**> and received an incentive of **<PAYMENT AMOUNT**> from AEP Ohio. We are calling to do a follow-up study about your firm's participation in this program, which is called the Business Custom Program. I was told you're the person most knowledgeable about this project. Is that correct? [IF NOT, ASK TO BE TRANSFERRED TO MOST KNOWLEDGABLE PERSON OR RECORD NAME & NUMBER.]

This survey will take about 30 minutes. Is now a good time? [If no, schedule call-back] SCREENING QUESTIONS

A1. Just to confirm, during 2013 did **<ORGANIZATIONNAME**> receive an incentive from AEP Ohio's Business Custom Program at **<SERVICEADDRESS**>? (IF NEEDED: This is a program where your business received an incentive for installing **<MeasureSubcategory1>**).

- 1 YES, PARTICIPATED AS DESCRIBED
- 2 YES, PARTICIPATED BUT AT ANOTHER LOCATION (THANK & TERMINATE)

- 3 NO, DID NOT PARTICIPATE IN PROGRAM (THANK AND TERMINATE)
- 00 OTHER, SPECIFY (THANK AND TERMINATE)
- 98 DON'T KNOW (THANK AND TERMINATE)
- 99 REFUSED (THANK AND TERMINATE)

[SKIP A2 IF A1=1, 2]

A2. Is it possible that someone else dealt with the energy-efficient product installation?

- 1 YES, SOMEONE ELSE DEALT WITH IT
- 2 NO
- 00 OTHER, SPECIFY
- 98 DON'T KNOW
- 99 REFUSED

[IF A2=1, ask to be transferred to that person and/or get contact name and phone number. If not available, thank and terminate. If available, go back to A1]

[IF A1=2, 3, 00, 98, 99: THANK AND TERMINATE. RECORD DISPOSITION AS "COULD NOT CONFIRM PARTICIPATION".]

Before we begin, I want to emphasize that this survey will only be about the energy efficient equipment you installed through the AEP Ohio Custom Program at **<SERVICEADDRESS**>.

A3. I'd like to confirm some information in AEP Ohio's database. Our records show that you implemented a project through the Business Custom Program. Is this correct?

- 1 YES (CONTINUE TO A3A)
- 3 NO, DID NOT INSTALL
- 8 DON'T KNOW
- 9 REFUSED

A3_1. Is it possible that someone else dealt with the energy-efficient product installation?

- 1 YES, SOMEONE ELSE DEALT WITH IT (ASK FOR TRANSFER AND/OR
 - CONTACT NAME AND NUMBER AND GO BACK TO A2)
- 2 NO (THANKS AND TERMINATE)
- 00 OTHER, (SPECIFY) (THANK AND TERMINATE)
- 98 DON'T KNOW (THANK AND TERMINATE)
- 99 REFUSED (THANK AND TERMINATE)

Note: the **<MEASURESUBCATERGORY1>** Field may help the interviewer and respondent confirm the correct project.

DO NOT ASK A3A, A3B OR A3C IF **<MEASURECATEGORY1>** OR **<MEASURECATEGORY2>**, OR **<MEASURECATEGORY3>** = 'DELAMPING'.

A3a Our records indicate that you installed **<MEASURECATEGORY** 1> measures. How many **< MEASURECATEGORY**1> were installed? [NUMERIC OPEN END; RANGE 1-3000, DK, REF]

> 00. NUMERIC OPEN END_____ 97. NONE



98. DON'T KNOW 98. REFUSED

(ASK IF < MEASURECATEGORY2> IS NOT BLANK ON SAMPLE FILE)

A3b I see that you also installed < MEASURECATEGORY2>. How many < MEASURECATEGORY2> were installed?

01. NUMERIC OPEN END_____ (RANGE 1-3000) 97. NONE 98. DON'T KNOW

98. REFUSED

(ASK IF <measurecategory3> IS NOT BLANK ON SAMPLE FILE)

A3c I see that you also installed a third measure. How many <**MEASURECATEGORY3**> were installed? [NUMERIC OPEN END; DK, REF]

02. NUMERIC OPEN END_____ (RANGE 1-3000) 97. NONE 98. DON'T KNOW

99. REFUSED

IF A3A =0 AND A3B=0 AND A3C=0: THANK AND TERMINATE, RECORD DISPOSITION AS "COULD NOT CONFIRM MEASURES"



HEARD ABOUT PROGRAM AND COMPLETED THE APPLICATION

- S0 How did you <u>first</u> hear about the Business Custom program? (SP TEAM: ALPHEBATIZE LIST) [DO NOT READ LIST, SINGLE RESPONSE]
 - 1. AEP OHIO ACCOUNT MANAGER
 - 2. AEP OHIO WEBSITE
 - 3. WORKSHOP/GREEN RIBBON KICKOFF EVENT
 - 4. CONTRACTOR/TRADE ALLY/SOLUTION PROVIDER
 - 5. EMAIL
 - 6. FRIEND/COLLEAGUE/WORD OF MOUTH
 - 7. BILL INSERT
 - 8. WEBINAR
 - 9. SPEAKER/PRESENTATION AT AN EVENT
 - 10. NEWSLETTER
 - 11. VENDOR
 - 14. SUPPLIER
 - 17. SALES REPRESENTATIVE
 - 00. OTHER, SPECIFY [OPEN END]
 - 98. DON'T KNOW
 - 99. REFUSED

PL1 Who was the <u>most</u> influential in identifying and recommending that you install the **<MEASURECATEGORY** 1> project you completed through the Custom Program? [DO NOT READ LIST; SINGLE RESPONSE]

- 1. ME/RESPONDENT
- 2. CONTRACTOR/SOLUTION PROVIDER
- 3. ENGINEER
- 4. ARCHITECT
- 5. MANUFACTURER
- 6. DISTRIBUTOR
- 7. OWNER
- 8. SUPPLIER
- 9. AEP OHIO REPRESENTATIVE/PROGRAM STAFF
- 00. OTHER, SPECIFY [OPEN END]
- 98. DON'T KNOW
- 99. REFUSED

E 1. Where did you get your incentive application?

[DO NOT READ LIST. PROMPT AS NECESSARY. RECORD ONE RESPONSE.] (SINGLE PUNCH)

- 1. CONTRACTOR OR EQUIPMENT VENDOR OR SOLUTION PROVIDER
- 2. WEBSITE/ON-LINE
- 3. AEP OHIO
- 4. PROGRAM STAFF
- 5. CONSULTING ENGINEER, ARCHITECT OR ENERGY CONSULTANT
- 6. OTHER (SPECIFY) [OPEN END]
 - 98. DON'T KNOW
 - 99. REFUSED
- **E 2.** Who was most responsible for completing the rebate application? Was this...?

