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# 2012 PORTFOLIO STATUS REPORT OF THE ENERGY EFFICIENCY AND PEAK DEMAND RESPONSE PROGRAMS

## VOLUME II

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## APPENDIX F

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## COMMUNITY ASSISTANCE PROGRAM

### Program Year 2012 Evaluation Report

Prepared for:  
AEP Ohio



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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, 2012 through December 31, 2012. The goal of this report is to present a summary of the findings and results from the evaluation of AEP Ohio's Community Assistance Program. 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.

### *Program Summary*

The Community Assistance Program's primary 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 program is administered by an implementation contractor, Ohio Partners for Affordable Energy (OPAE), through a network of local community based organizations, 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.

### *Evaluation Objectives*

The objective of this evaluation report is to provide verification of electric savings impacts during the program year, as well as to present process evaluation findings. Navigant Consulting, Inc.'s (Navigant) findings provide key findings and recommendations for improving the program.

The major objectives of this evaluation are to:

1. Determine the electrical energy and peak demand savings impacts from the program
2. Provide process related feedback to improve the program

### *Evaluation Methods*

The data collected for the evaluation of the 2012 Community Assistance Program were gathered through several means, including:

- » In-depth telephone interviews with program managers
- » On-site technical review of a sample of projects
- » Tracking system data review
- » Analysis of billing data provided by AEP Ohio

Table ES-1 provides a summary of the data collection activities, including the targeted population, the sample frame, and timing in which the data collection occurred.

**Table ES-1. Data Collection Activities for 2012 Evaluation**

Data Collection Type	Targeted Population	Sample Frame	Sample Design	Sample Size	Timing
Tracking Data Analysis	2012 CAP projects	AEP Ohio CAP Tracking Database	-	All	March, 2013
In-depth Interviews	Program staff at AEP Ohio	Contacts from AEP Ohio	-	2	April, 2013
In-depth Interviews	Implementer and Agencies	Implementer and Agencies	Selection of the most active agencies	10	March, 2013
Billing Data	2012 Participants	AEP Ohio Customer Information System	Census	39,561	April, 2013
Onsite Data Verification	Projects in the 2012 Program	CAP Tracking Database	Random Sample of Program Participants	70	March, 2013

### Key Finding

Table ES-2 shows the program goals, *ex-ante* and *ex-post* savings estimates for energy and peak demand, as well as the realization rates for the 2012 Community Assistance Program.

**Table ES-2. Savings Estimates for 2012 Community Assistance Program**

Program	Program Goals		Ex-ante Reported Savings (a)		Ex Post Savings (b)		Realization Rates RR = (b) / (a)	
	MWh	MW	MWh	MW	MWh	MW	MWh	MW
CAP	12,100	1.20	11,554	1.09	4,825	1.32	42%	121%

Based on a billing analysis, the evaluation team estimates a realization rate of 42 percent. That is, *Ex Post* savings are equal to 42 percent of *ex-ante* savings reported in the tracking database. The 90% confidence interval around this estimate is 35% to 49%. This corresponds to average annual savings of 611 kWh per participant, representing a 5.0 percent reduction in participant energy usage due to the Community Assistance Program. The 90% confidence interval around this estimate is 512 kWh to 710 kWh per account, with a relative precision of 16%. 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. The realization rate for demand savings was determined by deemed saving estimates which resulted in 121 percent demand savings. Explanation of the realization rate and possible causes will be discussed in detail later in the report.



## *Recommendations*

**Finding.** In 2012, the average number of CFLs installed in a participating homes was over eighteen. The on-site surveys conducted revealed that some CFLs are being installed in locations with few hours or use, thus diminishing the potential energy savings from this measure.

**Recommendation #1** – AEP Ohio should work with OPAE to develop a protocol for CFL installation that directs that lamps be installed in high use locations. The Department of Energy recommends installing CFLs in living rooms, kitchens, dining rooms, and porches.<sup>1</sup>

**Finding.** Contrary to the program protocol, the program tracking system indicated that 5.5 percent of the refrigerators and freezers were not removed from participant homes, which reduced the savings from this measure.

**Recommendation #2** – AEP Ohio should confirm with OPAE, the program implementer, that old refrigerators and freezers must be removed from homes.

**Finding.** This was the first year that the new online tracking system was used. There is an extensive amount of information that is gathered which may require multiple data entry instruction sessions.

**Recommendation #3** – AEP Ohio should host a follow-up instruction session with the implementer on proper data entry methods. Data entry instructions for 2013 should be modified to focus on data entry areas where common problems were found, such as missing information in certain fields.

**Finding.** Discussion with local implementation agencies revealed that unattended appointments by scheduled program participants is an issue that needs to be addressed.

**Recommendation #4** - Navigant recommends that OPAE explore further ways to improve participants' attendance for their scheduled appointments. OPAE and the community based agencies should look into the costs incurred by canceled and absent participants. If the costs incurred are substantial, OPAE or the community based agencies may wish to offer a participation bonus, such as a gift card to improve participant's attendance at scheduled appointments.

**Finding.** The database created from the online tracking system has entry fields that are blank when these should be populated.

**Recommendation #5** – Navigant recommends the tracking system be monitored to ensure that all the data entered into the tracking system is being exported to AEP Ohio. The community based agencies may need follow up training to ensure that all required fields are being populated.

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<sup>1</sup>[https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&ved=0CDAQFjAA&url=http%3A%2F%2Fwww.energystar.gov%2Fia%2Fpartners%2Fmanuf\\_res%2FCFL\\_PRG\\_FINAL.pdf&ei=pD-BUdDgEvbG4AO9i4D4AQ&usg=AFQjCNHQcBGRhOZkYLptzewdwZZ\\_TSXUA&sig2=UBTLI3cuVKTc7AvHKC8rug](https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&ved=0CDAQFjAA&url=http%3A%2F%2Fwww.energystar.gov%2Fia%2Fpartners%2Fmanuf_res%2FCFL_PRG_FINAL.pdf&ei=pD-BUdDgEvbG4AO9i4D4AQ&usg=AFQjCNHQcBGRhOZkYLptzewdwZZ_TSXUA&sig2=UBTLI3cuVKTc7AvHKC8rug)



## 1 Introduction

### 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 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. The overall program is managed by OPAE, which works with a network of local community based agencies that perform the weatherization services and energy efficient measure installations.

#### 1.1.2 **Measures and Incentives**

CAP provides direct installation services of numerous measures. Each agency has a different way they deliver the program which influences the measures they install. The measures assumed to have the greatest savings impact are CFLs, refrigerators, freezers and air sealing.

### 1.2 *Evaluation Objectives*

This evaluation report covers the CAP element of the AEP Ohio's business energy efficiency and peak demand reduction (EE/PDR) portfolio. The goals of a 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 Impact Questions

This evaluation will seek to answer the following key research 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 2012 evaluation provides AEP Ohio with combined quantitative results for these impact questions.

### 1.2.2 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

### 2.1 *Impact Evaluation*

A billing analysis of 2011 and 2012 participants served as the basis for determining program savings. The regression model takes advantage of the difference in 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.

#### 2.1.1 **Verification and Due Diligence**

Under this task, the evaluation team reviewed quality assurance/quality control (QA/QC) activities already in place to determine whether correct measure information was entered in an accurate manner in the tracking system.

#### 2.1.2 **Tracking Systems**

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.

#### 2.1.3 **Data Collection**

##### 2.1.3.1 *Tracking Data*

The evaluation team utilized the 2011 and 2012 tracking databases provided by AEP Ohio staff. The 2011 and early 2012 tracking data were provided in the form of monthly spreadsheets for each community based agency. The late 2012 tracking data were provided in a Microsoft Access database. The new tracking database format (corresponding to the late 2012 tracking data) is a significant improvement over previous tracking databases, both in terms of format and content. Key data fields in the late 2012 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 tracking database could be useful for future analyses, including the estimated kW and kWh savings (necessary for a Statistically Adjusted Engineering<sup>2</sup> analysis) and building characteristics. The 2011 and early 2012 databases lacked dates

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<sup>2</sup> Statistically adjusted engineering analysis simulate end-use loads from engineering methods entered as explanatory variables in statistical models, and estimated parameters adjust the engineering loads on the basis of customers' observed loads. The resulting end-use loads depend on a variety of conditioning variables.



indicating when the work was being done, a consistent measure description field, and ex-ante savings estimates.

#### 2.1.3.2 *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 February 2013 for 2011 and 2012 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.

#### 2.1.3.3 *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 March 2013. Daily heating and cooling degree days were summed to calculate the degree days unique to each customer bill.

#### 2.1.3.4 *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 2013 tracking spreadsheet, Navigant assumed the project work began on January 1, 2013 and ended on January 31, 2013. 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 unable to estimate a Statistically Adjusted Engineering (SAE) regression model as stated in the evaluation plan. The measure groups are described in Table 2-1.





**Table 2-1. Measure Groups Used in Billing Analysis**

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

*Source: Navigant analysis*



Navigant received tracking data for 15,347 2011 and 2012 participants and billing data for 39,561 accounts. Navigant excluded accounts from the analysis if any of the criteria listed in Table 2-2 were met.

**Table 2-2. Premise Exclusion Criteria**

Exclusion Criteria	Number of Customers
Original Dataset, less:	39,814
All bills were estimated	1,176
Account number differed from the account number at the time of participation†	21,248
Navigant received no billing data for the account	984
Premise with usage greater than 50,000 kWh during the pre-program year	47
Customer had no work completion date (late 2012 participants)	2
<b>Customers included in the analysis</b>	<b>16,357</b>

†These accounts correspond to customers that previously occupied the premise.

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.<sup>3</sup> 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.

### 2.1.4 Regression Analysis

Navigant estimated a fixed effects regression model in which pipeline participants and participants that participated in the program later in the year serve as controls for participants that enter earlier in the year. 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 post-installation variable for each measure group. Seasonal binary variables allow energy usage and program 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:

<sup>3</sup> Multiple billing records for a given time period can result from presence of outside lights, amongst other reasons.



### Equation 2-1. Seasonality of Savings Regression Equation

$$\begin{aligned}
 ADU_{it} = & \alpha_i + \sum_{s=1}^{16} \beta_s * Season_{st} + \sum_{s=8}^{16} \gamma_s * Season_{st} * PostLighting_{it} \\
 & + \sum_{s=8}^{16} \delta_s * Season_{st} * PostRefrigerator_{it} + \sum_{s=8}^{16} \omega_s * Season_{st} * PostFreezer_{it} \\
 & + \sum_{s=8}^{16} \tau_s * Season_{st} * PostShellMeasures_{it} + \sum_{s=8}^{16} \rho_s * Season_{st} * PostHotWater_{it} \\
 & + \sum_{s=8}^{16} \eta_s * Season_{st} * PostHVAC_{it} + \sum_{s=8}^{16} \phi_s * Season_{st} * PostOther_{it} + \epsilon_{it}
 \end{aligned}$$

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

$ADU_{it}$	= Average daily usage (kWh) for participant $i$ in period $t$
$\alpha_i$	= The constant term ("fixed effect") for participant $i$
$Season_{st}$	= A binary variable taking a value of 1 if period $t$ is in season $s$ , where $s$ equals 1 to 16. The sixteen seasons include winter 2009 ( $s=1$ ) and summer 2009 ( $s=2$ ) to winter 2013( $s=16$ ). 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 $i$ received a lighting measure prior to period $t$
$PostRefrigerator_{it}$	= A binary variable taking a value of 1 if customer $i$ received a refrigerator measure prior to period $t$
$PostFreezer_{it}$	= A binary variable taking a value of 1 if customer $i$ received a freezer measure prior to period $t$
$PostShell_{it}$	= A binary variable taking a value of 1 if customer $i$ received a shell measure prior to period $t$
$PostHotWater_{it}$	= A binary variable taking a value of 1 if customer $i$ received a hot water measure prior to period $t$
$PostHVAC_{it}$	= A binary variable taking a value of 1 if customer $i$ received a HVAC measure prior to period $t$
$PostOther_{it}$	= A binary variable taking a value of 1 if customer $i$ received a measure in the "other" group prior to period $t$
$\epsilon_{it}$	= The model error for participant $i$ in period $t$ . 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  $\gamma_s$  parameters.

As mentioned previously, Navigant was unable to estimate the SAE regression model as stated in the 2012 evaluation plan, due to deficiencies in the tracking database. The SAE model replaces binary program variables (see Equation 1) with participant-specific *ex-ante* savings estimates. 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. For the PY 2013 evaluation, Navigant intends to estimate the SAE model, which will more accurately capture the variation in savings for CAP participants.

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%. Because lighting measures and refrigerators account for 85% 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 refrigerators or freezers are much smaller than the *ex-ante* savings estimates (976 kWh and 956 kWh, respectively). The late 2012 tracking



database contained an indicator of whether the old unit was removed. The data indicate that for 5.5 percent of all refrigerator and freezer installations, the old unit was not removed. Additionally, 13.5 percent of all refrigerator installations had a missing indicator, so the percentage of installations for which the old unit was not removed could be as high as 19 percent of refrigerators. 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 2-3. 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.

**Table 2-3. Regression Model Parameter Estimates**

Variable	Coefficient	Standard Error	T-Statistic	Variable	Coefficient	Standard Error	T-Statistic
Winter 2009	17.068	0.255	67.05	Spring 2012 * Post * Freezer	-2.609	0.506	-5.15
Summer 2009	1.177	0.138	8.55	Summer 2012 * Post * Freezer	-0.945	0.749	-1.26
Fall 2009	0.976	0.098	9.97	Fall 2012 * Post * Freezer	-1.022	0.417	-2.45
Winter 2010	17.155	0.245	70.15	Winter 2013 * Post * Freezer	2.917	0.886	3.29
Spring 2010	-0.174	0.091	-1.91	Winter 2011 * Post * Shell	-3.009	2.901	-1.04
Summer 2010	6.254	0.163	38.41	Spring 2011 * Post * Shell	-1.951	1.342	-1.45
Fall 2010	1.071	0.113	9.45	Summer 2011 * Post * Shell	-1.808	1.007	-1.80
Winter 2011	16.786	0.240	69.90	Fall 2011 * Post * Shell	-2.676	0.528	-5.07
Spring 2011	2.572	0.120	21.49	Winter 2012 * Post * Shell	-0.900	0.795	-1.13
Summer 2011	5.675	0.200	28.37	Spring 2012 * Post * Shell	-2.094	0.479	-4.37
Fall 2011	1.398	0.153	9.14	Summer 2012 * Post * Shell	-1.514	0.729	-2.08
Winter 2012	13.703	0.265	51.64	Fall 2012 * Post * Shell	-2.856	0.450	-6.34
Spring 2012	-0.022	0.169	-0.13	Winter 2013 * Post * Shell	-1.023	0.789	-1.30



Variable	Coefficient	Standard Error	T-Statistic	Variable	Coefficient	Standard Error	T-Statistic
Summer 2012	6.196	0.271	22.84	Spring 2011 * Post * HVAC	-4.907	1.709	-2.87
Fall 2012	2.270	0.234	9.69	Summer 2011 * Post * HVAC	-5.760	0.664	-8.68
Winter 2013	14.961	0.548	27.31	Fall 2011 * Post * HVAC	-1.282	0.357	-3.59
Winter 2011 * Post * Lighting	1.243	2.862	0.43	Winter 2012 * Post * HVAC	2.141	0.574	3.73
Spring 2011 * Post * Lighting	-1.547	0.526	-2.94	Spring 2012 * Post * HVAC	-1.881	0.358	-5.25
Summer 2011 * Post * Lighting	0.789	0.526	1.50	Summer 2012 * Post * HVAC	-5.358	0.519	-10.32
Fall 2011 * Post * Lighting	-0.095	0.276	-0.34	Fall 2012 * Post * HVAC	-1.838	0.372	-4.94
Winter 2012 * Post * Lighting	-2.049	0.465	-4.41	Winter 2013 * Post * HVAC	1.868	0.723	2.58
Spring 2012 * Post * Lighting	-0.165	0.258	-0.64	Winter 2011 * Post * Water	-12.684	4.022	-3.15
Summer 2012 * Post * Lighting	0.114	0.409	0.28	Spring 2011 * Post * Water	-0.988	0.715	-1.38
Fall 2012 * Post * Lighting	0.158	0.274	0.58	Summer 2011 * Post * Water	-2.098	0.622	-3.38
Winter 2013 * Post * Lighting	-0.374	0.591	-0.63	Fall 2011 * Post * Water	-0.910	0.289	-3.15
Winter 2011 * Post * Refrigerator	-8.646	2.825	-3.06	Winter 2012 * Post * Water	0.351	0.469	0.75
Spring 2011 * Post * Refrigerator	-1.339	0.592	-2.26	Spring 2012 * Post * Water	-1.113	0.260	-4.29
Summer 2011 * Post * Refrigerator	0.782	0.501	1.56	Summer 2012 * Post * Water	-3.167	0.398	-7.96
Fall 2011 * Post * Refrigerator	0.181	0.248	0.73	Fall 2012 * Post * Water	0.016	0.237	0.07
Winter 2012 * Post * Refrigerator	-3.012	0.405	-7.43	Winter 2013 * Post * Water	2.791	0.469	5.96
Spring 2012 * Post * Refrigerator	0.233	0.231	1.01	Winter 2011 * Post * Other	1.307	4.812	0.27
Summer 2012 * Post * Refrigerator	0.782	0.350	2.23	Spring 2011 * Post * Other	-0.915	1.520	-0.60
Fall 2012 * Post * Refrigerator	-0.027	0.218	-0.13	Summer 2011 * Post * Other	-1.651	1.970	-0.84



Variable	Coefficient	Standard Error	T-Statistic	Variable	Coefficient	Standard Error	T-Statistic
Winter 2013 * Post * Refrigerator	-1.974	0.440	-4.49	Fall 2011 * Post * Other	-1.314	0.885	-1.48
Winter 2011 * Post * Freezer	-1.014	5.123	-0.20	Winter 2012 * Post * Other	-0.651	1.188	-0.55
Spring 2011 * Post * Freezer	-4.439	1.465	-3.03	Spring 2012 * Post * Other	-2.190	0.669	-3.28
Summer 2011 * Post * Freezer	-2.270	1.477	-1.54	Summer 2012 * Post * Other	-1.387	0.877	-1.58
Fall 2011 * Post * Freezer	-1.485	0.623	-2.38	Fall 2012 * Post * Other	-0.189	0.370	-0.51
Winter 2012 * Post * Freezer	1.139	0.997	1.14	Winter 2013 * Post * Other	-0.411	0.721	-0.57

Source: Navigant analysis

## 2.2 Process Evaluation

The purpose of the process evaluation is to identify possible program improvements in the administration of the program by AEP Ohio, OPAGE, and Community Based Agencies.

### 2.2.1 Data Collection Methods

The evaluation team conducted in-depth interviews with AEP Ohio program staff, OPAGE, and select community based agencies to clarify program processes, administration, marketing, delivery, and tracking system procedures.

### 2.2.2 Documents Reviewed

#### Data Collection Methods and Material

1. Billing Data
  - a. The data included monthly billing data spanning January 2009 through February 2013 for participants in 2011 and 2012.
2. Tracking Data
  - a. The early 2012 tracking data were provided in the form of monthly spreadsheets for each community based agency.
  - b. The late 2012 tracking data were provided in a Microsoft Access database.
3. In-depth interviews
  - a. AEP Ohio staff
  - b. OPAGE
  - c. Implementing community based agencies



#### 4. On-site field surveys

- a. Navigant hired a local auditor to verify the services performed by the community based agencies

Table 2-4 provides a summary of the principal data sources contributing to the evaluation of the AEP Ohio CAP.

**Table 2-4. Data Collection Activities**

Data Collection Type	Targeted Population	Sample Frame	Sample Design	Sample Size	Timing
Tracking Data Analysis	2012 CAP Projects	AEP Ohio CAP Tracking Database	-	All	March, 2013
In-depth Interviews	Program Staff at AEP Ohio	Contacts from AEP Ohio	-	2	April, 2013
In-depth Interviews	Implementer and Agencies	Implementer and Agencies	Selection of the Most Active Agencies	10	March, 2013
Billing Data	2012 Participants	AEP Ohio Customer Information System	Census	16,357	April, 2013
Onsite Data Verification	Projects in the 2012 Program	CAP Tracking Database	Random Sample of Program Participants	70	March, 2013





### 3 Program Level Results

This section presents the AEP Ohio CAP impact and process evaluation results.

#### 3.1 *Impact Evaluation Results*

##### 3.1.1 Program Impact Results

The evaluation team conducted a regression analysis using monthly billing data from 16,357 participants<sup>4</sup>, including 6,613 in 2011, 6,977 in 2012, and 2,767 pipeline participants<sup>5</sup>. 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 42 percent. That is, *Ex Post* savings are equal to 42 percent of *ex-ante* savings reported in the tracking database. The 90% confidence interval around this estimate is 35% to 49%. This corresponds to average annual program savings of 611 kWh per participant, representing a 5.0 percent reduction in participant energy usage due to the Community Assistance Program. The 90% confidence interval around this estimate is 512 kWh to 710 kWh per account, with a relative precision of 16%. 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 2012 evaluation plan, due to deficiencies in the tracking database. The SAE regression model requires *ex-ante* savings estimates for each participant. This information was available only for participants that enrolled in the second half of 2012.

2012 program savings are calculated as the average savings per measure group multiplied by the number of participants who received the measure in 2012. Total 2012 savings from the Community Assistance Program are 4,825 MWh and 1.31 kW. The energy savings were derived from the billing analysis. The demand savings were derived from engineering saving estimates.

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<sup>4</sup> Note: for the billing analysis, a participant is considered to be the customer account active while the work was completed at the corresponding premise.

<sup>5</sup> Pipeline participants provide the control group for the regression model. For this model, pipeline participants are 2013 participants.



### 3.1.1.1 *Installation Rates*

The evaluation team conducted 70 on-site visits to participants' homes. The evaluation team verified if the measures were installed as claimed in the tracking database. Table 3-1 displays the installation rates per measure verified by the evaluation team's on-site visits.

**Table 3-1. On-Site Verified Measure Installation Rates**

Measure	Number of Units Inspected	Number of Units Verified	Installation Rate
Heat Pumps	0	0	100%
Attic insulation	3	3	100%
Wall insulation	3	3	100%
CFLs	1,151	1,001	87%
Low-Flow Showerhead	23	17	74%
Faucet Aerator	29	25	86%
Refrigerators	34	33	97%
Freezer	13	12	92%
Hot Water heater wrap	8	8	100%
Smart Strips	8	7	87%

### 3.1.1.2 *Demand Savings*

Billing analysis does not estimate electric demand savings. Adjustments were made to AEP Ohio's demand savings estimates based on the installation rates per measure found in the evaluation team's on-site verification visits. Navigant conducted a review of measure savings algorithms and underlying assumptions. The review of measures savings was conducted by Navigant to improve the accuracy of *ex-ante* program impact claims, and minimize the potential for major *ex-post* adjustments to program savings. Table 3-2 presents the demand savings for each measure. The algorithms and assumptions used to calculate demand savings for all measures can be found in the Appendix.

**Table 3-2. Demand Savings Totals by Measure**

Measure	Number of Units*	Total <i>Ex-Post</i> Demand Savings (MW)	Average Per-Unit Demand Savings (kW)	Percent of Savings
Heat Pumps	39	0.006	0.148	0.44%
Attic insulation (1000 sq. ft.)	333	0.008	0.023	0.58%
Wall insulation (1000 sq. ft.)	53	0.001	0.013	0.05%
CFLs	108,001	0.477	0.004	36.19%
Low-Flow Showerhead	2,409	0.053	0.022	4.05%
Faucet Aerator	4,070	0.012	0.003	0.93%
Refrigerators	4,153	0.581	0.140	44.13%
Freezer	861	0.164	0.191	12.49%
Hot Water heater wrap	322	0.003	0.009	0.22%
Window AC	206	0.005	0.024	0.38%
CAC	15	0.001	0.098	0.11%
Pipe insulation	419	0.006	0.014	0.44
<b>Total Savings</b>	-	<b>1.317</b>	-	-

\*Number of Units adjusted for the installation rate

### 3.1.2 Sampling Plan

The Impact Evaluation for savings was based on a billing analysis of an attempted census of 2011 and 2012 participants. Individual projects were dropped from the analysis due to insufficient data. The attempted census achieves our impact goal of a relative precision of  $\pm 10$  percent at a 90 percent level of confidence.

## 3.2 Process Evaluation Results

The process component of the program evaluation focused on program design and processes, program implementation, marketing and outreach, and participant satisfaction. The primary data sources for the process component were interviews with program administration, implementation contractor, community based agencies and on-site visits to participants' homes.

### 3.2.1 Verification and Due Diligence

The following provides the results of the evaluation of AEP Ohio's Verification and Due Diligence of CAP. Under this task, Navigant explored the quality assurance and verification activities currently carried out by program and implementation staff. We compared these activities to industry Best Practices<sup>6</sup> for similar programs to determine the following:

<sup>6</sup>. See the Best Practices Self Benchmarking Tool developed for the Energy Efficiency Best Practices Project: <http://www.eebestpractices.com/benchmarking.asp>.



- » Whether any of the current quality assurance and verification activities are biased (i.e., incorrect sampling that may inadvertently skew results, purposeful sampling that is not defensible, etc.).
- » Whether any of the current quality assurance and verification activities are overly time-consuming and might be simplified or dropped.

This assessment was based primarily on documentation of current program processes, where available. Information was also obtained from program staff.

AEP Ohio has contracted with OPAE to deliver the CAP. OPAE has contracted with numerous local community based agencies to conduct weatherization services and energy efficient measure installations. Most of the agencies receive their training from the Ohio Weatherization Training Center.

The online tracking system is an improvement over the previous system which used monthly spreadsheets gathered from multiple agencies. OPAE should administer follow up training with community based agencies regarding the on-line tracking system is likely to improve data entry errors.

### 3.2.2 Tracking System Review

For the first half of 2012 OPAE provided a series of spreadsheets each month from participating agencies. Each agency provided a separate spreadsheet monthly, if they perform services for the CAP. The tracking system records each weatherization service and energy efficient measure installed by each agency. Deemed savings per measure were used to estimate total program savings.

This tracking system was difficult to monitor. There are 33 different agencies that performed services for the CAP in 2012. With 33 agencies submitting monthly spreadsheets there could be hundreds of spreadsheets to combine for program year savings. Due to the large number of spreadsheets, input errors can easily be missed and checking the spreadsheets is very time consuming.

In June of 2012, OPAE introduced an online tracking system to the agencies. The tracking data from the online system was provided in a Microsoft Access database. The new tracking database format was a significant improvement over the previous tracking database, both in terms of format and content. Key data fields in the online 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 online tracking database could be useful for future analyses, including the kW and kWh estimated savings (necessary for a Statistically Adjusted Engineering analysis) and building characteristics. The early 2012 database lacked both a completion date and a consistent measure description field.

The database created from the online tracking system has entry fields that are blank when these should be populated. Navigant recommends the tracking system be monitored to ensure that all the data entered into the tracking system is being exported to AEP Ohio. The community based agencies may need to follow up training to ensure that all the required fields are being populated.



The agencies appreciate the ease of new online tracking system. Most of the agencies were already familiar with the online database as they use it for data entry in another energy efficiency program offered in Ohio.

### 3.2.3 On-site Visits

The on-site visits sample is a stratified random sample from the population of program participants in the 2012 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. The Navigant team bundled the measures that are likely to have the same range of verification rates, which effectively results in stratification primarily based on measure type.

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 site contact on the reason(s) for such discrepancies. Information gathered on site was recorded for subsequent analysis and reporting.

Navigant conducted a debriefing meeting once the on-site visits were completed to obtain any additional information that the field form did not gather. The field technicians reported that satisfaction was high among participants. Field technicians also noted that participants frequently asked if AEP Ohio offered any additional services that would be available to them.

### 3.2.4 Program Delivery

In 2012, AEP Ohio specified that installed measures must meet a \$0.70/ kWh threshold for cost of conserved energy. The community based agencies that Navigant interviewed were not accustomed to calculating such statistics per measure. There was initial apprehension by the agencies that they would not meet the savings goals. When interviewed, the agencies stated that they had delivered the program for almost eight months under \$0.70/kWh program structure. The agencies felt confident that they could meet the \$0.70/kWh goal after implementing it for eight months. One of the consequences of the agencies' initial apprehension of meeting the \$0.70/kWh threshold was that it would effectively restrict the measures installed to those that clearly met the goal, such as CFLs and refrigerators. The agencies reported that they felt confident they could meet the \$0.70/kWh goal now and would incorporate more measures into their installation routine.

During interviews with agencies, a common problem cited was participants' last minute cancellations or not being home when the appointment was scheduled. The evaluation team's on-site verification visits confirmed this trend. When the evaluation team was conducting on-site visits, 11 instances occurred where the participant either called at the last minute to cancel or was not home when the visit was scheduled. It is burdensome for the agencies to have participants consistently cancel appointments. The agencies have implemented strategies to reduce the number of cancellations and absent participants. They often call the day before or the day of the appointment to confirm with the participant that they will be present for the installations. One agency that was interviewed stated that they have started to



send out reminder postcards “similar to what you get from the doctor.” Navigant recommends exploring further ways to improve participants’ attendance for their scheduled appointments.

It was determined from Navigant’s analysis of the tracking information and confirmed by on-site visits that on average, over eighteen CFLs were installed per participant in 2012. As more CFLs are installed per home, the likelihood that they are being installed in areas with low hours of use increases. Navigant recommends that standards be set for CFL installation that specify the location must be in a high use or medium use area. The Department of Energy recommends installing CFLs in living rooms, kitchens, dining rooms, and porches.<sup>7</sup>

### 3.3 *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 3-3 summarizes the unique inputs used in the TRC test.

**Table 3-3. Inputs to Cost-Effectiveness Model for CAP Program**

Item	
Measure Life	13
Participants	8,579
Annual Energy Savings (MWh)	4,825
Coincident Peak Savings (kW)	1,320
Third Party Implementation Costs	1,030,119
Utility Administration Costs	57,298
Utility Incentive Costs	5,748,845
Participant Contribution to Incremental Measure Costs	\$0

Based on these inputs, the TRC ratio is 0.4. Therefore, the program does not pass the TRC test. Table 3-4 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. Because the participants did not contribute to costs, the Participant Cost Test is not applicable for this program.

**Table 3-4: Cost Effectiveness Results for the CAP Program**

Test Results	
Total Resource Cost	0.4
Participant Cost Test	N/A
Ratepayer Impact Measure	0.3
Utility Cost Test	0.4

<sup>7</sup>[http://www.energystar.gov/ia/partners/manuf\\_res/CFL\\_PRG\\_FINAL.pdf](http://www.energystar.gov/ia/partners/manuf_res/CFL_PRG_FINAL.pdf)



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 Results

This section summarizes the impact evaluation results.

#### 4.1.1 Impact Results

Table 4-1 shows the impact results for the 2012 Community Assistance Program.

**Table 4-1. Savings Estimates for 2012 Community Assistance Program**

Program	Program Goals		<i>Ex-ante</i> Reported Savings (a)		<i>Ex Post Savings</i> (b)		Realization Rates RR = (b) / (a)	
	MWh	MW	MWh	MW	MW	MW	MWh	MW
CAP	12,100	1.20	11,554	1.09	4,825	1.32	42%	121%

The evaluation team estimates an energy savings realization rate of 42 percent. That is, *Ex Post* energy savings are equal to 42 percent of *ex-ante* savings reported in the tracking database. The 90% confidence interval around this estimate is 35% to 49%. This corresponds to average annual program savings of 611 kWh per participant, representing a 5.0 percent reduction in participant energy usage due to the Community Assistance Program. The 90% confidence interval around this estimate is 512 kWh to 710 kWh per account, with a relative precision of 16%. 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.

The realization rate for demand savings is 121 percent. This result was calculated using the algorithms include in the appendix.

### 4.2 Process Evaluation Results

This section provides a summary of the process evaluation results.

#### 4.2.1 Verification and Due Diligence

Navigant finds that OPAE performed due diligence and verification throughout the program, with procedures meeting the applicable national best practice criteria.<sup>8</sup> The online tracking system is an improvement over the previous system which used monthly spreadsheets gathered from multiple agencies. Follow up training with Community Agencies regarding the on-line tracking system is likely to improve data entry errors.

<sup>8</sup> See the Best Practices Self-Benchmarking Tool developed for the Energy Efficiency Best Practices Project:  
<http://www.eebestpractices.com/benchmarking.asp>





### 4.3 Recommendations

**Finding.** In 2012, the average number of CFLs installed in a participating homes was over 18. The on-site surveys conducted revealed that some CFLs are being installed in locations with few hours or use, thus diminishing the potential energy savings from this measure.

**Recommendation #1** – AEP Ohio should work with OPAE to develop a protocol for CFL installation that directs that lamps be installed in in high use locations. The Department of Energy recommends installing CFLs in living rooms, kitchens, dining rooms, and porches.<sup>9</sup>

**Finding.** Contrary to the program protocol, the program tracking system indicated that 5.5 percent of the refrigerators and freezers were not removed from participant homes, which reduced the savings from this measure.

**Recommendation #2** – AEP Ohio should confirm with OPAE, the program implementer, that old refrigerators and freezers must be removed from homes.

**Finding.** This was the first year that the new online tracking system was used. There is an extensive amount of information that is gathered which may require multiple data entry instruction sessions.

**Recommendation #3** – AEP Ohio should host a follow-up instruction session with the implementer on proper data entry methods. Data entry instructions for 2012 should be modified to focus on data entry areas where common problems were found, such as missing information in certain fields.

**Finding.** Discussion with local implementation agencies revealed that an unattended appointment by scheduled program participants is an issue that needs to be addressed.

**Recommendation #4** - Navigant recommends exploring further ways to improve participants' attendance for their scheduled appointments. OPAE and the community based agencies should look into the costs incurred by canceled and absent participants. If the costs incurred are substantial OPAE or the community based agencies may wish to offer a participation bonus, such as a gift card to improve participant's attendance at scheduled appointments.

**Finding.** The database created from the online tracking system has entry fields that are blank when they should be populated.

**Recommendation #5** – Navigant recommends the tracking system be monitored to ensure that all the data entered into the tracking system is being exported to AEP Ohio. The community based agencies may need follow up training to ensure that all required fields are being populated.

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<sup>9</sup>[https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&ved=0CDAQFjAA&url=http%3A%2F%2Fwww.energystar.gov%2Fia%2Fpartners%2Fmanuf\\_res%2FCFL\\_PRG\\_FINAL.pdf&ei=pD-BUdDgEvbG4AO9i4D4AQ&usg=AFQjCNHQcBGRhOZkYLptzewdwZZ\\_TSXUA&sig2=UBTLI3cuVKTc7AvHKC8rug](https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&ved=0CDAQFjAA&url=http%3A%2F%2Fwww.energystar.gov%2Fia%2Fpartners%2Fmanuf_res%2FCFL_PRG_FINAL.pdf&ei=pD-BUdDgEvbG4AO9i4D4AQ&usg=AFQjCNHQcBGRhOZkYLptzewdwZZ_TSXUA&sig2=UBTLI3cuVKTc7AvHKC8rug)



## Appendix A

### A.1 Onsite Verification Form

CAP Program On-Site Verification Form				
Field Staff Name:			Date:	
			Time In:	
Site ID:			Time Out:	
Customer Name:			Total Time:	
Phone Number:			Travel Time (hrs):	
Street Address:			Travel Dist. (miles):	
City:			Zip Code:	
<b>Section 2: Building Characteristics</b>				
<b>Home Type</b> (enter number to right) 1) Single Family 2) Multi Family 3) Other (specify)		<b>Foundation Type</b> 1) Basement 2) Crawlspace 3) Slab on Grade		
Year Built		Number of Occupants		
Total Conditioned Floor Area (CFA)		Floors Above Grade		



**Section 3: Furnace Verification**

<b>Number of Furnaces Reported</b>		<b>Number of Furnaces Verified</b>	
<b>Number of ECMs Reported</b>		<b>Number of ECMs Verified</b>	
	<b>System #1</b>	<b>System #2</b>	
<b>Fuel Type</b>			
<b>Location</b> (Basement / Crawl)			
<b>Capacity (BTU)</b>			
<b>Furnace Manufacturer</b>			
<b>Furnace Model Number</b>			
<b>Furnace Efficiency (AFUE)</b>			
<b>Notes</b>			



**Section 3: Central Air Conditioner Verification**

<b>Number of New Systems Reported</b>		<b>Number of New Systems Verified</b>	
<b>Number of RCA Tune-Ups Reported</b>		<b>Number of RCA Tune-Ups Verified</b>	
	<b>System #1</b>	<b>System #2</b>	
<b>Location</b> (Basement / Crawl)			
<b>Capacity</b> (BTU)			
<b>Condensing Unit Manufacturer</b>			
<b>Condensing Unit Model Number</b>			
<b>Evaporator Coil Manufacturer</b>			
<b>Evaporator Coil Model Number</b>			
<b>Split or Packaged</b>			
<b>SEER</b>			
<b>EER</b>			
<b>Notes</b>			



**Section 3: ASHP Verification**

<b>Number of New Systems Reported</b>		<b>Number of New Systems Verified</b>	
<b>Number of RCA Tune-Ups Reported</b>		<b>Number of RCA Tune-Ups Verified</b>	
	<b>System #1</b>	<b>System #2</b>	
<b>Location</b> (Basement / Crawl)			
<b>Capacity (BTU)</b>			
<b>Condensing Unit Manufacturer</b>			
<b>Condensing Unit Model Number</b>			
<b>Evaporator Coil Manufacturer</b>			
<b>Evaporator Coil Model Number</b>			
<b>Split or Packaged</b>			
<b>SEER</b>			
<b>EER</b>			
<b>HSPF</b>			
<b>Notes</b>			



**Section 6: Windows - complete as much as possible for windows replaced by program**

Number of Windows Reported		Window Area Reported	
	Type 1	Type 2	Type 3
Number of Windows Verified			
Area of Verified Windows (sq ft)			
Manufacturer (if known)			
Model (if known)			
U-Value (if known)			
Solar Heat Gain Coeff. (if known)			
Frame Type (Vinyl, Wood, Aluminum)			
Notes			



**Section 6: Attic Insulation - complete if insulation was installed**

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

**Section 7: Wall Insulation - verify with homeowner**

<b>Wall Insulation Reported?</b>		<b>Notes</b>
<b>Homeowner able to confirm installation?</b> (Yes / No)		
<b>Wall Insulation Visually Verified?</b> (Y/N)		
<b>Insulation Type</b> (if known)		
<b>Insulated Wall Area</b> (sq. ft.)		



**Section 8: Envelope Air Sealing - Visual Inspection**

Air Sealing Reported?		Notes
Homeowner able to confirm installation? (Yes / No)		
Evidence of Sealing Verified? (Y/N)		

**Section 7: 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)		



<b>Location (enter number)</b> 1) Kitchen      6) Closet 2) Living        7) Basement 3) Bedroom     8) Garage 4) Bathroom    9) Outdoor 5) Hall          10) Other	<b>Base Type</b> (Pin Based / Screw Based)	<b>Wattage</b>	<b>Quantity</b>
<b>Notes</b>			

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)		



**Section 9: Aerators**

1) Number Received During Audit		Notes
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		

**Section 10: Pipe Insulation**

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

**Section 11: Programmable Thermostats**

Number of Thermostats Reported		Notes
Number Visually Verified		
Setback Programmed? (Yes / No)		

**Section 12: LED Nightlight**

1) Number Received During Audit		Notes
2) Number Installed During Audit (ask homeowner)		
3) Number Removed (after initial installation)		



## A.2 Savings Algorithms

### Program Demand Impact Parameter Estimates

This section presents the results of the evaluation's technical review of the savings assumptions for each measure included in either CAP.

#### CFL Replacement

**Table A-1. CFL Replacement Lamp Wattages**

Measure	Base Incandescent (watts/lamp)	CFL (watts/lamp)	Delta Watts Reduction (watts/lamp)
11W CFL replacing 60W incandescent	60	11	49
20W CFL replacing 75W incandescent	75	20	55
26W CFL replacing 100W incandescent	100	26	74

#### Algorithms

The gross energy and demand algorithms used for evaluating the integral CFL measure savings are as follows:

#### Equation A-1. CFL Demand Savings

$$\text{Gross Coincident kW} = \frac{\text{Delta Watts} * \text{Coincidence Factor}}{1000 \text{ W/kW}}$$

The installation rate accounts for CFLs installed through the program in the current program year and not since removed by the occupant. The demand interactive effect accounts for savings that the measures achieve through avoided air conditioning load because of reduced internal heat gains from the energy efficient lighting. The energy interactive effect accounts for increase in space heating and decrease in space cooling energy because of reduced internal gains from the energy efficient lighting.

**Table A-2. Default Savings Assumptions for CFL Gross Impacts**

Gross Impact Parameter	Evaluation Review Comments
Incandescent Wattage	Base Measure
CFL Wattage	Installed CFL
Delta Watts Saved	Base Measure – CFL Wattage
Installation Rate	Navigant used 87 percent for program tracking savings, based on the verified installations from the on-site verifications.
Coincidence Factor	EmPOWER Maryland Metering Study <sup>a</sup>

<sup>a</sup> Navigant Consulting 2012 EmPOWER Maryland 2011 Evaluation Report Chapter 5: Residential Lighting And Appliances, prepared for Baltimore Gas & Electric, Potomac Electrical Power Company, Delmarva Power, Southern Maryland Electric Cooperative, and Potomac Edison

### Results

Table A-3 summarizes AEP's ex-ante coincident peak demand savings and the ex-post estimates based on Table A-3 assumptions. The difference between the ex-ante and ex-post values is due to the mix of CFLs installed in the program. Navigant applied the percent of CFLs by type from the online tracking system to the entire years' worth of reported CFLs, this resulted in a slightly different delta watts number.

**Table A-3. Ex-post Savings Estimates for CFL Impacts**

Measure	Unit	Ex-ante (kW/unit)	Ex-post (kWh/unit)
CFLs	Lamp	0.0048	0.0044

### Low-Flow Showerhead

#### Measure Definition

This measure consists of direct installation of a new showerhead to reduce the flow rate relative to the existing showerhead. The program implementation contractor instructs its energy specialists to visually inspect the base showerhead rated water flow and offer to replace it if it is rated at or greater than 2.5 GPM, which is the current Federal standard for maximum flow rate at 80 psi water pressure.

#### Algorithms and Assumptions

The energy and demand algorithms used for evaluating the low-flow showerhead measure savings are as follows:



### Equation A-2. Showerhead Energy Savings

$$\Delta kWh = ((GPM\_base - GPM\_low) * Length * Household * SPCD * 365 / SPH) * EPG\_electric * ISR$$

### Equation A-3. Showerhead Demand Savings

$$kW = kWh / Hours * CF$$

The *ex-post* impact parameters are provided in Table A-4.

**Table A-4. Key Impact Parameters for Low-flow Showerheads**

Parameter Description	Parameter	Mean Value	Source
Household	Household	2.4	2012 participant survey
Showers per household	SPH	1.6	Pacific Northwest Laboratory (a)
Showers per capita per day	SPCD	0.7	LBNL report (b)
Gallons per minute baseload	GPM_base	2.5	Federal minimum standard
Gallons per minute replaced unit	GPM_low	1.75	Program specification
Shower length (minutes)	Length	8.2	LBNL report (b)
Energy per gallon of hot water supplied by electric	EPG_electric	0.127	Formula from the Illinois Statewide Technical Reference Manual (c)
Average cold water temperature	Supply Temp	58.1	Average mains temperature in Columbus, OH: Building America Benchmark 2010
Average mixed temperature of shower	Shower Temp	105	LBNL report (b)
In-service rate	ISR	74%	2012 on-site survey results
Annual electric DHW recovery hours for showerhead use	Hours	268	Formula from the Illinois Statewide Technical Reference Manual (d)
Peak Demand Coincidence Factor	CF	0.0196	Aquacraft, Inc. Water Engineering and Management (e)

<sup>a</sup> "Estimate based on Pacific Northwest Laboratory; "Energy Savings from Energy-Efficient Showerheads: REMP Case Study Results, Proposed Evaluation Algorithm, and Program Design Implications"

<sup>b</sup> Biermayer, Peter J., Potential Water and Energy Savings from Showerheads, March 17, 2006, Lawrence Berkeley National Laboratory.

<sup>c</sup> Calculated as follows: Specific weight of water (8.33 lbs/gal) \* heat capacity of water (1.0 btu/lb-F) \* Shower Temp (105 F) - Supply Temp (58.1F) / (Water heater recovery efficiency (0.98) \* 3412)

<sup>d</sup> Calculated as follows: (Total annual hot water used for showers = 2.65\*10.1\*365\*0.78 HW% = 7361 gallons) / (27.51GPH recovery of electric water heater) = 268 hours per year. GPH calculated for 65.9F temp rise (120-54.1), 98% recovery efficiency, and typical 4.5kW electric resistance storage tank.

<sup>e</sup> Calculated as follows: Assume 11% showers take place during peak hours (based on:

<http://www.aquacraft.com/sites/default/files/pub/DeOreo-%282001%29-Disaggregated-Hot-Water-Use-in-Single-Family-Homes-Using-Flow-Trace-Analysis.pdf>). Assuming savings are constant throughout the year, the coincidence factor (or probability that the kW savings occur during peak hours) is 3/12 (months) \* 5/7 days \* 0.11% during peak hours = 0.0196



## Results

Table A-5 provides *ex-ante* and *ex-post* demand savings for low-flow showerheads.

**Table A-5. *Ex-post* Evaluation Savings Estimates for Direct Installation of Low-Flow Showerheads**

Measure	Unit	<i>Ex-ante</i> (kW/unit)	<i>Ex-post</i> (kWh/unit)
Low Flow Showerhead	Showerhead	0.0195	0.022

## Refrigerator Replacement

Navigant used the draft Ohio TRM for energy and demand savings for this measure. The equation used in the draft Ohio TRM is similar to other reputable sources. Navigant verified the inputs used in the draft Ohio TRM. The inputs were gathered from the most recent reputable source or the changes were insignificant.

$$\Delta kW = 0.14 \text{ kW}$$

## Freezer Replacement

Navigant used the draft Ohio TRM for energy and demand savings for this measure. The equation used in the draft Ohio TRM is similar to other reputable sources. Navigant verified the inputs used in the draft Ohio TRM. The inputs were gathered from the most recent reputable source or the changes were insignificant.

$$\begin{aligned} \Delta kW &= \Delta kWh / \text{Hours} \\ &= 956 / 5000 \\ &= 0.191 \text{ kW} \end{aligned}$$

**Table A-6. Key Impact Parameters for Freezers**

Parameter Description	Parameter	Mean Value	Source
Gross customer annual kWh savings	$\Delta kWh$	956	Ohio TRM
Annual hours of use per year	HOURS	5000	Ohio TRM

## Attic and Wall Insulation

Navigant used the draft Ohio TRM for energy and demand savings for this measure. The equation used in the draft Ohio TRM is similar to other reputable sources. Navigant verified the inputs used in the draft Ohio TRM. The inputs were gathered from the most recent reputable source or the changes were insignificant. If the home had gas heating the savings were adjusted to only reflect the electric savings of the measure.



Attic  $\Delta$ kW per 1000 sq. ft. of an R rating increase of 8 = 0.023

Wall  $\Delta$ kW per 1000 sq. ft. of an R rating increase of 8 = 0.013

### Room Air Conditioner Replacement

Navigant assumes the conventional room air conditioning (AC) unit has an EER rating of 8.8, while the Energy Star room AC has an EER rating of 11.5. Based on these values, the Energy Star calculator estimates an annual kWh usage of 750 for the conventional unit and 574 for the efficient unit. The total annual savings per unit from this calculation is 176 kWh.

Navigant explored Vermont's 2010 TRM and Pennsylvania's 2011 TRM. With the given EER rating parameters, the 176 kWh is a reasonable estimate.

### Energy Savings

#### Equation A-4. Room Air Conditioner Demand Savings

$$\Delta \text{kW} = \text{Btu/H} * ((1/\text{EER}_{\text{base}} - 1/\text{EER}_{\text{ee}}))/1000) * \text{CF}$$

**Table A-7. Key Impact Parameters for Room Air Conditioners**

Parameter Description	Parameter	Mean Value	Source
EER baseline	EER <sub>base</sub>	9.8	Ohio TRM
EER existing	EER <sub>ee</sub>	10.8	Ohio TRM
Summer Peak Coincidence Factor	CF	0.3	RLW Report (a)
Gallons per minute base load	BTU/H	8500	RLW Report (a)

(a) Consistent with coincidence factors found in: RLW Report: Final Report Coincidence Factor Study Residential Room Air Conditioners, June 23, 2008

([http://www.puc.nh.gov/Electric/Monitoring%20and%20Evaluation%20Reports/National%20Grid/117\\_RLW\\_CF%20Res%20RAC.pdf](http://www.puc.nh.gov/Electric/Monitoring%20and%20Evaluation%20Reports/National%20Grid/117_RLW_CF%20Res%20RAC.pdf))

### Faucet Aerators

Navigant used the draft Ohio TRM for energy and demand savings for this measure. The equation used in the draft Ohio TRM is similar to other reputable sources. Navigant verified the inputs used in the draft Ohio TRM. The inputs were gathered from the most recent reputable source or the changes were insignificant such as number of people per household.

$$\Delta \text{kW} = 0.003 \text{ kW}$$



## Hot Water Heater Insulation Wrap

### Equation A-5. Hot Water Heater Insulation Wrap Energy Savings

$$\Delta kWh = (GPD * 365.25 * \gamma_{Water} * (T_{OUT} - T_{IN})) / 3412 * (1/EF_{BASE} - 1/EF_{NEW})$$

**Table A-8. Key Impact Parameters for Hot Water Heater Insulation Wrap Energy Savings**

Parameter Description	Parameter	Mean Value	Source
Gallons Per Day of hot water use per household	GPD	50	Federal Register (a)
Specific weight of water pounds per gallon	$\gamma_{Water}$	8.33	Ohio TRM
Tank temperature	$T_{out}$	120°F	US DOE Building America Program (b)
Incoming water temperature from well or municipal system	$T_{in}$	54°F	US DOE Building America Program (b)
Assumed efficiency of electric tank with tank wrap installed	$EF_{new}$	0.88	Oak Ridge National Lab (c)
Assumed efficiency of electric tank without tank wrap installed	$EF_{base}$	0.86	Oak Ridge National Lab (c)

(a) Federal Register, Test Procedures for Water Heaters, Comments on "Test Conditions," [http://www1.eere.energy.gov/buildings/appliance\\_standards/residential/pdfs/wtrhtr.pdf](http://www1.eere.energy.gov/buildings/appliance_standards/residential/pdfs/wtrhtr.pdf)

(b) US DOE Building America Program. Building America Analysis Spreadsheet. [http://www1.eere.energy.gov/buildings/building\\_america/analysis\\_spreadsheets.html](http://www1.eere.energy.gov/buildings/building_america/analysis_spreadsheets.html).

(c) The Oak Ridge study predicted that wrapping a 40 gal water heater would increase Energy Factor of a 0.86 electric DHW tank by 0.02 (to 0.88);

"Meeting the Challenge: The Prospect of Achieving 30 percent Energy Savings Through the Weatherization Assistance Program" by the Oak Ridge National Laboratory - May 2002. [http://www.cee1.org/eval/db\\_pdf/309.pdf](http://www.cee1.org/eval/db_pdf/309.pdf)

### Equation A-6. Hot Water Heater Insulation Wrap Demand Savings

$$\Delta kW = \Delta kWh / \text{Hours of operation}$$

$$= 77.8 / 8760$$

$$= 0.0089 \text{ kW}$$

## Pipe Insulation

### Equation A-7. Pipe Insulation Energy Savings

$$\Delta kWh = ((1/R_{exist} - 1/R_{new}) * (L * C) * \Delta T * 8,760) / \eta_{DHW} / 3413$$



**Table A-9. Key Impact Parameters for Pipe Insulation**

Parameter Description	Parameter	Mean Value	Source
R-value of existing un-insulated piping	Rexist	R-1	Ohio TRM
R-value of existing pipe plus installed insulation	Rnew	R-6	Ohio TRM
Length of piping insulated (ft)	Length	5 ft	Program survey results
Circumference = Circumference of piping (ft)	Circumference	0.196 ft	Ohio TRM
Temperature difference between water in pipe and ambient air	$\Delta T$	56.5	NCDC - OH Climate Norms
Hours per year	HOURS	8760	Ohio TRM
DHW Recovery efficiency	$\eta_{DHW}$	0.98	Ohio TRM
In-service rate	ISR	1	On-site survey

**Equation A-8. Pipe Insulation Demand Savings**

$$\Delta kW = \Delta kWh / \text{Hours of operation}$$

$$= 120.85 / 8760$$

$$= 0.014 \text{ kW}$$

**Heat Pump Water Heaters**

The sources and definitions of key parameters for the water heater calculations are summarized Table A-10. These findings are from deemed demand savings report of the program year 2012 AEP Ohio Efficient products report.



**Table A-10. Key Parameters for Hot Water Heat Pumps**

Definition	Parameter	Mean Value	Source
Consumption Typical Water Heater	kWh <sub>std</sub>	3,460 kWh	DOE <sup>(a)</sup>
Space heating loss from conversion of heat in home to water heat	kWh <sub>heat</sub>	346.4 kWh	DOE, Energy Center of Wisconsin, EIA <sup>(b)</sup>
Cooling savings from conversion of heat in home to water heat	kWh <sub>cool</sub>	180 kWh	DOE and Energy Center of Wisconsin <sup>(c)</sup>
Efficiency – Energy-Efficient Unit	EF <sub>EE</sub>	2.38	Program tracking data and ENERGY STAR <sup>(d)</sup>
Efficiency – Standard Unit	EF <sub>std</sub>	0.9	DOE <sup>(e)</sup>
Unit Volume	Vol	50.5 gallons	ENERGY STAR <sup>(d)</sup>
Coincidence Factor	CF	0.275	2012 Participant Survey Data
Heat Pump Factor	HPF	0.67	2012 Participant Survey Data
Annual Load Hours	LH	2,533 hours	Mid-Atlantic TRM <sup>(f)</sup>
Conditioned Space Factor	CSF	0.65	2012 Participant Survey Data

<sup>a</sup> Assumption of 3,460 kWh taken from: Residential Water Heaters Technical Support Document for the January 17, 2001, Final Rule Table 9.3.9, p9-34, [http://www1.eere.energy.gov/buildings/appliance\\_standards/residential/pdfs/09.pdf](http://www1.eere.energy.gov/buildings/appliance_standards/residential/pdfs/09.pdf)

<sup>b</sup> Assumption of 1,577 kWh for electric home heating and 779 kWh for heat pump heating [http://www.eia.doe.gov/emeu/recs/recs2005/hc2005\\_tables/hc6airconditioningchar/pdf/tablehc12.6.pdf](http://www.eia.doe.gov/emeu/recs/recs2005/hc2005_tables/hc6airconditioningchar/pdf/tablehc12.6.pdf); applying the Discretionary Usage Adjustment of 0.75% (Based on Energy Center of Wisconsin, May 2008 metering study; “Central Air Conditioning in Wisconsin, A Compilation of Recent Field Research”, p31); adjusted for types of home heating in Ohio (<http://www.eia.gov/consumption/residential/data/2009/#undefined>)

<sup>c</sup> Assumption of 180 kWh determined by calculating the MMBtu removed from the air, as above, applying the REMRate determined percentage (45%) of lighting savings that result in increased heating loads, converting to kWh and dividing by efficiency of heating system (1.0 for electric resistance, 2.0 for heat pump).

<sup>d</sup> Energy Star Qualified Heat Pump Water Heaters, [http://www.energystar.gov/index.cfm?fuseaction=find\\_a\\_product.showProductGroup&pgw\\_code=WHH](http://www.energystar.gov/index.cfm?fuseaction=find_a_product.showProductGroup&pgw_code=WHH).

<sup>e</sup> DOE Buildings Energy Data Book Table 7.5.3 Efficiency Standards for Residential Water Heaters

<sup>f</sup> The Mid-Atlantic TRM from October 2010 uses this value of 2,533 full load hours for heat pump water heater savings; this value is based on an Efficiency Vermont load curve generated from Itron eShapes; [http://neep.org/uploads/EMV%20Forum/EMV%20Products/Mid%20Atlantic%20TRM\\_V1.1.pdf](http://neep.org/uploads/EMV%20Forum/EMV%20Products/Mid%20Atlantic%20TRM_V1.1.pdf)



Ex-post demand savings are based on the percent of units that are described by survey participants as being kept in heat pump mode and a per-unit demand savings constant. Unit demand savings in heat pump mode during the peak summer hours are assumed to be 0.17 kW.<sup>10</sup> The Heat Pump Factor (HPF) takes into account the portion of participants who stated that their heat pump water heater is in either heat pump or hybrid operating mode, and Units is a count of heat pump water heaters listed in the program-tracking database.

**Equation A-9. Heat Pump Water Heaters Demand Savings**

$$TDS = HPF \times Units \times (0.17kW)$$

---

<sup>10</sup> Specific peak hours are defined by the PJM, based on weather; the performance period is 2PM to 6PM on non-holiday weekdays between June 1 and August 31. Based on a chart showing summer weekday average electrical demand on page 10 of FEMP Study "Field Testing of Pre-Production Prototype Residential Heat Pump Water Heaters" ([http://www1.eere.energy.gov/femp/pdfs/tir\\_heatpump.pdf](http://www1.eere.energy.gov/femp/pdfs/tir_heatpump.pdf)). Using data points from the chart, the average delta kW in heat pump mode during the peak hours compared to resistance mode is 0.17kW.

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## APPENDIX G

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## ENERGY STAR® NEW HOMES PROGRAM

### Program Year 2012 Evaluation Report

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AEP Ohio



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## Executive

### *Program Description*

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. The program is performance-based, and builders are not required to install a list of prescriptive measures, but instead are expected to meet one of two performance levels.

Builders are provided with financial incentives to meet and exceed the ENERGY STAR Version 3 standards and to go beyond those levels by applying additional prescriptive requirements. A less stringent performance level ("Energy Path") was also offered in 2012 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 30–50 percent of the cost to upgrade and certify each home. In addition, builders are provided with personalized training on marketing ENERGY STAR homes to customers, the 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.

### *Key Impact Findings and Recommendations*

Navigant used calibrated building simulation modeling to verify energy and demand savings for the ENERGY STAR New Homes Program. A baseline new home model was created, along with a model for each performance path (ENERGY STAR/Energy Path). The annual energy and demand savings associated with each program home was calculated as the difference between the baseline and program home simulation results. Modeling results were applied to all projects in the database to determine program total *ex-post* savings.

The ENERGY STAR® Program reported *ex-ante* 2,177 MWh of energy savings and 0.616 MW of demand savings in 2012. The *ex-post* energy and demand savings for 2012 were 2,067 MWh and 0.620 MW. These savings fell short of the program goals of reducing energy usage by 3,535 MWh and peak demand by 1.18 MW, as shown in Table ES-1. The realization rates were 95 percent for energy savings and 101 percent for peak demand savings.

**Table ES-1. Overall Evaluation Results**

2012 Program Goals		2012 <i>Ex-Ante</i> Claimed Savings		2012 <i>Ex-Post</i> Savings		Realization Rates	
MWh	kW	MWh	kW	MWh	kW	MWh	kW
1,581	388	2,177	618	2,068	620	0.95	1.01

**Program cost-effectiveness:** Cost-effectiveness of the ENERGY STAR New Homes program was identified as a major concern in 2012. The program received a Total Resource Cost Test (TRC) result of 0.4, largely due to the high incremental participant cost of building an ENERGY STAR home, per kWh saved.

- **Conduct further research on the participant cost of program homes.** The incremental participant cost used in the TRC test was \$5,390 per home, which is based on a deemed estimate of the cost per square foot to meet program standards. MaGrann applies a cost of \$1.10-\$2.10 per square foot depending on the performance path achieved, resulting in an incremental cost ranging from \$1,000 to \$14,000 per home. The evaluation team does not support scaling participant costs based on house size and recommends further research. Using the EPA's estimate<sup>1</sup> of the costs of building to the ENERGY STAR standard in Ohio, the incremental cost per home would range between \$2,800-\$3,000. Applying this incremental cost to the cost-effectiveness tests results in a TRC of 0.7, illustrating the importance of accurate cost estimates.

### ***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 2011 evaluation found a need to increase incentive levels, improve QA/AC efforts and reduce incentive processing times. This evaluation found that all of these issues have been addressed to some degree in program year 2012 and improvements were made in each area.

**Effective program administration:** Most aspects of program administration and delivery were unchanged in 2012 aside from changes to performance pathways and incentive design. These changes were found to have been effective in maintaining program participation during the transition to

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<sup>1</sup>

[http://www.energystar.gov/ia/partners/bldrs\\_lenders\\_raters/downloads/Savings\\_and\\_Cost\\_Estimate\\_Summary.pdf](http://www.energystar.gov/ia/partners/bldrs_lenders_raters/downloads/Savings_and_Cost_Estimate_Summary.pdf)



ENERGY STAR Version 3, while decreasing HERS scores (a lower score indicates better performance) and increasing energy savings.

**Incentive processing time:** Program participants reported being very satisfied with most elements of the program. Incentives, marketing and training opportunities were reported by all respondents as being key benefits to participating in the program. Lower satisfaction was reported for incentive processing time, though builders reported increased satisfaction with incentive amounts compared to 2011.

**Data tracking and reporting:** Navigant found a significant discrepancy between the numbers of completed homes in AEP Ohio's tracking system (796) compared to the number reported in MaGrann's monthly reports (1138). This discrepancy is due to a disagreement over how to define homes as "complete." AEP Ohio considers a home to be complete once the incentive has been paid to the builder. MaGrann, however, considers the home to be complete once the home has been certified by the program and the incentive application approved for payment. Due to the fact that it takes two months, on average, for a builder to receive payment once the application has been approved, 342 projects approved by MaGrann at the end of 2012 were not included as "complete" in AEP Ohio's records during 2012.

- » **Align tracking and reporting systems.** In order to allow for consistency and accuracy in monitoring project completions and progress towards goals, MaGrann should adopt AEP Ohio's reporting criteria for designating projects as "complete" only when the incentive payment has been sent to the builder.
- » **Continue to improve rebate processing time.** The two month lag between application approval and incentive payment resulted in 342 projects and roughly 1,000 MWh of savings that could not be reported in 2012. Focus on efforts to streamline the incentive payment process once projects have been approved.

**Meeting program requirements:** The data tracking system was found to be well organized, comprehensive and streamlined, and all data needed for evaluation is being tracked. Quality assurance/quality control (QA/QC) processes appear to be well designed and effective, though some opportunities for improvement exist, as some homes were found to be non-compliant with some program requirements.

- » **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 2011. 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 give builders detailed guidance on how to meet program requirements.



**Incentives are the key to builder satisfaction and participation:** Interviews with builders found that incentives are the main benefit to participating in the program.

- » **Continue to optimize incentives levels based on HERS score:** Consider decreasing incentive amounts available for homes that achieve higher HERS scores (and therefore lower energy savings). This could encourage builders to pursue additional energy savings opportunities that increase the per-unit savings for each home, requiring fewer completions to meet program goals, while allowing for greater program participation within the incentive budget.
- » **Shift focus to other program assets:** Consider efforts to begin shifting the value proposition for the builder towards other program assets such as marketing support, training, and quality assurance. Consider additional marketing and outreach efforts on educating builders about long-term benefits of quality, efficient homes so they can more effectively generate consumer interest and sell energy-efficient homes to homebuyers.

**Marketing to prospective homebuyers:** Marketing materials are clear and effective, though builders surveyed indicated a desire for additional assistance from the program in marketing ENERGY STAR homes to prospective homebuyers. Effective marketing support for builders will become increasingly important as the program relies more on marketing efforts to generate program participation.

- » **Consider additional marketing efforts to drive participation:** Consider developing marketing materials that display more information regarding the business case for becoming an ENERGY STAR partner. A table or checklist could highlight the actual costs of becoming a partner (time, builder registration, paperwork) and particularly emphasize the myriad benefits (performance-based incentive payments, free marketing, referrals, fewer callbacks, improved reputation, free training, etc.). Comparing the costs and benefits of program participation side-by-side will highlight the fact that incentives are just one of many benefits to becoming a participating homebuilder. Further emphasis on the performance-based aspect of the incentive system could challenge builders to be the best in their industry to receive financial rewards commensurate with the quality of their work, and be recognized in the newsletter for their achievements. Promoting friendly competition between builders could perpetuate a “race to the top.” Consider offering awards for the most efficient new homes at annual meetings of program participants. Awards and recognition for builders will help participants distinguish themselves, providing a non-incentive value for program participation.

Consider including a more concrete analysis of the potential savings accrued as a resident of an ENERGY STAR home compared to a HERS 100 home. The current marketing materials state that a CFL could save \$70 over the life of the home, which is a good start, but similar metrics could be included by measure, or on a whole-house basis. While the builders receive the incentive payment from AEP Ohio, the true financial reward is captured by the homeowner throughout the duration of their residency. A table could be developed showing the estimated energy cost savings for a HERS 75, 65 (or average Energy Path), and 55 (or average ENERGY STAR) home when compared to a HERS 100 home, with expected homebuyer occupancy of 10, 20, and 30 years. This simple chart would certainly appeal to the investment mindset that all prospective



homebuyers undertake before making these consequential decisions. As more data on ENERGY STAR and Energy Path homes become available, these homes could be differentiated on the red and green visual HERS scale that is distributed to homeowners, rather than averaging the HERS of the typical program home. This data will help highlight the true energy consumption differences between the two types of program homes, and help homebuyers decide if the extra investment in ENERGY STAR is something they are willing to pursue.



## 1 Program Description and Theory

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

### 1.1 *Implementation Strategy*

#### 1.1.1 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 ally groups
- » Rater or rating company enrollment (Raters must show evidence of certification by a Residential Energy Services Network [RESNET]-accredited rating provider.)
- » Builder enrollment
- » 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 2012 focused on face-to-face meetings with builders through events and one-on-one meetings between program staff and selected building companies.

#### 1.1.2 Role of AEP Ohio Staff

The AEP Ohio staff person that oversees program administration is the Consumer Programs Coordinator. The AEP Ohio Consumer Programs Coordinator is responsible for management of both the ENERGY STAR® New Homes and the In-home Energy (retrofit) Programs. The Consumer Programs 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.

### **1.1.3 Roles of the Implementation Contractor**

MaGrann Associates (MaGrann) implement 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

## **1.2 Participation Levels and Incentives**

The program is performance-based, and builders are not required to install a list of prescriptive measures, but instead are expected to meet one of two performance levels, which are detailed in Table 1-2. 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.

The incentive design was re-structured in 2012 around a sliding scale based on the HERS rating achieved by the home. Higher incentive amounts were offered for a lower HERS score, which results in greater energy savings. The enrollment bonus offered at the end of 2011 also resulted in 340 projects that were completed in 2012 at 2011 performance levels (Levels 1 and 2). Table 1-1 presents a summary of each performance level offered through the program in 2012.

**Table 1-1. Technical Requirement for Program Homes**

Technical Requirement	Level 1	Level 2	Energy Path	ENERGY STAR
ENERGY STAR certified (version)	v2.0	v2.0	-	v3.0
Maximum HERS rating	85	65	-	-
ENERGY STAR Central A/C or Heat Pump	X	X	-	X
ENERGY STAR Central Heat	X	X	X	X
Ducts fully mastic and sealed or v3.0 compliant	X	X	X	X
Duct air leakage tested	-	-	X	X
HVAC installation compliant with v3.0 HVAC contractor checklist	X	X	X	X
Maximum 5.0 ACH50 building envelope air leakage	X	X	X	X
ENERGY STAR lighting (percent of total)	60%	80%	80%	80%
All ENERGY STAR appliances if supplied by builder	-	X	X	X

The program also collaborates with Columbia Gas to offer a simplified, consistent program offering across both territories. Incentive amounts were previously based on service territory, with reduced incentive amounts paid by AEP Ohio for homes heated by gas. Builders completed separate incentive application processes to receive each utility portion of the incentive. In 2012, both utilities adopted an identical incentive structure and removed the separate incentive levels based on utility service territory. Builders are now only required to submit one application to either utility, with incentives split by the utilities on the back-end. Table 1-2 presents incentive amounts based on HERS score and home type.

**Table 1-2. AEP Ohio ENERGY STAR® New Homes Participation Levels and Incentives**

HERS Score Incentive	0-50	51-55	56-60	61-65	66-70	71-75	76-80
ENERGY STAR Homes (Single-Family)	\$3,500	\$2,750	\$2,250	\$2,000	\$1,250	\$1,000	\$850
Energy Path Homes (Single-Family)	\$3,000	\$2,250	\$1,750	\$1,500	\$750	\$500	\$350
Multi-Single Family Homes	75% of single-family incentive amounts per unit						
Multifamily Homes	50% of single-family incentive amounts per unit						

### 1.3 Program Theory

This section contains the program theory, logic model, and performance indicators of the ENERGY STAR® New Homes Program. 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. ENERGY STAR® has been at the forefront of efforts to establish standards for what constitutes an energy-efficient home, and the program being implemented by AEP Ohio takes full advantage of the concepts and tools developed by ENERGY STAR®. Since the ENERGY STAR® Homes Program is a market transformation program; the program will periodically shift toward higher requirements to achieve increased efficiency over time.

### **1.3.1 Creation of the Logic Model**

Best practices for energy efficiency programs indicate that all programs should have a sound program plan and clearly articulated program theory. Figure 1-1 shows the program logic model drafted by the evaluation team, following program documentation review and program staff interviews. The goal of creating the logic model was to show the main programmatic activities AEP Ohio has in place, and the anticipated market outputs and outcomes. More importantly, the logic model identifies the key performance indicators appropriate for the ENERGY STAR® New Homes Program.

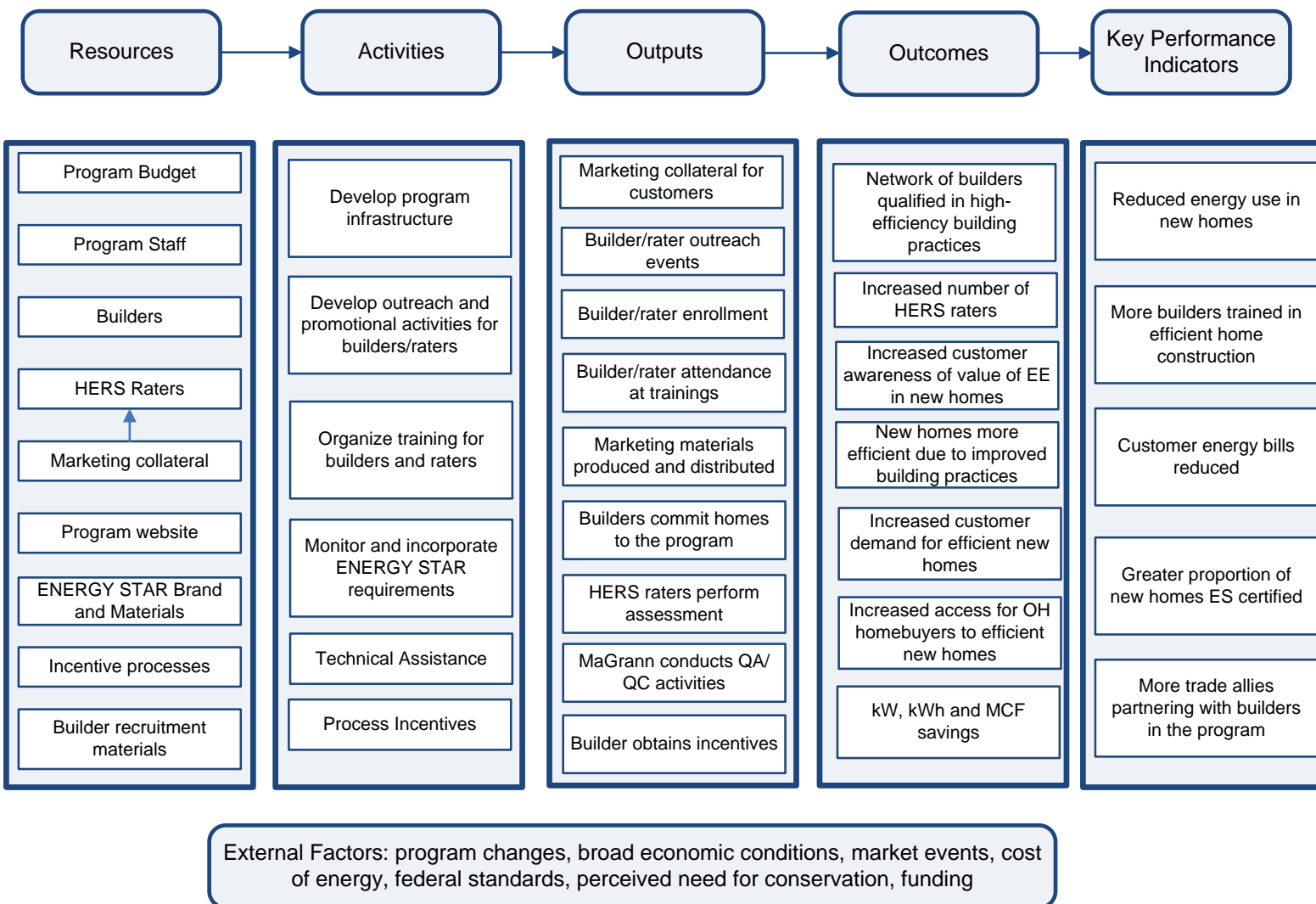
The logic model can be linked to key performance indicators to provide ongoing feedback to program management. The model flows from top to bottom and left to right, and is organized according to five basic categories:

- » Resources (Inputs)
- » Activities
- » Outputs
- » Outcomes
- » Key Performance Indicators

Stepping across the activities enumerated in the logic model indicates an approximate “flow” in the sequence of activities. The logic model starts with the program resources that support program activities that are expected to yield immediate outputs, and the short-term and long-term outcomes that are expected to have a series of impacts, including direct energy savings, and key performance indicators. The program theory links market and program outputs causally with the expected market and program short-term and long-term outcomes.



**Figure 1-1. AEP Ohio ENERGY STAR® New Homes Logic Model**





## 2 Evaluation Methods

This section describes the analytic methods and data collection activities implemented as part of the 2012 evaluation of the ENERGY STAR® New Homes Program, including an overview of data collection activities and analysis.

### 2.1 *Evaluation Objectives*

The three major objectives of this evaluation are to: (1) quantify energy and summer peak demand savings impacts from the program during 2012; (2) determine key process-related program strengths and weaknesses and identify ways in which the program can be improved and; (3) determine program cost-effectiveness.

### 2.2 *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 energy simulation modeling

### 2.3 *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 2012 evaluation plan with AEP Ohio staff and a review of the key outcomes of the 2011 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 2011 (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 develop calibrated building simulation models of baseline and program homes to measure program impacts.
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.



## **2.4 Evaluation Questions**

### **2.4.1 Impact Questions**

1. What are the level 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?

### **2.4.2 Process Questions**

#### **2.4.2.1 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?

#### **2.4.2.2 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. Should the budget allocation between incentive spending and marketing spending be adjusted to meet participation and savings goals?
  - c. 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?

#### **2.4.2.3 Market Progress**

1. What are the key market progress indicators for the program?
2. 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?
3. What are the key factors contributing to and/or limiting further penetration of the ENERGY STAR Homes program?



4. How does market penetration for the AEP Ohio's ENERGY STAR Homes program compare to similar programs around the country?

#### **2.4.2.4 Administration and Delivery**

1. Has the program as implemented changed from 2011? 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?

#### **2.4.2.5 Reporting**

1. Why do the Monthly Reports continue to report numbers that do not match the data base provided to AEP Ohio? How are the numbers derived?
2. How do the fields in the database translate to the categories in the report?

### **2.5 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 in-depth interviews with program staff and through telephone surveys with program participant builders who completed homes through the program in 2012.

Program staff members were interviewed by telephone in January and March, 2013. Each interview lasted roughly an hour and covered program design and implementation, marketing and promotion, and perceived barriers to participation. Table 2-1 provides a summary of the data collection activities conducted to support the process evaluation.

A telephone survey of ten program builders (attempted census) was conducted in March, 2013. The telephone survey addressed process related research objectives including marketing and promotion, customer satisfaction and suggestions for program improvement.

**Table 2-1. Data Collection Activities**

Data Collection Type	Targeted Population	Sample Frame	Sample Design	Sample Size	Timing
In-Depth Telephone Interviews	AEP Ohio Program Staff	Contacts from AEP Ohio	New Homes Program Coordinator	1	January, 2013
	Staff of Program Implementer	Contacts from McGrann Associates	Program Manager, Program Director	2	March, 2013
Participant Telephone Surveys	Participating Builders	Tracking Database	Random Sample of Program Participants	10	March, 2013

## 2.6 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
- » REM/Rate files submitted by Raters for completed homes

Program tracking data and REM/Rate files were used to determine 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, missing values, and potentially missing variables.

## 2.7 Building Simulation Modeling

Navigant used the BEopt<sup>TM2</sup> (Building Energy Optimization) software to calculate energy and demand savings. Models were created with an aggregate of home characteristics (wall construction, roof construction, window U-factors, window to wall area, etc.) derived from extracts of project REM/Rate files. Models were developed and calibrated to be within five percent of 2010-2011 AEP Ohio records for participants' annual electric consumption using lighting, appliance loads, home electronics loads, heating loads and cooling loads. The annual energy and demand savings associated with the program homes were calculated as the difference between the baseline and program simulation results. Peak demand savings from retrofit measures were extracted directly from the BEopt hourly simulation results during AEP Ohio's peak period

<sup>2</sup> See <http://beopt.nrel.gov/>.





## ***2.8 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 2012 were 2,177 MWh and 0.618 MW. These results fell short of the program goals of reducing energy usage by 3,535 MWh and peak demand by 1.18 MW in 2012.

##### 3.1.2 Ex-Ante Energy Savings

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

**Table 3-1. Total Ex-Ante Energy Savings**

	Level 1	Level 2	EPATH	ESTAR	Total
Average Savings/Unit (kWh)	1,914	2,642	2,950	3,407	--
Number of Units	109	231	428	28	796
Ex-Ante Energy Savings (MWh)	208.6	610.3	1,262.6	95.4	2,176.9

##### 3.1.3 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 energy savings.

**Table 3-2. Ex-Post Energy Savings**

	Level 1	Level 2	EPATH	ESTAR	Total
Average Savings / Unit (kWh)	1,881	2,505	2,787	3,248	--
Number of Units	109.0	231.0	428.0	28.0	796.0
Ex-Post Energy Savings (MWh)	205.1	578.7	1,192.9	91.0	2,067.6



### 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.

**Table 3-3. Ex-Ante Demand Savings**

	Level 1	Level 2	EPATH	ESTAR	Total
Average Savings / Unit (kW)	1.15	1.10	0.51	0.65	
Number of Units	109	231	428	28	796
<i>Ex-Post</i> Energy Savings (MW)	0.13	0.25	0.22	0.02	0.62

### 3.1.5 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 demand savings.

**Table 3-4. Ex-Post Coincident Demand Savings**

	Level 1	Level 2	EPATH	ESTAR	Total
Average Savings / Unit (kW)	0.60	0.72	0.83	1.18	
Number of Units	109.0	231.0	428.0	28.0	796.0
<i>Ex-Post</i> Energy Savings (MW)	0.06	0.17	0.36	0.03	0.62

### 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 2012. For energy savings, the realization rate is 95 percent and for demand savings, the realization rate is 101 percent.

**Table 3-5. PY 2012 Realization Rates**

2012 <i>Ex-Ante</i>		2012 <i>Ex-Post</i>		Realization Rates	
Claimed Savings		Savings			
MWh	MW	MWh	MW	MWh	MW
2,177	0.6	2,068	0.6	0.95	1.01



## 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

Ten 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 2012 for both the time required to certify a home and receive an incentive. Respondents reported a noteworthy increase in satisfaction with incentive amounts over 2011, likely due to the HERS based incentive scale. In some instances, survey respondents mentioned that the incentive application processes could be simplified and streamlined.

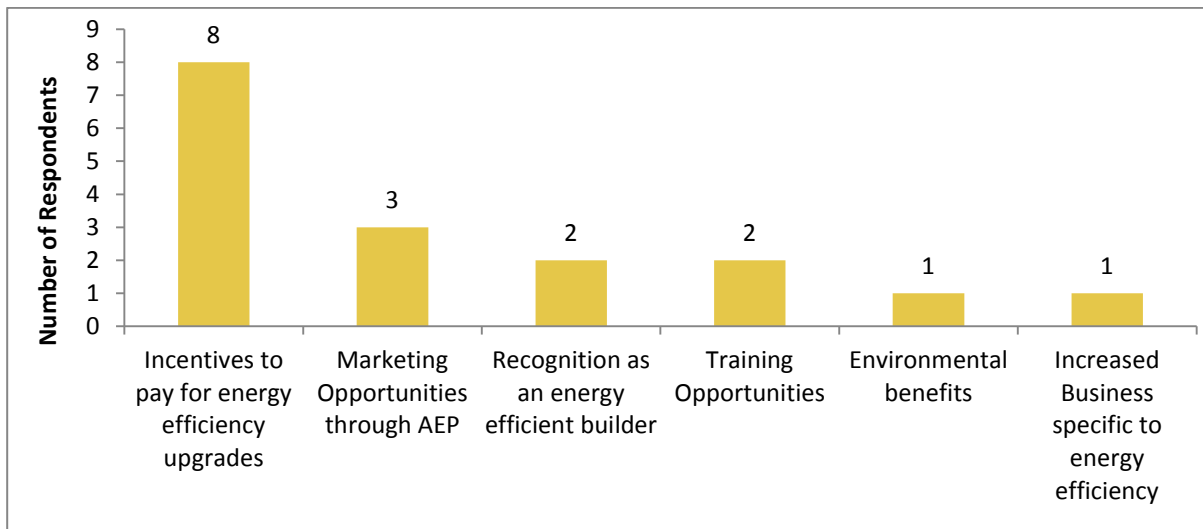
**Table 3-6. Mean Satisfaction Scores**

Program Aspect	Satisfaction Rating (Scale of 1 to 5)
	Mean
Time Required to Certify a Home	3.60
Raters who Qualify Homes	4.56
Overall Experience with ENERGY STAR® Homes Program	4.44
Site Submittal & Incentive Application Process	4.00
Incentive Amounts for Energy STAR Homes	4.37
Incentive Amounts for Energy PATH Homes	4.28
Time to Receive Incentive	2.40
Interaction with program staff	4.30

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 recognition as an energy efficient builder, marketing opportunities and training opportunities as benefits. Respondents were allowed to provide more than one response.