[READ LIST. RECORD ONE RESPONSE.]

1	You	GOTO E3
2	Someone else in your organization	GOTO LOGIC BEFORE LIGHTING
		MODULE
3	Contractor/vendor/other trade ally/solution provider	CONTINUE WITH S4A
4	AEP Ohio/Kema staff	GOTO LOGIC BEFORE LIGHTING
		MODULE
5		
6	OTHER [RECORD]_[OPEN END]	GOTO LOGIC BEFORE LIGHTING
		MODULE
98	DON'T KNOW	GOTO LOGIC BEFORE LIGHTING
		MODULE
99	REFUSED	GOTO LOGIC BEFORE LIGHTING
		MODULE

Contractor Completed Application Module

S4a Was the contractor who completed the application affiliated with the AEP Ohio Business Custom program? (IF NEEDED: Was the contractor/solution provider <u>registered</u> with the Custom program?)

- 1 YES
- 2 NO
- 98 DON'T KNOW
- 99 REFUSED

[ASK S5 IF S4a=1 ELSE SKIP TO E3]

S5 How would you rate the solution provider's ability to meet your needs in terms of implementing your project? Please use a scale from 0 to 10, where 0 is "not at all able to meet needs" and 10 is "completely able to meet needs"?

00. NOT AT ALL ABLE TO MEET NEEDS

01.

02.

03. 04.

05.

06.

07.

08.

09.

- 10. COMPLETELY ABLE TO MEET NEEDS
- 98. DON'T KNOW
- 99. REFUSED

S6a Would you recommend the solution provider you worked with to others?

- 1 YES
- 2 NO
- 98 DON'T KNOW
- 99 REFUSED

[ASK S6b IF S6a=2]

S6b Why not?

00. [OPEN END] _____

98. DON'T KNOW

99. REFUSED

[IF E2<>1, SKIP RESPONDENT TO LOGIC BEFORE LIGHTING MODULE



Customer Completed Application Module

Now thinking about how easy or hard it was to complete the application, how satisfied were you with the ease of filling out the application?

E 3. Please use a scale from 0 to 10, where 0 is "not at all satisfied" and 10 is "completely satisfied"? [SCALE 0-

- 10; 98=DON'T KNOW, 99=REFUSED]?
 - 00. NOT AT ALL SATISFIED
 - 01. -----09.
 - 10. COMPLETELY SATISFIED
 - 98. DON'T KNOW
 - 99. REFUSED

ASK IF E3 is < 4

E 4. What would have made you more satisfied with the application?

- OPEN END
- 97. NOTHING
- 98. DON'T KNOW
- 99. REFUSED

ASK IF E3 is >= 4

E4a.Why did you give that rating?

- OPEN END
- 98. DON'T KNOW
- 99. REFUSED

LIGHTING MODULE

[ASK IF **MEASURECATEGORY1, 2 OR 3** = 'LIGHTING' or 'EXTERIOR LIGHTING', ELSE SKIP TO NEXT MEASURE MODULE OR GOTO N3]

Measure Modules

[For Loop 2, replace "1" at the end of read-ins with "2"; for Loop 3, replace "1" with "3".]

Verify that lighting projects are still installed through the Custom Program. The following questions are about the lighting you installed through the Custom Program.

- L0 When did you implement this project (IF NECESSARY, PROBE FOR BEST GUESS)
 - A MONTH [PRECODES FOR JAN THROUGH DEC., DK, REF]
 - B YEAR [PRECODES FOR, 2010, 2011, 2012 OR 2013 DK, REF]



L1 Please tell me what types of lighting projects were installed through the Custom Program during 2013. [CHECK ALL THAT APPLY.]

- 1. CUSTOM LINEAR FLUORESCENTS
- 2. CUSTOM LED LIGHTING
- 3. CUSTOM HID LIGHTING
- 4. CUSTOM EXTERIOR LIGHTING
- 5. CUSTOM DISPLAY OR SPECIALTY LIGHTING
- 6. CUSTOM LIGHTING CONTROLS
- 7. OTHER [RECORD VERBATIM]_[OPEN END]______
- 98. DON'T KNOW
- 99. REFUSED
- L2 Was the new lighting equipment installed in an air conditioned (cooled) space?
 - 1. YES
 - 2. NO
 - 3. SOME OF THE LIGHTING WAS AND SOME WASN'T
 - 98. DON'T KNOW
 - 99. REFUSED

LIGHTING CONTROLS

[ASK L3 AND L4 IF L1 = 6; ELSE GO TO L5]

L3 Before Lighting Controls were installed, about how many hours per day were the lights in operation? [NUMERIC OPEN END; 0 TO 24; 98=DON'T KNOW, 99=REFUSED]

L4 After controls were installed, about how many hours per day were the lights in operation? [NUMERIC OPEN END; 0 TO 24; 98=DON'T KNOW, 99=REFUSED]

L5 Why was this lighting project submitted through the Custom Program rather than the Prescriptive Program? (DO NOT READ) ((SP TEAM: ALPHEBATIZE LIST)

- 1. SPECIAL LIGHTING TECHNOLOGY INSTALLED
- 2. PRESCRIPTIVE PROGRAM OVER-SUBSCRIBED
- 4. INTEGRATED LIGHTING AND CONTROLS
- 7. OTHER [RECORD VERBATIM] [OPEN END]_____
- 98. DON'T KNOW
- 99. REFUSED

EQUIPMENT INTO STORAGE

L6 Was any of the rebated lighting equipment placed into inventory or installed at another facility?

- 1. YES
- 2. NO
- 98. DON'T KNOW
- 99. REFUSED



[SKIP L6a AND L6b IF L6<>1]

L6a What percentage of the rebated lighting equipment was placed in inventory? [NUMERIC OPEN END, 0 TO 100; 98=DON'T KNOW, 99=REFUSED]

L6b And what percentage was installed at another facility? [NUMERIC OPEN END, 0 TO 100; 98=DON'T KNOW, 99=REFUSED]

[END OF MEASURE LOOP; GO TO NEXT MEASURE MODULE OR N3]

HVAC MODULE

[ASK IF MEASURECATEGORY1, 2, 3 = 'HVAC' ELSE SKIP TO NEXT MEASURE MODULE OR GOTO N3]

The following questions are about the HVAC equipment you installed through the Business Custom Program.