**Figure 3-1. Benefits of Participating (n=17)**



### 3.2.2 Program Delivery

#### ENERGY STAR® Version 3.0

Survey respondents were asked several questions geared at understanding any issues builders had adjusting to the ENERGY STAR® updates. Total Duct Leakage Requirements were most commonly reported by participants as the biggest complication resulting from the update to the new ENERGY STAR® Version 3.0. As shown in Table 3-7, increased stringency of requirements (i.e. R-values, efficiency levels, etc.) was also reported as a complication to the new version.

**Table 3-7. Complications Associated with Transition to ENERGY STAR® Version 3.0**

	Number of Respondents
Total Duct Leakage Requirements	4
Increased Stringency of Program Requirements	3
Training Required for Builders	1
No Issues/hurdles/complications with switching	1

When asked to identify the effect of the move to the new ENERGY STAR versions on 2012 program participation compared to 2011, six respondents indicated the same number of houses qualified, two indicated that more homes qualified, and one participant indicated that fewer homes qualified than in 2011. Eight out of ten builders responded that they planned to continue to build ENERGY STAR certified homes in the future, for as long as incentives remained available. The remaining two builders indicated that they would begin building ENERGY STAR homes again if the cost of materials decreased or when the program incentives increased.



Several new checklists are involved in ENERGY STAR® Versions 3.0. When asked to indicate how well they understand the checklist on a scale of 1 to 10 where 1 = “Do not understand” and 10 = “Completely understand”, builders reported an extremely high level of understanding, as shown in Table 3-8.

**Table 3-8. Level of Understanding of Program Checklists**

Checklist	Understanding
Thermal Enclosure System Rater	9.37
HVAC System Quality Installation Contractor	8.50
HVAC System Quality Installation Rate	8.37
Water Management System Builder	9.00

### **Program Resources and Training**

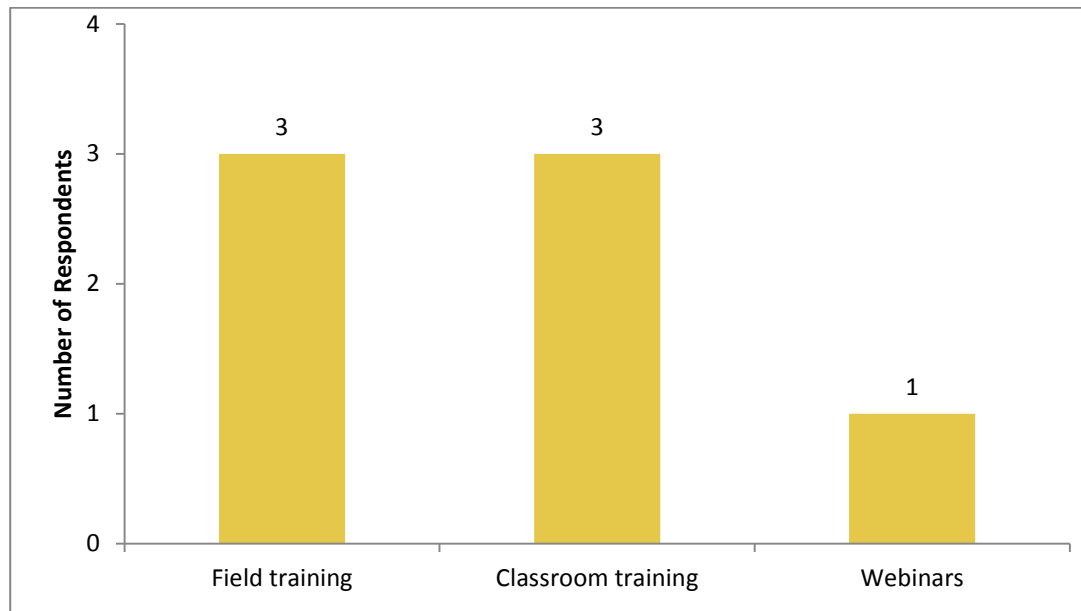
Participating builders worked with a MaGrann program manager or program staff from AEP Ohio. A high level of satisfaction was reported for these interactions, with three of ten builders reported that they were very satisfied, and the remaining seven reported being satisfied.

Respondents were very satisfied with the training on Version 3 requirements, but mentioned that regular emails about changes made to program requirements and actual on-site visits to see wall/ceiling insulation work would be beneficial.



AEP Ohio offered training opportunities for builders who were interested in participating in the program. Figure 3-2 indicates that builders feel a number of approaches would be helpful to provide training for Version 3.0. Field training and classroom training were the most commonly cited approaches. Only one respondent thought that a webinar was a good medium for training.

**Figure 3-2. Best Approaches to Provide Training for Version 3.0 (n=7)**



Training materials and sessions should continue to be a high priority for AEP Ohio. During implementation contractor interviews conducted by Navigant, the lack of technical skills among builders and/or their subcontractors was identified as a barrier to wider participation in the program, especially given the new ENERGY STAR requirements. Navigant conducted a review of the materials used to promote training sessions and found the materials were professional, concise, and informative. Offering the training sessions in a variety of locations and on a number of dates allows potential students to easily plan to attend the classes. The materials also do a great job of highlighting the specific audiences that will find each training most helpful. In the future, as marketing efforts continue to emphasize the non-incentive benefits of program participation, training sessions should be vigorously promoted in trade ally meetings, via email, and through the builder newsletter. Including testimonials from satisfied students on the training fliers would serve to increase participation among builders who have yet to experience an AEP Ohio training session.



### 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 3-9 illustrates that the number of ENERGY STAR® homes built by surveyed participants varied significantly, from builders who built fewer than ten ENERGY STAR® homes, to those who built over 100.

**Table 3-9. Number of ENERGY STAR® New Homes Built in 2011-2012**

Number of Homes	Number of Respondents
None <sup>a</sup>	2
1 to 10	3
10 to 50	4
50 to 100	1
over 100	1

<sup>a</sup> Builders who responded "none" only built Energy Path homes in 2011-2012

Builders were asked to report several building statistics related to all the homes built by their company in 2012. Table 3-10 shows that more than half of all the homes built by respondents in 2012 received ENERGY STAR certification through the program. Energy Path homes made up 32 percent of all homes built by respondents in 2012. Only eight percent of homes built by respondents were reported to have not met program standards. Six of the ten respondents indicated that they do not build ENERGY STAR® homes outside of the AEP Ohio program, the remaining four indicated that they do. A very small percentage of homes, one percent for ENERGY STAR homes and eight percent of Energy Path homes, met the standards but did not receive an incentive, according to the builders surveyed.

**Table 3-10. Participating Builders Home Statistics**

Builder Participation	Percent of all Homes Built by Company in 2012
Homes which received incentives through ENERGY STAR® Labeled Homes Program	53%
Energy Path certified homes that received incentives through the program	32%
Homes that met ENERGY STAR standards but did not receive an incentive	1%
Homes that met Energy Path standards but did not receive an incentive	6%
Homes that did not meet program standards	8%

There was a noteworthy range among builders about the additional cost of building an ENERGY STAR® home, which was reported to be between \$400 and \$10,000. Two builders reported that these costs have





increased significantly in the last few years, two indicated that costs have increased somewhat, five indicated that costs have stayed the same, and one indicated that costs have decreased somewhat.

Half of the ten respondents indicated that they would not have participated in the program had the Energy Path certification level not been available. Considering the fact that eight of those builders indicated they would build ENERGY STAR homes in the future, the Energy Path option appears to have been a successful strategy for moving builders towards ENERGY STAR, while maintaining program participation in the meantime.

### 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**

	Number of Respondents
<b>Number of general contractors working for firm</b>	
1 to 10	4
30 to 40	1
50 to 100	1
<b>Number of trades work for firm full time</b>	
0	3
1 to 10	4
<b>Company Annual Revenue</b>	
Less than \$250,000	2
Between \$500,000 and \$1,000,000	3
Above \$1,000,000	5
<b>Business Structure</b>	
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 2012 was below target in relation to the original forecast. The program enrolled 1,058 building projects in 2012, of which 796 were completed. New home enrollments for 2012 were down over the previous year (2,099), though the number of completions more than doubled over 2011 (376). Marketing efforts resulted in the enrollment of two new HERS raters and 18 new building companies during 2012. The program currently has 80 builders registered to participate in the program, though only 27 completed homes in 2012.



The dramatic increase in new home certifications was in part due to an end-of-year enrollment bonus offered in 2011. AEP Ohio offered a 25% incentive bonus for homes that were enrolled during the bonus period (December, 2011). The incentive bonus generated 15 new building companies and nearly 1,200 new home enrollments in the program, 340 of which were not completed until 2012.

Navigant found a significant discrepancy between the numbers of completed homes in AEP Ohio's tracking system (796) compared to the number reported in MaGrann's monthly reports (1138). This discrepancy is due to a disagreement over how to define homes as "complete." AEP Ohio considers a home to be complete once the incentive has been paid to the builder. MaGrann, however, considers the home to be complete once the home has been certified by the program and the incentive application approved for payment. Due to the fact that it takes two months, on average, for a builder to receive payment once the application has been approved, 342 projects approved by MaGrann at the end of 2012 were not included as "complete" in AEP Ohio's records during 2012.

### **3.2.6 Administration and Delivery**

In response to concerns expressed by AEP in 2011 about staffing levels for the program, MaGrann added a new staff member to oversee program management and communications in 2012. The addition of an Operations Manager has allowed the Program Manager to focus on developing and maintaining builder relationships. AEP Ohio program staff has noted improvements in MaGrann's communications and management of the program and are satisfied with staffing adjustments.

The only significant change to program delivery in 2012 was related to collaboration with Columbia Gas to offer a simplified, consistent program offering across both territories. Incentive amounts were previously based on service territory, with reduced incentive amounts paid by AEP Ohio for homes heated by gas. Builders completed separate incentive application processes to receive each utility's portion of the incentive.

In 2012, both utilities adopted an identical incentive structure, removing the separate incentive levels based on utility service territory. Builders are now only required to submit one application to either utility, which is split by the utilities on the back-end. While requiring additional communication to coordinate, this change resulted in a simplified application process for builders and a stronger collaborative relationship between AEP Ohio and Columbia Gas.

### **3.2.7 Implementation Challenges**

The major challenge for the program in 2012 was in dealing with the transition to the more stringent ENERGY STAR® Version 3. Program staff anticipated a decline in ENERGY STAR certifications and added a new participation option, called Energy Path, as a short-term alternative. ENERGY STAR certifications did drop off dramatically in 2012 though greater participation in the Energy Path option succeeded in retaining builder participation.

However, the Energy Path option also presented some difficulties. Some elements of Version 3 were included to push the market towards ENERGY STAR, such as a simplified version of the HVAC Quality



Installation Checklist. HVAC contractors, however, were not completing the checklist, which held up the application process. In response, program staff streamlined the incentive application, removing information that could be obtained from REM/rate files, and suspended the HVAC checklist until 2013. In the meantime, program staff is focusing education and outreach on HVAC contractors to bring them up to speed on program requirements.

### **3.2.8 Marketing and Promotion**

#### **Marketing to Homebuilders**

As in 2011, 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

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.). A new feature of 2012 marketing efforts includes a professional ENERGY STAR New Homes newsletter that is intended to increase builder awareness of the program and enhance the builders' relationship with Columbia Gas and AEP Ohio. 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.

While marketing materials mention the incentives, these are not prominent on many of the marketing tools. Since the incentives were mentioned by all respondents as a main benefit to participating, this should be featured on marketing materials more prominently to further increase the number of builders interested in participating in the program.

Other recommendations include displaying more information regarding the business case for becoming an ENERGY STAR partner. A table or checklist could highlight the actual costs of becoming a partner (time, builder registration, paperwork) and particularly emphasize the myriad benefits (performance-based incentive payments, free marketing, referrals, fewer callbacks, improved reputation, free training, etc.). Comparing the costs and benefits of program participation side-by-side will highlight the fact that incentives are just one of many benefits to becoming a participating homebuilder. Further emphasis on the performance-based aspect of the incentive system could challenge builders to be the best in their industry to receive financial rewards commensurate with the quality of their work, and be recognized in the newsletter for their achievements. Promoting friendly competition between builders could perpetuate a "race to the top." Consider offering awards for the most efficient new home at annual meetings of program participants. Finally, AEP Ohio can make an effort to demonstrate to builders that their marketing materials are helping to improve the overall new construction market in the AEP Ohio



service territory, and encourage contractors to save time and money by adopting AEP Ohio materials for their own marketing efforts.

### **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 catchy slogans 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.

**Table 3-12. Change in Level of Participation in Marketing and Promotion over 2011**

	Number of Respondents
Increased significantly	3
Increased somewhat	4
Stayed the same	1
Decreased somewhat	0
Decreased significantly	0

Most participants said that the ENERGY STAR® Logo in home windows/yard signs has been the most effective marketing and promotion method for ENERGY STAR® labeled homes as shown in Table 3-13.

**Table 3-13. Most Effective Marketing and Promotion Method**

	Number of Respondents
Energy star logo in home windows/yard signs	4
Print materials (brochures, newsletters, emails, etc.)	3
Web sites	3
Consumer education	1
Builders’ own knowledge and sales people’s ability to explain it to buyers	1
Other	4
Don’t know	1



Table 3-14 shows that most participants indicated that buyers have become more aware of ENERGY STAR and Energy Path certifications and are showing more interest in buying certified homes.

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

Builder Response	ENERGY STAR certified home	Energy Path certified home
Yes	5	3
No	1	2
Somewhat	2	1

Participant builders also believed that more support in marketing would help them sell their ENERGY STAR homes, whereas the opposite was true for Energy Path homes, as shown in Table 3-15. Participants said that additional marketing support could be provided in the form of more documented data that can be handed out to the consumer, and greater web presence to help consumers identify builders in the program, such as links on the program website to participating builders.

**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	5	1
No	3	6

Another recommendation is to include a more concrete analysis of the potential savings accrued as a resident of an ENERGY STAR home as compared to a HERS 100 home. The current marketing materials state that a CFL could save \$70 over the life of the home, which is a good start, but similar metrics could be included by measure, or on a whole-house basis. While the builders receive the incentive payment from AEP Ohio, the true financial reward is captured by the homeowner throughout the duration of their residency. A table could be put together showing the estimated energy cost savings for a HERS 75, 65 (or average Energy Path), and 55 (or average ENERGY STAR) home when compared to a HERS 100 home, with expected homebuyer occupancy of 10, 20, and 30 years. This simple chart would certainly appeal to the investment mindset that all prospective homebuyers undertake before making these consequential decisions. As more data on ENERGY STAR and Energy Path homes become available, these homes could be differentiated on the red and green visual HERS scale that is distributed to homeowners, rather than averaging the HERS of the typical program home. This data will help highlight the true energy consumption differences between the two types of program homes, and help homebuyers decide if the extra investment in ENERGY STAR is something they are willing to pursue.

### 3.2.9 Market Progress

Currently, MaGrann's market penetration analysis compares the number of new building permits issued by county to the number of project applications approved. This analysis results in a misrepresentation of



the program's market penetration for three 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. Finally, AEP Ohio does not consider a project to be complete until the invoice has been paid, though MaGrann considers a project complete when they approve the application. As a result, MaGrann's market penetration estimate includes a higher number of program homes.

Navigant conducted an independent assessment of the program's market penetration using data provided by AEP Ohio on new meters installed in single family new construction. Table 3-16 presents a comparison of MaGrann and Navigant's market penetration assessment. MaGrann's definition of a completed project results in a higher number of projects completed (1,138) than AEP Ohio's (796), though MaGrann's use of permit data results in a lower market penetration than Navigant's estimate using meter data.

**Table 3-16. Market Penetration Based on Projects Completed in 2012**

Description	MaGrann Estimate	Navigant Estimate
Number of projects completed	1,138	796
Number of new meters installed in new single family homes in 2012	7,350	4,106
Market penetration of the Residential New Construction Program	15%	19%

Table 3-17 shows a more detailed market penetration assessment looking at the contribution of homes at each individual performance pathway. As the results indicate, ENERGY STAR Version 3.0 homes contributed only 1% to the program's market penetration, with the remainder made up of Energy Path, and Level 1/2 homes contributed through 2011's enrollment bonus. For comparison, this analysis also shows the projected market penetration if all MaGrann's approved applications had been completed in 2012, by AEP Ohio's definition.

**Table 3-17. Market Penetration by Participation Pathway**

Participation Path	2012 Completed Units in Tracking Database	Market Penetration by Path	Estimated 2012 Units Approved by MaGrann <sup>a</sup>	Market Penetration by Path
ENERGY STAR Level 1	109	3%	156	4%
ENERGY STAR Level 2	231	6%	330	8%
ENERGY STAR v3	28	1%	40	1%
Subtotal ENERGY STAR	368	9%	526	13%
Energy Path	428	10%	612	15%
Total	796	19%	1,138	28%

<sup>a</sup> Navigant does not have actual counts of units approved by MaGrann at each path. Navigant estimated these counts by scaling up the completed units in the tracking database.

The ENERGY STAR New Homes program as a whole achieved a market penetration of 19 percent in 2012, though only nine percent penetration of ENERGY STAR certified homes. 2012 was a transitional year for the program as the Version 3 standard was introduced. The added cost and stringency of new program requirements resulted in a significant decline in ENERGY STAR certifications. Market penetration of ENERGY STAR homes may be improved through the following:

- » Improving rebate processing time so that all homes approved in the program year are completed and counted towards market penetration estimates.
- » 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.

### 3.2.10 Application and Payment Processing

The application and incentive payment processes remained unchanged in 2012. 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 101 days, ranging from two to 559 days. Once incentive forms were approved, the average duration for incentive payment was 55 days, ranging from 42 to 185 days. The average duration between project completion and incentive payment was therefore 156 days, which is a small improvement over the previous year's average cycle time of 174 days. The application submittal date was not included as a field in the tracking system, which would likely clarify this delay, as it appears to be due to delays in submitting forms and/or demonstrating compliance with all technical requirements.

As in 2011, 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 2.4 out of 5.

There was, however, a noteworthy decline in incentive processing time between the Levels 1 and 2 and the Energy Path/STAR performance paths. While the duration between application approval and incentive payment remained the same, the time between project completion and application approval was significantly less than 2011. This improvement was the result of simplifications to the incentive application so that builders were no longer required to fill out information that program staff could obtain from REM/rate files that are submitted.

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

Participation Level	Project Completion to Application Approval	App. Approval to Payment	Project Completion to Payment
Level 1	124	52	176
Level 2	127	56	183
Energy Path	82	56	138
ENERGY STAR	82	51	133

### 3.2.11 Quality Assurance/Quality Control

Quality Assurance/Quality Control (QA/QC) processes are well established and remain unchanged from 2011. 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. The only significant QA/QC issue identified during 2012 was related to the HVAC contractor checklists. The QA/QC process was successful in identifying issues of noncompliance with checklist requirements, though program staff believes that compliance will require further transformation of the HVAC market through education and outreach. In the meantime, HVAC requirements were reduced.

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, which is a significant improvement over 2011, though a few projects did not meet all the





technical requirements for the various participation levels. Table 3-19 summarizes 2012 projects that did not meet some technical requirements.

**Table 3-19. Review of ENERGY STAR® New Homes Technical Requirements**

Energy Path Technical Requirements	Navigant Observations
Maximum 5.0 ACH50 building envelope air leakage	2 projects did not meet requirement
HVAC installation compliant with program checklist included	235 projects did not meet requirement
ENERGY STAR, ASHRAE 62.2 compliant mechanical ventilation	2 projects did not meet requirement
<b>ENERGY STAR Technical Requirements</b>	
ENERGY STAR v3 checklists compliant	2 projects did not meet requirement
ENERGY STAR® Central A/C or Heat Pump	6 projects did not meet requirement
<b>Level 1 &amp; Level 2 Technical Requirements</b>	
ENERGY STAR® Central A/C or Heat Pump	63 projects did not meet this requirement
Maximum 5.0 ACH50 building envelope air leakage	4 projects did not meet requirement
ENERGY STAR, ASHRAE 62.2 compliant mechanical ventilation	115 projects did not meet requirement

The majority of the unmet requirements above were due to noncompliant Central A/C or mechanical ventilation. These issues were identified by staff through the QA/QC process and attributed to a few builders who had specified noncompliant mechanical system in a large number of projects. Program staff allowed a temporary exemption from these requirements though reduced incentive amounts offered for these projects. The builders have since come into compliance with these program requirements.

### 3.2.12 Tracking and Reporting

There were no major changes to the data tracking processes for the ENERGY STAR New Homes Program in 2012. 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 2012. This data was exported from the Vision tracking system and contained 128 fields and 796 unique project entries. REM/rate files for each project were reviewed by the Navigant team for missing information, outliers and compliance with program requirements. The tracking system was found to be



well organized and complete and all data needed for evaluation is being tracked. However, not all data needed by AEP Ohio for program monitoring and reporting are provided on a regular basis. AEP Ohio would like to see REM/rate outputs for each home in the data extract they are provided.

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.

AEP Ohio program staff has expressed some concern over discrepancies between the monthly reports and the Vision database. The monthly reports show higher numbers of completions and energy savings than the tracking extracts. This is due to differences in the way AEP Ohio and MaGrann define completed homes and delays in MaGrann's input of data into the tracking system. MaGrann considers a home to be complete once the application has been approved, QA completed and an invoice sent to AEP Ohio. AEP Ohio, however, does not consider a home to be complete until the check is sent, which takes an average of 60 days after application approval. Complicating this process is the fact that incentive checks are not issued to participants until both AEP Ohio and Columbia Gas have fulfilled their portions of the invoice, which occasionally face delay for various reasons.



## 4 Conclusions and Recommendations

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

### 4.1 Impact Findings

Navigant used calibrated building simulation modeling to verify energy and demand savings for the ENERGY STAR New Homes Program. A baseline new home model was created, along with a model for each performance path (ENERGY STAR/Energy Path). The annual energy and demand savings associated with each program home was calculated as the difference between the baseline and program home simulation results. Modeling results were applied to all projects in the database to get program total *ex-post* savings.

The ENERGY STAR® Program reported 2,177 MWh of energy savings and 0.616 MW of demand savings in Program Year 2012. The *ex-post* energy and demand savings for 2012 were 2,068 MWh and 0.620 MW. These savings fell short of the program goals of reducing energy usage by 3,535 MWh and peak demand by 1.18 MW, as shown in Table 4-1. The realization rates were 95 percent for energy savings and 101 percent for peak demand savings.

**Table 4-1. Overall Evaluation Results**

2012 Program Goals		2012 <i>Ex-Ante</i> Claimed Savings		2012 <i>Ex-Post</i> Savings		Realization Rates	
MWh	kW	MWh	kW	MWh	kW	MWh	kW
1,581	388	2,177	618	2,068	620	0.95	1.01



## 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.

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

Item	
Average Measure Life	25
Units	796
Annual Energy Savings (MWh)	2,068
Coincident Peak Savings (kW)	620
Third Party Implementation Costs	581,595
Utility Administration Costs	56,002
Utility Incentive Costs	1,395,601
Participant Contribution to Incremental Measure Costs	4,289,810

Based on these inputs, the TRC ratio is 0.4. Therefore, the program does not pass the TRC test. Table 4-3 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.

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

Test Results	
Total Resource Cost	0.4
Participant Cost Test	0.7
Ratepayer Impact Measure	0.5
Utility Cost Test	1.0

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.

The incremental participant cost used in the TRC test was \$5,390 per home, which is based on a deemed estimate of the cost per square foot to meet program standards. MaGrann applies a cost of \$1.10-\$2.10 per square foot depending on the performance path achieved, resulting in an incremental cost ranging from \$1,000 to \$14,000 per home. The evaluation team does not support scaling participant costs based on house size and recommends further research. Using the EPA's estimate<sup>3</sup> of the costs of building to the ENERGY STAR standard in Ohio, the incremental cost per home would range between \$2,800-\$3,000.

<sup>3</sup>

[http://www.energystar.gov/ia/partners/bldrs\\_lenders\\_raters/downloads/Savings\\_and\\_Cost\\_Estimate\\_Summary.pdf](http://www.energystar.gov/ia/partners/bldrs_lenders_raters/downloads/Savings_and_Cost_Estimate_Summary.pdf)



Applying this incremental cost to the cost-effectiveness tests results in a TRC of 0.7, illustrating the importance of accurate cost estimates.

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 2011 evaluation found a need to increase incentive levels, improve QA/AC efforts and reduce incentive processing times. This evaluation found that all of these issues have been addressed to some degree in program year 2012 and improvements were made in each area.

**Effective program administration:** Most aspects of program administration and delivery were unchanged in 2012 aside from changes to performance pathways and incentive design. These changes were found to have been effective in maintaining program participation during the transition to ENERGY STAR Version 3, while decreasing HERS scores (a lower score indicates better performance) and increasing energy savings.

**Incentive processing time:** Program participants reported being very satisfied with most elements of the program. Incentives, marketing and training opportunities were reported by all respondents as being key benefits to participating in the program. Lower satisfaction was reported for incentive processing time, though builders reported increased satisfaction with incentive amounts compared to 2011.

**Data tracking and reporting:** Navigant found a significant discrepancy between the numbers of completed homes in AEP Ohio's tracking system (796) compared to the number reported in MaGrann's monthly reports (1138). This discrepancy is due to a disagreement over how to define homes as "complete." AEP Ohio considers a home to be complete once the incentive has been paid to the builder. MaGrann, however, considers the home to be complete once the home has been certified by the program and the incentive application approved for payment. Due to the fact that it takes two months, on average, for a builder to receive payment once the application has been approved, 342 projects approved by MaGrann at the end of 2012 were not included as "complete" in AEP Ohio's records during 2012.

- » **Align tracking and reporting systems.** In order to allow for consistency and accuracy in monitoring project completions and progress towards goals, MaGrann should adopt AEP Ohio's reporting criteria for designating projects as "complete" only when the incentive payment has been sent to the builder.
- » **Continue to improve rebate processing time.** The two month lag between application approval and incentive payment resulted in 342 projects and roughly 1,000 MWh of savings that could not



be reported in 2012. Focus on efforts to streamline the incentive payment process one projects has been approved.

**Meeting program requirements:** The data tracking system was found to be well organized, comprehensive and streamlined, and all data needed for evaluation is being tracked. Quality assurance/quality control (QA/QC) processes appear to be well designed and effective, though some opportunities for improvement exist, as some homes were found to be non-compliant with some program requirements.

- » **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 2011. 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 give builders detailed guidance on how to meet program requirements.

**Incentives are key to builder satisfaction and participation:** Interviews with builders found that incentives are the main benefit to participating in the program.

- » **Continue to optimize incentives levels based on HERS score:** Consider decreasing incentive amounts available for homes that achieve higher HERS scores (and therefore lower energy savings). This could encourage builders to pursue additional energy savings opportunities that increase the per-unit savings for each home, requiring fewer completions to meet program goals, while allowing for greater program participation within the incentive budget.
- » **Shift focus to other program assets:** Consider efforts to begin shifting the value proposition for the builder towards other program assets such as marketing support, training, and quality assurance. Consider additional marketing and outreach efforts on educating builders about long-term benefits of quality, efficient homes so they can more effectively generate consumer interest and sell energy-efficient homes to homebuyers.

**Marketing to prospective homebuyers:** Marketing materials are clear and effective, though builders surveyed indicated a desire for additional assistance from the program in marketing ENERGY STAR homes to prospective homebuyers. Effective marketing support for builders will become increasingly important as the program relies more on marketing efforts to generate program participation.

- » **Consider additional marketing efforts to drive participation:** Consider developing marketing materials that display more information regarding the business case for becoming an ENERGY STAR partner. A table or checklist could highlight the actual costs of becoming a partner (time, builder registration, paperwork) and particularly emphasize the myriad benefits (performance-based incentive payments, free marketing, referrals, fewer callbacks, improved reputation, free training, etc.). Comparing the costs and benefits of program participation side-by-side will highlight the fact that incentives are just one of many benefits to becoming a participating homebuilder. Further emphasis on the performance-based aspect of the incentive system could



challenge builders to be the best in their industry to receive financial rewards commensurate with the quality of their work, and be recognized in the newsletter for their achievements. Promoting friendly competition between builders could perpetuate a “race to the top.” Consider offering awards for the most efficient new homes at annual meetings of program participants. Awards and recognition for builders will help participants distinguish themselves, providing a non-incentive value for program participation.

Consider including a more concrete analysis of the potential savings accrued as a resident of an ENERGY STAR home compared to a HERS 100 home. The current marketing materials state that a CFL could save \$70 over the life of the home, which is a good start, but similar metrics could be included by measure, or on a whole-house basis. While the builders receive the incentive payment from AEP Ohio, the true financial reward is captured by the homeowner throughout the duration of their residency. A table could be developed showing the estimated energy cost savings for a HERS 75, 65 (or average Energy Path), and 55 (or average ENERGY STAR) home when compared to a HERS 100 home, with expected homebuyer occupancy of 10, 20, and 30 years. This simple chart would certainly appeal to the investment mindset that all prospective homebuyers undertake before making these consequential decisions. As more data on ENERGY STAR and Energy Path homes become available, these homes could be differentiated on the red and green visual HERS scale that is distributed to homeowners, rather than averaging the HERS of the typical program home. This data will help highlight the true energy consumption differences between the two types of program homes, and help homebuyers decide if the extra investment in ENERGY STAR is something they are willing to pursue.



## Appendix A Data Collection Instruments

### *A.1 AEP Ohio ENERGY STAR New Homes Participant Builder Telephone Survey*

**INTRODUCTION.** Hello my name is \_\_\_\_\_ with the Blackstone Group and I'm calling on behalf of AEP Ohio. I understand that in 2012 you participated in the ENERGY STAR Homes Program. As a 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:

- Depending on your responses, the survey will take about 20 minutes to complete.
- Please be assured that this is a survey and in no way a sales call.
- All of your responses will be kept completely confidential.

#### **Screener**

S1. Did your company participate in AEP Ohio's ENERGY STAR New Homes program during 2012?

- 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

#### **ENERGY STAR Homes Activity**

INT4. I'd like to ask you about any recent ENERGY STAR homes construction activity that you may have had in Ohio.

Q.1 How many ENERGY STAR homes did your company build in 2012 in AEP Ohio's service area?

- 00. RECORD NUMERIC OPEN END \_\_\_\_\_
- 01. NONE
- 98. DON'T KNOW
- 99. REFUSED

Q.2 How many Energy Path homes did your company build in 2012 in AEP Ohio's service area?

- 00. RECORD NUMERIC OPEN END \_\_\_\_\_
- 01. NONE
- 98. DON'T KNOW
- 99. REFUSED

Q.3 Now I'd like you to think about all the homes your company built in 2012 in Ohio's service area. What percent of these homes were:





- A. ENERGY STAR certified homes that received incentives through the program? RECORD PERCENT \_\_\_\_\_ (98. DON'T KNOW, 99. REFUSED)
  - B. Energy Path certified homes that received incentives through the program RECORD PERCENT \_\_\_\_\_ (98. DON'T KNOW, 99. REFUSED)
  - C. Homes that met ENERGY STAR standards but did not receive an incentive? RECORD PERCENT \_\_\_\_\_ (98. DON'T KNOW, 99. REFUSED)
  - D. Homes that met Energy Path standards but did not receive an incentive (not including those that met ENERGY STAR standards)? RECORD PERCENT \_\_\_\_\_ (98. DON'T KNOW, 99. REFUSED)
  - E. Homes that did not meet program standards? RECORD PERCENT \_\_\_\_\_ (98. DON'T KNOW, 99. REFUSED)
- Q.4 Do you build ENERGY STAR homes outside of the AEP Ohio New Homes program?
- 01. YES
  - 02. NO
  - 98. REFUSED
  - 99. DON'T KNOW

[If Q.4 = Yes]

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

- 00. RECORD NUMERIC OPEN END \_\_\_\_\_
- 97. NONE
- 98. DON'T KNOW
- 99. REFUSED

#### **Program Awareness/Acceptance**

Q.5 How did you hear about AEP Ohio's ENERGY STAR Homes program? [DO NOT READ LIST. CHECK ALL THAT APPLY.]

- 01. TRADE SHOW
- 02. WEBSITE
- 03. EMAIL
- 04. MAIL
- 05. COWORKER/PROFESSIONAL COLLEAGUE
- 06. PROFESSIONAL NETWORKING EVENT
- 07. UTILITY COMPANY (GENERAL)
- 08. OTHER, SPECIFY \_\_\_\_\_
- 98. DON'T KNOW
- 99. REFUSED

[IF MULTIPLE SELECTED IN Q5, ASK Q6. ELSE AUTOPUNCH]

Q.6 Which resource most heavily influenced your decision to participate in AEP Ohio's ENERGY STAR Homes program? [READ LIST]

[INSERT RESPONSES FROM Q6 IN LOWER CASE. SINGLE PUNCH.]



98. DON'T KNOW

99. REFUSED

Q.7 What have been the key benefits of participating in the program? [DO NOT READ LIST. CHECK ALL THAT APPLY.]

01. TECHNICAL ASSISTANCE

02. INCENTIVES TO PAY FOR ENERGY EFFICIENCY UPGRADES

03. INCREASED BUSINESS (GENERAL)

04. INCREASED BUSINESS SPECIFIC TO ENERGY EFFICIENCY

05. MARKETING OPPORTUNITIES THROUGH AEP OHIO

06. RECOGNITION AS AN ENERGY EFFICIENT BUILDER

07. INCREASED PROFITS

08. REDUCED LIABILITY

09. INCREASED COMPANY RECOGNITION/ASSOCIATION WITH ENERGY STAR

10. NO BENEFITS (MAKE EXCLUSIVE)

97. OTHER, SPECIFY \_\_\_\_\_

98. DON'T KNOW

99. REFUSED

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

Q.8 Which benefit do you see as the highest value to your organization?

[INSERT ANSWERS FROM Q7]

98. DON'T KNOW

99. REFUSED

[ASK IF Q2>0]

Q.9 Do you think you would have participated in the program in 2012 if the Energy Path certification level had not been available?

01. YES

02. NO

98. REFUSED

99. DON'T KNOW

Q.10 Thinking about your overall experience with the ENERGY STAR Homes program, on a scale of 1 to 5, where 1 is Extremely Dissatisfied, and 5 is Extremely Satisfied, please rate your overall satisfaction with the program.

01. EXTREMELY DISSATISFIED

02.

03.

04.

05. EXTREMELY SATISFIED

98. DON'T KNOW

99. REFUSED



[ASK IF Q10 < 2]

Q10a. Why did you not give your experience with the overall program a higher rating? [OPEN END]

98. DON'T KNOW

99. REFUSED

Q.11. 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 Extremely Dissatisfied, and 5 is Extremely Satisfied, please rate your overall satisfaction with the ENERGY STAR raters who inspected your homes.

01. EXTREMELY DISSATISFIED

02.

03.

04.

05. EXTREMELY SATISFIED

98. DON'T KNOW

99. REFUSED

[ASK IF Q11 < 2]

Q11a. Why did you not give your satisfaction with the ENERGY STAR raters a higher rating? [OPEN END]

98. DON'T KNOW

99. REFUSED

### **Program Changes**

INT5. Now I would like to ask you some questions about changes to program requirements and incentive levels.

Q12. What has been the biggest hurdle or complication, if any, resulting from changing to the new ENERGY STAR Version 3.0 requirements? [DO NOT READ LIST. CHECK ALL THAT APPLY.]

1. INCREASED STRINGENCY (GENERAL)

2. ADDITIONAL CHECKLIST REQUIREMENTS

3. TOTAL DUCT LEAKAGE REQUIREMENTS

4. INCREASED FIRST COSTS

5. INCREASED FIRST COSTS FOR ITEMS THAT DO NOT IMPACT HERS RATING

6. VARYING HERS TARGETS BASED ON PARTICULAR HOME SPECIFICATIONS

7. UNCERTAINTY ASSOCIATED WITH VARYING HERS TARGETS

8. TRAINING REQUIRED FOR STAFF

9. TRAINING REQUIRED FOR BUILDERS

10. UNFAMILIARITY WITH NEW REQUIREMENTS AMONG BUILDERS

11. UNFAMILIARITY WITH NEW REQUIREMENTS AMONG RATERS

12. UNFAMILIARITY WITH NEW REQUIREMENTS AMONG SUBCONTRACTORS

97. NO ISSUES/HURDLES/COMPLICATIONS WITH SWITCHING (MAKE EXCLUSIVE)

98. REFUSED

99. DON'T KNOW



Q13. Since the ENERGY STAR standard changed, has the number of homes you qualify for ENERGY STAR changed?

- 01. YES
- 02. NO (SKIP TO Q14)
- 98. REFUSED (SKIP TO Q14)
- 99. DON'T KNOW (SKIP TO Q14)

Q13A. How has it changed? (DO NOT READ LIST, CHECK ALL THAT APPLY)

- 1. MORE QUALIFIED/MORE PARTICIPATION
- 2. LESS QUALIFIED/LESS PARTICIPATION
- 3. I STOPPED CERTIFYING ENERGY STAR HOMES
- 4. SAME NUMBER OF HOMES COMPARED TO 2011/SAME LEVEL OF PARTICIPATION
- 98. DON'T KNOW
- 99. REFUSED

Q14. Do you anticipate building ENERGY STAR certified homes again in the future?

- 1. YES
- 2. NO
- 98. REFUSED
- 99. DON'T KNOW

Q15. What would it take for you to start building ENERGY STAR certified homes again in the future?  
[OPEN END]

- 98. DON'T KNOW
- 99. REFUSED

Q16. Regarding the new checklists associated with ENERGY STAR Version 3.0, on a scale of 1 to 10 where 1 is Do Not Understand at all and 10 is Completely Understand, please rate how well you understand the following checklists: (READ LIST)

[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

01. DO NOT UNDERSTAND AT ALL

- 02.
- 03.
- 04.
- 05.
- 06.
- 07.
- 08.
- 09.



- 10. COMPLETELY UNDERSTAND
- 98. DON'T KNOW
- 99. REFUSED

#### **ENERGY STAR Rebate Payment and Certification Process**

[ASK IF Q1>0]

Q17. On a scale of 1 to 5, where 1 is Extremely Dissatisfied, and 5 is Extremely Satisfied, please rate your overall satisfaction with the rebate amounts for the ENERGY STAR Homes.

- 01. EXTREMELY DISSATISFIED
  - 02.
  - 03.
  - 04.
  - 05. EXTREMELY SATISFIED
  - 98. DON'T KNOW
  - 99. REFUSED
- [ASK IF Q2>0]

Q18. On a scale of 1 to 5, where 1 is Extremely Dissatisfied, and 5 is Extremely Satisfied, please rate your overall satisfaction with the rebate amounts for the Energy Path Homes.

- 01. EXTREMELY DISSATISFIED
- 02.
- 03.
- 04.
- 05. EXTREMELY SATISFIED
- 98. DON'T KNOW
- 99. REFUSED

[ASK IF Q1 or Q2 > 0]

Q19. On a scale of 1 to 5, where 1 is Extremely Dissatisfied, and 5 is Extremely Satisfied, please rate your overall satisfaction with the time it takes to receive rebates for the program in general.

- 01. EXTREMELY DISSATISFIED
- 02.
- 03.
- 04.
- 05. EXTREMELY SATISFIED
- 98. DON'T KNOW
- 99. REFUSED

Q20. On a scale of 1 to 5, where 1 is Extremely Dissatisfied, and 5 is Extremely Satisfied, please rate your overall satisfaction with the Site Submittal and Incentive Application process.

- 01. EXTREMELY DISSATISFIED
- 02.
- 03.



- 04.
- 05. EXTREMELY SATISFIED
- 98. DON'T KNOW
- 99. REFUSED

[ASK IF Q20 < 3]

Q20a. Why did you not give a higher rating?