- C0 When did you install the HVAC equipment? (IF NECESSARY, PROBE FOR BEST GUESS)
 - A MONTH [PRECODES FOR JAN THROUGH DEC.; DK, REF]
 - B YEAR [PRECODES FOR 2010, 2011, 2012 AND 2013; DK, REF]

REMOVED EQUIPMENT

C1 What type of HVAC equipment was REMOVED when you installed the new equipment through the Business Custom Program? (DO NOT READ LIST) (SP TEAM: ALPHEBATIZE LIST)

- 1 SPLIT SYSTEM AIR CONDITIONERS (TWO COMPONENTS: COMPRESSOR IS SEPARATE FROM THE SUPPLY AIR FAN)
- 2 PACKAGED AIR CONDITIONING SYSTEMS (ONE COMPONENT, FOR EXAMPLE ROOFTOP UNITS OR UNITARY EQUIPMENT)
- 3 PACKAGE TERMINAL A/C (E.G., HOTEL/MOTEL UNITS)
- 4 WINDOW/WALL AIR-CONDITIONING UNITS
- 5 REMOTE CONDENSING UNIT
- 6 EVAPORATIVE COOLERS/SWAMP COOLERS
- 7 WATER CHILLERS
- 8 EVAPORATIVE CONDENSER
- 9 ADJUSTABLE SPEED DRIVES
- 10 THROTTLING DEVICES FOR HVAC FANS OR PUMPS (E.G. INLET VANES, BYPASS DAMPERS, THROTTLING VALVES)
- 11 HEAT PUMP UNITS
- 00 OTHER, SPECIFY [OPEN END]
- 96 NOTHING, EQUIPMENT ADDED NOT REPLACED [END OF MEASURE LOOP; GO TO NEXT MEASURE OR N3]
- 98 DON'T KNOW
- 99 REFUSED



[SKIP C2 AND C3 IF C1=96, 98, 99]

C2 How would you describe the condition of the equipment that was removed? Was it...

- 1 Inoperable/broken
- 2 Poor condition
- 3 Fair condition
- 4 Good condition
- 98 DON'T KNOW
- 99 REFUSED

C3 How old was the equipment that was removed? Was it...

- 1 Less than 5 years old
- 2 Between 5 and 10 years old
- 3 10 to 20 years old
- 4 More than 20 years old
- 98 DON'T KNOW
- 99 REFUSED

[END OF MEASURE LOOP; GO TO NEXT MEASURE OR N3]

REFRIGERATION MODULE

[ASK IF MEASURECATEGORY1, 2 or 3 = 'REFRIGERATION' ELSE SKIP TO NEXT MEASURE MODULE OR GOTO N3]

Measure Loop

[Loop 1: ASK IF MEAS1=1. Loop 2: ASK IF MEAS2=1. Loop 3: ASK IF MEAS3=1.] [For Loop 2, replace "1" at the end of read-ins with "2"; for Loop 3, replace "1" with "3".]

The following questions are about the refrigeration equipment installed through the Business Custom Program.

- R0 When did you install the refrigeration equipment? (IF NECESSARY, PROBE FOR BEST GUESS)
 - A MONTH [PRECODES FOR JAN THROUGH DEC.]
 - B YEAR [PRECODES FOR 2010, 2011, 2012, 2013]



REMOVED EQUIPMENT

R1 What type of refrigeration equipment was replaced when you installed the new equipment through the Custom Business Program? (DO NOT READ) (SP TEAM: ALPHEBATIZE LIST)

- 1 OLD STRIP CURTAINS
- 2 OLDER ANTI-SWEAT HEAT CONTROLLERS
- 3 STANDARD EFFICIENCY EVAPORATOR FAN MOTORS
- 4 OLDER ICE MAKER
- 5 OLDER CONTROLS
- 6 OLDER COMPRESSOR
- 7 OLDER CONDENSER
- 8 OLDER DISPLAY CASES OR WALK-IN EVAPORATOR
- 9 CASE LIGHTING UPGRADE
- 10 SAME EQUIPMENT, JUST NEWER
- 00 OTHER, SPECIFY [OPEN END]
- 96 NONE NOT A REPLACEMENT [END OF MEASURE LOOP; GO TO NEXT MEASURE OR PY3 NET-TO-GROSS MODULE]
- 98 DON'T KNOW
- 99 REFUSED

R2 Approximately how old was the refrigeration equipment that was replaced by the new refrigeration equipment? Was it...

- 1 Less than 5 years old
- 2 Between 5 and 10 years old
- 3 10 to 20 years old
- 4 more than 20 years old
- 98 DON'T KNOW
- 99 REFUSED

[END OF MEASURE LOOP; GO TO NEXT MEASURE OR N3]

VARIABLE FREQUENCY DRIVE MODULE

The following questions are about the variable speed drive equipment installed through the Business Custom Program.

[ASK IF MEASURECATEGORY1, 2, 3 = 'VSD' ELSE SKIP TO NEXT MEASURE MODULE OR GOTO N3]

MEASURE LOOP

- V0 When did you install the variable speed drive? (IF NECESSARY, PROBE FOR BEST GUESS?)
 - A MONTH [PRECODES FOR JAN THROUGH DEC.]
 - B YEAR [PRECODES FOR, 2010, 2011, 2012 AND 2013]
- V1 Are the variable speed drives used to... (READ LIST) [SINGLE PUNCH]
 - 1 Drive a newly installed piece of equipment
 - 2 Replace failed equipment
 - 3 Retrofit application to existing and functioning equipment
 - 4 Serve as a spare
 - 00 OR FOR SOME OTHER REASON (SPECIFY)
 - 98 DON'T KNOW
 - 99 REFUSED

V2a In the past month, how many hours per day did this equipment typically operate? [NUMERIC OPEN END, 0 TO 24; 98=DON'T KNOW, 99=REFUSED]

V2b And how many days per week? [NUMERIC OPEN END, 0 TO 7;98=DON'T KNOW, 99=REFUSED]

V2c Are there any months during the year when the operating schedule for this equipment differs significantly from what you just described?