- 00. RECORD OPEN END \_\_\_\_\_
- 98. DON'T KNOW
- 99. REFUSED

Q21. On a scale of 1 to 5, where 1 is Extremely Dissatisfied, and 5 is Extremely Satisfied, please rate your overall satisfaction with the time it take to certify a home through the program.

- 01. EXTREMELY DISSATISFIED
- 02.
- 03.
- 04.
- 05. EXTREMELY SATISFIED
- 98. DON'T KNOW
- 99. REFUSED

### **Utility Resources and Training**

Q22. How satisfied were you with the program manager and/or any other program staff you worked with or had contact with because of participating in the program? Would you say you are...? (READ LIST)

- 01. Very dissatisfied
- 02. Somewhat Dissatisfied
- 03. Neither satisfied nor dissatisfied
- 04. Somewhat Satisfied
- 05. Very satisfied
- 98. DON'T KNOW
- 99. REFUSED

Q22a. [ASK IF Q22=1 OR 2] Why were you dissatisfied with the program manager and/or any other program staff you worked with or had contact with?

- 00. RECORD OPEN END \_\_\_\_\_
- 98. DON'T KNOW
- 99. REFUSED

Q23. Have you ever participated or attended any of the trainings offered though the ENERGY STAR New Homes Program?

- 1. YES
- 2. NO



98. DON'T KNOW

99. REFUSED

Q24. What additional training, if any, would you like to have to be sure you can meet program requirements in 2013?

00. RECORD OPEN END \_\_\_\_\_

98. DON'T KNOW

99. REFUSED

Q25. What do you think are the best approaches for providing builders the training they need to meet program requirements? (CHECK ALL THAT APPLY.) (DO NOT READ LIST)

1. CLASSROOM TRAINING
2. FIELD TRAINING
3. WEBINARS
4. HAVING TAPES OF TRAINING AVAILABLE ON THE PROGRAM'S WEBSITE
5. HARD COPY TRAINING MANUALS
6. REAL TIME BLOG ON THE INTERNET OF A VERSION 3 HOME BEING BUILT FROM SCRATCH
7. DIFFERENT LEVELS OF TRAINING FOR BUILDERS WITH DIFFERENT LEVELS OF EXPERIENCE
8. OTHER

98. DON'T KNOW

99. REFUSED

### **ENERGY STAR Marketing**

[ASK IF Q1>0, OTHERWISE SKIP TO NEXT SECTION]

Q26. During the last few years, has your marketing and promotion of ENERGY STAR homes...?: (READ LIST)

1. Increased significantly
2. Increased somewhat
3. Stayed the same
4. Decreased somewhat
5. Decreased significantly

98. DON'T KNOW

99. REFUSED

[ASK Q.27 IF Q.26 = 1, 2, or 3]

Q27. What have been the most effective marketing and promotion activities for ENERGY STAR labeled homes? [DO NOT READ. CHECK ALL THAT APPLY.]

1. TV ADS
2. PRINT ADS SHOWING ENERGY STAR LOGO
3. RADIO ADS
4. WEB SITES



5. LABEL RECOGNITION
6. CONSUMER EDUCATION
7. HOME SHOWS/BUILDER SHOWS
8. ENERGY STAR LOGO IN HOME WINDOWS/YARD SIGNS
9. OPEN HOUSES/MODEL HOMES
10. REALTOR ADVERTISING
11. REBATES/INCENTIVES
12. WORD OF MOUTH
13. KNOWLEDGE OF THE RESULTING ENERGY EFFICIENCY AND INDOOR AIR QUALITY IMPROVEMENTS
14. BUILDERS' OWN KNOWLEDGE AND SALES PEOPLE'S ABILITY TO EXPLAIN IT TO BUYERS
15. PROGRAM'S AGGRESSIVE PUSHING OF BUILDERS TO DO IT
97. OTHER (SPECIFY): \_\_\_\_\_
98. DON'T KNOW
99. REFUSED

Q28. 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? Would you say it is...? (READ LIST)

1. Very important
2. Somewhat important
3. Neither important or unimportant
4. Not too important
5. Not at all important
98. DON'T KNOW
99. REFUSED

Q29. Are buyers showing more awareness of and/or interest in energy efficiency?

1. YES
2. NO
3. SOMEWHAT
98. DON'T KNOW
99. REFUSED

Q30. Are buyers showing more awareness of and/or interest in buying an ENERGY STAR certified home?

1. YES
2. NO
3. SOMEWHAT
98. DON'T KNOW
99. REFUSED

Q31. Do you think additional marketing support would help you sell your ENERGY STAR homes?





- 1. YES
- 2. NO
- 98. DON'T KNOW
- 99. REFUSED

Q31a. [ASK IF Q31=YES] Can you think of some examples of how you envision doing that?

00. RECORD OPEN END \_\_\_\_\_

- 98. DON'T KNOW
- 99. REFUSED

### **Energy Path Marketing**

[ASK IF Q2>0, otherwise skip to next section/Q35]

Q32. How 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? Would you say it is...? (READ LIST)

- 1. Very valuable
- 2. Somewhat valuable
- 3. Neither valuable or invaluable
- 4. Not too valuable
- 5. Not at all valuable
- 98. DON'T KNOW
- 99. REFUSED

Q33. Are buyers showing recognition of and/or interest in Energy Path Homes?

- 1. YES
- 2. NO
- 3. SOMEWHAT
- 98. DON'T KNOW
- 99. REFUSED

Q34. Do you think additional marketing support would help you sell your Energy Path homes?

- 1. YES
- 2. NO
- 98. DON'T KNOW
- 99. REFUSED

Q34a. [ASK IF Q34=YES] Can you think of some examples of how you envision doing that?

00. RECORD OPEN END \_\_\_\_\_

- 98. DON'T KNOW
- 99. REFUSED

### **Construction Activity and Cost**

INT4. Now I'd like to ask you about any recent home construction activity that you may have had.



Q35. On average, about how much more or less would you say it cost to build an ENERGY STAR Labeled Home versus a standard efficiency 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.

00. \$ \_\_\_\_\_ (RECORD DOLLAR AMOUNT)

98. DON'T KNOW

99. REFUSED

Q36. 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. Increased significantly
2. Increased somewhat
3. Stayed the same
4. Decreased somewhat
5. Decreased significantly

98. DON'T KNOW

99. REFUSED

[ASK Q.37 IF Q.36 = 1, 2, 4 or 5]

Q37. To what do you attribute this change? [DO NOT READ. CHECK ALL THAT APPLY.]

[IF INCREASE (Q36=1 OR 2): REASONS 1–6, 11, 12 AND 98, 99 SHOULD SHOW ON THE SCREEN.]

[IF DECREASE (Q36=3 OR 4): REASONS 7–11, 12 AND 98, 99 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): \_\_\_\_\_

98. DON'T KNOW

99. REFUSED

## Demographics

INT7. Now I have just a few categorization questions to ask and we'll be finished.



Q38. How many licensed general contractors work for your firm?

00. RECORD NUMERIC OPEN END \_\_\_\_\_

98. DON'T KNOW

99. REFUSED

Q39. How many tradesmen work for your firm full time?

00. RECORD NUMERIC OPEN END \_\_\_\_\_

98. DON'T KNOW

99. REFUSED

Q40. Would you say your company's annual revenue is...? [SINGLE PUNCH]

1. Less than \$250,000

2. Between \$250,000 and \$500,000

3. Between \$500,000 and \$1,000,000

4. Above \$1,000,000

98. DON'T KNOW

99. REFUSED

Q41. What specialties and trades do you employ full time (IF NEEDED: This refers to non-subcontractors)? [MULTIPUNCH] (DO NOT READ LIST)

1. CONSTRUCTION (GENERAL)

2. ELECTRICIANS

3. PLUMBERS

4. HVAC TECHNICIANS

5. ENERGY EFFICIENCY TECHNICIANS

6. OTHER, SPECIFY ~~~~~

7. NONE (MAKE EXCLUSIVE)

98. DON'T KNOW

99. REFUSED

Q42. How is your business structured? Are you a... [SINGLE PUNCH] (READ LIST)

1. A nationally affiliated organization

2. Privately owned and local at one location

3. Privately owned and at several locations

4. OTHER, SPECIFY \_\_\_\_\_

98. DON'T KNOW

99. REFUSED

Q43. Do you perform any commercial work? [SINGLE PUNCH]

1. YES

2. NO

98. DON'T KNOW

99. REFUSED

Q44. [If Q43 = Yes] What percent of your total work is commercial?



00. RECORD NUMERIC OPEN END \_\_\_\_\_

98. DON'T KNOW

99. REFUSED

**Closing**

Those are all the questions I have for you! Thank you for your time and participation!.

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## APPENDIX H

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## HOME ENERGY REPORTS PROGRAM

### Program Year 2012 Evaluation Report

Prepared for:  
AEP Ohio



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## Executive Summary

This document summarizes the 2012 evaluation of AEP Ohio's Home Energy Reports (HER) Program.<sup>1</sup> The program has been running since August 2010, making the 2012 program year the second full year in which the program was in operation. This report is the second annual impact evaluation of the program. It includes estimates of electric energy savings, demand savings, participant<sup>2</sup> engagement and satisfaction findings, and recommendations based on the impact and process evaluations conducted by Navigant.

### *Program Overview*

Classified as an "indirect feedback" program<sup>3</sup>, 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. Participants are enrolled on an opt-out basis in the energy efficiency service operated and delivered by Opower Inc., the program implementation subcontractor. 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).
- » Lower-income households (*abbreviated as* LI), enrolled in a State of Ohio program called Percentage of Income Payment Plan (PIPP).
- » Customer residences equipped with Advanced Metering Infrastructure (*abbreviated as* AMI).

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 the two groups of "similar homes"
- » 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

Access to participant information and more relevant tips is also available through an Internet web portal available to the participant even if they opt-out of the mailed reports.

<sup>1</sup> Also known as a Behavior Modification Program.

<sup>2</sup> *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).

<sup>3</sup> "The State of the Utility Bill" by Ben Foster and Elana Alschuler, ACEEE Report Number B111, November 11, 2011.



## ***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 and cohorts
- » 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 2012 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. This 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 397 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 compared specific participant results with those of a group of 120 control customers to see whether the actions of participants differ from a typical AEP Ohio residential customer and to understand whether participant satisfaction with AEP Ohio differs from non-participant customers. The sample included customers from three sub groups: 1) high energy users (HU), 2) low income (LI) customers, and 3) customers within the AEP Ohio's AMI program. Additionally, treatment customers were chosen from both the original program participants that were enrolled in August 2010 and the second program cohort that was enrolled in November 2011. Navigant compared responses from these various sub-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 staff to develop the research objectives, survey guides, and analysis process.

**Table ES-1. Data Collection Activities for Impact & Process**

Data Collection Type	Targeted Population	Sample Design	Sample Size	Timing
Billing Data	Participant and control customers	N/A	Attempted program census	Mar 2013 – Apr 2013
In-depth interview	AEP Ohio Program Coordinator	Continued contact as needed	1	Aug 2012-Apr 2013
CATI Surveys	Participant and control customers	Random sample of subgroups. Conducted by Blackstone Survey Group.	Participants = 397 Control = 120	Apr 2013

## Key Findings and Recommendations

### Impact Results

The Home Energy Report Program reported 53,174 MWh of energy savings and 6,913 kW of demand savings in 2012. The verified (*ex-post*) energy and demand savings for 2012 for the HU and LI customers combined were 63,243 MWh and 8,222 kW respectively. Both of these estimates exceeded the *ex-ante* savings values, resulting in a realization rate of 1.19 for both energy and demand savings. A comparison of *ex-ante* and *ex-post* HER Program savings are shown in Table ES-2

**Table ES-2. 2012 Overall Evaluation Results**

	2012 <i>Ex-ante</i> Claimed Savings (a)		2012 <i>Ex-post</i> Savings (b)		2012 Realization Rate = (a) / (b)	
	MWh	kW	MWh	kW	MWh	kW
Combined HU and LI Customers	53,174	6,913	63,243	8,222	1.19	1.19

Source: Navigant Analysis

AMI customers, not included in the above *ex-ante* and *ex-post* calculations, are estimated to have provided an additional 8,101 MWh energy savings and 1,053 kW of peak demand savings. Across all three customer groups (HU, LI, and AMI customers combined), Navigant estimates that the HER Program saved 71,344 MWh and 9,275 kW during the 2012 program year.

- » High-use customers accounted for a total of 60,535 MWh of energy savings, corresponding to 7,870 kW of peak demand savings.
- » Low-income customers accounted for 2,708 MWh of energy savings, corresponding to 352 kW of peak demand savings.
- » AMI customers accounted for 8,101 MWh of energy savings, corresponding to 1,053 kW of peak demand savings.



Detailed impact results for each customer group participating in the HER program are provided in Table ES-3.

**Table ES-3. Estimated Program Savings by Participant Type**

	HU - 2 <sup>nd</sup> Year	HU - 1 <sup>st</sup> Year	LI	AMI	TOTAL
Estimated Average Daily Household kWh Used	55.14	74.55	39.35	30.24	49.82
Estimated Percentage Savings (standard error)	2.19% (0.37%)	2.35% (0.98%)	1.25% (0.42%)	1.60% (0.29%)	1.99%
Estimated Daily kWh Savings per participant (standard error)	1.21 (0.21)	1.75 (0.73)	0.49 (0.17)	0.48 (0.09)	1.03
Estimated Annual kWh Savings per participant (standard error)	442 (75)	640 (267)	179 (61)	177 (32)	377
Estimated Total MWh Savings* (standard error)	48,240 (8,246)	12,573 (5,239)	2,741 (929)	8,201 (1,483)	71,755
Savings Counted in Other Programs†	236	42	33	100	411
Total Savings (MWh)	48,004	12,531	2,708	8,101	71,344
Total Savings (kW)	6,241	1,629	352	1,053	9,275

Source: Navigant analysis

\* 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 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, both on an absolute basis and a percentage basis. Though AMI customers saved roughly the same amount of energy as LI customers, this represented a higher percentage of household energy use due to the lower average household energy use of AMI customers. However, both groups generated less than 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.

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 the geographic location or 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. This approach ensures that energy savings from another AEP Ohio EE/PDR program is not counted again in the HER Program. The results of this program uptake analysis are shown in Table ES-4.

**Table ES-4. Double Counted Savings from Program Uptake Due to HER Program**

	Appliance Recycling	Efficient Products	In-Home Audit	Total
Increase in other Program Participation due to HER Program (Number of Participants)	213	209	265	687
Average Savings per Program Participant in these Other Programs (kWh)	1,019	250	536	598
Total HER Savings Also Included in Other Programs (MWh) (savings*#participants)	217	52	142	411

Source: Navigant analysis

The analysis determined that an estimated 411 MWh, or 0.57 percent, of the evaluated savings from the HER program was also counted in the savings calculated for other AEP EE/PDR programs.

### Process Results

Overall, participants reported being satisfied with the HERs; the majority (61%) of respondents reporting a positive level of satisfaction. Survey responses imply that the HER Program may have a positive impact on general customer satisfaction. Participants reported a slightly higher rate of satisfaction compared to non-participants, however, there did not appear to be a statistically significant difference in satisfaction between the two groups.

Survey respondents indicated that the Home Energy Reports are memorable and that they spend time thoroughly reading these. A high percentage of participants remember receiving the HERs (94%). A similarly high percentage of those that recall receiving the HERs reported that someone in their home reads the report (97%). Seventy-three percent reported spending an average of more than two minutes reading the HERs.

Participants most often reported purchasing small energy efficiency devices and making changes to how they use energy, and they did so at a significantly higher rate than 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 HER Program and higher rates of energy efficiency behaviors and small purchases.

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 larger proportion of respondents remember the comparisons than remember the tips.



As in past evaluation years, respondents reported a low level of confidence in the accuracy of the comparisons to energy use in similar homes. Only 37 percent of those that recall the comparisons reported believing their accuracy.

As expected, a small share of respondents reported being aware of the HER web site; only 18 percent of those that read the reports said they were aware of the web site, and only 5 percent of all respondents reported visiting the web site.

### **Recommendations**

- » AEP Ohio should consider a persistence study in the near future to determine if a measure lifetime different than one year is appropriate for a Home Energy Report.
- » Continue the HER Program as long as regularly reported electric savings remain cost-effective.
- » In future program years, AEP Ohio plans to expand the program to allow opt-in enrollment among participants. As discussed in this report, the construction of a control group has been a challenge for the AEP Ohio HER Program, and opt-in increases these challenges due to its implications on the ability to conduct a randomized control trial (RCT). AEP Ohio and the implementer should carefully consider the methodology used in constructing a control group for opt-in customers to facilitate program evaluation in future program years.
- » As the minimum household kWh threshold for participation is lowered in future program years, AEP Ohio should consider performing separate analyses of customers based on the level of energy usage prior to joining the HER Program. Doing this may help to determine the level of household energy use below which it is no longer cost effective to bring customers into the program.
- » Respondents reported a low level of confidence in the accuracy of the comparisons to energy use in similar homes. AEP Ohio and the implementer should consider providing a more transparent explanation of how it selects comparison homes. This may increase participant confidence in the reports, thus increasing HER influence on motivation and behavior.
- » As expected, 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 raffle for answering EE trivia, a contest among neighborhoods, or the development of a participant web site advisory group to provide input on possible changes to site.
- » Future evaluations should include analysis of the web site's analytics and additional survey questions regarding user experience with the site. Doing this will likely help AEP Ohio better



understand the benefits of the web site and identify how to increase customer traffic to the site over time.



## 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 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 single-family homes and consuming more than 21,000 kWh annually. The group was initially 125,000 participants at program launch in August 2010. AEP Ohio plans to lower the annual kWh criterion as the program is expanded in subsequent program years.
- » Lower-income households (*abbreviated as* LI), enrolled in a State of Ohio program called Percentage of Income Payment Plan (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. This group 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*. This group originally contained 62,025 participants.

Table 1-1 shows the number of treatment and control households in each program subgroup and cohort as of the beginning of the 2012 program year. Second year participants are those that were enrolled in the HER program during its initial rollout in August 2010 through July 2011. As such, program year 2012 is the year two for which savings from the participation of these customers are being estimated. First year participants are those that were enrolled more recently, in November of 2011, to replenish the program due to customers that had moved or opted out of the HER Program. The savings from customers that enrolled November 2011 or later are being evaluated for the first time in this report.

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

Customer Subgroup	Participants	Controls
High-use Customers	132,820	65,067
Second-year (initially enrolled Aug. 2010 to July 2011)	112,251	
First-year (enrolled Nov. 2011 or later)	20,579	
AMI Customers	48,553	13,608
Second-year	44,233	
First-year	4,320	
Low-income Customers	16,273	14,380
Total	197,646	93,055

Source: Navigant Analysis

### 1.1 Program Description

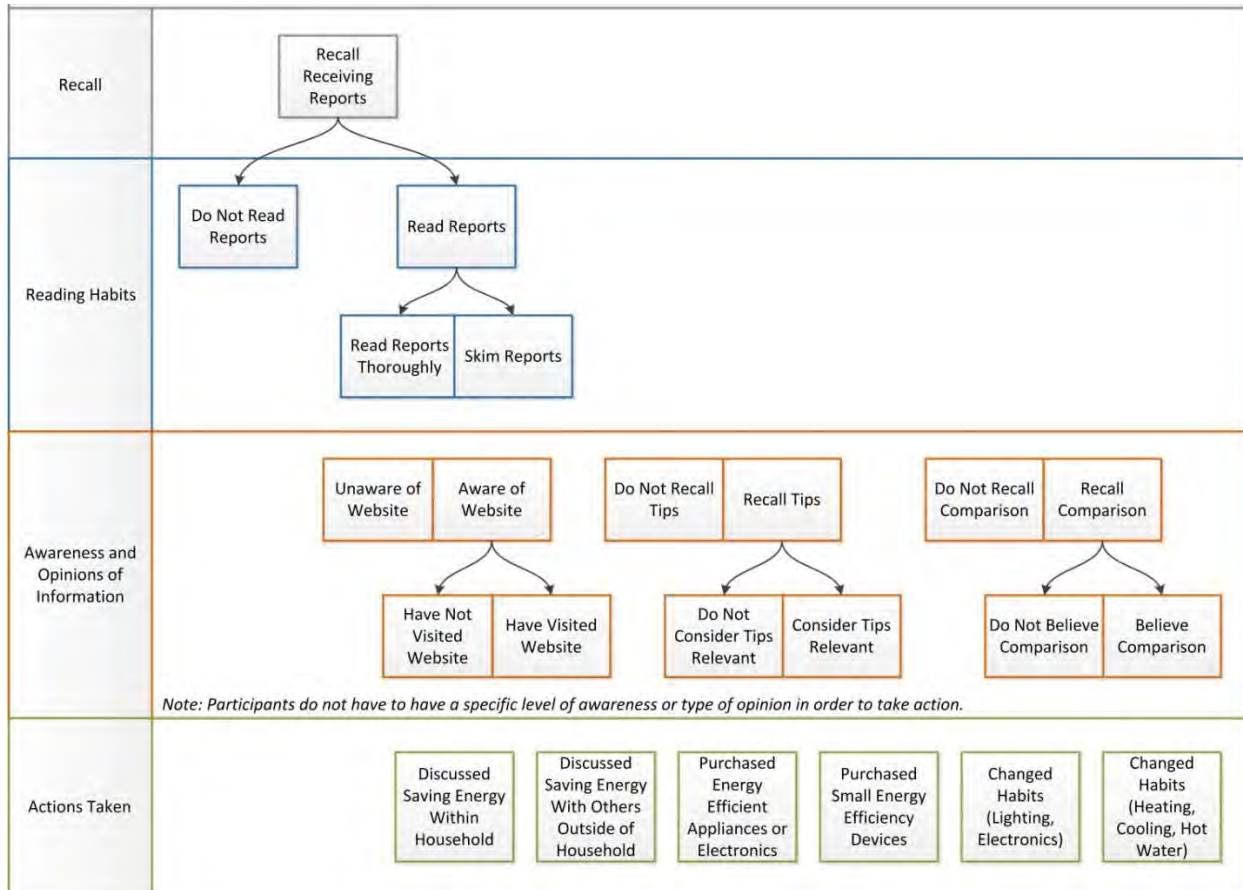
The purpose of the Home Energy Reports (HER) Program is to provide feedback to residential participants that will help them change energy use habits to save energy. This occurs through the use of a personalized report delivered to participating households either bi-monthly or quarterly. The information 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



**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 2012. 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, LI, and AMI participants, as well as between the original cohort of customers (second year program participants initially enrolled between August 2010 and July 2011) and the new cohort of customers that were enrolled since November 2011 (first year program 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 (LI) 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 the 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 2013. 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 information from AEP Ohio. This includes information about participation in the HER program, such as 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
- » Not a web-only participant

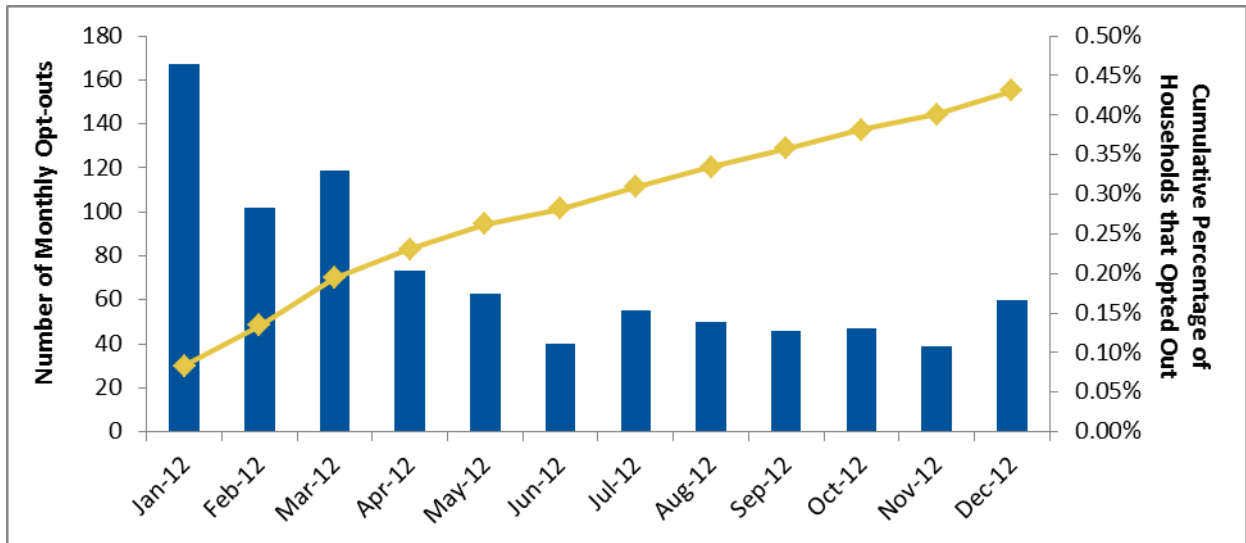
Navigant dropped web-only AMI customers due to a lack of similar control households. Web-only customers are AMI customers that elected to stop receiving paper reports or were originally selected as web-only participants. We take the conservative approach and treat all web-only customers as opt-outs, assuming no program savings for these customers. The final dataset contains 290,636 participants and control group members.

Figure 2-1 shows the number of program participants that opted-out in each month of the 2012 program year. By the end of December 2012, 824 households that were enrolled in the program at the beginning of 2012 had opted-out. This represents 0.42 percent of program year 2012 participants, a relatively low portion compared to similar programs.





**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 517 participant and non-participant customers, drawing from the sample frame used for the impact evaluation. The survey collected responses from 397 participants (HER recipients) and 120 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 (LI) 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.

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

Sub-group	Description	Number Completed
HU Control	Non-Participant customers with high energy usage (HU)*	40
HU Treatment – Second-year (initially enrolled Aug. 2010 to July 2011)	Participant customers in the original enrollment group with high energy usage (HU)*	76
HU Treatment – First-year (initially enrolled Nov. 2011 or later)	Participant customers in the 2011 reload enrollment group with high energy usage (HU)*	46
AMI Control	Non-Participant customers with interval electric metering through automated metering infrastructure (AMI)	40
AMI Treatment – Second-year (initially enrolled Aug. 2010 to July 2011)	Participant customers in the original enrollment group with interval electric metering through automated metering infrastructure (AMI)	85
AMI Treatment – First-year (initially enrolled Nov. 2011 or later)	Participant customers in the November 2011 reload enrollment group with interval electric metering through automated metering infrastructure (AMI)	46
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	144
<b>Total</b>		<b>517</b>

\* Consuming more than 21,000 kWh/year

The surveys utilized a computer-assisted telephone interview (CATI) and were completed by a subcontractor to the evaluation team between the weeks of April 8, 2013 and April 22, 2013, about 31 months after AEP Ohio launched the program and 13 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 2011 survey, Navigant included specific questions from the 2011 survey in this year's survey guide.<sup>4</sup> While the 2012 sample intentionally did not match the individual households surveyed in 2011, the evaluation team designed both 2011 and 2012 samples to represent the same customer attributes; as a result, the team was able to make rigorous comparisons between 2011 and 2012 responses.

## **2.2 Comparability of Treatment and Control Group**

When customers are enrolled in the Home Energy Report program, a randomized control trial (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 the energy usage in the pre-program period of the treatment and control groups within each customer group and cohort to determine whether they are statistically comparable and suitable for analysis. For the second year participants who initially enrolled in the program between August 2010 and July 2011, this comparison encompassed the 12 months prior to the inception of the program, August 2009 to July 2010. For first year participants who enrolled since November 2011, November 2010 to October 2011 was used. This period represents the 12 months prior to their enrollment in the HER program.

Graphs comparing average household energy usage are presented in Appendix C. Navigant's analysis found that in both the second year HU group and the second year PIP group, there was a statistically significant difference in only one month (March of 2010) during the 12 month pre-program period. In both instances, the difference just crossed the threshold of significance with t-statistics of 2.10 between the HU treatment and control groups and 2.13 for the PIP customer groups. Navigant used a 95% confidence threshold when determining differences between treatment and control groups. As such, it would not be unusual for one month out of twelve to demonstrate some degree of statistical difference even if the households were truly, randomly assigned to the treatment and control groups. Given the moderate difference between the treatment and control households in only a single month, Navigant is confident that this discrepancy is unintentional, that the households were randomly assigned, and that the construction of the control groups is suitable for analysis with no bias introduced into the fixed-effects models.

For the second year AMI group, Navigant found statistically significant differences in 11 out of the 12 months in the pre-program period. After consultation with the program implementer, it was 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

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<sup>4</sup> Navigant made slight revisions to some of the 2011 questions to improve question clarity and decrease the survey time.

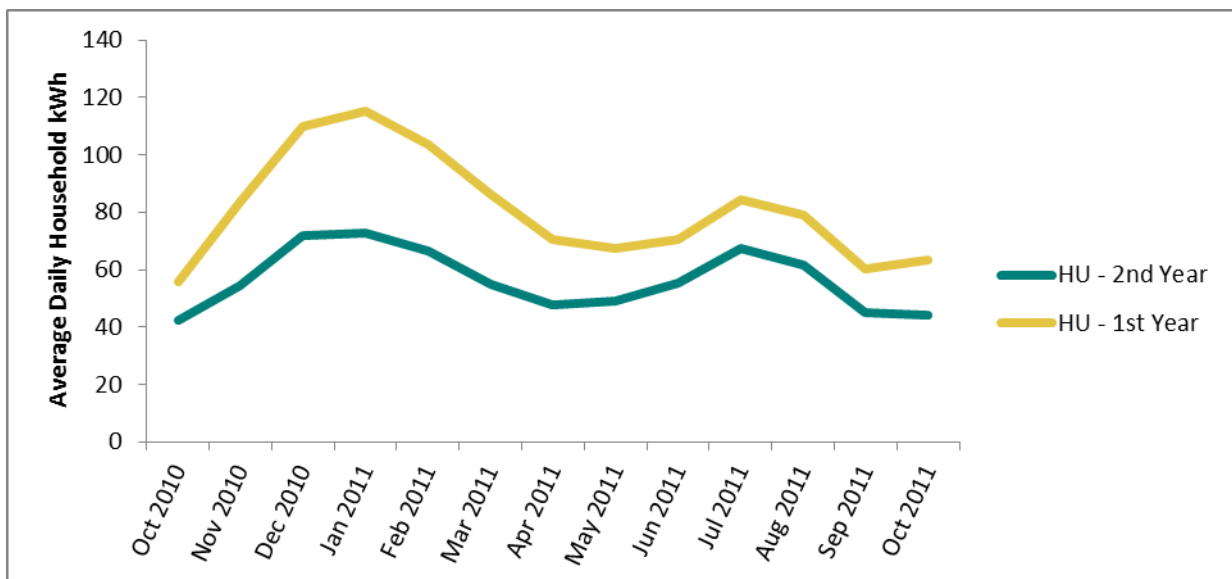


utilizing a different fuel source for heat. Electricity usage in the pre-program period was then compared separately for these two groups. When electric heat type was controlled for using this method, the vast majority of the differences in electricity usage between control and treatment households are eliminated. Graphs comparing the energy usage of treatment and control households before and after separating them by heating type are shown in Appendix C. As discussed in Section 2.1.1, this finding lead Navigant to incorporate additional terms into the regression equation for AMI customers.

Navigant found no statistically significant differences in the pre-program period (November 2010 to October 2011) for the first year HU and AMI participants. However, it should be noted that this comparison involved relatively large standard errors in some instances due to the small number of control and treatment households that were enrolled since November 2011.

A comparison of the cohorts within the two customer groups that reloaded also found that the average energy use of first year participants (initially enrolled Nov. 2011 or later) is substantially higher than the average energy use of second year participants (initially enrolled Aug. 2010 to July 2011). Figure 3-2 graphs the average daily energy usage for first year and second year treatment households in the HU customer groups. While the energy usage of the two cohorts of AMI participants are relatively similar, the new cohort of HU households consumes a much larger amount of electricity on average during the period depicted below. Some of this difference can be attributed to savings generated by enrollment in the HER Program in second year households during the period shown, whereas first year households have not yet been enrolled.

**Figure 2-2. Average Daily Household Energy Use of Treatment Households**



Source: Navigant Analysis



## 2.3 Analytical Methods

### 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, 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<sub>t</sub>*, 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<sub>t</sub> · Treatment<sub>k</sub>*.

This is referred to as a one-way fixed effects model because it includes a household-specific fixed-effects term. Formally,<sup>5</sup>

#### Equation 1. Annual 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 $t$ . This is the dependent variable in the model.
$Post_t$	= A binary variable indicating whether bill cycle $t$ 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 participant or non-participant -specific fixed effect (constant term) for household $k$ . 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.

<sup>5</sup> 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.



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. Formally,

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

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

Where,

ElectricHeat<sub>k</sub> = A binary variable indicating whether participant *k* utilizes electric heat (taking a value of 1) or non-electric heat (taking a value of 0).

Three observations about the model specification deserve comment.

First, the coefficient  $\alpha_{0k}$  is the household-specific fixed-effect that implicitly captures *all* participant-specific 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,  $\alpha_1$  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,  $\alpha_1 + \alpha_3$  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  $\alpha_2$ . 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 2012 are generated by multiplying the annual estimate of household ADS by 366 days. *This estimate of average annual savings applies to households that remain in the program for the full year.*

The one-way fixed effects model is used as a robustness check on the calculated savings estimates. For the primary model used to estimate program savings, Navigant expands the basic model to account for additional variation in the data that takes place over the course of the sample period. This involves turning the one-way fixed effects model described above into a two-way fixed effects model by adding additional dummy variables to the model equation for each month of the sample period (September 2009 until December 2012), 40 dummy variables in total. This adds a time-specific fixed-effect to the model that implicitly captures *all* month-specific effects on electricity use that do not vary across customers, such as general weather patterns and economic conditions. By doing so, the two-way fixed effects model



implicitly accounts for monthly differences in the impact of these unobserved variables on energy usage. The full regression equation is given by:<sup>6</sup>

### Equation 3. Annual Two-Way Fixed Effects Regression Model

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

Where,

$ADC_{kt}$	= The average daily use in kWh for participant or non-participant $k$ during billing cycle. This is the dependent variable in the model.
$Post_t$	= A binary variable indicating whether bill cycle $t$ 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).
$SampleMonth_t$	= A binary variable taking a value of 0 or 1 indicating whether the billing cycle $t$ is centered within a given month of the data sample. The included months go from September 2009 until December 2012, or 40 months in total.
$\alpha_{0k}$	= The participant or non-participant -specific fixed effect (constant term) for household $k$ . 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.
$\alpha_1$	= Regression parameter corresponding to the independent variables.
$\gamma_m$	= Regression parameters corresponding to the billing period month $m$ .

For the AMI group, the equation is once again augmented to account for customer heating type:

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

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

Where,

$ElectricHeat_k$	= A binary variable indicating whether participant $k$ utilizes electric heat (taking a value of 1) or non-electric heat (taking a value of 0).
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Of the 290,701 participants and non-participants included in the analysis, 18,715 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.

<sup>6</sup> 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.





### 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, second year HU participants represent 56 percent of all program participants, but only 19 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.

**Table 2-2. Participant Weighting Scheme**

Survey Subgroup	Sample Size	Sample %	Population	Population %	Weight
HU Treatment – Second-year (initially enrolled Aug. 2010 to July 2011)	76	19%	112,251	57%	2.973
HU Treatment – First-year (initially enrolled Nov. 2011 or later)	46	12%	20,579	10%	0.898
AMI Treatment – Second-year (initially enrolled Aug. 2010 to July 2011)	85	21%	44,233	22%	1.046
AMI Treatment – First-year (initially enrolled Nov. 2011 or later)	46	12%	4,320	2%	0.188
PIPP Treatment	144	36%	16,273	8%	0.227

Source: Navigant

Note: Weight = Population percentage divided by Sample percentage.

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

**Table 2-3. Non-Participant Weighting Scheme**

Survey Subgroup	Sample Size	Sample %	Population	Population %	Weight
HU Control	40	33%	65,067	70%	2.097
AMI Control	40	33%	13,608	15%	0.438
PIPP Control	40	33%	14,380	15%	0.464

Source: Navigant

Note: Weight = Population % divided by Sample %.

Weights were also developed for all HU participants combined and all AMI participants combined to enable analysis of entire customer groups. Similarly, weights were developed for all Second Year participants (initially enrolled August 2010 to July 2011), as well as First Year Participants (enrolled Nov. 2011 or later). Table 2-4 details these subgroup comparison weighting schemes.



**Table 2-4. Subgroup Comparison Weighting Schemes**

Survey Subgroup	Sample Size	Sample %	Population	Population %	Weight
All HU Participants					
HU Treatment – Second-year	76	62%	112,251	84%	1.357
HU Treatment – First-year	46	38%	20,579	16%	0.411
All AMI Participants					
AMI Treatment – Second-year	85	65%	44,233	91%	1.404
AMI Treatment – First-year	46	35%	4,320	9%	0.253
All Second Year Participants					
HU Treatment – Second-year	76	25%	112,251	64%	2.608
AMI Treatment – Second-year	85	28%	44,233	26%	0.919
PIP Treatment – Second-year	144	47%	16,273	10%	0.200
All First Year Participants					
HU Treatment – First-year	46	50%	20,579	83%	1.653
AMI Treatment – First-year	46	50%	4,320	17%	0.347

Source: Navigant

Note: Weight = Population percentage divided by Sample percentage.

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.



**Table 2-5. SPSS Cross Tabulation Outcomes**

Report Category	Strata Combinations	Purpose
Participant Response Frequencies	<ul style="list-style-type: none"> <li>- All Participants</li> <li>- All Second-year Participants</li> <li>- All First-year Participants</li> </ul>	Identify engagement trends within each enrollment group, and overall.
Participant Enrollment Group Comparison	<ul style="list-style-type: none"> <li>- AMI+HU (Second-year) vs. AMI+HU (First-year)</li> <li>- AMI (Second-year) vs. AMI (First-year)</li> <li>- HU (Second-year) vs. HU (Second-year)</li> </ul>	Identify differences between responses from each enrollment group.
Treatment vs. Control Group Comparison	<ul style="list-style-type: none"> <li>- All AMI Treatment vs. AMI Control</li> <li>- All HU Treatment vs. HU Control</li> <li>- PIP Treatment vs. PIP Control</li> </ul>	Identify differences between responses from participants and non-participants.

Source: Navigant



### 3 Detailed Evaluation Results

#### 3.1 Impact Results

The Home Energy Report Program reported 53,174 MWh of energy savings and 6,913 kW of demand savings in 2012. The verified (*ex-post*) energy and demand savings for 2012 for the HU and LI customers combined were 63,243 MWh and 8,222 kW respectively. Both of these estimates exceeded the *ex-ante* savings values, resulting in a realization rate of 1.19 for both energy and demand savings. A comparison of *ex-ante* and *ex-post* HER Program savings are shown in Table 3-1.

**Table 3-1. 2012 Overall Evaluation Results**

	2012 <i>Ex-ante</i> Claimed Savings (a)		2012 <i>Ex-post</i> Savings (b)		2012 Realization Rate = (a) / (b)	
	MWh	kW	MWh	kW	MWh	kW
Combined HU and LI Customers	53,174	6,913	63,243	8,222	1.19	1.19

Source: Navigant Analysis

AMI customers, not included in the above *ex-ante* and *ex-post* calculations, are estimated to have provided an additional 8,101 MWh energy savings and 1,053 kW of peak demand savings. Across all three customer groups (HU, LI, and AMI customers combined), Navigant estimates that the HER Program saved 71,344 MWh and 9,275 kW during the 2012 program year. The energy savings estimate corresponds to 1.99% of customer bills on average. This estimate is net of a Difference-in-Differences (DID) analysis performed by Navigant that determined 411 MWh of estimated savings that are likely already counted in other AEP Ohio EE/PDR programs. The total savings estimate assumed no savings from any customer who opted out of the HER Program, and pro-rated savings for customers that moved-out during the program year. All estimates are statistically significant at the 5 percent level and presented in further detail below.

##### 3.1.1 Results by Participant Type

Table 3-2 presents the estimated program savings using the one-way fixed effects model described in Equations 1 and 2 within each subgroup as well as the number of customers to which the savings estimates were applied.

**Table 3-2. Estimated Program Savings by Participant Group Using Equations 1 and 2**

	HU - 2 <sup>nd</sup> Year	HU - 1 <sup>st</sup> Year	LI	AMI	TOTAL
Number of Participants (beginning of 2012)	112,251	20,579	16,273	48,553	197,656
2012 Opt-outs	548	124	43	109	824
2012 Move-outs	4,955	1,621	1,915	4,392	12,883
Average Daily Household kWh Used	55.10	76.88	39.33	30.22	50.04
Estimated Daily kWh Savings per participant (standard error)	1.14 (0.21)	4.02 (0.72)	0.43 (0.17)	0.47 (0.09)	1.22
Estimated Annual kWh Savings per participant (standard error)	416 (76)	1471 (264)	157 (61)	173 (32)	445
Estimated Percentage Savings (standard error)	2.06% (0.37%)	5.23% (0.94%)	1.09% (0.42%)	1.56% (0.29%)	2.19%
Estimated Total MWh Savings* (standard error)	45,390 (8,253)	28,896 (5,179)	2,402 (931)	8,001 (1,496)	84,689
Savings Counted in Other Programs	236	42	33	100	411
Total Savings (MWh)	45,154	28,854	2,369	7,901	84,278
Total Savings (kW)†	5,870	3,751	308	1,027	10,956

\* 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.