- 1 YES
- 2 NO
- 98 DON'T KNOW
- 99 REFUSED

[ASK V2d-f IF V2c=1]

V2d How many hours per day does the equipment typically operate during the periods with different operating schedules? [NUMERIC OPEN END, 0 TO 24; 98=DON'T KNOW, 99=REFUSED]

V2e And how many days per week? [NUMERIC OPEN END, 0 TO 7; 98=DON'T KNOW, 99=REFUSED]

V2f How many months per year does the equipment run on the alternative schedule? [NUMERIC OPEN END, 0 TO 12; 98=DON'T KNOW, 99=REFUSED]

REPLACED EQUIPMENT

[ASK IF V1=2, 3, ELSE SKIP TO NEXT MEASURE MODULE OR GO TO N3]

I'd like to ask you a few questions about the equipment that was removed when you installed the new variable speed drives.



V3a How would you describe the condition of the equipment that was removed or retrofitted when you installed the new variable speed drives? Was it...

- 1 Inoperable (broken)
- 2 Poor condition
- 3 Fair condition
- 4 Good condition
- 98 DON'T KNOW
- 99 REFUSED

V3b How old was the equipment that was removed or retrofit? Would you say that most of it was ...?

- 1 Less than 5 years old
- 2 Between 5 and 10 years old
- 3 10 to 20 years old
- 4 More than 20 years old
- 98 DON'T KNOW
- 99 REFUSED

[END OF MEASURE LOOP; GO TO NEXT MEASURE OR N3]

MOTORS MODULE

[ASK IF MEASURECATEGORY1, 2, 3 = 'MOTOR' ELSE SKIP TO NEXT MEASURE MODULE OR GOTO N3]

MOTORS MEASURE LOOP

The following questions are about the new motors you installed through the AEP Ohio Business Custom Program.

M0 When did you install the new motors? (IF NECESSARY, PROBE FOR BEST GUESS)

- A MONTH [PRECODES FOR JAN THROUGH DEC.]
- B YEAR [PRECODES FOR , 2010 AND 2011, 2012, 2013]

M1 Are the new motors used to... (READ LIST) [SINGLE PUNCH]

- 1 Drive a newly installed piece of equipment
- 2 Replace a failed motor
- 3 Replace a functioning motor
- 4 Serve as a spare
- 5 FOR SOME OTHER REASON (SPECIFY) [OPEN END]
- 98 DON'T KNOW
- 99 REFUSED



M1a Are the new motors controlled by a variable frequency drive (VFD) – either new or existing? [SINGLE PUNCH]

- 1 YES, NEW
- 2 YES, EXISTING
- 2 98 DON'T KNOW
- 99 REFUSED

M2a In the past month, how many hours per day did this equipment typically operate? [NUMERIC OPEN END, 0 TO 24; 98=DON'T KNOW, 99=REFUSED]

M2b And how many days per week? [NUMERIC OPEN END, 0 TO 7; 8=DON'T KNOW, 9=REFUSED]

M2cAre there any months during the year when the operating schedule for this equipment differs significantly from what you just described?

- 1 YES
- 2 NO
- 98 DON'T KNOW
- 99 REFUSED

[ASK M2d-f IF M2c=1]

M2d How many hours per day does the equipment typically operate during the periods with the alternative schedule? [NUMERIC OPEN END, 0 TO 24; 98=DON'T KNOW, 99=REFUSED]

M2e And how many days per week? [NUMERIC OPEN END, 0 TO 7; 98=DON'T KNOW, 99=REFUSED]

M2fHow many months per year does the equipment run on the alternative schedule? [NUMERIC OPEN END, 0 TO 12; 98=DON'T KNOW, 99=REFUSED]

REPLACED EQUIPMENT

[ASK IF M1=2, 3, ELSE SKIP TO N3]

I'd like to ask you a few questions about the equipment that was removed when you installed the new motors.

M3a Were the motors you removed...

(IF NEEDED: ""In this survey we use the term "NEMA Premium motors" to refer to very high efficiency motors that meet specific performance criteria developed by the National Electrical Manufacturers Association. We use the term "EPAct Motors" to refer to motors that meet current federal minimum efficiency standards contained in the Energy Policy Act; new motors installed in OHIO after 1997 must be, at a minimum, EPAct motors. Finally, we use the term "Standard Efficiency Motors" to refer to typically older motors that do not meet the current Federal standards.)

- 1 NEMA Premium motors
- 2 EPAct motors
- 3 Standard efficiency motors
- 98 DON'T KNOW
- 99 REFUSED

M3b How many hours per day did the replaced equipment typically operate during the periods with different operating schedules? [NUMERIC OPEN END, 0 to 24; 98=Don't know, 99=Refused]

M3cHad all, some, or none of the motors you removed been rewound?

- 1 ALL THE REMOVED MOTORS WERE REWOUND IN THE PAST
- 2 SOME OF THE REMOVED MOTORS WERE REWOUND
- 3. NONE OF THE MOTORS REMOVED WERE REWOUND
- 98 DON'T KNOW
- 99 REFUSED

M3d How would you describe the condition of the motors that were removed when you installed the new motors? Were they...

- 1 Inoperable (broken)
- 2 Poor condition
- 3 Fair condition
- 4 Good condition
- 98 DON'T KNOW
- 99 REFUSED

M3e How old were the motors that were removed? Would you say that most of them were...?

- 1 Less than 5 years old
- 2 Between 5 and 10 years old
- 3 10 to 20 years old
- 4 More than 20 years old
- 98 DON'T KNOW
- 99 REFUSED



M4 What has been done with the removed motors? Would you say that most of them were...? [MULTIPUNCH]

- 1 Scrapped for salvage
- 2 Rewound within 3 months
- 3 Stored for future rewind
- 4 Stored for future installation as is
- 5. Moved and installed elsewhere
- 6. Removed from site permanently by motor vendor
- 98 DON'T KNOW
- 99 REFUSED

[END OF MEASURE LOOP; GO TO NEXT MEASURE OR N3]

EMS MODULE

[ASK IF **MEASURECATEGORY1, 2, 3** = 'Energy Management System' ELSE SKIP TO NEXT MEASURE MODULE OR GOTO N3]

The following questions are about the Energy Management System you installed through the Business Custom Program.

- EM0 When did you install the Energy Management System? (IF NECESSARY, PROBE FOR BEST GUESS)
 - A MONTH [PRECODES FOR JAN THROUGH DEC.; DK, REF]
 - B YEAR [PRECODES FOR 2010, 2011, 2012, 2013; DK, REF]

EM1 How comprehensive is the Energy Management System installed through the Business Custom Program? [READ LIST. RECORD ALL THAT APPLY] (MULTI PUNCH)

- 1 Scheduling and start / stop of major equipment
- 2 Full air-handler temperature and ventilation control (staging and resets)
- 3 Minimum air-handler control
- 4 Cooling system control and optimization (staging and resets)
- 5 Cooling Tower control and optimization (staging and resets)
- 6 Heating / boiler control and optimization (staging and resets)
- 7 Lighting on/off
- 8 Lighting dimming
- 9 Active load shedding or demand response
- 10 Night modes (unoccupied set points)
- 00 OTHER, SPECIFY
- 98 DON'T KNOW
- 99 REFUSED

REMOVED EQUIPMENT

EM2 What type of Energy Management System was REMOVED when you installed the new equipment through the Business Custom Program? (READ LIST. RECORD ALL THAT APPLY)

- 1 An older generation direct digital control (DDC) system
- 2 A pneumatic control system
- 3 Digital controls with pneumatic components (actuators for example)
- 4 Time clocks multiple stand-alone
- 5 Equipment Stand-alone controls
- 00 OTHER, SPECIFY [OPEN END]
- 96 NOTHING, EQUIPMENT ADDED NOT REPLACED [End of Measure Loop; GO TO NEXT MEASURE OR GO TO N3]
- 98 DON'T KNOW [SKIP TO NEXT MEASURE]
- 99 REFUSED [SKIP TO NEXT MEASURE]

[ASK IF EM2=1-5, 00]

EM3 How would you describe the condition of the equipment that was removed? Was it...

- 1 Inoperable/broken
- 2 Poor condition
- 3 Fair condition
- 4 Good condition
- 98 DON'T KNOW
- 99 REFUSED

EM4 How old was the equipment that was removed? Was it...

- 1 Less than 5 years old
- 2 Between 5 and 10 years old
- 3 10 to 20 years old
- 4 more than 20 years old
- 98 DON'T KNOW
- 99 REFUSED

[END OF MEASURE LOOP; GO TO NEXT MEASURE OR N3]



COMPRESSED AIR MODULE

[ASK IF **MEASURECATEGORY1, 2, 3** = 'COMPRESSED AIR' ELSE SKIP TO NEXT MEASURE MODULE OR GOTO N3] The following questions are about the compressed air system you installed through the AEP Ohio Custom Program.

CA0 When did you install the compressed air system? (IF NECESSARY, PROBE FOR BEST GUESS)

- A MONTH [PRECODES FOR JAN THROUGH DEC.]
- B YEAR [PRECODES FOR 2010, 2011, 2012, 2013]

CA1 Are the air compressors used to... (READ LIST)

- 1 Provide air service to newly installed equipment loads
- 2 Replace failed equipment
- 3 Upgrade to existing and functioning equipment
- 4 Serve as a spare
- 00 Or for some other reason (Specify) [OPEN END]
- 98 DON'T KNOW
- 99 REFUSED

CA2a In the past month, how many hours per day did this equipment typically operate? [NUMERIC OPEN END, 0 TO 24; 98=DON'T KNOW, 99=REFUSED]

CA2b And how many days per week? [NUMERIC OPEN END, 0 TO 7; 8=DON'T KNOW, 9=REFUSED]

CA2c Are there any months during the year when the operating schedule for this equipment differs significantly from what you just described?

- 1 YES
- 2 NO
- 98 DON'T KNOW
- 99 REFUSED

[ASK CA2d-f IF CA2c=1,]

CA2d How many hours per day did the equipment typically operate during the periods with different operating schedules? [NUMERIC OPEN END, 0 TO 24; 98=DON'T KNOW, 99=REFUSED]

CA2e And how many days per week? [NUMERIC OPEN END, 0 TO 7; 98=DON'T KNOW, 99=REFUSED]

CA2f How many months per year did the equipment run on the alternative schedule? [NUMERIC OPEN END, 0 TO 12; 98=DON'T KNOW, 99=REFUSED]



REPLACED EQUIPMENT

[ASK IF CA1=2, 3, ELSE SKIP TO NEXT MODULE OR N3]

I'd like to ask you a few questions about the equipment that was removed when you installed the new compressed air system.

- CA3a How would you describe the size of the equipment that was removed when you installed the new system? Were they...
 - 1 The same size (Horse Power)
 - 2 Smaller Horse Power (replacement increased capacity)
 - 3 Larger Horse Power (replacement decreased capacity)
 - 98 DON'T KNOW
 - 99 REFUSED
- CA3b How would you describe the condition of the equipment that was removed when you installed the new air compressors? Were they...
 - 1 Inoperable (broken)
 - 2 Poor condition
 - 3 Fair condition
 - 4 Good condition
 - 98 DON'T KNOW
 - 99 REFUSED
- CA3c How old was the equipment that was removed? Would you say that it was...?
 - 1 Less than 5 years old
 - 2 Between 5 and 10 years old
 - 3 10 to 20 years old
 - 4 more than 20 years old
 - 98 DON'T KNOW
 - 99 REFUSED

[END OF MEASURE LOOP; GO TO NEXT MEASURE OR N3]

OTHER MODULE

[ASK IF OTHER=1, ELSE SKIP TO N3]

[ASK IF MEASURECATEGORY1, 2, 3 = 'CUSTOM' ELSE SKIP TO NEXT MEASURE MODULE OR GOTO N3]

The following questions are about the other equipment you installed through the Business Custom Program.

OTO When did you install the other measures? (IF NECESSARY, PROBE FOR BEST GUESS)

- A MONTH [PRECODES FOR JAN THROUGH DEC.; DK, REF]
- B YEAR [PRECODES FOR , 2010, 2011, 2012, 2013;2014; DK, REF]

REMOVED EQUIPMENT

OT1 What type of OTHER equipment was REMOVED when you installed the new equipment through the Business Custom Program?

00 RECORD VERBATIM

Confidential and Proprietary Custom Program Program Year 2013 Evaluation Report

- 96 NOTHING, EQUIPMENT ADDED NOT REPLACED [GO TO N3] (MAKE EXCLUSIVE)
- 98 DON'T KNOW
- 99 REFUSED

[SKIP OT2 AND OT3 IF OT1=96, 98, 99]

OT2 How would you describe the condition of the equipment that was removed? Was it...

- 1 Inoperable/broken
- 2 Poor condition
- 3 Fair condition
- 4 Good condition
- 98 DON'T KNOW
- 99 REFUSED

OT3 How old was the equipment that was removed? Was it...