Source: Navigant Analysis

As shown in Table 3-2, Navigant found that savings varied by customer group. Savings from the HER program were dominated by high use (HU) customers. This is due both to their higher level of percentage energy savings and their higher level of household energy usage. Though AMI customers saved roughly the same amount of energy as LI customers, this represented a higher percentage of household energy use due to the lower average household energy use of AMI customers. However, both groups generated less than half the savings of high use households on a per-participant, absolute basis.

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 the geographic location or household characteristics, might explain the relationship.

Navigant also ran a separate analysis using the two-way fixed effects models shown in Equations 3 and 4. This model incorporates monthly fixed effects that implicitly accounts for temporal factors that do not



vary across customers, such as weather and economic conditions. The intent of this comparison was to see if there is any discernible difference between savings estimates using the two model specifications. The results of this analysis are shown in Table 3-3.

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

	HU - 2 <sup>nd</sup> Year	HU - 1 <sup>st</sup> Year	LI	AMI	TOTAL
Number of Participants (beginning of 2012)	112,251	20,579	16,273	48,553	197,656
2012 Opt-outs	548	124	43	109	824
2012 Move-outs	4,955	1,621	1,915	4,392	12,883
Average Daily Household kWh Used	55.14	74.55	39.35	30.24	49.82
Estimated Daily kWh Savings per participant (standard error)	1.21 (0.21)	1.75 (0.73)	0.49 (0.17)	0.48 (0.09)	1.03
Estimated Annual kWh Savings per participant (standard error)	442 (75)	640 (267)	179 (61)	177 (32)	377
Estimated Percentage Savings (standard error)	2.19% (0.37%)	2.35% (0.98%)	1.25% (0.42%)	1.60% (0.29%)	1.99%
Estimated Total MWh Savings* (standard error)	48,240 (8,246)	12,573 (5,239)	2,741 (929)	8,201 (1,483)	71,755
Savings Counted in Other Programs	236	42	33	100	411
Total Savings (MWh)	48,004	12,531	2,708	8,101	71,344
Total Savings (kW) <sup>†</sup>	6,241	1,629	352	1,053	9,275

Source: Navigant Analysis

\* Aggregate savings values have been adjusted to account for customer move-outs throughout the program year and opt-outs

† 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.

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

The combination of the analyses using one-way and two-way fixed effects show that the savings estimates are robust for all customer groups except the first year HU customer group. The difference in the savings estimate for this group is the single largest factor leading to the difference in program savings estimates using the two models. Navigant's analysis determined that the likely reason is related to differences in the pre-program energy usage of first-year HU treatment and control customers. Though average monthly energy use in the pre-program period (November 2010 to October 2011) is not statistically different at the 95% confidence level, there are still notable fluctuating differences between the treatment and control groups in several months, as shown in Appendix C.



In total, Equations 3 and 4 estimate that the HER program saved 71,344 MWh of energy after the subtraction of double counted savings. Savings come from customer groups as follows:

- » High-use customers accounted for a total of 60,535 MWh of energy savings, corresponding to 7,870 kW of peak demand savings.
- » Low-income customers accounted for 2,708 MWh of energy savings, corresponding to 352 kW of peak demand savings.
- » AMI customers accounted for 8,101 MWh of energy savings, corresponding to 1,053 kW of peak demand savings.

### 3.1.2 Enrollment to Other AEP Ohio Programs

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. Navigant compared the change in participation for the treatment group to the change in participation for the control group via the Difference-in-Differences (DID) statistic:

$$\text{DID} = (\text{Treatment: Pre/Post change in \# of participants as \% of total HER participants}) - (\text{Control: Pre/Post change in \# of participants as \% of total control households})$$

Navigant then multiplies the DID statistic by the number of treatment households to get the change in uptake of the three programs due to the HER Program. The inputs to and results of the DID calculation are presented in Table 3-4.

**Table 3-4. Change in Program Uptake due to HER Program**

	Appliance Recycling	Efficient Products	In-Home Energy
# of HER Treatment Households	197,656	197,656	197,656
# of Participants, Pre	1,874	0	0
# of Participants, 2012	2,004	4,342	1,747*
Change in Participants (#)	130	4,342	1,747*
Change in Participants (%)	0.066%	2.197%	0.884%
# of HER Control Households	93,037	93,037	93,037
# of Participants, Pre	858	0	0
# of Participants, 2012	819	1,946	698*
Change in Participants (#)	-39	1,946	698*
Change in Participants (%)	-0.042%	2.092%	0.750%
DID Statistic (%)	0.108%	0.106%	0.134%
Change in Program Participation due to HER Program (# of Participants)	213	209	265

Source: Navigant Analysis

\* Identifying customer data was only available from the implementer for In-Home Energy Program. The rate of uptake due to HER was extrapolated to the entire In-Home Energy Program to produce these estimates.

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.

**Table 3-5. Double Counted Savings from Program Uptake Due to HER Program**

	Appliance Recycling	Efficient Products	In-Home Audit	Total
Change in Program Participation due to HER Program (# of Participants)	213	209	265	687
Average Savings per Program Participant (kWh)	1,019	250	536	598
Total Savings (MWh)	217	52	142	411

Source: Navigant Analysis

### 3.2 Process Results

This section addresses the process evaluation of the 2012 Home Energy Report Program year. Two main topic areas were included in the evaluation: Participant Engagement and Customer Satisfaction.



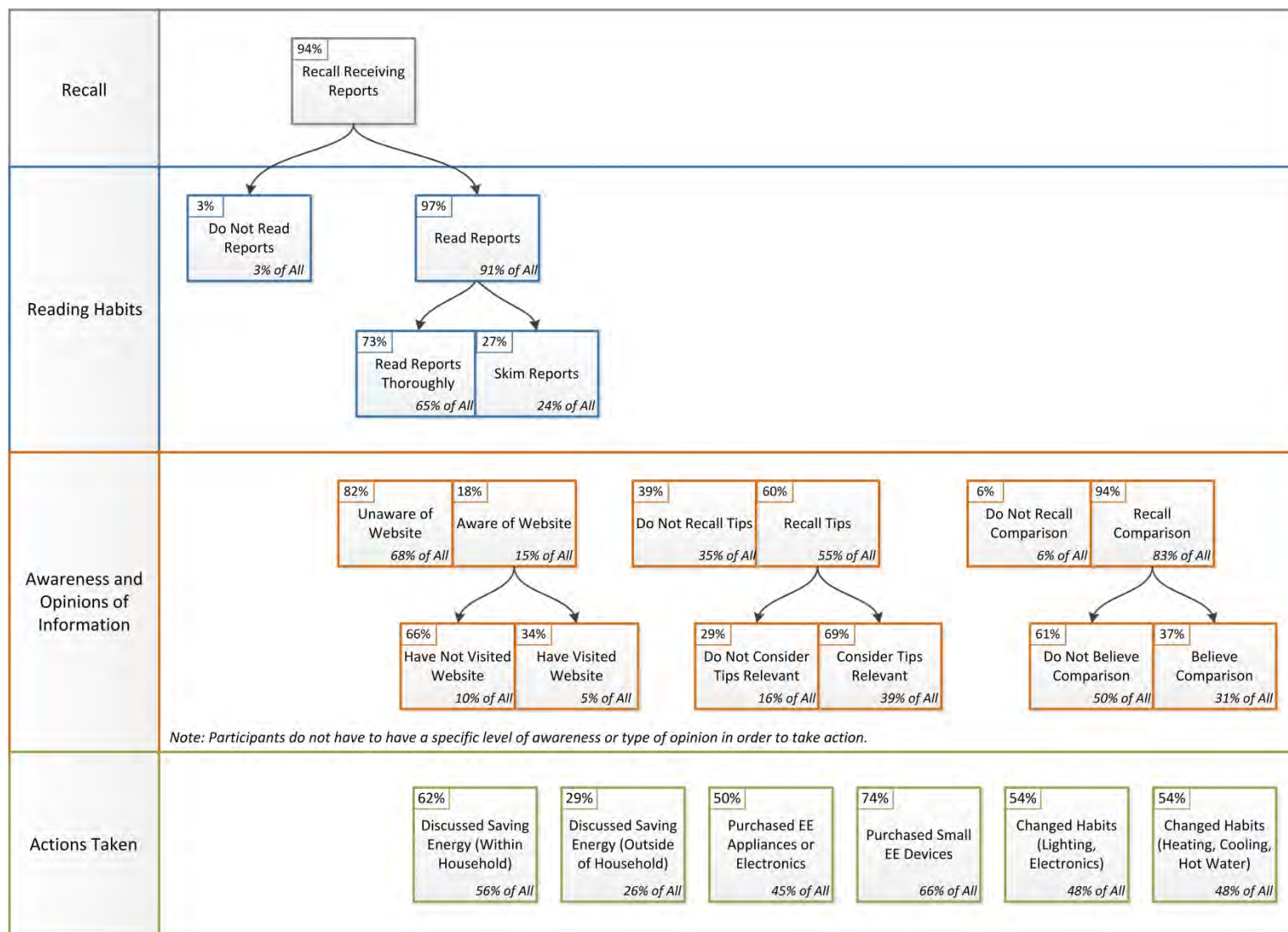
### 3.2.1 Participant Engagement

“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 3-1 presents the proportion of participant survey responses to each of these engagement questions.





Figure 3-1. Participant Survey Respondent Engagement Results



Source: Navigant



Each set of boxes in Figure 3-1 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 359 respondents that recalled the tips given in their Home Energy Report, 69 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, 39% of all 397 respondents considered the tips relevant to their household). The sections that follow align with each of Figure 3-1's tiers: Recall and Reading Habits, Awareness of Opinions and Information, and Actions Taken.

#### **3.2.1.1 Recall and Reading Habits**

Survey respondents indicated that the Home Energy Reports are memorable and that they spend time reading them thoroughly. A high percentage of participants remember receiving the HERs (94%). A similarly high percentage of those that recall receiving the HERs reported that someone in their home reads the report (97%). When asked how much time they spend reading the HERs, the majority (73%) reported reading the HERs thoroughly.<sup>7</sup> These high response rates imply that the HERs are 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 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 larger proportion of respondents remember the comparisons than remember the tips. Of those that read the reports, only 60 percent recalled the energy saving tips compared to 94 percent recalling the comparisons. As in past evaluation years, respondents reported a low level of confidence in the accuracy of the comparisons. Only 37 percent of those that recall the comparisons reported believing their accuracy. Most respondents who reported not believing the comparisons described their household's circumstances as unique, thus making comparison impractical.

As expected, a small share of respondents reported being aware of the HER website; only 18 percent of those that read the reports said they were aware of the website, and only 5 percent of all respondents reported visiting the website. This is not surprising since AEP Ohio just recently launched the site. Navigant includes this information here to assist AEP Ohio and its implementation contractor in setting future goals for the website.

#### **3.2.1.3 Actions Taken**

The Home Energy Report Program's ultimate goal is to encourage recipients to alter their habits of energy use. Thus, the final stage of 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

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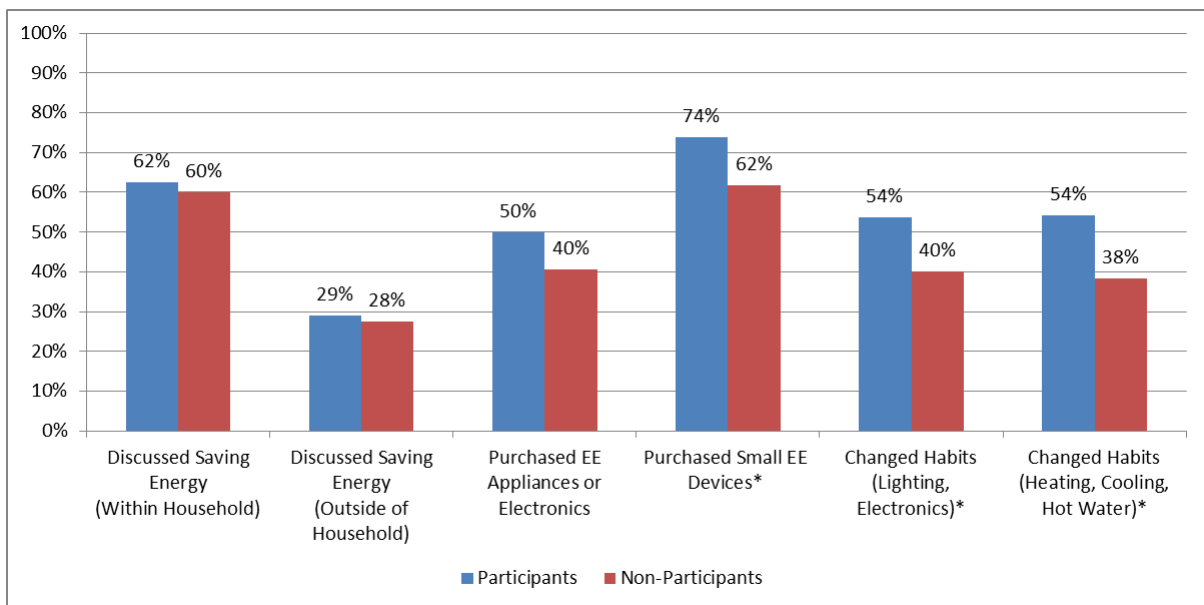
<sup>7</sup> Navigant asked respondents to describe how much time they spend on average reviewing the report and used prompts as necessary. For analysis, Navigant considered selections above "more than two minutes" as reading the HERs "thoroughly" and selections of two minutes or less as "skimming" the HERs.



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 3-1 highlights the results of this series among participant respondents. Figure 3-2 compares the types of actions reported by participants and non-participants.

**Figure 3-2. Types of Actions Taken by Respondents “Within the Last 12 Months”**



Source: Navigant Analysis

Participant n = 355, Non-Participant N = 120

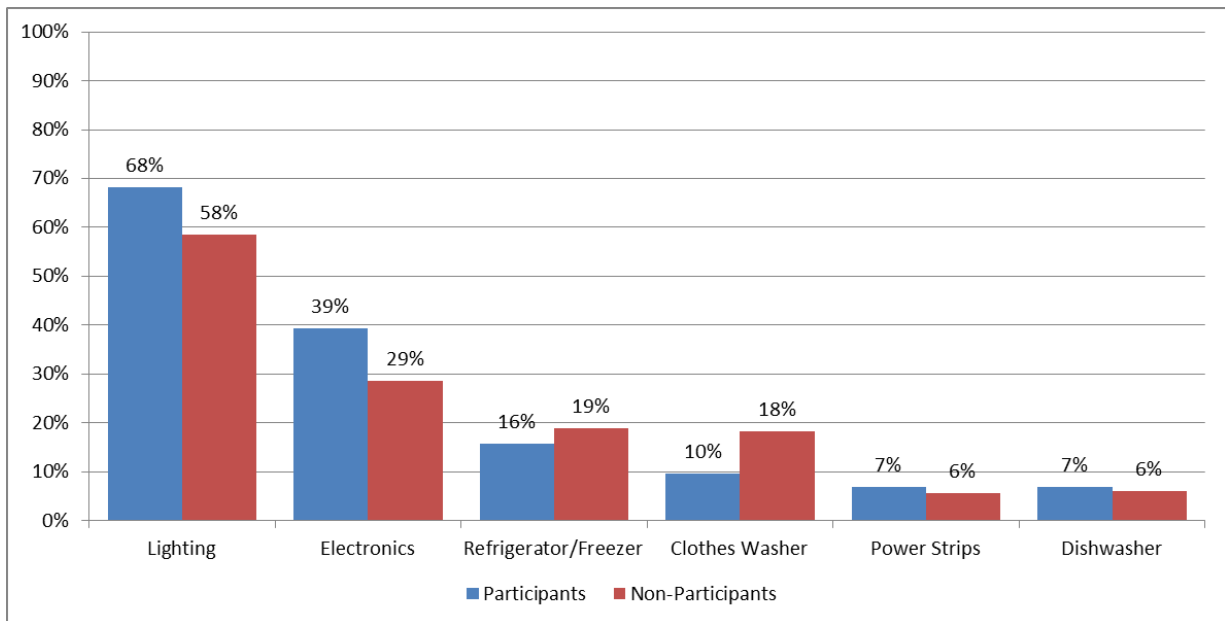
\*Difference is statistically significant at the 90% confidence level.

The responses imply that participants most often purchase small energy efficiency devices and make changes to how they use energy, and that they do so at a significantly higher rate than non-participants. The majority (74%) of respondents who read the HERs reported purchasing a small energy efficiency device, such as efficient light bulbs, within the last 12 months compared to 62 percent of non-participants. Participants also reported changing their energy use habits at a significantly higher rate than did non-participants. Over half (54%) of participants stated that they have changed how they use their lights, electronics, heat, air conditioning and hot water within the last 12 months compared to roughly 40 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 higher rates of energy efficiency behaviors and small purchases.



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

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



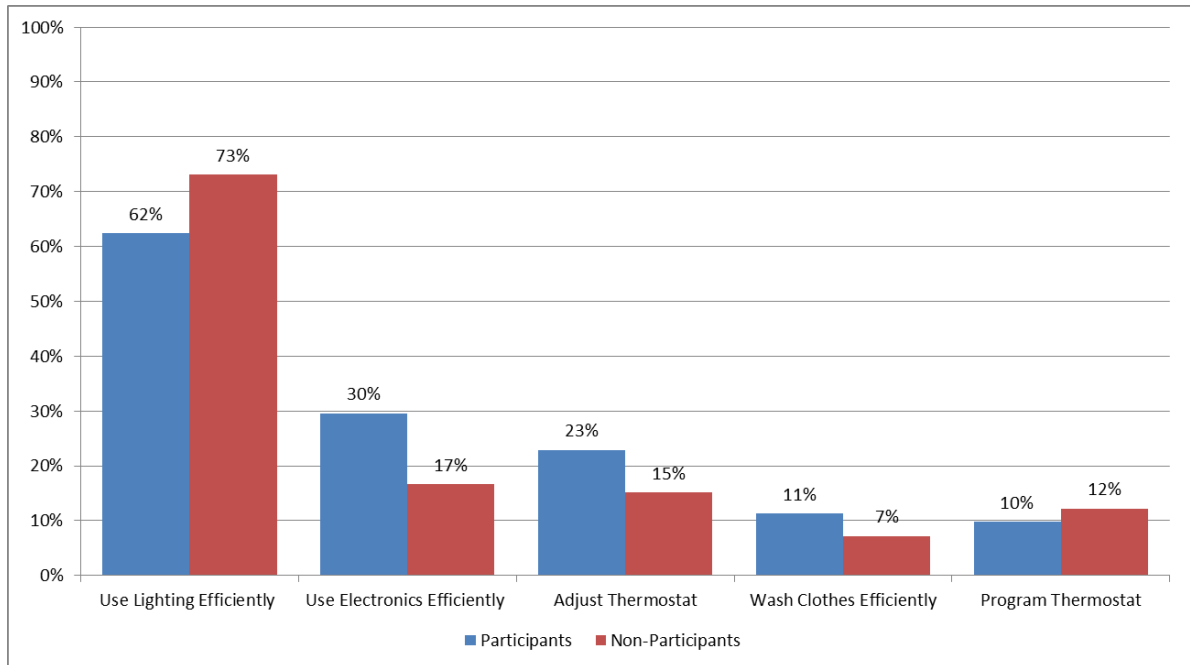
Source: Navigant Analysis

Note: Participant n = 353, Non-Participant n = 120. Includes the top six most frequently reported purchases among participants. Respondents may have reported more than one type of energy efficient purchase. Navigant aligned the response categories for these questions with the HER tips.

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 3-4 presents the percent of respondents that reported each type of habit change.



**Figure 3-4. Percent of Respondents Reporting Each Type of Habit Change**



Source: Navigant Analysis

Note: Includes the top five most frequently reported habitual changes among participants. Respondents may have reported more than one type of habit change. Navigant aligned the response categories for these questions with the HER tips.

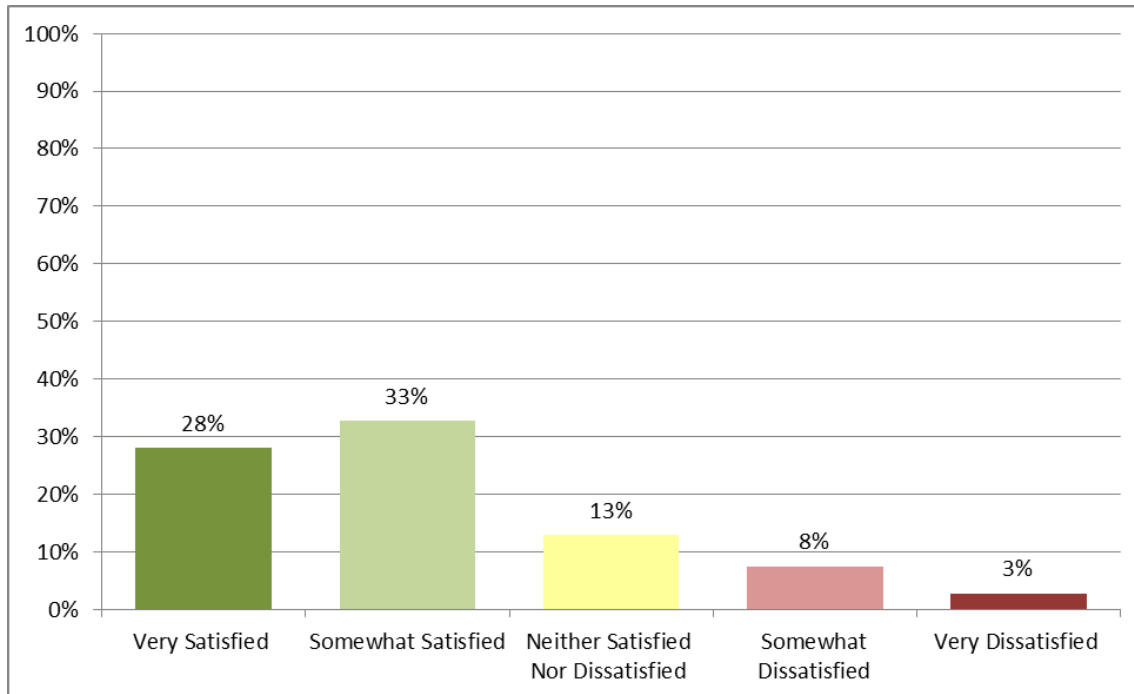
### 3.2.2 Customer Satisfaction

#### 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 (61%) of respondents reported a positive level of satisfaction. Figure 3-5 summarizes the proportion of satisfaction ratings provided by all participants surveyed.



**Figure 3-5 Participant Satisfaction with the Home Energy Reports**



Source: Navigant

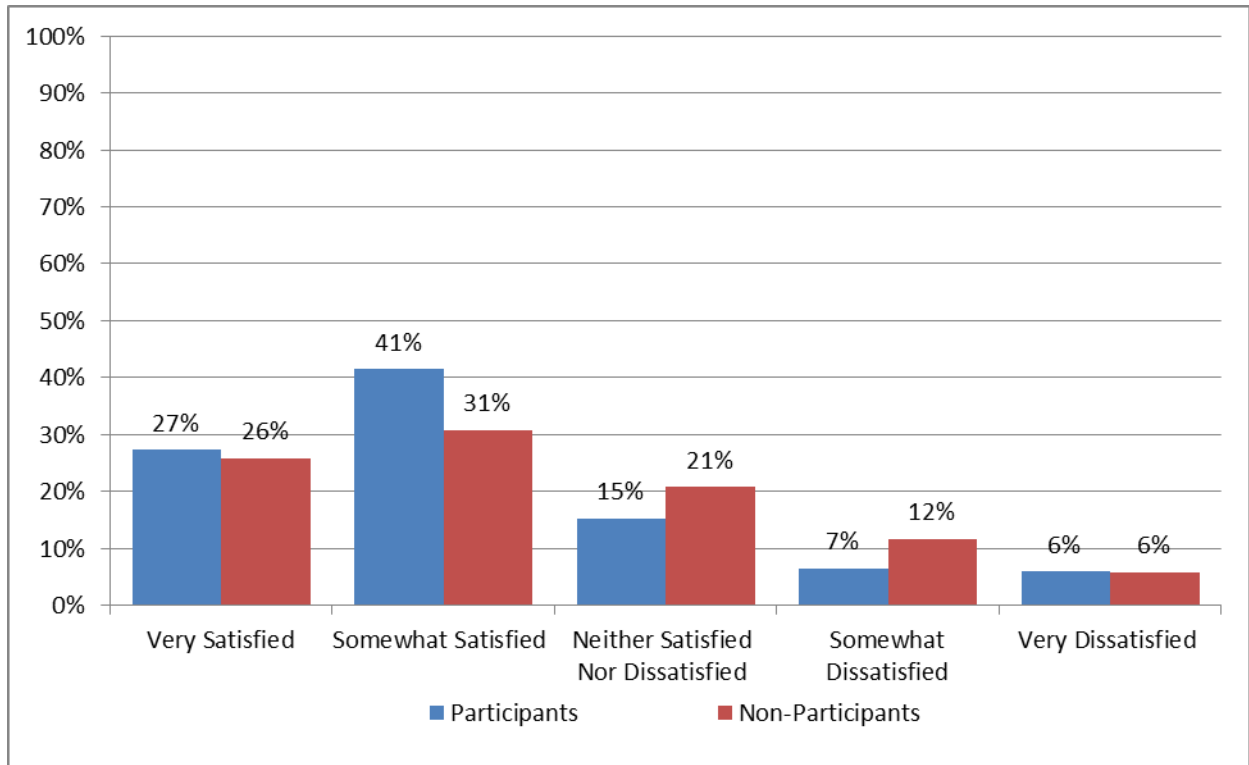
Notes: Percent of all participant respondents; N=397; Colors indicate positive or negative feelings regarding HER Program: green = positive, yellow = neutral, red = negative.

### 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 a positive impact on general customer satisfaction. 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-eight percent of participants reported a positive level of satisfaction with AEP Ohio's efforts to help them save on their utility bills, compared to 57 percent of non-participants. On the opposite end of the spectrum, 13 percent of participants reported a negative level of satisfaction compared to 18 percent of non-participants. Figure 3-6 summarizes the proportion of satisfaction ratings provided by participants and non-participants.



**Figure 3-6. Participant and Non-Participant Satisfaction with AEP Ohio**



Source: Navigant Analysis

Note: Participant n = 352, Non-Participant n = 120

### **3.3 Cost Effectiveness Review**

This section addresses the cost effectiveness of the 2012 Home Energy Report Program. Cost effectiveness is assessed through the use of the Total Resource Cost (TRC) test. Table 3-6 summarizes the unique inputs used in the TRC test.

**Table 3-6. Inputs to Cost-Effectiveness Model for AEP HER Program**

Item	Value
Measure Life	1
Participants	138,605
Annual Energy Savings (MW)	63,243
Coincident Peak Savings (kW)	8,222
Third Party Implementation Costs	1,111,174
Utility Administration Costs	59,040
Utility Incentive Costs	0
Participant Contribution to Incremental Measure Costs	\$0

Source: AEP Ohio Analysis

Based on these inputs, the TRC ratio for the AEP Ohio HER program is 2.3, and the program passes the TRC test for the program. Table 3-7 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.

**Table 3-7. Cost-Effectiveness Results for the HER Program**

Cost-Benefit Test	Result
Total Resource Cost	2.3
Participant Cost Test	N/A
Ratepayer Impact Measure	0.4
Utility Cost Test	2.3

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

#### 4.1.1 Key Findings

The Home Energy Report Program reported 53,174 MWh of energy savings and 6,913 kW of demand savings in 2012. The verified (*ex-post*) energy and demand savings for 2012 for the HU and LI customers combined were 63,243 MWh and 8,222 kW respectively. Both of these estimates exceeded the *ex-ante* savings values, resulting in a realization rate of 1.19 for both energy and demand savings. AMI customers, not included in the reported *ex-ante* savings, are estimated to have provided an additional 8,101 MWh energy savings and 1,053 kW of peak demand savings.

Across all three customer groups (HU, LI, and AMI customers combined), Navigant estimates that the HER Program saved 71,344 MWh and 9,275 kW during the 2012 program year. The energy savings estimate corresponds to 1.99% of customer bills on average. This estimate is net of a Difference-in-Differences (DID) analysis performed by Navigant that determined 411 MWh of estimated savings that are likely already counted in other AEP Ohio EE/PDR programs. The total savings estimate assumed no savings from any customer who opted out of the HER Program, and pro-rated savings for customers that moved-out during the program year. All estimates are statistically significant at the 5 percent level and presented in further detail below.

Savings from the HER program were dominated by high use (HU) customers. This is due both to their higher level of percentage energy savings and their higher level of household energy usage. Though AMI customers saved roughly the same amount of energy as LI customers, this represented a higher percentage of household energy use due to the lower average household energy use of AMI customers. However, both groups generated less than half the savings of high use households on a per-participant, absolute basis.

#### 4.1.2 Impact Recommendations

- » AEP Ohio should consider a persistence study in the near future to determine if a measure life other than one year is appropriate the Home Energy Report Program.
- » Continue the HER program as long as regularly reported electric savings remain cost-effective.
- » In future program years, AEP Ohio plans to expand the program to allow opt-in enrollment among participants. As discussed in this report, the construction of control group has been a challenge for the AEP HER Program, and opt-in increases these challenges due to its implications on the ability to conduct a randomized control trial (RCT). AEP Ohio and the implementer should consider the methodology used in constructing a control group for opt-in customers to facilitate program evaluation in future program years.



- » As the minimum household kWh threshold is lowered in future program years, AEP Ohio should consider performing separate evaluations of customers depending on their levels of energy usage prior to joining the HER Program. This may help to determine the level of household energy use below which it is no longer cost effective to bring customers into the program.

## **4.2 Process Evaluation**

### **4.2.1 Key Findings**

Overall, participants reported being satisfied with the Home Energy Reports, with the majority (61%) of respondents reporting a positive level of satisfaction. Navigant found that participation in the Home Energy Report Program was correlated with a slightly higher overall satisfaction rate with AEP Ohio. Though the difference is not statistically significant, participants reported a slightly higher rate of satisfaction compared to non-participants.

Survey respondents indicated that the Home Energy Reports are memorable and that they spend time thoroughly reading these. Ninety-four percent of participants remember receiving the Home Energy Reports, while a similarly high percentage of those that recall receiving the HERs reported that someone in their home reads the report (97%). Seventy-three percent reported spending an average of more than two minutes reading the HERs.

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 larger proportion of respondents remember the comparisons than remember the tips. Though survey responses demonstrated a wide variety of actions possibly taken in response to receiving the Home Energy Reports, participants most often reported purchasing small energy efficiency devices and making changes to how they use energy, and they did so at a significantly higher rate than non-participants.

### **4.2.2 Process Recommendations**

- » Respondents reported a low level of confidence in the accuracy of the comparisons to energy use in similar homes. Only 37 percent of those that recall the comparisons reported believing their accuracy. AEP Ohio and the implementer should consider providing a more transparent explanation of how it selects comparison homes. This may increase participant confidence in the reports, thus increasing HER influence on motivation and behavior.
- » As expected, 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 raffle for answering EE trivia, a contest among neighborhoods, or the development of a participant web site advisory group to provide input on possible changes to site.



- » Future evaluations should include analysis of the web site's analytics and additional survey questions regarding user experience with the site. Doing this will likely help AEP Ohio better understand the benefits of the web site and identify how to increase customer traffic to the site over time.



## 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.

**Table A-1. Parameter Estimates Resulting from Equation 1**

Customer Group	Parameter	Parameter Estimate	T-statistic
HU – 2 <sup>nd</sup> Year	Post	-3.7350261	-23.37
	Post*Treatment	-1.1354164	-5.50
HU – 1 <sup>st</sup> Year	Post	-4.2928010	-7.54
	Post*Treatment	-4.0190016	-5.58
AMI	Post	-0.7151165	-10.13
	Post*Treatment	-0.4338902	-5.44
	Post*ElectricHeat	-3.0318067	-9.60
	Post*ElectricHeat*Treatment	-0.2679329	-0.57
LI	Post	-0.4820162	-3.98
	Post*Treatment	-0.4297301	-2.58

Source: Navigant Analysis

**Table A-2. Parameter Estimates Resulting from Equation 2**

Customer Group	Parameter	Parameter Estimate	T-statistic
HU – 2 <sup>nd</sup> Year	Post*Treatment	-1.206713	-5.85
	Month-Year 1	-19.049643	-36.76
	Month-Year 2	-19.442205	-38.38
	Month-Year 3	-13.147909	-25.22
	Month-Year 4	7.277305	13.04
	Month-Year 5	10.783286	18.39
	Month-Year 6	4.148921	7.93
	Month-Year 7	-13.496539	-24.57
	Month-Year 8	-21.130469	-39.74
	Month-Year 9	-19.952009	-39.13
	Month-Year 10	-5.745337	-10.95
	Month-Year 11	1.472342	2.76
	Month-Year 28	-5.253176	-7.90
	Month-Year 29	-1.037844	-1.82
	Month-Year 30	-4.450628	-7.62
	Month-Year 31	-18.151205	-32.08
	Month-Year 32	-23.581123	-43.42
	Month-Year 33	-19.612664	-36.80
	Month-Year 34	-7.18367	-12.95
	Month-Year 35	-2.390407	-4.36
	Month-Year 36	-9.917371	-18.56
	Month-Year 37	-20.575141	-36.95
	Month-Year 38	-23.830988	-45.26
	Month-Year 39	-12.978478	-22.83
	Month-Year 40	-4.704454	-8.30
HU – 1 <sup>st</sup> Year	Post*Treatment	-1.7487	-2.40
	Month-Year 15	10.6543	10.88
	Month-Year 16	39.81497	34.79
	Month-Year 17	44.96068	31.98
	Month-Year 18	31.48149	26.65
	Month-Year 19	13.21503	12.67
	Month-Year 20	-2.7777	-2.71
	Month-Year 21	-5.57719	-5.81
	Month-Year 22	-1.42523	-1.60



Customer Group	Parameter	Parameter Estimate	T-statistic
AMI	Month-Year 23	12.91739	13.29
	Month-Year 24	7.536647	6.94
	Month-Year 25	-11.7325	-13.42
	Month-Year 26	-12.7855	-16.50
	Month-Year 28	22.04227	13.56
	Month-Year 29	26.45353	19.81
	Month-Year 30	19.79411	17.75
	Month-Year 31	-0.13399	-0.12
	Month-Year 32	-13.356	-15.07
	Month-Year 33	-11.0955	-12.25
	Month-Year 34	2.519792	2.22
	Month-Year 35	3.706546	4.08
	Month-Year 36	-3.19892	-3.52
	Month-Year 37	-9.99375	-9.78
	Month-Year 38	-11.6743	-13.14
	Month-Year 39	8.398373	7.37
	Month-Year 40	23.27946	18.36
	Post*Treatment	-0.44567	-5.53
	Post*ElectricHeat	-2.81573	-8.89
	Post*ElectricHeat*Treatment	-0.26739	-0.77
	Month-Year 1	-13.6158	-175.61
	Month-Year 2	-15.9154	-168.59
	Month-Year 3	-15.1146	-164.61
	Month-Year 4	-7.30116	-64.14
	Month-Year 5	-4.141	-30.21
	Month-Year 6	-5.03611	-35.57
	Month-Year 7	-12.6646	-112.50
	Month-Year 8	-17.2427	-148.71
	Month-Year 9	-14.9665	-171.02
	Month-Year 10	-4.25565	-61.51
	Month-Year 11	1.527807	24.26
	Month-Year 28	-10.8834	-46.29
	Month-Year 29	-7.44207	-54.23
	Month-Year 30	-9.65548	-72.63
	Month-Year 31	-14.9538	-132.76



Customer Group	Parameter	Parameter Estimate	T-statistic
	Month-Year 32	-16.9693	-156.82
	Month-Year 33	-12.56	-121.65
	Month-Year 34	-5.29328	-49.55
	Month-Year 35	3.055494	29.53
	Month-Year 36	-3.3171	-33.92
	Month-Year 37	-13.0155	-128.32
	Month-Year 38	-16.816	-155.41
	Month-Year 39	-13.0714	-109.84
	Month-Year 40	-9.73805	-78.14
	Post*Treatment	-0.490289	-2.95
LI	Month-Year 1	-13.1401	-49.47
	Month-Year 2	-9.77215	-35.76
	Month-Year 3	-5.0207	-16.39
	Month-Year 4	8.18805	19.46
	Month-Year 5	10.81331	24.98
	Month-Year 6	8.602155	25.95
	Month-Year 7	-5.64791	-18.57
	Month-Year 8	-13.1241	-49.82
	Month-Year 9	-12.8156	-49.67
	Month-Year 10	-4.40964	-16.55
	Month-Year 11	0.715821	2.66
	Month-Year 28	5.95639	6.54
	Month-Year 29	5.994869	17.43
	Month-Year 30	2.932727	8.70
	Month-Year 31	-8.52757	-28.86
	Month-Year 32	-11.8067	-41.95
	Month-Year 33	-11.2288	-40.15
	Month-Year 34	-4.82449	-17.17
	Month-Year 35	0.693191	2.48
	Month-Year 36	-4.26163	-15.39
	Month-Year 37	-11.6334	-42.52
	Month-Year 38	-10.3279	-35.95
	Month-Year 39	-1.48777	-4.72
	Month-Year 40	4.155354	12.43

Source: Navigant Analysis



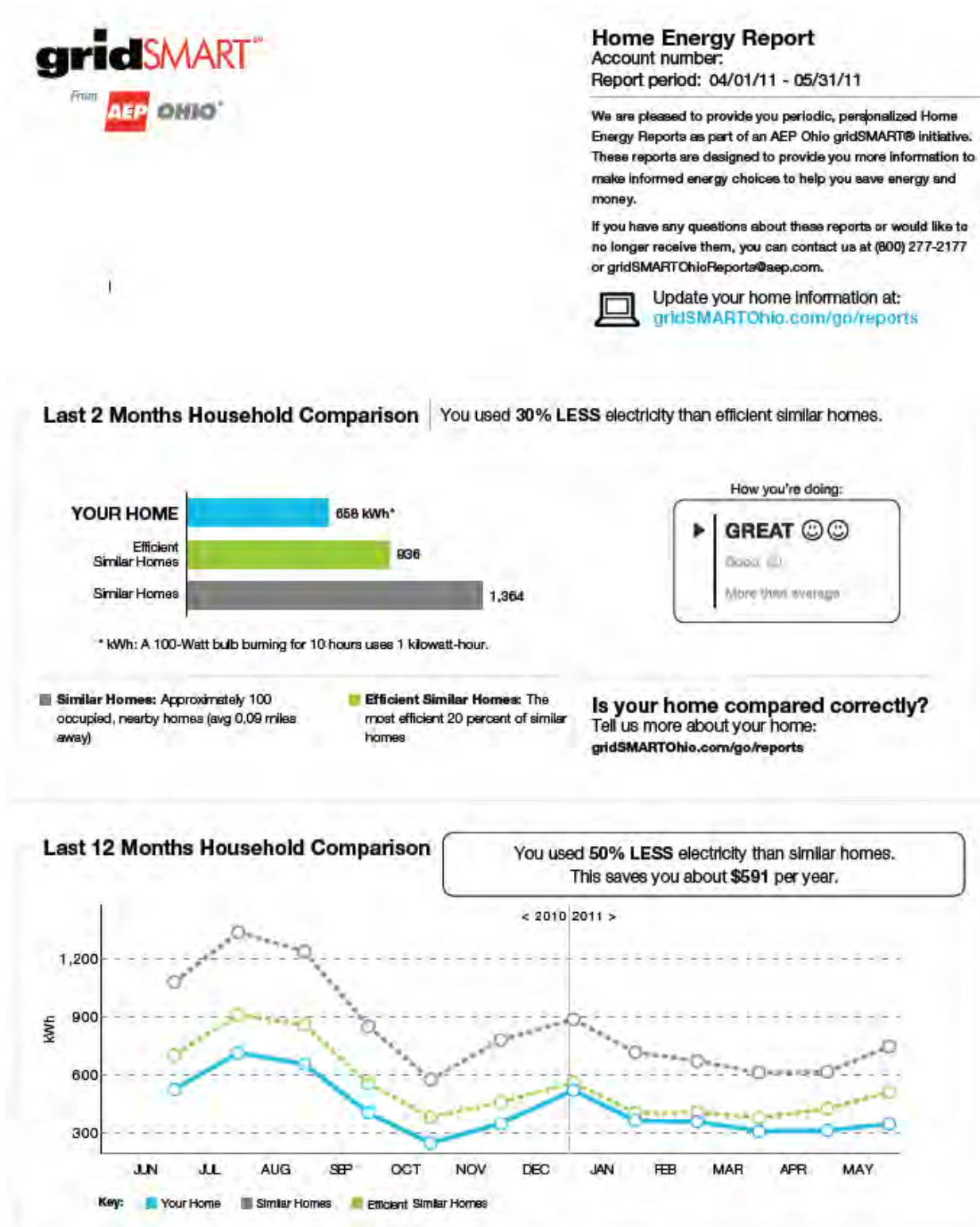
## Appendix B Sample Home Energy Report

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





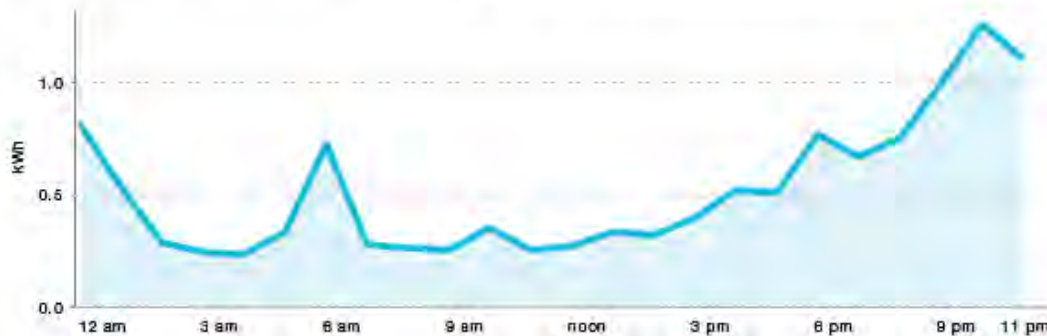
Figure B-1. Example of AEP Ohio Home Energy Report





## An Average Day Last Month

On average, you used the most from 10 pm – 12 am.  
Think about what uses electricity during this time.