- 1 Less than 5 years old
- 2 Between 5 and 10 years old
- 3 10 to 20 years old
- 4 more than 20 years old
- 98 DON'T KNOW
- 99 REFUSED

[END OF ALL MEASURE LOOPS]

IMPORTANCE OF PROGRAM

N3 Next, I'm going to ask you to rate the importance of the program as well as other factors that might have influenced your decision to implement the **<MEASURECATEGORY 1>.** Think of the degree of importance on a scale with equally spaced units from 0 to 10, where 0 means not at all important and 10 means extremely important. Now using this scale please rate the importance of each of the following in your decision to install the energy efficient equipment at this time.

[FOR N3a-n, RECORD 0 TO 10; 96=NOT APPLICABLE; 98=DON'T KNOW; 99=REFUSED]

(If needed: How important in your DECISION to implement the project was...)

- N3a. The age or condition of the old equipment
- N3b. Availability of the PROGRAM incentive
- N3d. Recommendation from a vendor or contractor that helped you choose the equipment
- N3e. Previous experience with the <MEASURECATEGORY 1>

N3f. Recommendation from an AEP Ohio program staff person

N3h. Information from AEP Ohio Business Custom Program or AEP Ohio marketing materials

N3j. Standard practice in your business/industry

N3k. Recommendation by an account manager of AEP Ohio

- N3I. Corporate policy or guidelines
- N3m. Payback on the investment

PAYBACK BATTERY

[ASK N8-N10e IF N3m>5]

I'd like to find out more about the payback criteria <ORGANIZATIONNAME> uses for its investments.
N8 What financial calculation does <ORGANIZATIONNAME> make before proceeding with installation of equipment like this?

[RECORD VERBATIM]

98 DON'T KNOW

99 REFUSED

N9 What is the payback cut-off point <ORGANIZATIONNAME> uses before deciding to proceed with an investment? Would you say...?

- 1 0 to 6 months
- 2 7 months to 1 year
- 3 more than 1 year up to 2 years
- 4 more than 2 years up to 3 years
- 5 more than 3 years up to 5 years
- 6 Over 5 years
- 98 DON'T KNOW
- 99 REFUSED

N10a What was the estimated payback period for the new <MEASURECATEGORY 1>, in months, WITH the incentive from the Custom Program?

00 [NUMERIC OPEN END, UP TO 240] 998 DON'T KNOW 999 REFUSED

N10b And what was the estimated payback period for the <MEASURECATEGORY 1>, in months, WITHOUT the incentive from the Custom Program?

00 [NUMERIC OPEN END, UP TO 240] 998 DON'T KNOW 999 REFUSED

CORPORATE POLICY BATTERY

[ASK N11-N17 IF N3L>5]

N11 Earlier you indicated the importance of corporate policy in your decision to implement projects, does your organization have a corporate policy to reduce environmental emissions or energy use? Some examples would be to "buy green" or to use sustainable approaches to business investments.

- 1 YES
- 2 NO
- 98 DON'T KNOW
- 99 REFUSED

[ASK N12-N17 IF N11=1]

N12 What specific corporate policy influenced your decision to adopt or install the <MEASURECATEGORY 1> through the AEP Ohio Custom program?

- 00 [RECORD VERBATIM]
- 98 DON'T KNOW
- 99 REFUSED



N13 Had that policy caused you to adopt energy efficient **<MEASURECATEGORY 1>** at this facility before participating in the AEP Ohio program?

- 1 YES
- 2 NO
- 98 DON'T KNOW
- 99 REFUSED

N14 Had that policy caused you to adopt energy efficient **<MEASURECATEGORY 1>** at other facilities before participating in the AEP Ohio Program?

- 1 YES
- 2 NO
- 98 DON'T KNOW
- 99 REFUSED

[ASK N15-N16 IF N13=1 OR N14=1]

N15 Did you receive an incentive for a previous installation of <**MEASURECATEGORY 1**>?

- 1 YES
- 2 NO
- 98 DON'T KNOW
- 99 REFUSED

[ASK N16 IF N15=1]

N16 To the best of your ability, please describe.... [RECORD VERBATIM; 98=DON'T KNOW; 99=REFUSED]

- a. the amount of incentive received
- b. the approximate timing
- c. the name of the program that provided the incentive

[ASK N17 IF N13=1 OR N14=1]

N17 If I understand you correctly, you said that **<ORGANIZATIONNAME**>'s corporate policy has caused you to install energy efficient **<MEASURECATEGORY 1**> previously at this and/or other facilities. I want to make sure I fully understand how this corporate policy influenced your decision versus the AEP Ohio program. Can you please clarify that?

- 00 [RECORD VERBATIM]
- 98 DON'T KNOW
- 99 REFUSED

STANDARD PRACTICE BATTERY

[ASK N18-N22 IF N3j>5]

N18 Earlier you indicated the importance of standard practice in your decision to implement projects, approximately, how long has use of energy efficient **<MEASURECATEGORY 1**> been standard practice in your industry?

Month [00 RECORD NUMBER OF MONTHS; 98=DON'T KNOW, 99=REFUSED] Year [00 RECORD NUMBER OF YEARS; 98=DON'T KNOW, 99=REFUSED]

N19 Does < ORGANIZATIONNAME> ever deviate from the standard practice?

- 1 YES
- 2 NO



- 98 DON'T KNOW
- 99 REFUSED

[ASK IF N19=1]

N19a Please describe the conditions under which **<ORGANIZATIONNAME>** deviates from this standard practice.

- 00 [RECORD VERBATIM]
- 98 DON'T KNOW
- 99 REFUSED

N20 How did this standard practice influence your decision to install the **<MEASURECATEGORY 1>** through the Custom Program?

- 00 [RECORD VERBATIM]
- 98 DON'T KNOW
- 99 REFUSED

N20a Could you please rate the importance of the Business Custom Program, versus this standard industry practice in influencing your decision to install the **<MEASURECATEGORY 1>**? Would you say the Business Custom Program was...?

- 1 Much more important
- 2 Somewhat more important
- 3 Equally important
- 4 Somewhat less important
- 5 Much less important
- 98 DON'T KNOW
- 99 REFUSED

N21 What industry group or trade organization do you consult to establish standard practice for your industry?

- 00 [RECORD VERBATIM]
- 98 DON'T KNOW
- 99 REFUSED

N22 How do you and other firms in your industry receive information on updates in standard practice?