Do you use more on weekdays or weekends? Visit [gridSMARTOhio.com/go/reports](http://gridSMARTOhio.com/go/reports) to find out.

## 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.

SAVE UP TO  
**\$120** PER YEAR

### 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.

SAVE UP TO  
**\$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



Questions? Want to opt-out of reports? | (800) 277-2177 | [gridSMARTOhioReports@aep.com](mailto:gridSMARTOhioReports@aep.com)

runs on **OPOWER®**

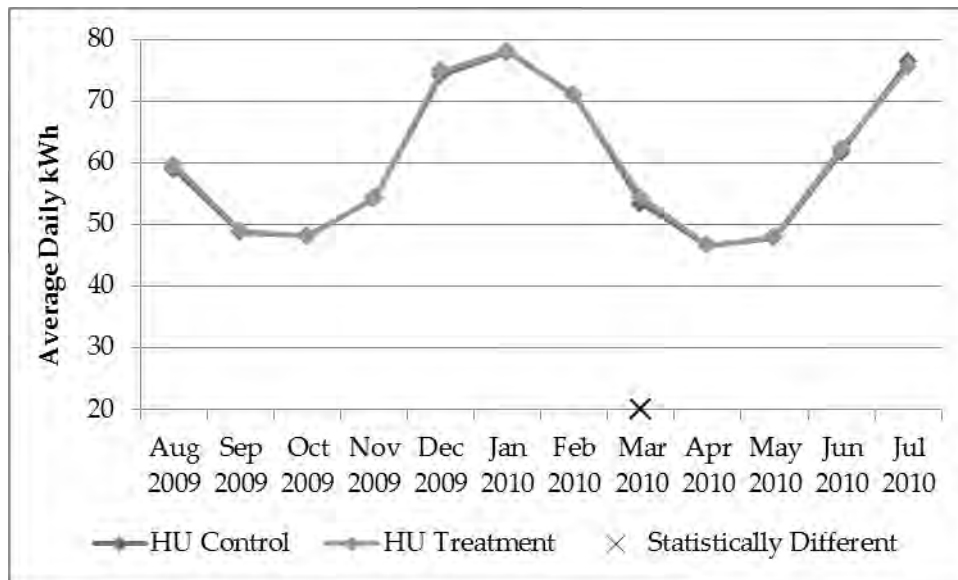
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## Appendix C Verification of Control Group

The charts contained in this section compare the energy usage of treatment and control household during the 12 months prior to enrollment of treatment households in the HER Program. The average energy use among treatment and control households are graphed and compared to help determine if households were randomly assigned and if the control group is appropriately constructed for the analysis. This comparison is done separately for each customer group, since each group was analyzed separately. Months are labeled as statistically different if average energy usage can be differentiated at the 95% confidence level. Most of all of the month should not be statistically different if the control group was randomly assigned.

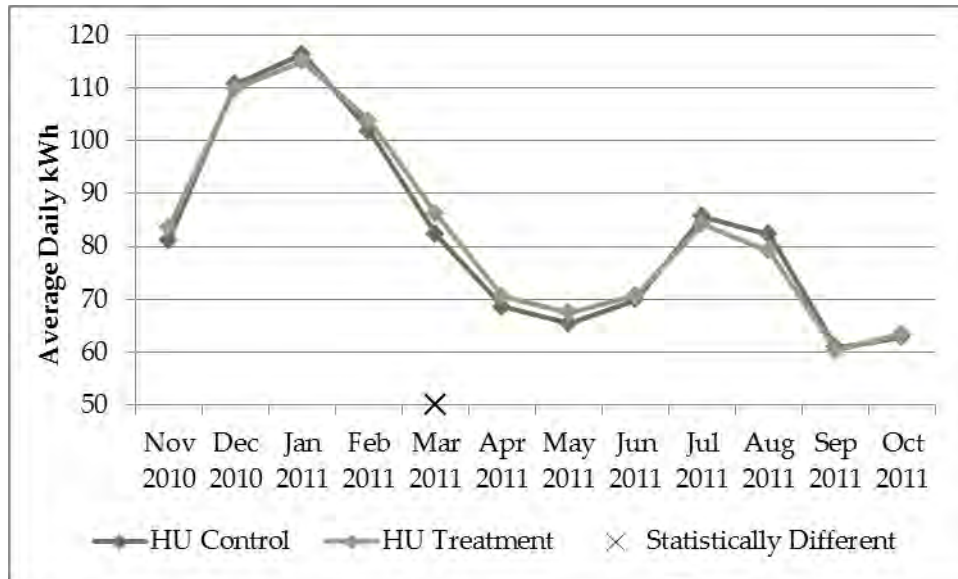
**Figure C-1. Comparison of Second Year HU Control and Treatment Customers**



Source: Navigant Analysis

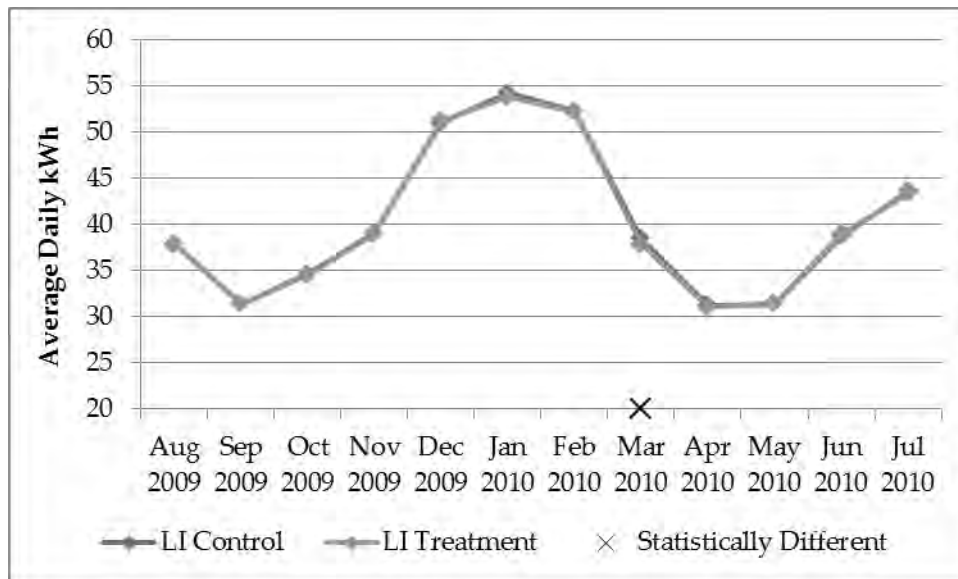


**Figure C-2. Comparison of First Year HU Control and Treatment Customers**



Source: Navigant Analysis

**Figure C-3. Comparison of Second Year LI Control and Treatment Customers**



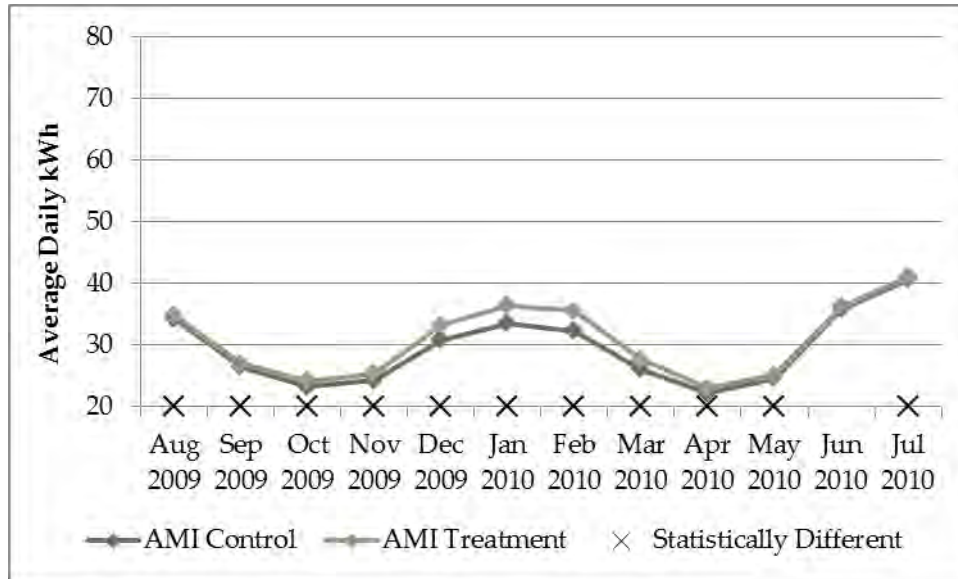
Source: Navigant Analysis

Figure C-4 shows the initial discrepancies that existed between the AMI treatment and control groups, especially during the winter heating months. Figure C-5 and Figure C-6 shows the same comparison separately for customers with and without electric heat. As the charts show, when heating source is controlled for, the discrepancies between the AMI treatment and control groups largely disappear. Navigant incorporated heating type into the regression model for AMI customers for this reason.



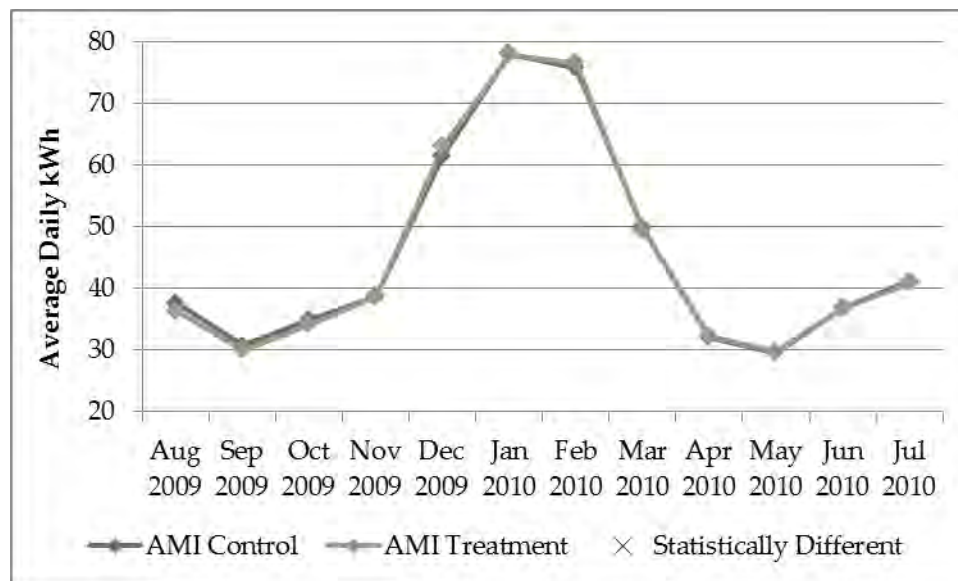


**Figure C-4. Comparison of Second Year AMI Control and Treatment Customers without Heat Type Incorporated**



Source: Navigant Analysis

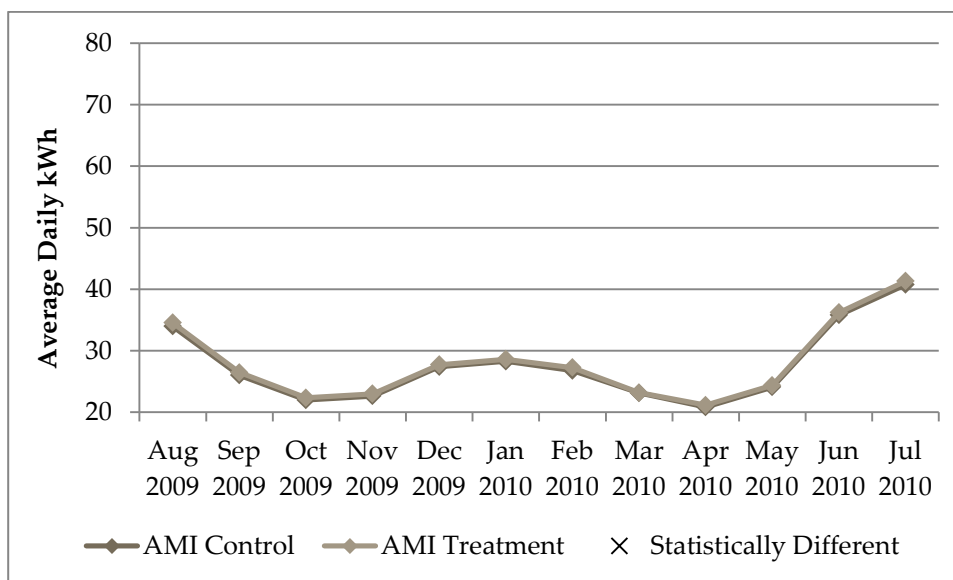
**Figure C-5. Comparison of Second Year AMI Control and Treatment Customers with Electric Heat**



Source: Navigant Analysis



**Figure C-6. Comparison of Second Year AMI Control and Treatment Customers without Electric Heat**



Source: Navigant Analysis



## 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 2012 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	Code	Page Number
Introduction & Screener	S	2
Home Energy Report Engagement	E	4
Satisfaction	SA	8

#### Introduction & Screener

INTRO. Hello, 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.

S1. 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?"

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 five to ten minutes.

S2. Are you willing to participate?

1. YES
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

99. REFUSED

[IF S3 = 2 or 99]

S4. Are you driving a vehicle or using any equipment that requires your attention?

1. NO
2. YES **[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 input will be extremely helpful.





E1. Do you recall whether your household receives a report in the mail that describes your home's energy use? 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. **[DO NOT READ LIST]**

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 **[SKIP TO E4]**
2. I PERSONALLY READ THEM AND OTHERS IN MY HOUSEHOLD LOOK AT THEM **[SKIP TO E4]**
3. 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? **[IF NECESSARY, PROMPT: "Do you spend more than 20 minutes reviewing it? More than 10 minutes? More than five ? More than two minutes or two minutes or less?"] [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 E7]**

97. OTHER (SPECIFY)

98. DON'T KNOW

99. REFUSED

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

1. Yes **[SKIP TO E8]**
2. No

97. Other **[SKIP TO E8]**

99. Refused **[SKIP TO E8]**

**[IF E6 = 2]**

E7. Why do you feel the suggestions are not relevant to you and your household? **[OPEN END, 98 DON'T KNOW, 99 REFUSED]**

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. Have you... **[RANDOMIZE ATTRIBUTES A-F] [CHECK BOXES] [INTERVIEWER NOTE: EVERY THIRD ATTRIBUTE REITERATE THAT IT IS WITHIN THE LAST 12 MONTHS]**

	Yes (1)	No (2)	Don't Know (98)	Refused (99)
<b>a.</b> Discussed ideas about how to save energy within your household?				
<b>b.</b> Discussed ideas about how to save energy with others outside of your household (i.e., co-workers, neighbors, and friends)?				
<b>c.</b> Purchased energy efficient appliances or energy efficient electronic equipment, such as computers or televisions?				
<b>d.</b> Purchased any small energy efficiency devices, such as efficient light bulbs or power strips?				
<b>e.</b> Changed any of your habits related to how often or how long you use lighting and/or electronics in your home?				
<b>f.</b> Changed any of your habits related to the amount of heating, cooling, and/or hot water you use in your home?				



[IF E8c. OR E8d. = 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)
97. OTHER (**SPECIFY**)
98. DON'T KNOW
99. REFUSED

[IF E8e. OR E8f. = 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. DRY **CLOTHES** EFFICIENTLY (I.E., HANG CLOTHES TO AIR DRY, RUN THE CLOTHES DRYER WITH A FULL LOAD)
2. WASH **CLOTHES** EFFICIENTLY (I.E., USE COLD WATER, RUN THE WASHER WITH A FULL LOAD)
3. RUN **DISHWASHER** EFFICIENTLY (I.E., RUN ON FULL LOADS, AIR DRY, AVOID USING SPECIAL SETTINGS)
4. 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)
5. 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)
6. 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)
7. **SEAL** LEAKS AND DRAFTS (I.E., LEAKY DOORS, WINDOWS, REFRIGERATOR SEALS, FIREPLACES, AIR DUCTS, AIR CONDITIONER UNITS, OUTLETS AND LIGHT SWITCHES)
8. TAKE SHORTER **SHOWERS**
9. 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)
10. PROGRAM **PROGRAMMABLE THERMOSTAT** TO HEAT AND COOL EFFICIENTLY (I.E., PROGRAM TO REDUCE HEATING AND/OR COOLING WHEN AWAY FROM HOME OR ASLEEP)
11. INSULATE **WATER HEATER** AND/OR PIPES (I.E., INSTALL A WATER HEATER BLANKET, INSULATE WATER PIPES)
12. USE **WINDOW SHADES** (I.E., TO LET HEAT FROM SUN IN ON COLD DAYS, AND/OR KEEP HEAT FROM SUN OUT ON WARM DAYS)
97. OTHER (**SPECIFY**)
98. DON'T KNOW
99. REFUSED
- E11. How influential are the reports in terms of helping you making informed energy choices and in saving money? Please rate this on a 1 to 5 scale, where 1 means "not at all influential" and 5 means "very influential"?



1	NOT AT ALL INFLUENTIAL
2	
3	
4	
5	VERY INFLUENTIAL
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]**
3. 98. DON'T KNOW **[SKIP TO NEXT SECTION]**
4. 99. REFUSED **[SKIP TO NEXT SECTION]**

**[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, 98 DON'T KNOW, 99 REFUSED]**

## Satisfaction

SA1. Thinking broadly, how satisfied or dissatisfied 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, 98 DON'T KNOW, 99 REFUSED]

SA3. How satisfied or dissatisfied 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 [SKIP TO END]
99	REFUSED [SKIP TO END]

[IF SA3 > 3]

SA4. Why did you give that rating? [OPEN END, 98 DON'T KNOW, 99 REFUSED]

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. 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 **[THANK AND RECORD AS COMPLETE]**

98. DON'T KNOW [THANK AND RECORD AS COMPLETE]

99. REFUSED [THANK AND RECORD AS COMPLETE]

SA7. 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 SA7 = 1]

SA8. How satisfied or dissatisfied 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 SA8 > 3]

SA9. Why did you give that rating? [OPEN END, 98 DON'T KNOW, 99 REFUSED]

END. Thank you for taking time to help with our survey and the helpful information you provided.

Have a great day/evening. **[RECORD AS COMPLETE]**



## ***D.2 AEP OHIO Home Energy Report Program Non-Participant Survey for 2012 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.

Title	Code	Page Number
Introduction & Screener	S	2
Energy Efficiency Actions	E	4
Satisfaction	SA	6

### **Introduction & Screener**

INTRO. Hello, 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.

S1. 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?"

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 five to ten minutes.

S2. Are you willing to participate?

4. YES





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?
1. LANDLINE [SKIP TO NEXT SECTION]
  2. MOBILE PHONE
99. REFUSED

[IF S3 = 2 or 99]

- S4. Are you driving a vehicle or using any equipment that requires your attention?
1. NO
  2. YES [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] Have you... [RANDOMIZE ATTRIBUTES A-F] [INTERVIEWER NOTE: EVERY THIRD ATTRIBUTE REITERATE THAT IT IS WITHIN THE LAST 12 MONTHS]



	Yes (1)	No (2)	Don't Know (98)	Refused (99)
<b>a.</b> Discussed ideas about how to save energy within your household?				
<b>b.</b> Discussed ideas about how to save energy with others outside of your household (i.e., co-workers, neighbors, and friends)?				
<b>c.</b> Purchased energy efficient appliances or energy efficient electronic equipment, such as computers or televisions?				
<b>d.</b> Purchased any small energy efficiency devices, such as efficient light bulbs or power strips ?				
<b>e.</b> Changed any of your habits related to how often or how long you use lighting and/or electronics in your home?				
<b>f.</b> Changed any of your habits related to the amount of heating, cooling, and/or hot water you use in your home?				

**[IF E8c. OR E8d. = YES]**

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

16. AIR CONDITIONER (I.E., WINDOW UNIT, CENTRAL AIR, ROOM AIR CONDITIONER, DUCTLESS AIR CONDITIONER)
17. CLOTHES DRYER
18. CLOTHES WASHER
19. DEHUMIDIFIER
20. DISHWASHER
21. ELECTRONICS (I.E., TELEVISION, LAPTOP, DESKTOP COMPUTER, HOME OFFICE EQUIPMENT)
22. FANS (I.E., WHOLE-HOUSE FAN, ATTIC FAN, SOLAR ATTIC FAN, BOX FANS, CEILING FANS)
23. HEAT PUMP (FOR HEATING OR COOLING HOME; I.E., A "REGULAR" HEAT PUMP, GEOTHERMAL HEAT PUMP, OR DUCTLESS HEAT PUMP)
24. INSULATION IN ATTIC AND/OR WALLS OF HOME
25. 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)
26. POOL EQUIPMENT (I.E., HEATER, POOL PUMP, VARIABLE SPEED POOL PUMP)
27. REFRIGERATOR AND/OR FREEZER
28. PROGRAMMABLE THERMOSTAT



- 29. 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)
- 30. WINDOWS (I.E., DOUBLE PANE, STORM WINDOWS, STRATEGICALLY PLACED NEW WINDOWS)
- 31. 97. OTHER [SPECIFY]
- 32. 98. DON'T KNOW
- 33. 99. REFUSED

**[IF E8e. OR E8f. = 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. DRY **CLOTHES** EFFICIENTLY (I.E., HANG CLOTHES TO AIR DRY, RUN THE CLOTHES DRYER WITH A FULL LOAD)
- 14. WASH **CLOTHES** EFFICIENTLY (I.E., USE COLD WATER, RUN THE WASHER WITH A FULL LOAD)
- 15. RUN **DISHWASHER** EFFICIENTLY (I.E., RUN ON FULL LOADS, AIR DRY, AVOID USING SPECIAL SETTINGS)
- 16. 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)
- 17. 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)
- 18. 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)
- 19. **SEAL** LEAKS AND DRAFTS (I.E., LEAKY DOORS, WINDOWS, REFRIGERATOR SEALS, FIREPLACES, AIR DUCTS, AIR CONDITIONER UNITS, OUTLETS AND LIGHT SWITCHES)
- 20. TAKE SHORTER **SHOWERS**
- 21. 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)



- 22. PROGRAM **PROGRAMMABLE THERMOSTAT** TO HEAT AND COOL EFFICIENTLY (I.E., PROGRAM TO REDUCE HEATING AND/OR COOLING WHEN AWAY FROM HOME OR ASLEEP)
- 23. INSULATE **WATER HEATER** AND/OR PIPES (I.E., INSTALL A WATER HEATER BLANKET, INSULATE WATER PIPES)
- 24. USE **WINDOW SHADES** (I.E., TO LET HEAT FROM SUN IN ON COLD DAYS, AND/OR KEEP HEAT FROM SUN OUT ON WARM DAYS)

97. OTHER (**SPECIFY**)

98. DON'T KNOW

99. REFUSED

### Satisfaction

SA1. Thinking broadly, how satisfied or dissatisfied 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, 98 DON'T KNOW, 99 REFUSED]

END. Those are all of the questions I have for you today. Thank you for your time. AEP Ohio appreciates your participation!

---

## APPENDIX I

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## PREScriptive PROGRAM

### Program Year 2012 Evaluation Report

Prepared for:  
AEP Ohio



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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.

### Program Participation

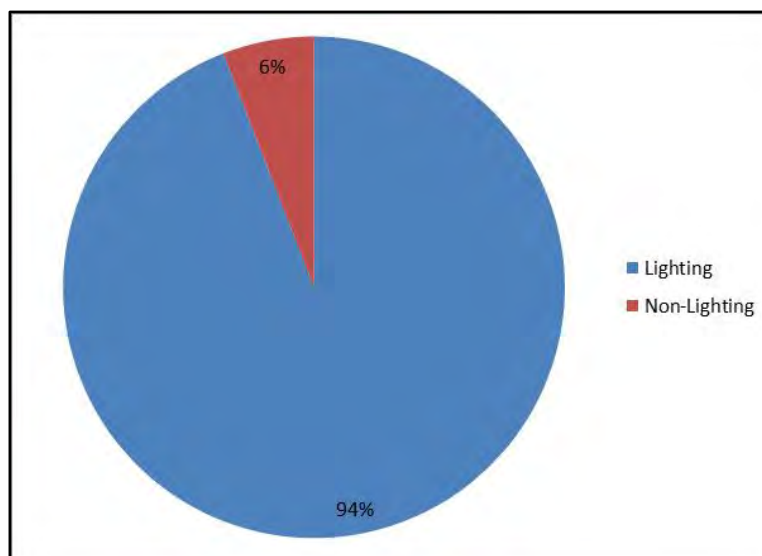
As shown in Table ES-1, the 2012 Prescriptive Program paid incentives on 2,643 projects constituting 142,331 MWh of *ex-ante* reported annual energy savings. The vast majority (94%) of installed measures were lighting measures, as shown in Figure ES-1.

**Table ES-1. 2012 Prescriptive Program Projects, Measures, and Reported Savings**

Metric	Reported Value
Number of Projects	2,643
Number of Measures	8,813
Annual Energy Savings (MWh)	142,331 MWh
Electric Peak Demand Savings (kW)	30,228 kW

Source: Evaluation analysis of AEP Ohio tracking data from March 25, 2013

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



Source: Evaluation analysis of AEP Ohio tracking data from March 25, 2013



### ***Data Collection Activities***

Table ES-2 provides a summary of 2012 data collection activities for the Prescriptive Program impact and process evaluations.

**Table ES-2. Data Collection Activities for 2012 Prescriptive Evaluation**

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 2012	Project	NA	NA	May 2012 to April 2013
Process	In-depth Interviews	AEP Ohio Program Staff	Contact from AEP Ohio	NA	1	January 2013 to February 2013
		Prescriptive Program implementation staff	Contact from DNV KEMA	NA	4	
Process	CATI Surveys	Prescriptive Program participants	Unique contact from tracking database	Random	297	March 2013 to April 2013
Process	CATI Surveys	Business Solution Providers	Contact from DNV KEMA	Random sampling using stratified ratio estimation	90	March 2013 to April 2013
Impact	Project Technical Reviews	Prescriptive projects paid in 2012	Project	Random sampling using stratified ratio estimation	53	October 2012 to April 2013
Impact	On-site Measurement & Verification	Projects with Industrial Lighting measures	Project	Random subset of technical review sample	22	January 2013 to April 2013

Source: Evaluation activities conducted from May 2012 through April 2013.

### ***Key Evaluation Findings and Recommendations***

#### **Key Impact Findings and Recommendations**

As shown in Table ES-3, the impact evaluation verified 93 percent of the *ex-ante* reported energy savings and 94 percent of the *ex-ante* reported peak demand savings. The relative precision at the two-tailed 90%



confidence interval was  $\pm 5.3\%$  for energy and  $\pm 3.2\%$  for demand. Overall, DNV KEMA is doing a good job estimating the savings resulting from the Prescriptive Program.

**Table ES-3. 2012 *Ex-post* Savings and Realization Rates**

Metric	Energy Savings (MWh)	Demand Savings (kW)
<i>Ex-ante</i> Reported Savings	142,331 MWh	30,228 kW
<i>Ex-post</i> Savings	132,132 MWh	28,486 kW
Realization Rate	0.93	0.94
Relative Precision @ 90% CI	5.3%	3.2%

*Source: Evaluation data collection and analysis as described in Section 2*

Other key impact findings and recommendations include:

1. More than 40 percent of program savings come from replacing HID or T12 fixtures with new, standard efficiency T5 or T8 fixtures. Legislation from 2007 (the Energy Independence and Security Act- EISA) effectively eliminates standard 40-Watt T12 lamps and ballasts from being manufactured or imported in the United States. As the full effect of EISA 2007 is realized in the coming years, the installed base of standard 40-Watt T12 fixtures will be reduced.<sup>1,2</sup>

**Recommendation:** AEP Ohio should consider ways to reduce its dependency for savings on this single measure type. One way of mitigating this risk is to place greater emphasis on reduced wattage and high performance T8 measures, which accounted for 8 percent and 7 percent (respectively) of reported program energy savings in 2012, and which provides more savings per measure than standard efficiency fixtures.

2. Navigant found that DNV KEMA, the program implementation contractor, used an average of the HVAC interactive effects in DEER 2008 across all 16 California climate zones, including those in coastal and desert areas. The evaluation team's research suggests that DEER 2008 is a reasonable source, but that climate zone 11 is more appropriate for Ohio than any other.

**Recommendation:** Navigant recommends that DNV KEMA use the HVAC interactive effects for climate zone 11 going forward. This was an evaluation adjustment for 2012 that decreased the *ex-ante* reported program savings by 6.4 percent for energy and 4.1 percent for demand.

<sup>1</sup> As the installed base of this equipment dwindles over the next few years, the baseline for this measure will get more efficient, thus reducing the potential for savings from this measure.

<sup>2</sup> Newly developed high CRI 40-Watt lamps (CRI at least 87) are exempt from the federal efficacy requirements, but they are relatively expensive, and unlikely to replace the 34w energy-efficient alternative.



3. Navigant found the range of fixtures meeting the requirements of the high performance and reduced wattage (HP/RW) measures to have a lower overall input wattage than assumed by DNV KEMA. This lower wattage results in savings that are underreported.

**Recommendation:** Navigant suggests that DNV KEMA update its fixture wattage assumption for HP/RW measures based on Navigant's research for the range of qualifying fixtures reported by the Consortium for Energy Efficiency (CEE). This evaluation adjustment increased program savings by 5.2 percent for energy and 6.4 percent for demand. This increase represents savings left "off the table".

4. As in previous years, Navigant found the demand savings for occupancy sensors to be underreported by 2 to 32 times the actual savings. This is a result of mistakes in the calculation methodology for the per-unit demand savings, in which (a) the same coincidence factor of 0.15 is used for all building types, and (b) the coincidence factor is applied *twice*, resulting in a squared value that significantly underestimates savings.

**Recommendation:** Navigant recommends that DNV KEMA make the simple correction to the squared term in the per-unit savings algorithm as originally suggested in 2011, and index the coincidence factor by building type to determine savings. This was an evaluation adjustment for 2012, and it increased the program demand savings by 2.7 percent.

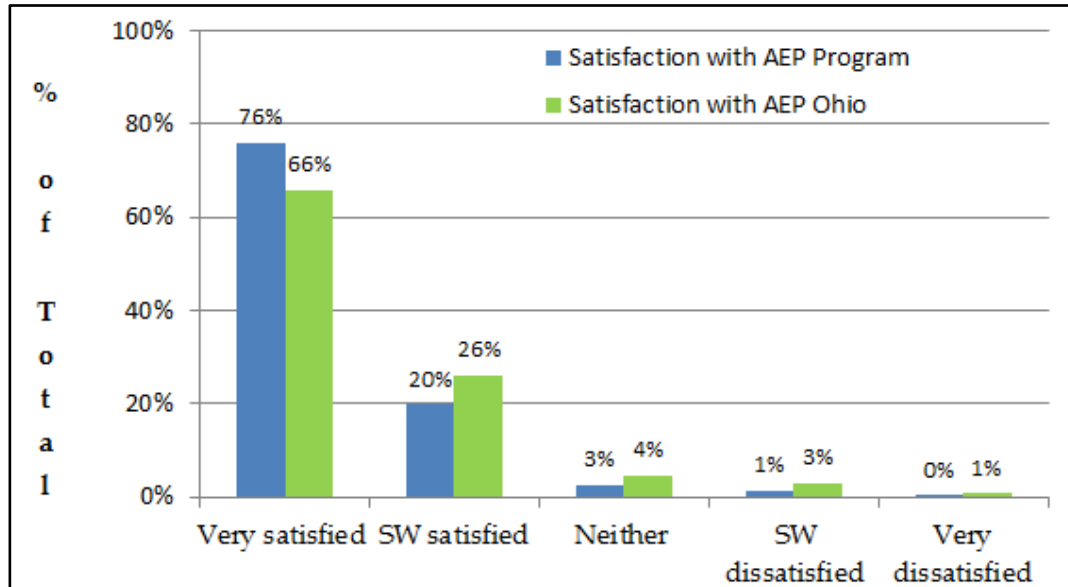
### Key Process Findings and Recommendations

As shown in Figure ES-2, approximately three-fourths of program participants (76%) were *very satisfied* with the AEP Ohio Prescriptive Program. Two-thirds of respondents (66%) indicated they were *very satisfied* with AEP Ohio. Overall, satisfaction levels with the Prescriptive Program and with AEP Ohio were similar with 96 percent reporting they were very or somewhat satisfied with the Prescriptive Program and 92 percent reporting they were very or somewhat satisfied with AEP Ohio.





**Figure ES-2. Satisfaction with the Prescriptive Program and AEP Ohio**



Source: 2012 Participant Survey. Base N=300.

Other key process findings and recommendations include:

- Interviews with program staff suggest that Solution Providers may be getting confused by the number of changes across all Business Programs in the last two years. Recent modifications to the Prescriptive program include:
  - » Adding new lighting and LED prescriptive measures
  - » Increasing Exterior and Interior LED incentives
  - » Expanding HVAC prescriptive menu
  - » Adding an EMS measure to the Prescriptive program
  - » Adding a Compressed Air worksheet

**Recommendation:** Consider keeping the Prescriptive Program offerings stable for one year. Customers and Solution Providers do value consistency and ‘taking a break’ from adding new technologies may provide customers and trade allies time to consolidate and integrate the changes that have been implemented in recent years.

- Prescriptive Program participants still report that lack of capital was a major reason customers are unable to proceed with a planned improvement project.

**Recommendation:** Consider how AEP Ohio can help Prescriptive Program participants for whom lack of capital is a major reason for postponing an improvement project. Navigant suggests that AEP Ohio considers partnering with a financial institution or bank to provide financing of projects.



3. The increase in participation levels from 2011 to 2012 may be a result of the increased number of technologies added to the Prescriptive Program from the Custom Program, the Solution Provider bonus for timely applications and, possibly, reaching a critical mass in educating business customers about the existence of the programs. The latter, lack of knowledge of the program, was named as a barrier to program participation by customers.

**Recommendation:** Navigant suggests that AEP Ohio consider hosting a media event, where AEP Ohio presents incentive checks to its customers. These types of events can boost both program awareness and customer satisfaction. Local news stations can provide invaluable public relations, and the event can be an opportunity to stress that energy savings will continue every month.

4. 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 cannot improve the program, suggests that most of major issues (excluding the application) have been reduced to minor issues.

**Recommendation:** Navigant suggests that AEP Ohio and DNV KEMA continue working with trade allies, offering the trade ally bonus and developing new case studies and targeted messages. 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.



## 1. Introduction

This evaluation report chapter 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 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.

The program launched in mid-year 2009 as a Lighting Program in AEP Ohio's service territory. In April 2010, AEP Ohio launched the 2010 Prescriptive Program by expanding the program to additional end-uses such as HVAC, motors, and refrigeration systems, and increasing the number of eligible lighting measures. Over 200 eligible measures were introduced in the 2010 program. DNV KEMA expanded the program in 2012 by adding transformers and Uninterruptible Power Supply (UPS) systems.

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 KEMA Services Inc., in coordination with AEP Ohio.

### 1.2 Key Program Elements

The goals of the 2012 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 Caps.** Incentives for 2012 may not exceed \$300,000 per project, or \$1,200,000 per business entity.

**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 required 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. DNV KEMA reviews final applications for eligibility and completeness.

**Final Inspection.** DNV KEMA 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.

### ***1.3 Prescriptive Program 2012 Participation Summary***

The evaluation team analyzed data extracted from AEP Ohio's tracking system on March 25, 2013. As shown in Table 1-1, the 2012 Prescriptive Program paid incentives on 2,643 projects constituting 142,331 MWh of *ex-ante* reported annual energy savings. The vast majority (94%) of installed measures were Lighting measures, as shown in Figure 1-1.

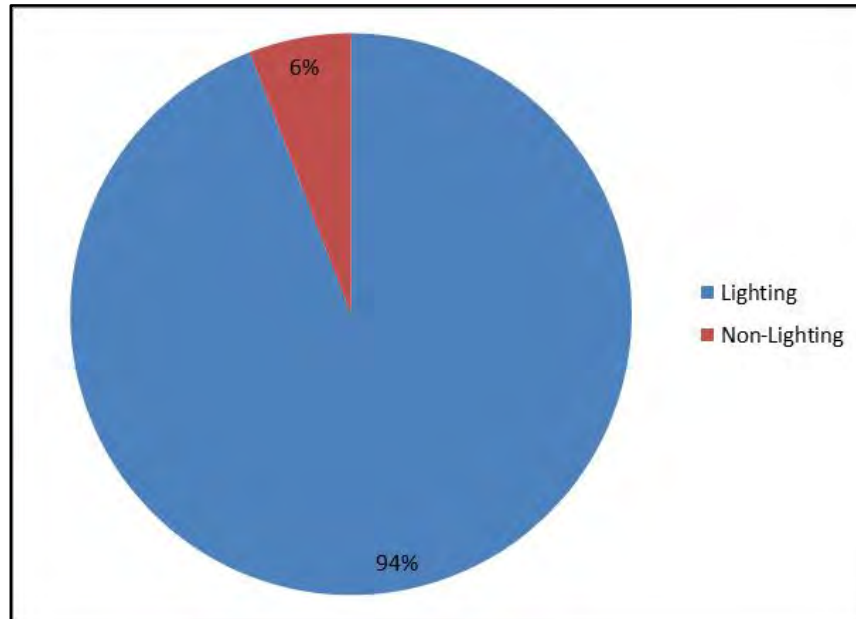
**Table 1-1. 2012 Prescriptive Program Projects, Measures, and Reported Savings**

Metric	Reported Value
Number of Projects	2,643
Number of Measures	8,813
Annual Energy Savings (MWh)	142,331 MWh
Electric Peak Demand Savings (kW)	30,228 kW

*Source: Evaluation analysis of AEP Ohio tracking data from March 25, 2013*



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



*Source: Evaluation analysis of AEP Ohio tracking data from March 25, 2013*

Section 3 provides a more detailed profile of the *ex-ante* reported projects, measures, and savings achieved by the 2012 Prescriptive Program.