- 00 [RECORD VERBATIM]
- 98 DON'T KNOW
- 99 REFUSED



AEP OHIO SATISFACTION QUESTION

SAT1: Using the 0 to 10 satisfaction scale, how would you rate your satisfaction with the AEP Ohio Business Custom Program? [SCALE 0-10; 98=DON'T KNOW, 99=REFUSED]

SAT2: Why do you give it that rating? RECORD VERBATIM

8. DON'T KNOW 9. REFUSED

State-Wide Evaluator Non-Residential Participation Process and Program Satisfaction Module

I'd now like to ask you a few more general questions about your participation in the Business Custom program.

E 5. How satisfied were you with the energy efficiency level required to qualify for an incentive? Please use a scale from 0 to 10, where 0 is "not at all satisfied" and 10 is "completely satisfied"? [SCALE 0-10; 98=DON'T KNOW, 99=REFUSED]

E 6. [ASK IF E5<4)What would have made you more satisfied? RECORD VERBATIM

- 7. NOTHING
- 8. DON'T KNOW
- 9. REFUSED

(ASK IF E5>=4) E6a. Why did you give that rating?

00. RECORD VERBATIM

98. DON'T KNOW 99. REFUSED

E 7. How satisfied were you with the amount of the incentive? (READ IF NECESSARY: Please use a scale from 0 to 10, where 0 is "not at all satisfied" and 10 is "completely satisfied"?) [SCALE 0-10; 98=DON'T KNOW, 99=REFUSED]

E 8. How satisfied were you with the equipment offered by the program? (READ IF NECESSARY: Please use a scale from 0 to 10, where 0 is "not at all satisfied" and 10 is "completely satisfied"?) [SCALE 0-10; 98=DON'T KNOW, 99=REFUSED]

E 9. [ASK IF E8<4] What would have made you more satisfied with the energy efficient equipment? RECORD VERBATIM

- 7. NOTHING
- 8. DON'T KNOW
- 9. REFUSED

E9a. (ASK IF E8>=4) Why did you give that rating?

RECORD VERBATIM

8. DON'T KNOW

9. REFUSED

E 10. In the course of participating in the AEP Ohio program, and other than sending in the incentive application, how often did you contact AEP Ohio or program staff with questions? (DON'T READ)

1	Never	E 14
2	Once	continue
3	2 or 3 times	continue
4	Four times or more	continue
98	DON'T KNOW	continue
99	REFUSED	continue

E 11. How did you contact them? [CHECK ALL THAT APPLY; AFTER EACH RESPONSE, ASK: Were there any other ways you contacted them?]

1	PHONE	continue
2	EMAIL OR FAX	continue
3	LETTER	continue
4	IN PERSON	continue
97	OTHER [OPEN END]	continue
98	DON'T KNOW	continue
99	REFUSED	continue

E 12. And overall how satisfied were you with your communications with AEP Ohio and program staff? Please use a scale from 0 to 10, where 0 is "not at all satisfied" and 10 is "completely satisfied"? [SCALE 0-10; 98=DON'T KNOW, 99=REFUSED]

E 13. [ASK IF E12<4] What would have made you more satisfied?

OPEN END_

7. NOTHING
8. DON'T KNOW
9. REFUSED

(ASK IF E12>=4) E13a. Why did you give that rating? OPEN END______ 8. DON'T KNOW 9. REFUSED

E 14. From the time you had [MEASURE_1] installed and submitted the application, about how many weeks did it take to receive your incentive? [INSERT NUMERIC OPEN END 0-200, 98 DON'T KNOW, 99 REFUSED]

E 15. How satisfied were you with how long it took to receive the incentive? Please use a scale from 0 to 10, where 0 is "not at all satisfied" and 10 is "completely satisfied"? [SCALE 0-10; 98=DON'T KNOW, 99=REFUSED] (ASK IF E15<4)

E15a. What would have made you more satisfied?

OPEN END_____ 7. NOTHING 8. DON'T KNOW

9. REFUSED

ASK IF E15>=4 E15B. Why did you give that rating? OPEN END______ 8. DON'T KNOW

9. REFUSED

E 16. Did AEP Ohio or its contractors conduct a post-installation inspection of the equipment you installed through the incentive Program?

1	Yes	continue
2	No	
8	DON'T KNOW	
9	REFUSED	

E 17. How satisfied were you with the inspection? Please use a scale from 0 to 10, where 0 is "not at all satisfied" and 10 is "completely satisfied"? [SCALE 0-10; 98=DON'T KNOW, 99=REFUSED]

E 18. [ASK IF E17<4] What would have made you more satisfied with the inspection?

RECORD VERBATIM

7. NOTHING 8. DON'T KNOW 9. REFUSED

ASK IF E17>=4 E18A. Why did you give that rating? OPEN END______ 8. DON'T KNOW

9. REFUSED

E 19. Have you noticed lower electricity bills since you installed your new energy efficient equipment?

1	YES	Continue
2	NO	E 21.
8	DON'T KNOW	Continue
9	REFUSED	Continue

E 20. Would you say your bill savings are...[READ LIST]

1	About what you expected	continue
2	More than you expected	Continue
3	Less than you expected	Continue
8	DON'T KNOW	Continue
9	REFUSED	Continue

E 21. If you were rating your overall satisfaction with the AEP Ohio Custom Program, would you say you were Very Satisfied, Somewhat Satisfied, Neither Satisfied nor Dissatisfied, Somewhat Dissatisfied or Very Dissatisfied?

1	VERY SATISFIED	Continue
2	SOMEWHAT SATISFIED	Continue
3	NEITHER SATISFIED NOR DISSATISFIED	Continue
4	SOMEWHAT DISSATISFIED	Continue
5	VERY DISSATISFIED	Continue
8	DON'T KNOW	B1a
9	REFUSED	B1a

E 22. Why do you give it that rating? RECORD VERBATIM

- CORD VERBATIM
 - 8. DON'T KNOW
 - 9. REFUSED

BENEFITS AND BARRIERS

- B1a What do you see as the main benefits to participating in the Business Custom Program? [DO NOT READ, MULTIPLE RESPONSE, UP TO 3] (ALPHABETIZE LIST)
 - 1. ENERGY SAVINGS
 - 2. GOOD FOR THE ENVIRONMENT
 - 3. LOWER MAINTENANCE COSTS
 - 4. BETTER QUALITY/NEW EQUIPMENT
 - 5. REBATE/INCENTIVE
 - 7. IMPROVED SAFETY/MORALE
 - 8. SET EXAMPLE/INDUSTRY LEADER
 - 9. ABLE TO MAKE IMPROVEMENTS SOONER
 - 10. SAVES MONEY ON UTILITY BILL
 - 00. OTHER, SPECIFY [OPEN END]
 - 98. DON'T KNOW
 - 99. REFUSED



B1b What do you see as the drawbacks to participating in the program? [MULTIPLE RESPONSE, UP TO 3] (DO NOT READ LIST) (ALPHABETIZE LIST)

- 1. PAPERWORK TOO BURDENSOME
- 2. INCENTIVES NOT HIGH ENOUGH/NOT WORTH THE EFFORT
- 3. PROGRAM IS TOO COMPLICATED
- 4. COST OF EQUIPMENT
- 5. NO DRAWBACKS
- 6. POOR COMMUNICATION
- 7. TIME CONSUMING
- 8. UNDERFUNDED/RAN OUT OF MONEY
- 00. OTHER, SPECIFY [OPEN END]
- 98. DON'T KNOW
- 99. REFUSED

FEEDBACK AND RECOMMENDATIONS

R1 Do you plan to participate in the program again in the future?