## 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

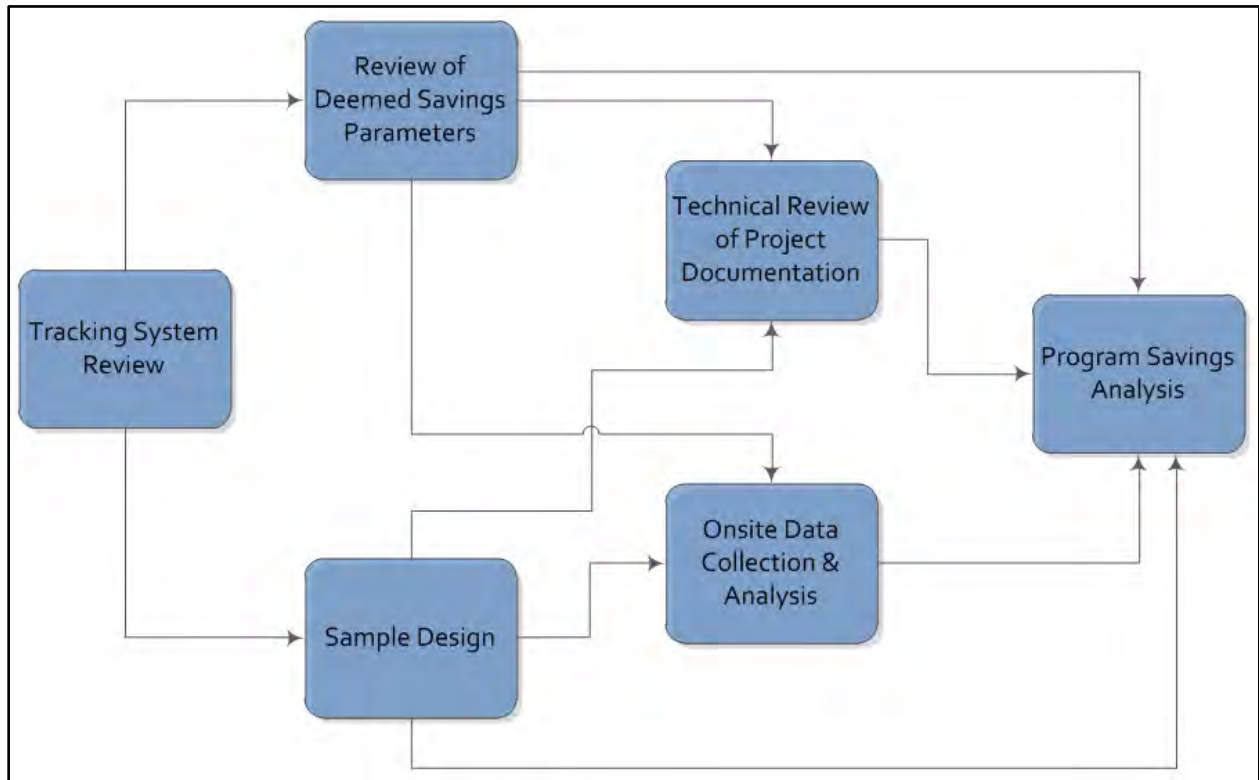
The purpose of the impact evaluation is to determine 2012 evaluation-verified (*ex-post*) energy and demand savings. The evaluation followed a multi-step approach as outlined below:

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 DNV KEMA's Appendix A.
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. **Onsite Data Collection & Analysis.** The evaluation team conducted onsite 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.

**Figure 2-1. 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 sectors and 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:

- Assessment of the appropriate measures for review
- Critical review and adjustment of the algorithms and inputs for the selected measures
- Systematic recording of adjustments for use in the Technical Review of Project Documentation
- Recalculation of *ex-ante* savings for reviewed measures

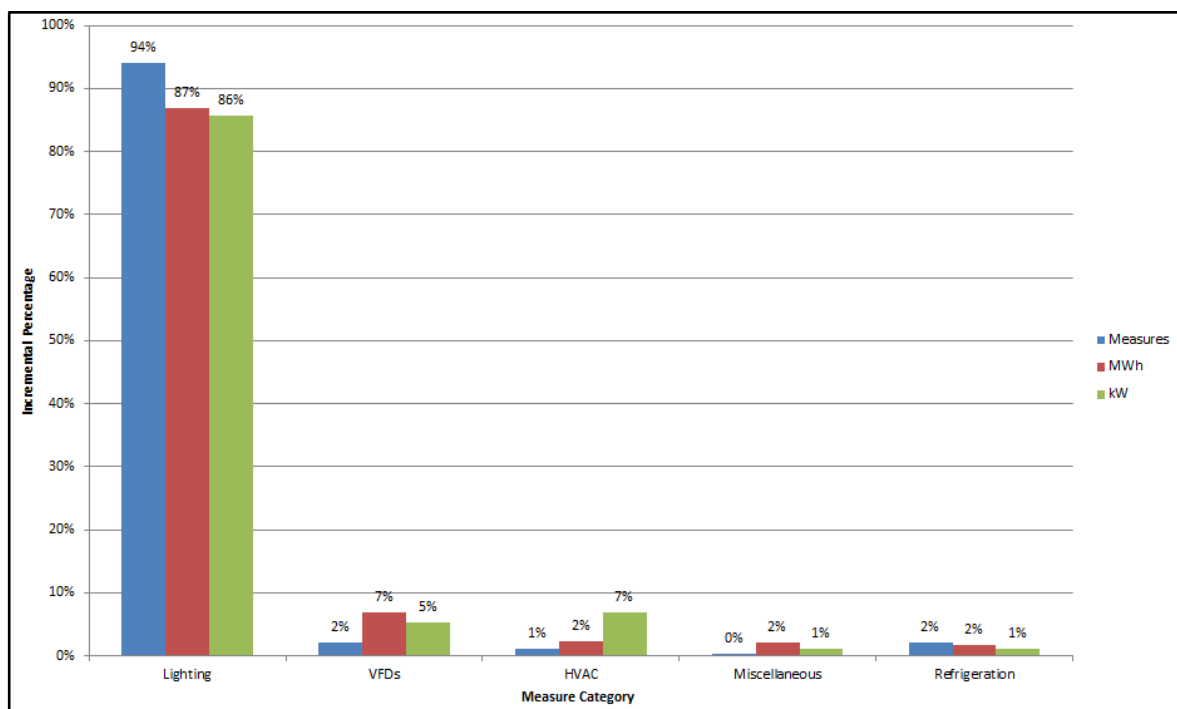


The following sections provide a brief overview of the Deemed Savings Review task.<sup>3</sup>

### 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 94 percent of the installed measures and 87 percent of the energy savings (see Figure 2-2), Navigant restricted the list to lighting only.

**Figure 2-2. Percentage of Measures and Savings by Measure Category<sup>1</sup>**



Source: Evaluation analysis of AEP Ohio tracking data from March 25, 2013

<sup>1</sup> The program reported a handful of measures in the categories of Food Service, Ice Makers, and Motors (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, the review of deemed savings parameters covered 83 percent of the installed measures and 81 percent of the savings.

<sup>3</sup> A more detailed description of the methodology and findings from this task will be provided in a separate deliverable to AEP Ohio.





### 2.1.3.2 Critical Review and Adjustment

For each lighting measure selected for review, the team conducted a technical review of the assigned default savings values to assess the reasonableness of underlying algorithms, technology assumptions, and input values. Navigant first reviewed the basic lighting algorithms for energy and demand savings, and the team found them to be reasonable and consistent with industry standard practice. Next, Navigant critically reviewed the source and values of the parameters affecting all lighting measures, including operating hours, coincidence factors, and HVAC interactive effects. Navigant also reviewed the measure-specific inputs, such baseline and energy efficient wattages, for those identified as contributing a majority of savings. In the final step, the team adjusted the inputs where newer, better, or more representative data could be used.

### 2.1.3.3 Systematic Recording of Adjustments

Navigant systematically documented the source and substantiated the reasoning behind any adjustment made to the *ex-ante* parameter values. The adjusted values were recorded in a spreadsheet, and they were indexed by measure and building type. Finally, Navigant engineers used the adjusted values as required during the Technical Review of Project Documentation (see Section 2.1.5).

### 2.1.3.4 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 DNV KEMA's Appendix A, and once using Navigant's adjusted values. This exercise resulted in two databases of savings, where the majority of Prescriptive measures (7,298 out of 8,809, or 83%) have a recalculated savings value, while the remaining minority uses the existing *ex-ante* values. The two databases are defined as:

1. **"Audited savings" database:** savings for the majority of measures recalculated using DNV KEMA's Appendix A inputs
2. **Navigant's "adjusted savings" database:** savings for the majority of measures recalculated using Navigant's improved inputs

The adjusted savings database was used as the basis of comparison for the *ex-post* savings from the sampled projects. A more detailed description of the program savings analysis, including the use of the audited and adjusted savings databases, is provided in Section 2.1.7 and Section 4.4.

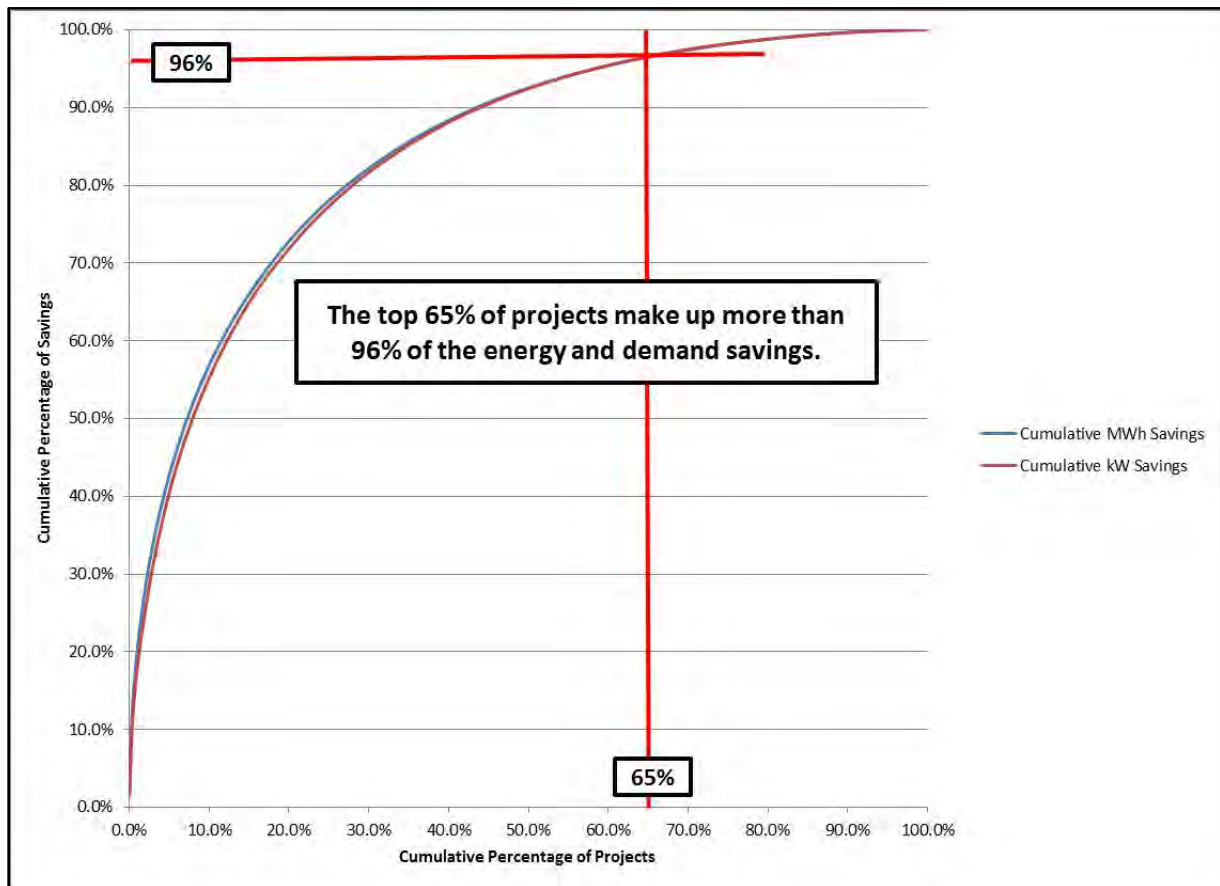
## 2.1.4 Impact Evaluation Sample Design

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 onsite 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 2012 evaluation included only those projects reported as paid during Program Year 4, January 7, 2012 through December 31, 2012.<sup>4</sup> The savings summaries from the Tracking System Review task revealed the top 65 percent of projects based on individual project savings accounted for more than 96 percent of the program's energy and demand savings (see Figure 2-3).

**Figure 2-3. Cumulative Percentage of Savings vs. Cumulative Percentage of Projects**



Source: Evaluation analysis of AEP Ohio tracking data from March 25, 2013

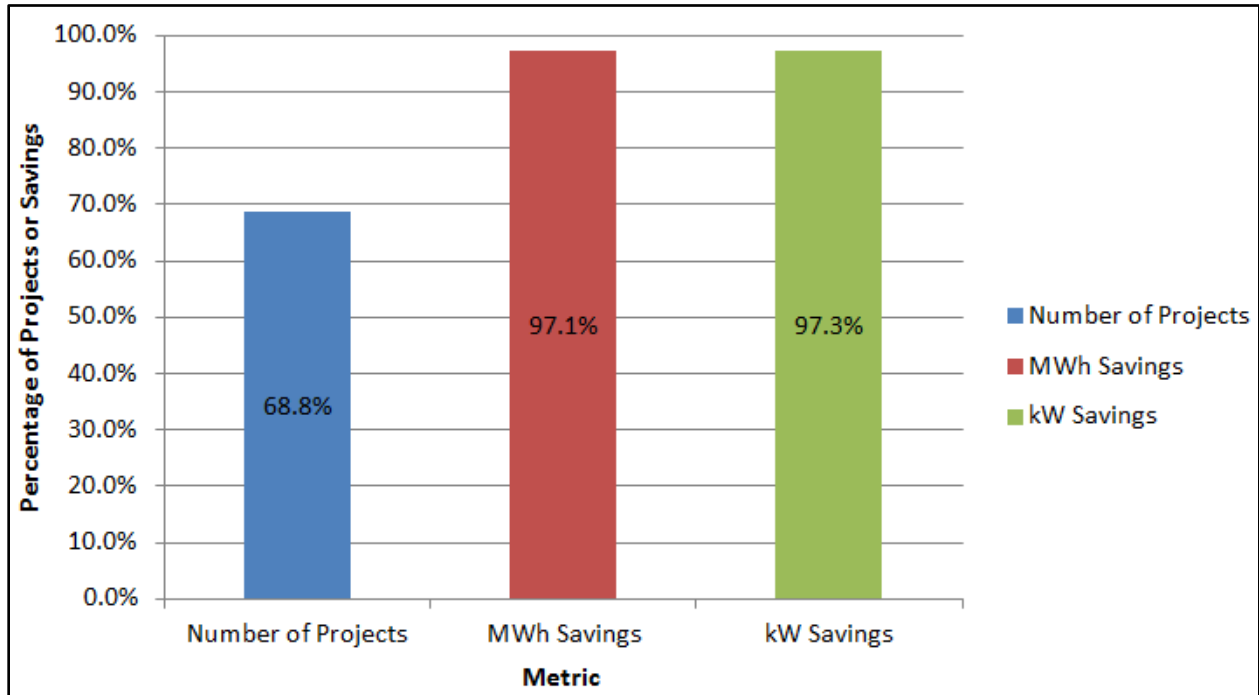
The team subsequently set thresholds of 10,000 kWh/project and 2.5 kW/project. If a project met neither of these criteria, it was removed from the sample frame. This key step increases the sampling efficiency, since the cost of evaluating these small savings projects exceeds the value of the information gleaned from them. As shown in Figure 2-4, this task resulted in a final sample frame representing more than 97 percent of the savings with 69 percent of the projects.<sup>5</sup>

<sup>4</sup> 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 2012.

<sup>5</sup> The percentage of projects meeting either the kWh or kW criteria (69%) is greater than the percentage of projects meeting just the kWh or just the kW criteria (65%).



**Figure 2-4. Percentage of the Population Reported Projects and Savings in Sample Frame**

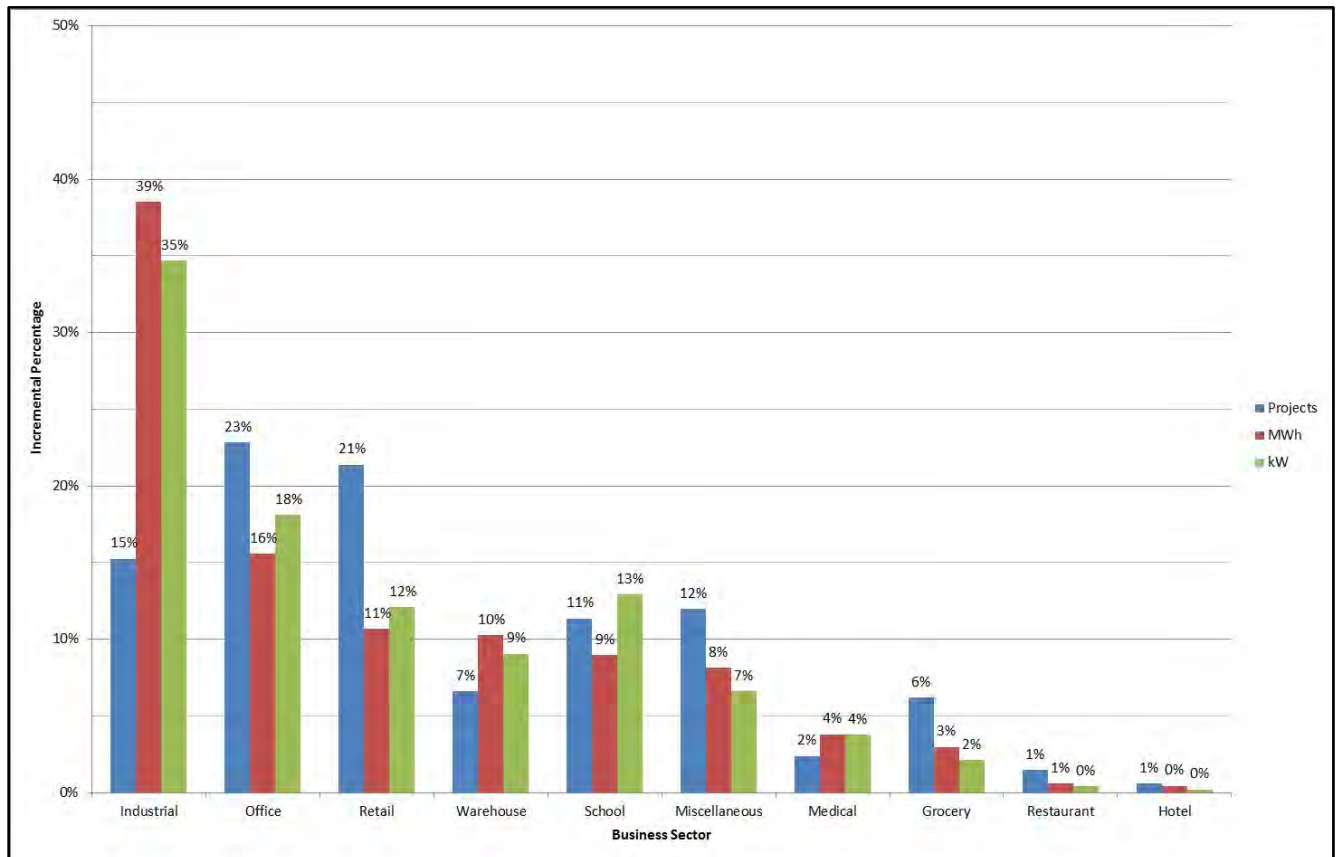


*Source: Evaluation analysis of AEP Ohio tracking data from March 25, 2013*



The savings summaries also showed that a substantial portion of savings (39 percent of energy savings) come from the Industrial/Manufacturing sector (see Figure 2-5). In addition, projects from this sector had the greatest concentration of savings with 136 MWh/project on average (see Figure 2-6).

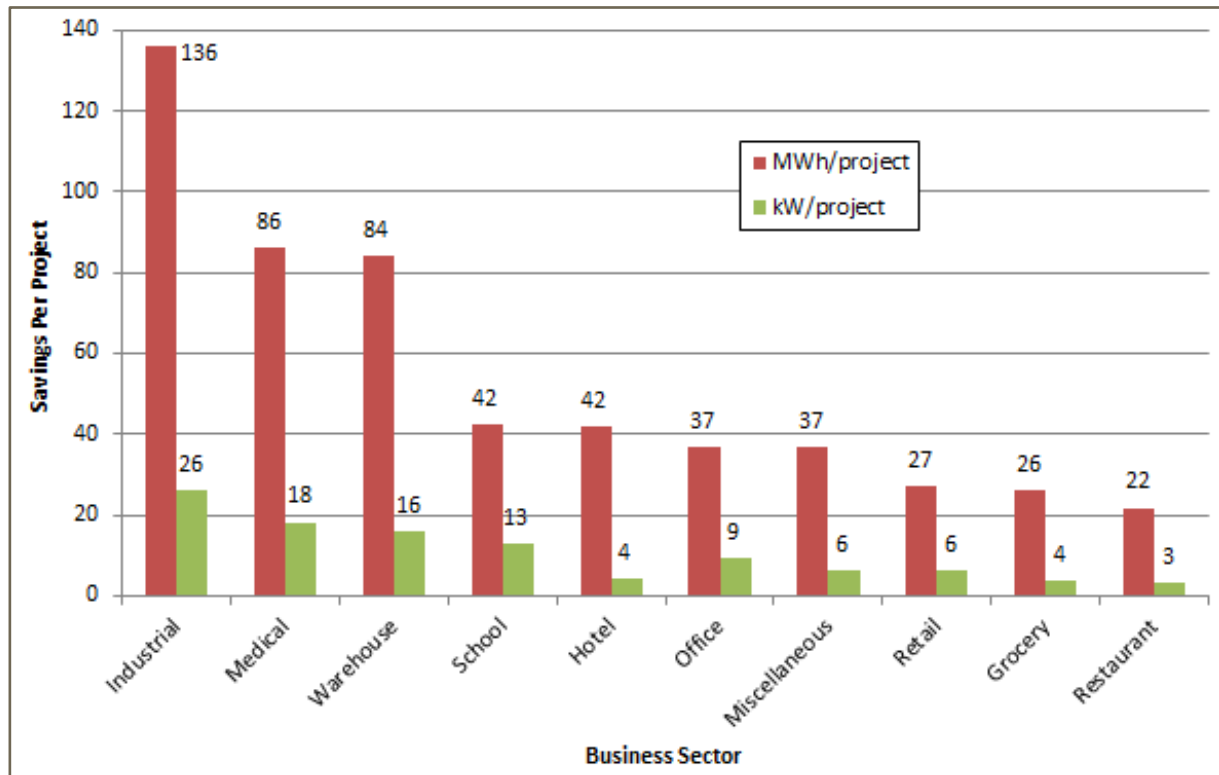
**Figure 2-5. Percentage of Projects and Savings by Business Sector**



Source: Evaluation analysis of AEP Ohio tracking data from March 25, 2013



**Figure 2-6. Average Savings Per Project by Business Sector**



Source: Evaluation analysis of AEP Ohio tracking data from March 25, 2013

As expected, further examination showed that a large majority of the installed savings came from lighting measures. Given the significant savings from this sector/measure combination, as well as the high savings per project, Navigant decided to target this category of projects in its sample design by separating them into their own strata.<sup>6</sup>

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. The sample sizes within each stratum were calculated to provide 10% relative precision at the two-tailed 90% confidence interval (90/10) for Prescriptive program annual energy (kWh) and peak demand (kW) savings.<sup>7</sup> Table 2-1 shows the strata definitions, the number of projects within each stratum, and the calculated sample sizes.

<sup>6</sup> If a project occurred in the Industrial/Manufacturing sector, and any portion of it was lighting, it was placed into an "Industrial Lighting" stratum.

<sup>7</sup> The Navigant team analyzed sample results from the 2011 evaluation to determine an appropriate starting point for the coefficient of variation (CV) on the *ratio* of verified to *ex-ante* savings. The final CVs used in the sample design were 0.45 for energy and 0.40 for demand.


**Table 2-1. Strata Definitions and Sample Sizes**

Stratum Number	Stratum Name	Lower kWh Threshold	Lower kW Threshold	Sample Frame Projects	Sample Size
1	Large Industrial Lighting	500,000	150	16	7
2	Medium Industrial Lighting	100,000	35	99	8
3	Small Industrial Lighting	10,000	2.5	194	7
4	Large Other	450,000	50	66	9
5	Medium Other	75,000	20	258	12
6	Small Other	10,000	2.5	1,185	10
<b>Total</b>				<b>1,818</b>	<b>53</b>

Source: Evaluation analysis of AEP Ohio tracking data from March 25, 2013

Finally, Navigant selected the samples within each stratum randomly. Once the sample points were selected, the sample was compared to the sample frame in a few key categories<sup>8</sup> 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. Table 2-2 shows the final sample claimed savings that were evaluated as a percentage of the sample frame.

**Table 2-2. Strata Definitions and Sample Sizes**

Stratum Number	Stratum Name	MWh Savings			kW Savings		
		Sample Frame (SF)	Sample	% of SF	Sample Frame (SF)	Sample	% of SF
1	Large Industrial Lighting	17,189	7,620	44%	2,808	1,075	38%
2	Medium Industrial Lighting	22,415	2,084	9%	4,478	323	7%
3	Small Industrial Lighting	8,446	170	2%	1,998	41	2%
4	Large Other	24,786	3,040	12%	6,396	1,034	16%
5	Medium Other	32,407	1,738	5%	6,379	262	4%
6	Small Other	33,030	406	1%	7,340	84	1%
<b>Total or Overall Value</b>		<b>138,272</b>	<b>15,058</b>	<b>11%</b>	<b>29,399</b>	<b>2,820</b>	<b>10%</b>

Note: Total may not sum to 100% due to rounding.

Source: Evaluation analysis of AEP Ohio tracking data from March 25, 2013

<sup>8</sup> The categories included Building Type, Measure Category, and broad geographic area.



### 2.1.5 Technical Review of Project Documentation

Navigant requested the project-specific documentation for each of the 53 sampled projects from DNV KEMA, and conducted a detailed technical review of each. The assessment included a review of the *ex-ante* database, the recalculated savings in the audited and adjusted savings 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.

### 2.1.6 Onsite Data Collection & Analysis

Navigant conducted onsite data collection and analysis for a subset of projects selected from the technical review sample. A project-specific 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 onsite M&V tasks included:

- 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, the team installed data loggers on the lighting measures for projects from an Industrial Lighting stratum. 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.<sup>9</sup> All of the data collected in the field was summarized and converted into algorithm inputs.

### 2.1.7 Program Savings Analysis

In the final step of the impact evaluation, Navigant combined the outputs from all previous steps to determine program-level *ex-post* energy and demand savings. More specifically, 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

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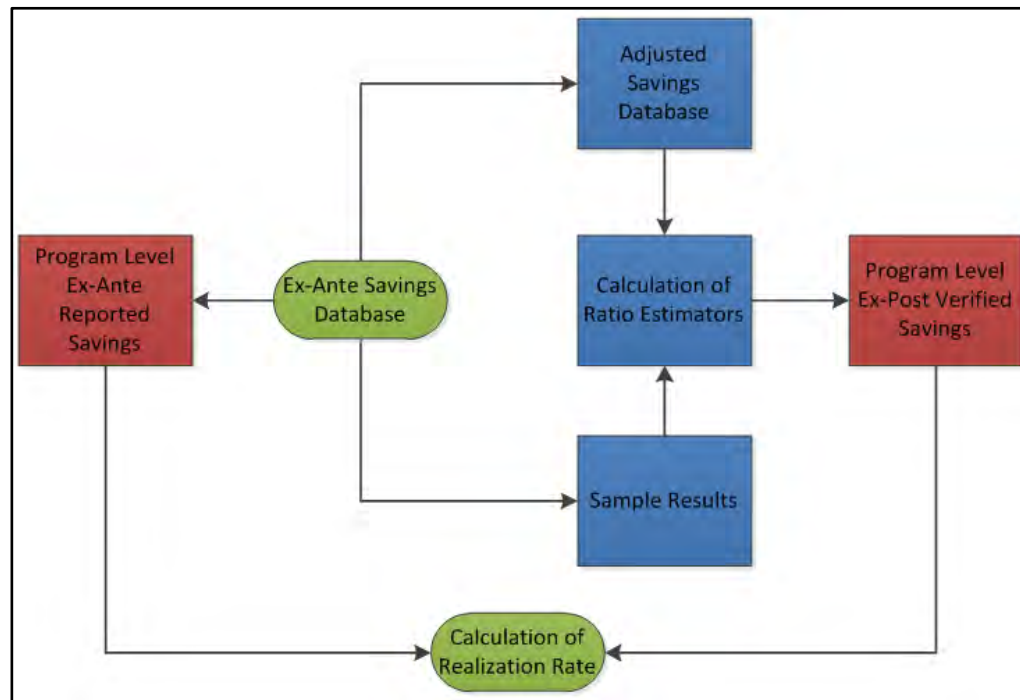
<sup>9</sup> Navigant also analyzed the logger data across all lighting measures at all Industrial/Manufacturing sites to calculate annual operating hours and coincidence factors for this sector. The findings from this analysis will be provided in a separate deliverable to AEP Ohio.



sample results by *first* improving the denominator (i.e. savings against which we compare sample results) used in the ratio estimation technique.<sup>10</sup>

The sample results were then extrapolated to the population of program participants 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 *ex-post* (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 2-7 shows the program savings analysis process in graphical form.

**Figure 2-7. Program Savings Analysis Process**



<sup>10</sup> 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.





## ***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, DNV KEMA, 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. Finally, the evaluation team conducted a CATI survey with Solution Providers to identify their perspectives on the program.<sup>11</sup>

### **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. Four interviews were conducted with members of the DNV KEMA implementation staff. These interviews were completed in January and February 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.

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<sup>11</sup> The methodology and results behind the Solution Provider surveys are provided in the Solution Provider chapter of the Business Programs report.



#### **2.2.4 CATI Telephone Survey of Program Participants**

A CATI survey targeted a population of 1,271 unique customer contact names drawn from the Prescriptive Program December 27, 2012 tracking system extract. The survey finished with 300 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 2013.

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 B.

#### **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 1,314 unique customer contact names with paid projects for the 2012 Prescriptive program.<sup>12</sup> The targeted number of completes was calculated to support the analysis of survey responses that are statistically valid at a 95% confidence interval with a relative precision of 5% (95/5), assuming a CV of 0.5. The sample design showed 297 samples required to meet 95/5.

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<sup>12</sup> This analysis was conducted on a data extract from December 27, 2012.



### 2.3 Summary of Data Collection Activities

Table 2-3 provides a summary of 2012 data collection activities for the Prescriptive Program impact and process evaluations.

**Table 2-3. Data Collection Activities for 2012 Prescriptive Evaluation**

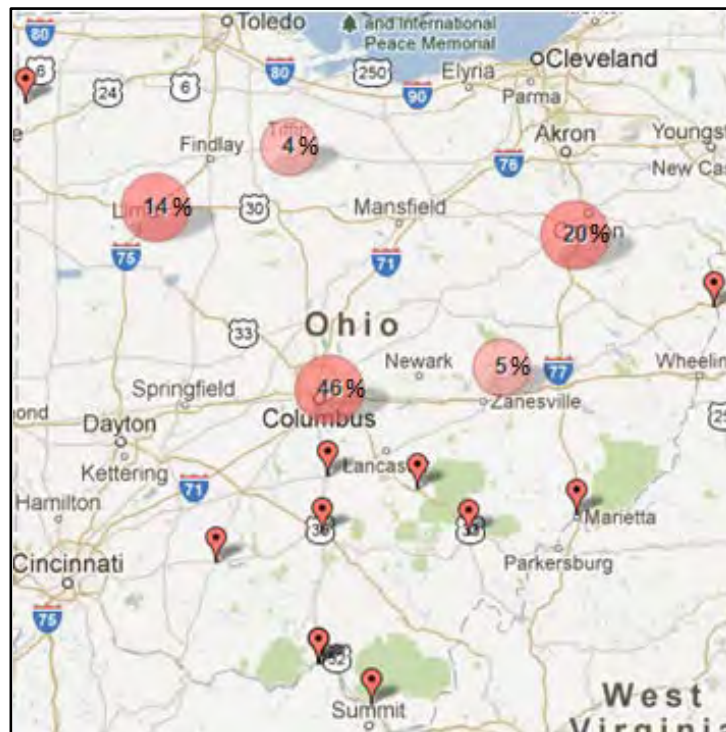
Evaluation Effort	Data Collection	Targeted Population	Sampling Unit	Sample Design	Sample Size	Timing
Impact and Process	Collection of Program Tracking Data	Prescriptive projects paid in 2012	Project	NA	NA	May 2012 to April 2013
Process	In-depth Interviews	AEP Ohio Program Staff	Contact from AEP Ohio	NA	1	January 2013 to February 2013
		Prescriptive Program implementation staff	Contact from DNV KEMA	NA	4	
Process	CATI Surveys	Prescriptive Program participants	Unique contact from tracking database	Random	297	March 2013 to April 2013
Process	CATI Surveys	Business Solution Providers	Contact from DNV KEMA	Random sampling using stratified ratio estimation	90	March 2013 to April 2013
Impact	Project Technical Reviews	Prescriptive projects paid in 2012	Project	Random sampling using stratified ratio estimation	53	October 2012 to April 2013
Impact	On-site Measurement & Verification	Projects with Industrial Lighting measures	Project	Random subset of technical review sample	22	January 2013 to April 2013

Source: Evaluation activities conducted from May 2012 through April 2013.

### 3. Program Participation

Figure 3-1 shows the percentage of 2012 Prescriptive projects installed in selected locations around the state. Nearly half (45%) of all projects were completed in the Columbus area, while 20% of the projects were completed in the Canton area.

**Figure 3-1. Percentage of Projects Installed in Selected Locations**

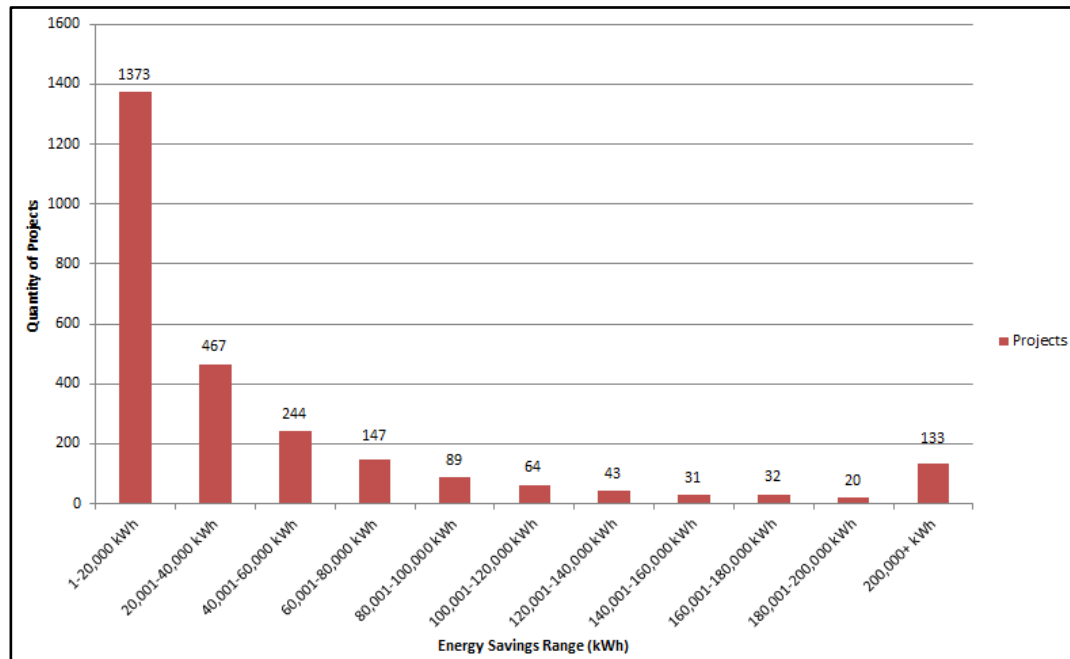


Source: Evaluation analysis of AEP Ohio tracking data from March 25, 2013

Figure 3-2 and Figure 3-3 show histograms of project quantity by savings range (energy and demand, respectively). As is typical with Business programs, the number of projects are concentrated at the lower end of the savings spectrum. The 138 projects reporting zero demand savings in the program tracking database included a range of measures such as exterior lighting and controls, VFDs for HVAC, and EMS.

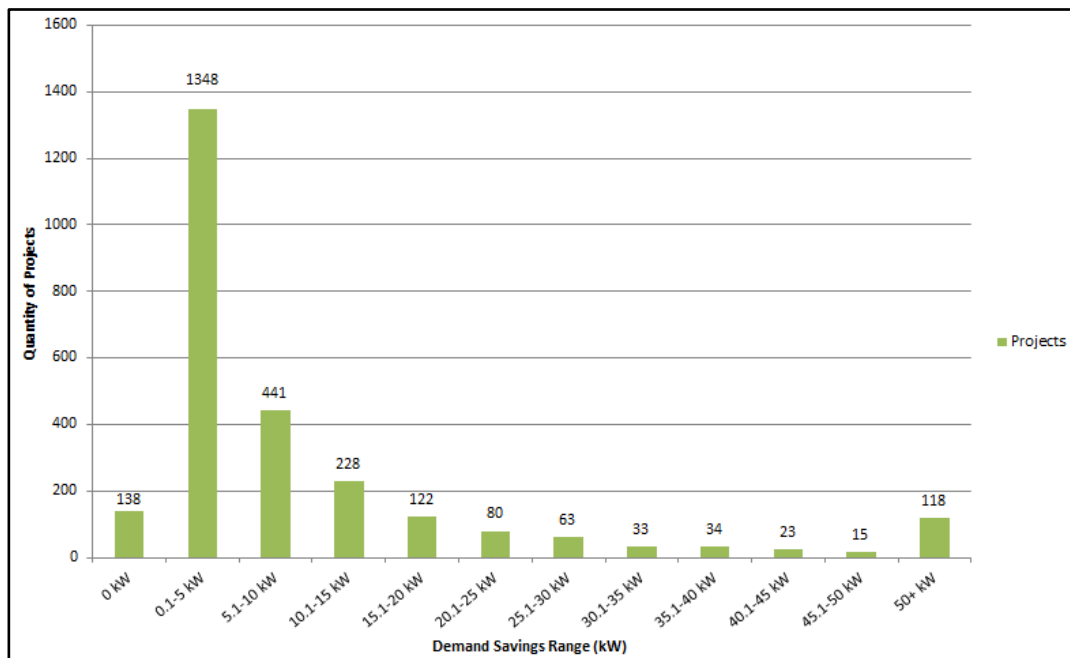


**Figure 3-2. Quantity of Projects by Energy Savings Range**



Source: Evaluation analysis of AEP Ohio tracking data from March 25, 2013

**Figure 3-3. Quantity of Projects by Demand Savings Range**

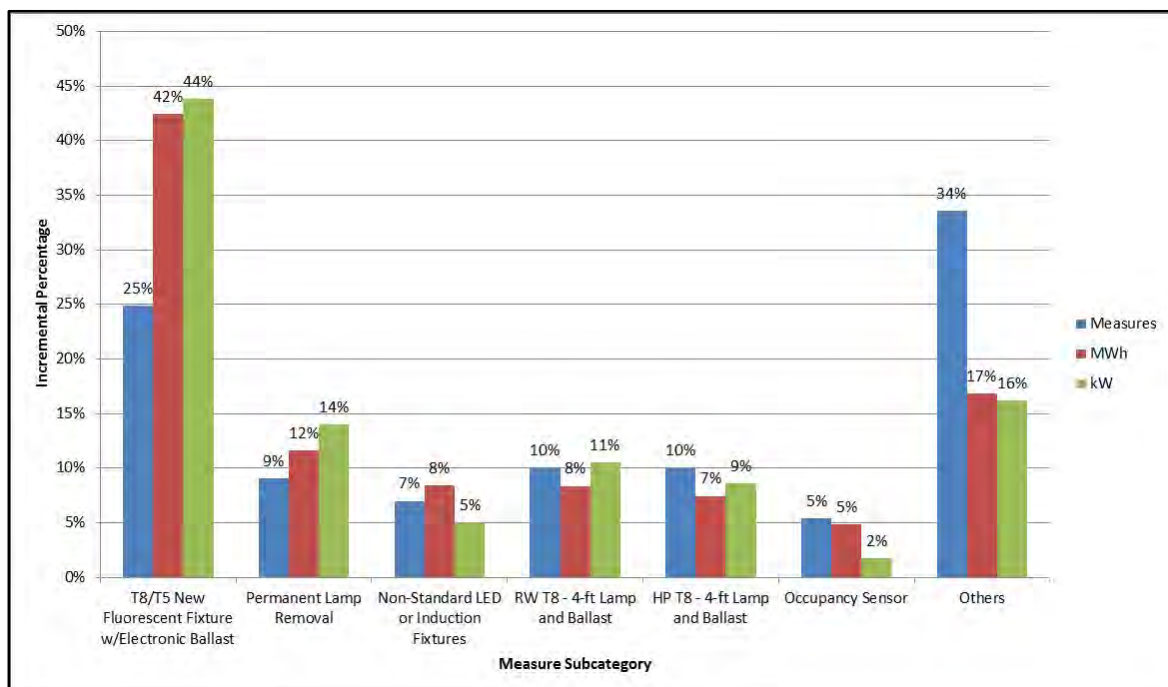


Source: Evaluation analysis of AEP Ohio tracking data from March 25, 2013



As shown previously in Figure 2-2, the installation of energy-efficient lighting measures dominated the program, both in number of measures installed and savings achieved. A closer examination of the lighting measures (Figure 3-4) shows that more than 40% of program savings come from replacing HID/T12 fixtures with new, standard efficiency T5 or T8 fixtures. As the full effect of EISA 2007 is realized in the coming years<sup>13,14</sup>, AEP Ohio should consider ways to reduce its dependency for savings on this single measure type. One way of mitigating this risk is greater promotion and emphasis on reduced wattage and high performance T8 measures, which accounted for 8 percent and 7 percent of program energy savings in 2012, respectively.