- 1. YES
- 2. NO
- 3. MAYBE
- 8. DON'T KNOW
- 9. REFUSED

E23. Do you have any suggestions on how the program could be improved? [DO NOT READ, MULTIPLE RESPONSE, UP TO 4]

- 1. HIGHER INCENTIVES
- 2. MORE MEASURES
- 3. GREATER PUBLICITY
- 4. BETTER COMMUNICATION/IMPROVE PROGRAM INFORMATION
- 5. CONTACT/INFORMATION FROM ACCOUNT EXECUTIVES
- 6. LONGER TIME PERIOD TO COMPLETE PROJECT
- 7. BETTER REVIEW OF APPLICATIONS
- 8. SIMPLIFY APPLICATION PROCESS
- 9. ELECTRONIC APPLICATIONS
- 10. MORE FUNDS FOR THE PROGRAM
- 00. OTHER, SPECIFY [OPEN END]
- 96. NO RECOMMENDATIONS
- 98. DON'T KNOW
- 99. REFUSED

MK2 AEP Ohio wishes to reach more customers about their energy efficiency programs. How do you suggest that AEP Ohio reach customers like yourself?

[OPEN ENDED] 98. DON'T KNOW

- 99. REFUSED
- E21. If you were rating your overall satisfaction with AEP Ohio, would you say you were Very Satisfied, Somewhat Satisfied, Neither Satisfied nor Dissatisfied, Somewhat Dissatisfied or Very Dissatisfied?

1	VERY SATISFIED	continue
2	SOMEWHAT SATISFIED	continue
3	NEITHER SATISFIED NOR DISSATISFIED	continue
4	SOMEWHAT DISSATISFIED	continue
5	VERY DISSATISFIED	continue
8	DON'T KNOW	B 1
9	REFUSED	B 1

E22. Why do you give it that rating? RECORD VERBATIM______ 8. DON'T KNOW

9. REFUSED

FIRMOGRAPHICS

Now I'd like to ask you few general questions about you and your company.

B 1. What is your job title or role?

- 1 FACILITIES MANAGER
- 2 BUILDING MANAGER
- 3 ENERGY MANAGER
- 4 OTHER FACILITIES MANAGEMENT/MAINTENANCE POSITION
- 5 CHIEF FINANCIAL OFFICER
- 6 OTHER FINANCIAL/ADMINISTRATIVE POSITION
- 7 PROPRIETOR/OWNER
- 8 PRESIDENT/CEO
- 00 (OTHER (SPECIFY) [OPEN END] ___)
- 88 DON'T KNOW
- 99 REFUSED

[RECORD RESPONSE]

B 2. What is the principal business activity your [COMPANY] conducts at this location? [IF NEEDED:] This may not be the main business activity of your organization, but should be the main business activity that occurs at this location. For example, is it an office, a warehouse, a store? [DO NOT READ LIST. RECORD ONE RESPONSE.]

- 1 OFFICE
- 2 RETAIL (NON-FOOD)
- 3 COLLEGE/UNIVERSITY
- 4 SCHOOL
- 5 GROCERY STORE

- 6 CONVENIENCE STORE
- 7 RESTAURANT
- 8 HEALTH CARE/HOSPITAL
- 9 HOTEL OR MOTEL
- 10 WAREHOUSE
- 11 PERSONAL SERVICE
- 12 COMMUNITY SERVICE/ CHURCH/ TEMPLE/MUNICIPALITY
- 13 INDUSTRIAL ELECTRONIC & MACHINERY
- 14 INDUSTRIAL MINING, METALS, STONE, GLASS, CONCRETE
- 15 INDUSTRIAL PETROLEUM, PLASTIC, RUBBER AND CHEMICALS
- 16 OTHER INDUSTRIAL
- 17 AGRICULTURAL
- 18 CONDO ASSOC/APARTMENT MGMT
- 77 MISCELLANEOUS [OPEN END]
- 98 DON'T KNOW
- 99 REFUSED

B 3. Does your organization own or lease the space at [SITE_ADDRESS]?

1	OWN	continue
2	LEASE	continue
3	OWN PART AND LEASE PART	continue
99	DON'T KNOW	continue

B4. What is the total square footage of the portion of the facility that you occupy at this location?

#	SQUARE FEET [MAX 999,997]	
#	DON'T KNOW	
#	REFUSED	

F4a How old is this facility? [NUMERIC OPEN END, 0 TO 150; 998=Don't know, 999=Refused]

[ASK F4b IF F4a=998]

F4b Do you know the approximate age of the building? Would you say it is...?

- 1. Less than 2 years
- 2. 2-4 years
- 3. 5-9 years
- 4. 10-19 years
- 5. 20-29 years
- 6. 30 years or more years
- 8. DON'T KNOW
- 9. REFUSED

F6 Which of the following best describes the facility? This facility is...

- 1. < ORGANIZATIONNAME>'s only location
- 2. One of several locations owned by <ORGANIZATIONNAME>
- 3. The headquarters location of <ORGANIZATIONNAME> with several locations

B 7. About how many full-time equivalent employees work at the facility at <ServiceAddress>?

- 1 Less than 10
- 2 11 to 25
- 3 26 to 40
- 4 41 to 75
- 5 76 to 100
- 6 More than 100 and less than 500
- 7 More than 500
- 88 DON'T KNOW
- 99 REFUSED

Those are all the questions I have. Thank you and have a good day!.

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Case No(s). 14-0853-EL-EEC

Summary: Application (Part 2 of 3) electronically filed by Mr. Steven T Nourse on behalf of Ohio Power Company