**Figure 3-4. Percentage of Lighting Projects and Savings by Lighting Measure Subcategory**



Source: Evaluation analysis of AEP Ohio tracking data from March 25, 2013

<sup>13</sup> This federal efficacy standard effectively eliminates standard T12 lamps and ballasts from being manufactured or imported in the United States as of July 2012. As the installed base of this equipment dwindles over the next few years, the baseline for this measure will get more efficient, thus reducing the potential for savings from this measure.

<sup>14</sup> Newly developed high CRI 40-Watt lamps (CRI at least 87) are exempt from the federal efficacy requirements, but they are relatively expensive, and unlikely to replace the 34w energy-efficient alternative.



## 4. Impact Evaluation Results

The results of the impact evaluation are presented in the following parts:

1. Summary of program savings
2. Findings from the Deemed Savings Review
3. Findings from the Technical Review and Onsite Data Collection
4. Program savings analysis

Section 4.1 through Section 4.4 explains each part in more detail.

### 4.1 Savings Summary

As shown in Table 4-1, the impact evaluation verified 93 percent of the *ex-ante* reported energy savings and 94 percent of the *ex-ante* reported demand savings. The relative precision at the two-tailed 90% confidence interval was  $\pm 5.3\%$  for energy and  $\pm 3.2\%$  for demand.

**Table 4-1. 2012 *Ex-post* Savings and Realization Rates**

Metric	Energy Savings (MWh)	Demand Savings (kW)
<i>Ex-ante</i> Reported Savings	142,331 MWh	30,228 kW
<i>Ex-post</i> Savings	132,132 MWh	28,486 kW
Realization Rate	0.93	0.94
Relative Precision @ 90% CI	5.3%	3.2%

*Source: Evaluation data collection and analysis as described in Section 2*

### 4.2 Findings from Deemed Savings Review

The review of deemed savings parameters included three major outputs:

1. Adjusted per-unit savings values for the reviewed measures
2. Audited savings database
3. Navigant's adjusted savings database

The following sections provide an overview of the key findings from this task.<sup>15</sup>

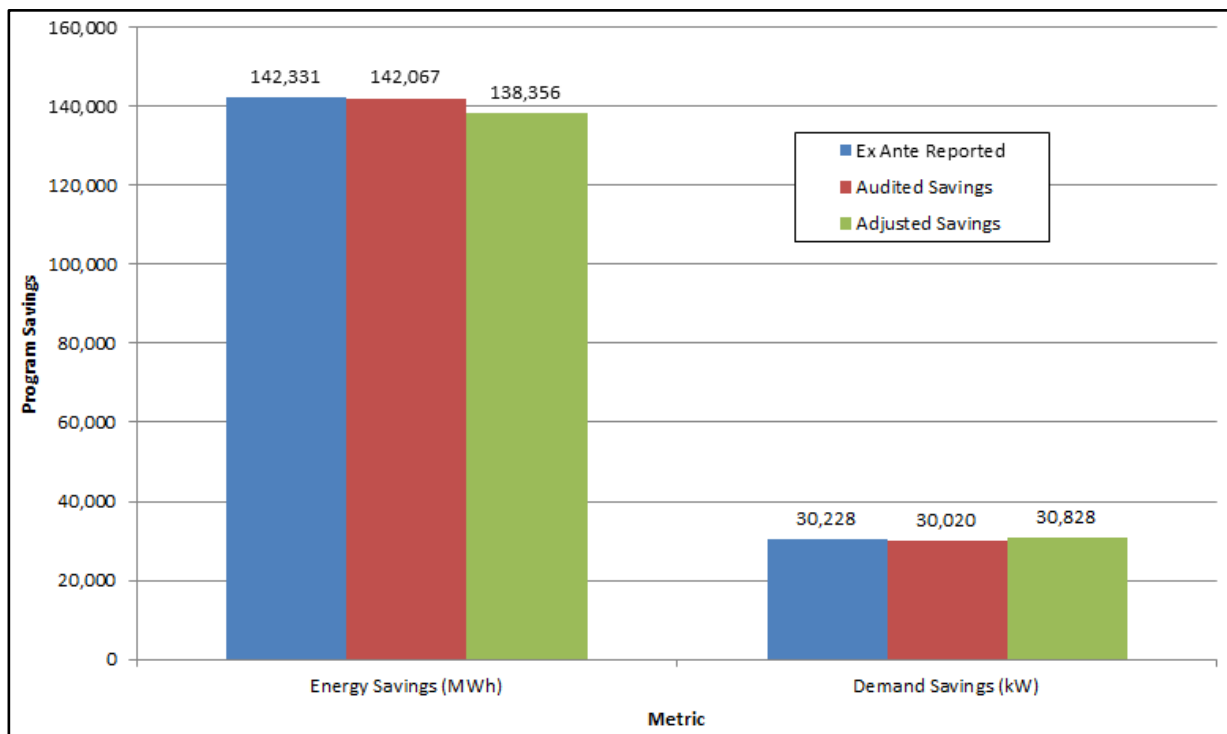
<sup>15</sup> A more detailed description of the methodology and findings will be provided in a separate deliverable to AEP Ohio.



#### 4.2.1 Summary of Deemed Savings Review Adjustments

Figure 4-1 shows a summary comparison of the *ex-ante* reported, the audited savings, and Navigant's adjusted savings at the program level. Overall, Navigant's adjustments from the Deemed Savings Review served to reduce the energy savings by 2.8 percent and increase the demand savings by 2.0 percent.

**Figure 4-1. Comparison of Ex-ante Reported, Audited Savings, and Navigant's Adjusted Savings**



Source: Evaluation data collection and analysis as described in Section 2

#### 4.2.2 Ex-Post Adjustments to Per-Unit Savings Values

As described in Section 2.1.3, Navigant conducted a critical review of the deemed savings parameters for the 42 deemed lighting measures constituting the top 81 percent of energy and demand savings. Adjustments to operating hours, coincidence factors, and HVAC interactive effects affected all 42 of the deemed lighting measures. Other adjustments were made on a measure-specific basis, but they can be aggregated into four major categories:

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





Navigant found that DNV KEMA uses DEER 2008, indexed by building type, as the basis for its operating hours, coincidence factors, and HVAC interactive effects. While Navigant agrees that DEER is an appropriate source for these values, the team found that the 2011 version of DEER is likely a better alternative. Specifically, Navigant's due diligence revealed that the 2008 DEER database disaggregated hours of use by space type within each building type, and that **"these values were an approximation of operating hours based on hand calculations of each daily profile to an entire year and were not accurate for some building types."**<sup>16</sup> In addition, the operating hours and coincidence factors presented in DEER 2011 reflect the most up-to-date information from metering studies completed in the last few years.

Navigant also adjusted DNV KEMA's methodology for determining HVAC interactive effects. Navigant's examination showed that DNV KEMA used the simple average of the DEER 2008 interactive effects calculated across all 16 of California's climate zones. Many of these climate zones are coastal, desert, or otherwise misrepresentative of the typical climate in Ohio. Navigant compared the major city for each California climate zone to the Columbus in a few key areas, including cooling degree days, latitude, and elevation. Navigant ultimately selected California climate zone 11<sup>17</sup> as the most representative of Ohio, and the adjusted values reflect the interactive effects from climate zone 11.

Navigant also adjusted the baseline wattage for lighting measures with a T12 linear fluorescent baseline. DNV KEMA used a baseline of Energy-Saver T12 lamps with Magnetic Standard ballasts for measures in which the baseline is a four foot T12 fixture.<sup>18</sup> Navigant's thorough investigation revealed that the National Appliance Energy Conservation Act of 1988 effectively banned the manufacture of Magnetic Standard Ballasts in favor of Efficient Magnetic Ballasts starting in 1990. Assuming a five-year lag time for retailers to switch entirely to the efficient ballasts, and a 15-year lifetime for the ballasts themselves<sup>19</sup>, this suggests the baseline for T12 ballasts would be 100% Efficient Magnetic Ballasts by 2010. As a result, Navigant used Efficient Magnetic Ballasts for all T12 baseline measures.<sup>20</sup>

For the high performance and reduced wattage (HP/RW) measures, DNV KEMA used a post-installation fixture assumption of T8 lamps with a reduced light output ballast (<0.85 ballast factor). Navigant's research for fixtures meeting the requirements of this measure definition showed a range of qualifying lamp and ballast combinations, as reported by the Consortium for Energy Efficiency (CEE). Navigant subsequently updated the post-installation fixture wattage to be more representative of the lamps and ballasts listed on the CEE website.

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<sup>16</sup> Itron Inc. *DEER Database: 2011 Update Documentation Appendices*, November 2011

<sup>17</sup> Climate zone 11 is the northern California valley, and the reference city is Red Bluff. For more information, go to: [http://www.pge.com/includes/docs/pdfs/about/edusafety/training/pec/toolbox/arch/climate/california\\_climate\\_zone\\_11.pdf](http://www.pge.com/includes/docs/pdfs/about/edusafety/training/pec/toolbox/arch/climate/california_climate_zone_11.pdf).

<sup>18</sup> For measures with an eight foot T12 fixture as the baseline, DNV KEMA used a Standard Lamp with a Standard Ballast as the baseline.

<sup>19</sup> DEER 2011 states that the effective useful life for linear fluorescents is based on a ballast lifetime of 70,000 hours divided by annual hours for the building type, or 15 years (whichever is less).

<sup>20</sup> Navigant determined the appropriate wattage value by calculating a weighted average from the percentage of each type as found during 2010 AEP Ohio Baseline Study.



As in previous years, Navigant also adjusted the deemed savings values for the lighting control measures. There are two primary issues with the per-unit savings for lighting controls. First, as noted in the 2011 Prescriptive Program Evaluation Report, the occupancy sensor savings algorithm and inputs originate from the draft Ohio TRM. This draft document includes a couple of significant mistakes in its calculation methodology, in that it (a) assumes the same coincidence factor of 0.15 for all building types, and (b) incorrectly applies this coincidence factor *twice*, which results in a squared value. Second, the demand savings factor (DSF) should be lower than the energy savings factor (ESF) for occupancy sensors and timeclocks, as these measures are more likely to reduce usage during off-peak times than on-peak. On the other hand, daylighting controls should have a higher DSF than ESF, since they reduce usage primarily during the peak hours. Navigant corrected these errors in its adjusted savings calculations.

Finally, Navigant made minor adjustments to the CFL measure “Interior CFL—Screw-in (16W-26W). DNV KEMA assumed a retrofit wattage of 15 watts, which is outside of the range specified by the measure. Navigant subsequently used the DEER 2011 database value of 21 watts as a more suitable assumption for CFLs in this range replacing a 75-watt incandescent lamp.

#### 4.2.3 Calculation of the Audited Savings

As described in Section 2.1.3, Navigant recalculated<sup>21</sup> the *ex-ante* savings for 83 percent (7,298 records) of the reported Prescriptive measure installations using DNV KEMA’s Appendix A inputs (the “audited” savings). For the remaining 17 percent of records that could not easily be recalculated, Navigant used the *ex-ante* reported savings as a proxy for the audited value.

This exercise yielded a few intriguing results. Navigant expected that the sum of the audited savings (i.e. those recalculated using DNV KEMA’s *stated* methods and inputs) would equal the sum of the *ex-ante* (i.e. database *reported*) savings. Instead, Navigant found a slight, almost negligible difference of -0.2 percent for energy and -0.7 percent for demand.<sup>22</sup>

Figure 4-2 shows a histogram of the percentage difference between the audited and the *ex-ante* energy savings for the 7,298 measures that were recalculated; Figure 4-3 shows the same information for the demand savings. Nearly all of the recalculated measures (97%) show a difference of less than 0.5 percent between the audited and *ex-ante* energy savings, but just 63 percent of the measures show a difference of less than 0.5 percent for the demand savings.

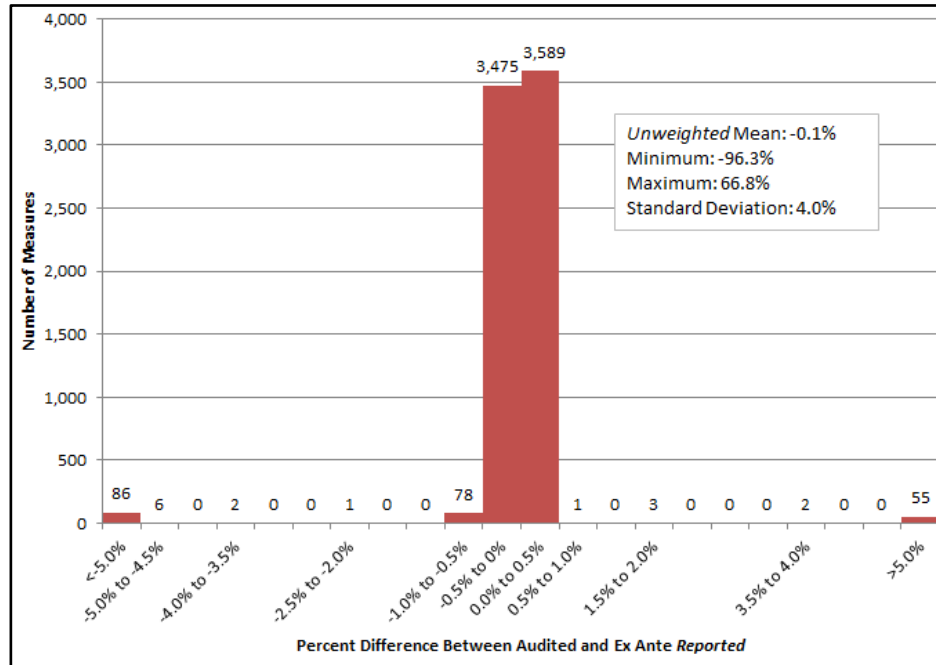
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<sup>21</sup> DNV KEMA’s methodology for determining savings from lighting measures is to multiply the per-unit savings value from Appendix A by the operating hours and energy HVAC interactive effects (for energy), or the coincidence factor and demand 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.

<sup>22</sup> The negative sign on these percentage differences indicates that *ex-ante* savings are slightly *over-reported*.

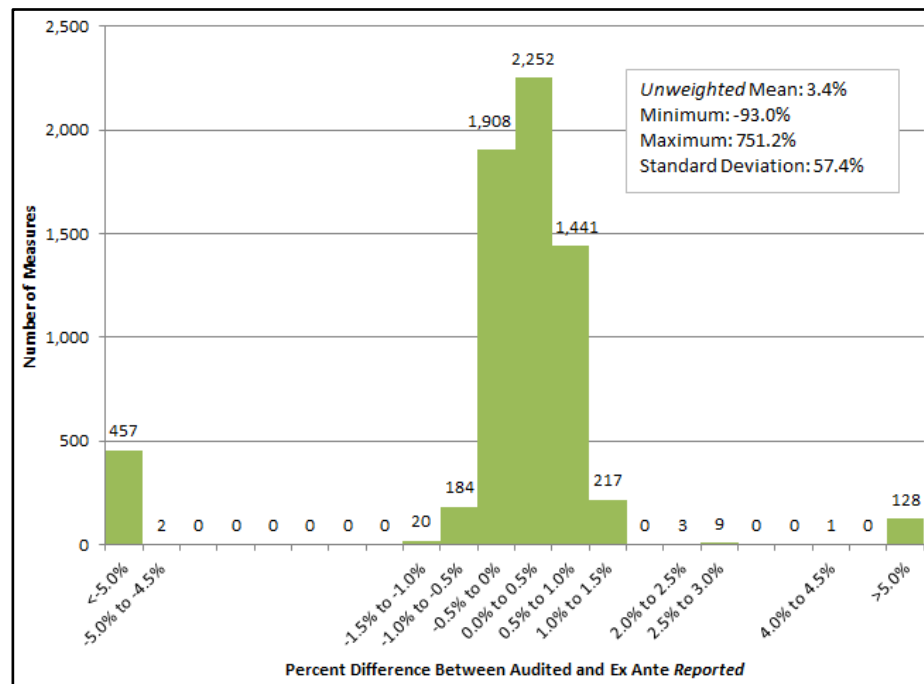


**Figure 4-2. Histogram of Percent Difference Between Audited and Reported Energy Savings**



Source: Evaluation data collection and analysis as described in Section 2

**Figure 4-3. Histogram of Percent Difference Between Audited and Reported Demand Savings**



Source: Evaluation data collection and analysis as described in Section 2



Further investigation revealed that the divergences bunched around the 0% bin<sup>23</sup> are a result of truncating the per-unit savings values at one decimal place for energy (kWh/unit) and three decimal places for demand (kW/unit). This has a relatively small impact on the energy savings, whose magnitude mutes the impact of the truncation. It has a greater effect on the demand savings, however, where the small magnitude of values amplifies the impact.

The cause of the differences further from 0% is less clear. For energy, the differences greater than 5 percent account for just 141 out of 7,298 records (2%); for demand, these differences accounts for 9 percent of the records. Navigant reviewed the project-specific documentation and DNV KEMA's calculations for a subset of these records and found that the per-unit savings values used often did not match those listed in Appendix A. One possible cause is that these projects were reserved early when DNV KEMA was determining savings with previous versions of their savings calculator. Navigant suggests that DNV KEMA review a sample of these records to determine whether this concern is likely to persist in future program years.<sup>24</sup>

#### 4.2.4 Calculation of Navigant's Adjusted Savings

Navigant also recalculated the *ex-ante* savings using Navigant's adjusted per-unit savings values as described above. This exercise was completed on the exact same set of measures (83 percent of the total) as the audited calculations, and the remaining 17 percent of measures used the *ex-ante* reported values as a proxy for the adjusted savings values.

As expected, the distribution of percentage differences between the adjusted savings and the audited savings at the measure level is wide. Figure 4-4 and Figure 4-5 show histograms of these percentage differences for energy and demand, respectively. For energy, 4,158 out of the 7,298 recalculated records (57%) have a difference between -15 percent and 0 percent; for demand, 42 percent of the records have a difference between -15 percent and 0 percent.

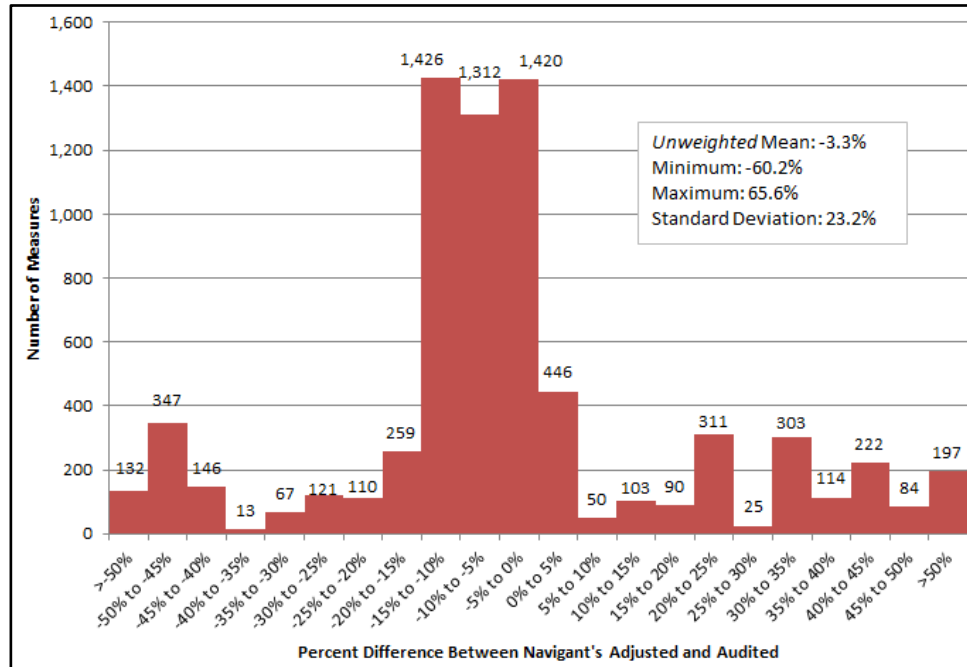
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<sup>23</sup> The percentage differences for this bunch of values around zero range from -0.5% to 1.0% for energy, and -1.0% to 2.0% for demand.

<sup>24</sup> Navigant will provide AEP Ohio and DNV KEMA the full list of measures with audited savings greater than 5% from the *ex-ante* savings in a separate deliverable.

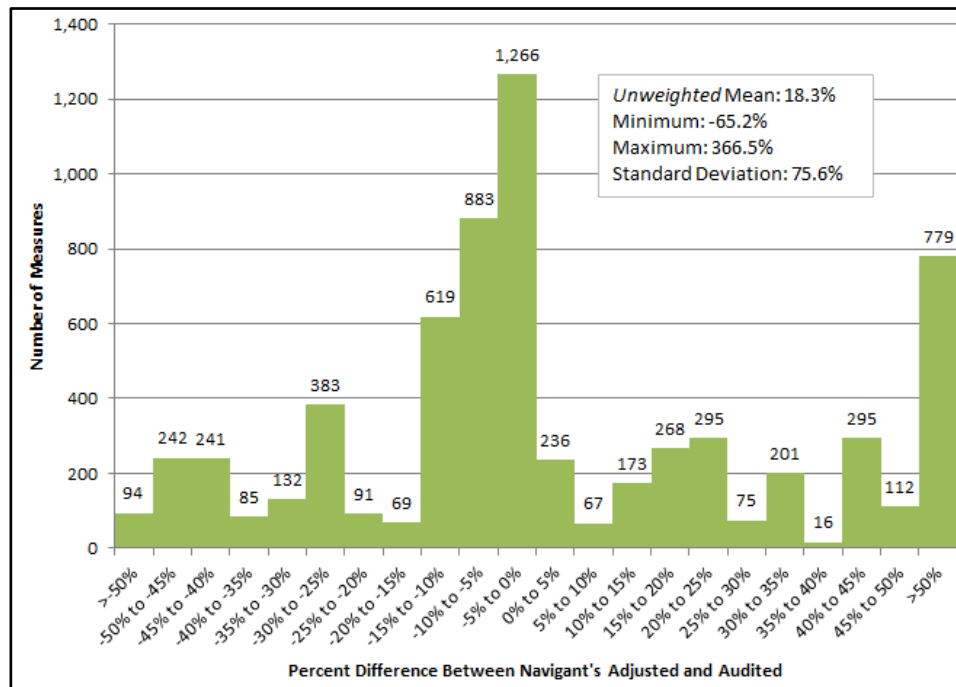


**Figure 4-4. Histogram of Percent Difference Between Adjusted and Audited Energy Savings**



Source: Evaluation data collection and analysis as described in Section 2

**Figure 4-5. Histogram of Percent Difference Between Adjusted and Audited Demand Savings**



Source: Evaluation data collection and analysis as described in Section 2



Of the 779 records showing greater than +50% difference on the demand savings (Figure 4-5), 458 (59%) of them are occupancy sensor records. The difference when comparing adjusted to audited savings is significant, ranging from 134 percent to 367 percent. The difference is even more pronounced when it is coupled with the adjustment due solely to recalculation, i.e., when the adjusted number is compared to the *ex-ante* reported number.

As shown in Figure 4-6, the differences between the adjusted demand savings and the *ex-ante* reported demand savings range from 100 percent to 3,100 percent. This means that occupancy sensor demand savings are *always underestimated by 2 to 32 times the actual savings*. The differences are also tightly grouped by business sector, where the Government/Municipal sector shows the greatest difference (between 3,000% and 3,100%). The unweighted mean difference is 621 percent.

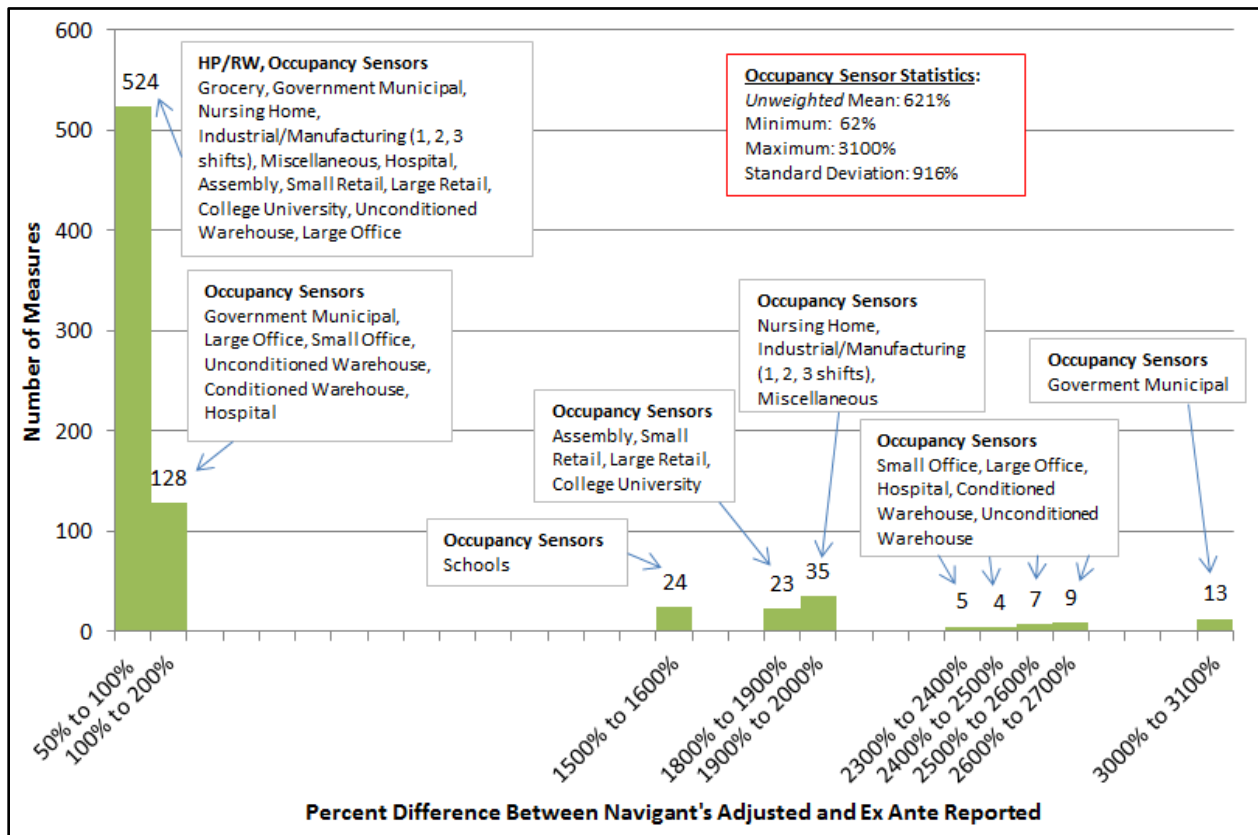
Navigant's research showed that DNV KEMA is using a per-unit demand savings value for occupancy sensors that includes a squared coincidence factor term.<sup>25</sup> By not using the correct per-unit savings values, a portion of the *ex-ante* reported savings is ignored. Navigant recommends that DNV KEMA make this simple correction to the per-unit occupancy sensor savings in order to avoid evaluation divergences on demand savings in future years.

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<sup>25</sup> For more discussion of Navigant's findings surrounding the deemed per-unit savings values for occupancy sensors, see the Prescriptive Program evaluation report.



**Figure 4-6. Histogram of Percent Difference Between Navigant's Adjusted and *Ex-ante* Reported Demand Savings for Differences Greater than 50%**



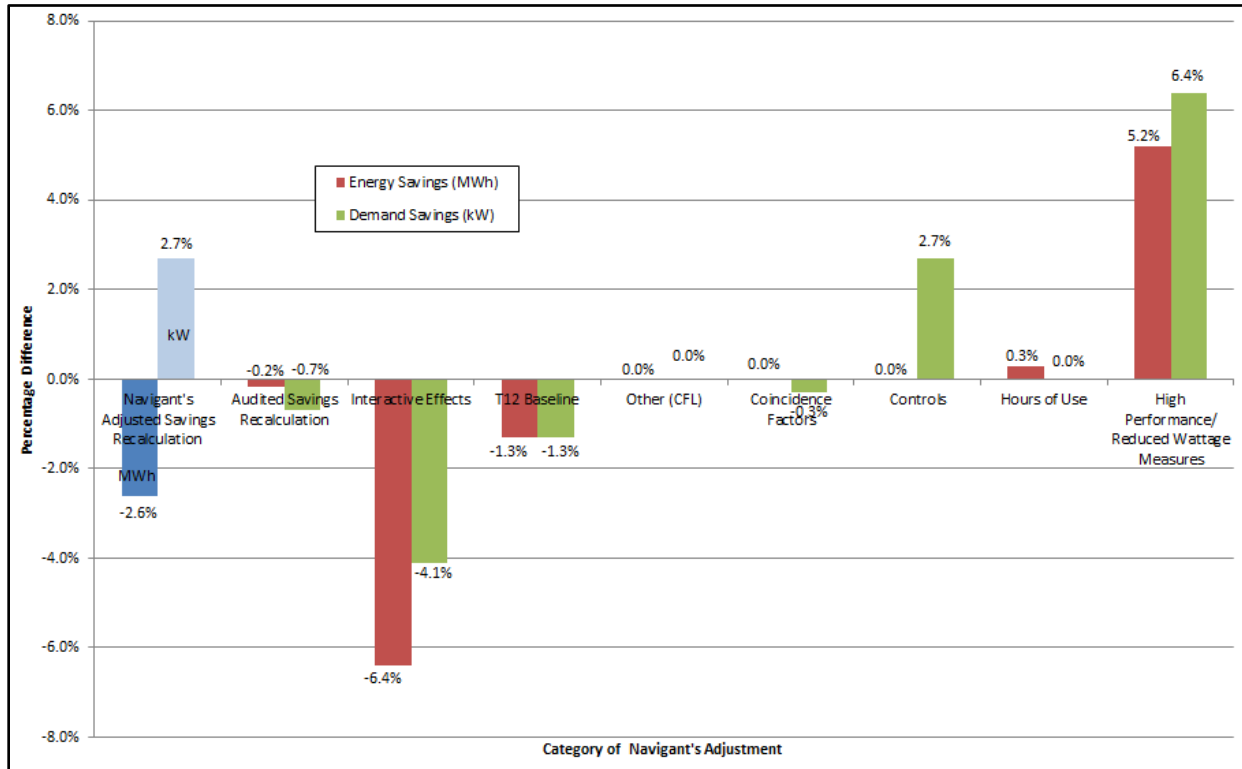
Source: Evaluation data collection and analysis as described in Section 2

Figure 4-7 shows the relative impact of each of Navigant's adjustments due to the Deemed Savings Review. Navigant calculated the values for each category of adjustment by changing the inputs made to a single category while holding all other category adjustments constant using the Appendix A stated inputs. The recalculated values were then compared to the audited savings to determine the percent difference. This exercise was then repeated for the next category of adjustments until the impact of every adjustment was quantified against the audited savings.

Overall, Navigant's adjustments as a result of the Deemed Savings Review reduced the energy savings by 2.6 percent and increased the demand savings by 2.7 percent. Navigant's adjustments to the HVAC interactive effects had the greatest downward effect, while Navigant's adjustments to the HP/RW measures had the greatest upward impact. Navigant's adjustments to controls measures (primarily occupancy sensors) had no impact on the energy savings, but increased the demand savings by 2.7 percent.



**Figure 4-7. Relative Impact of Each Deemed Savings Review Adjustment<sup>1,2</sup>**



Source: Evaluation data collection and analysis as described in Section 2

<sup>1</sup> The component parts representing each adjustment will not be strictly additive to the total adjusted savings due to interactions between the inputs within a single measure.

<sup>2</sup> The Audited Savings Recalculation adjustment is compared to the Ex-ante Reported savings, while all other adjustments are compared against the Audited savings.

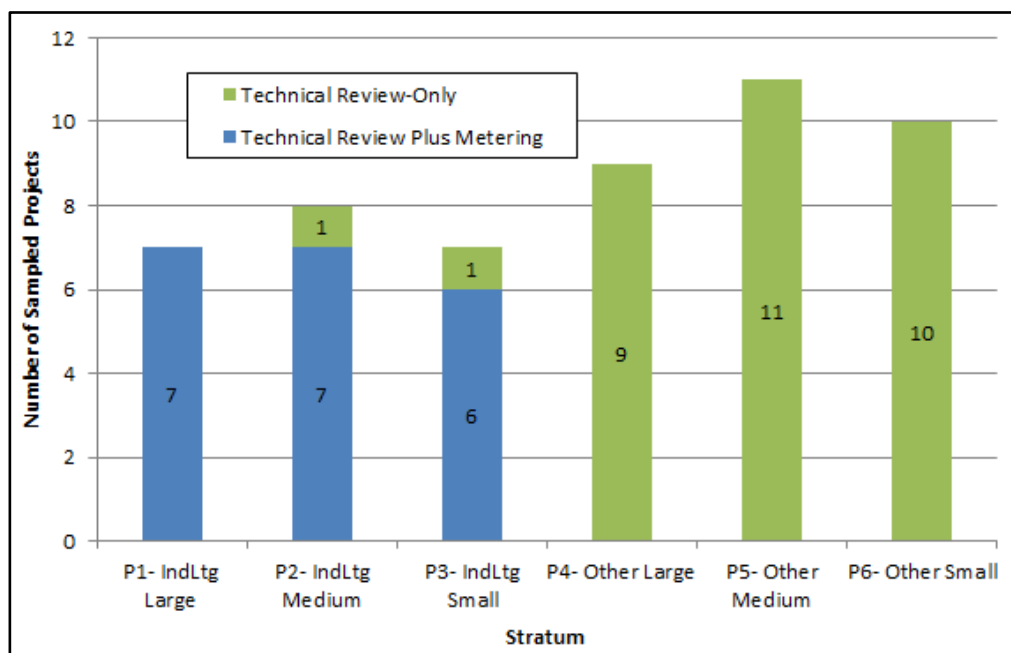
### 4.3 Findings from Technical Review and Onsite Data Collection

Navigant conducted a technical review of project documentation for a total of 52 projects selected from the sample. Navigant also completed 20 onsite visits with data loggers installed to measure lighting operating hours. Figure 4-8 shows the sample disposition by stratum.





**Figure 4-8. Sample Disposition by Completed Task and Stratum**

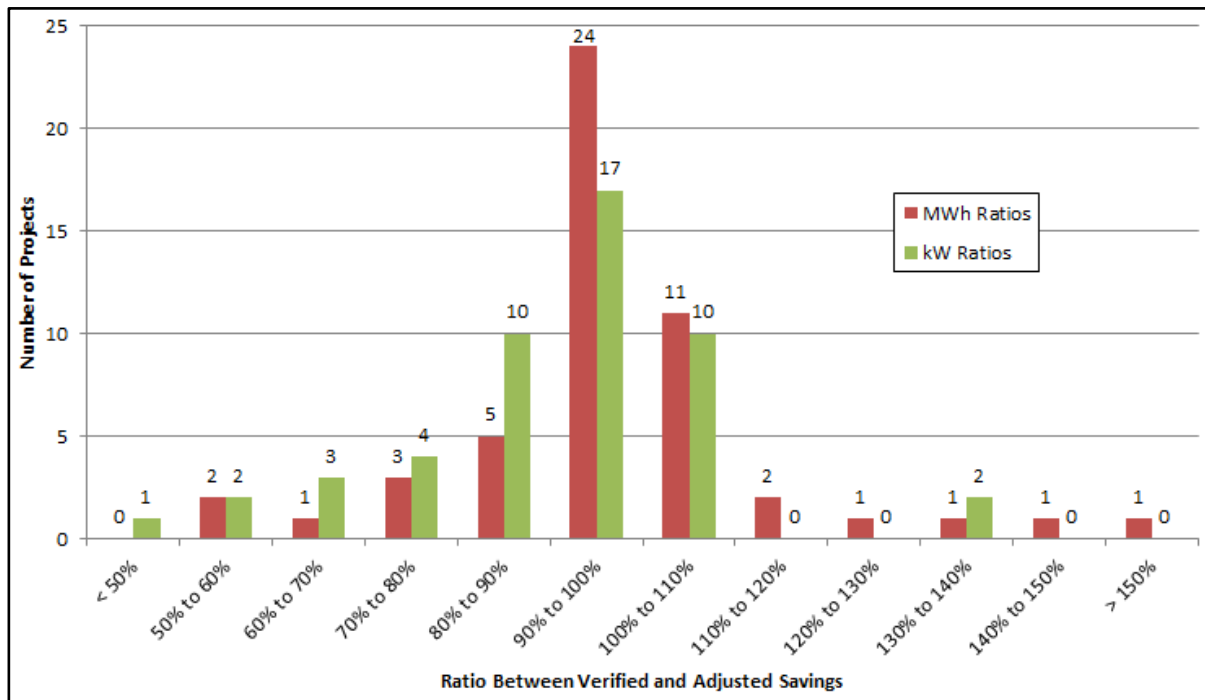


Source: Evaluation data collection and analysis as described in Section 2



Figure 4-9 shows the distribution of the ratio between *ex-post* savings and Navigant's adjusted savings for the sampled projects. For both energy and demand savings, the ratios were grouped most heavily between 90 percent and 100 percent. The demand savings ratios show less dispersion at the higher end of the range (greater than 110%) than the energy savings ratios.

**Figure 4-9. Sample Distribution of the Ratio of *Ex-post* to Navigant's Adjusted Savings**



Source: Evaluation data collection and analysis as described in Section 2

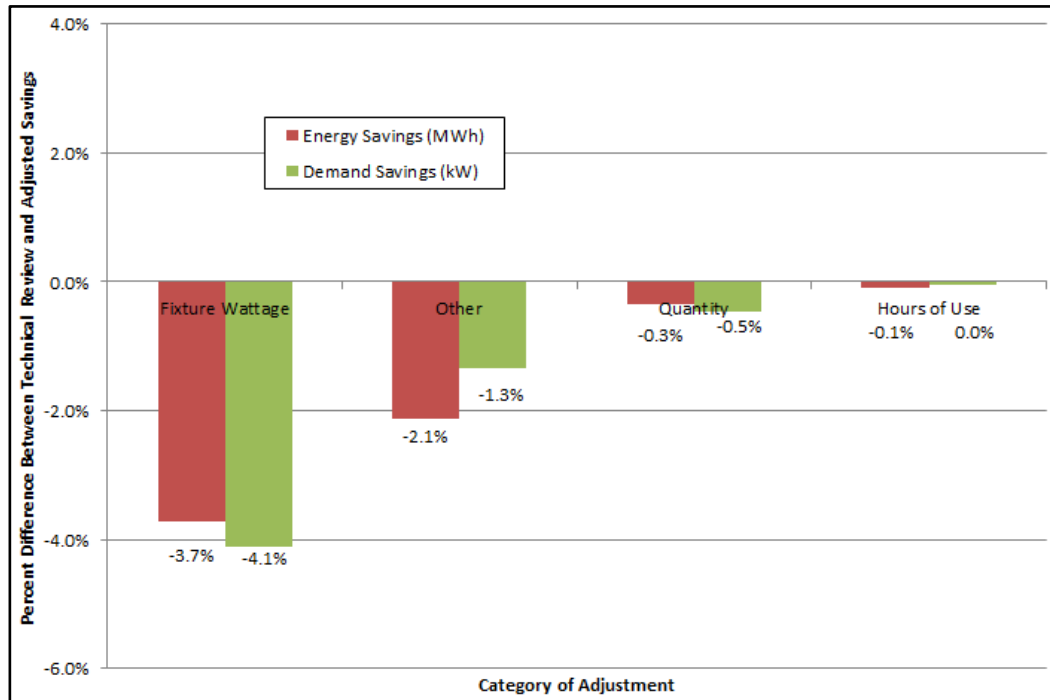
Next, Navigant investigated the primary drivers behind measure-level savings with a significant difference between the *ex-post* savings and the adjusted savings. As expected, the primary drivers resulting from the technical review only projects were different than the primary drivers resulting from the onsite visits.

As shown in Figure 4-10, the key driver of differences from the technical review came from changes in lighting fixture wattages. Navigant made these changes for the sampled measures based on actual manufacturer specifications of lamp and ballast power draw, rather than using the default values identified during the Deemed Savings Review. Frequently, Navigant found that fixtures installed as a HP/RW measure had ballast factors greater than allowed in the measure definition (0.85). This resulted in an increase to energy efficient fixture wattage, and a subsequent reduction to savings. In future



program years, DNV KEMA should consider more closely examining this particular aspect of application-submitted fixture specifications to ensure that the measure requirements are met.<sup>26</sup>

**Figure 4-10. Relative Impact of Key Technical Review Adjustments**



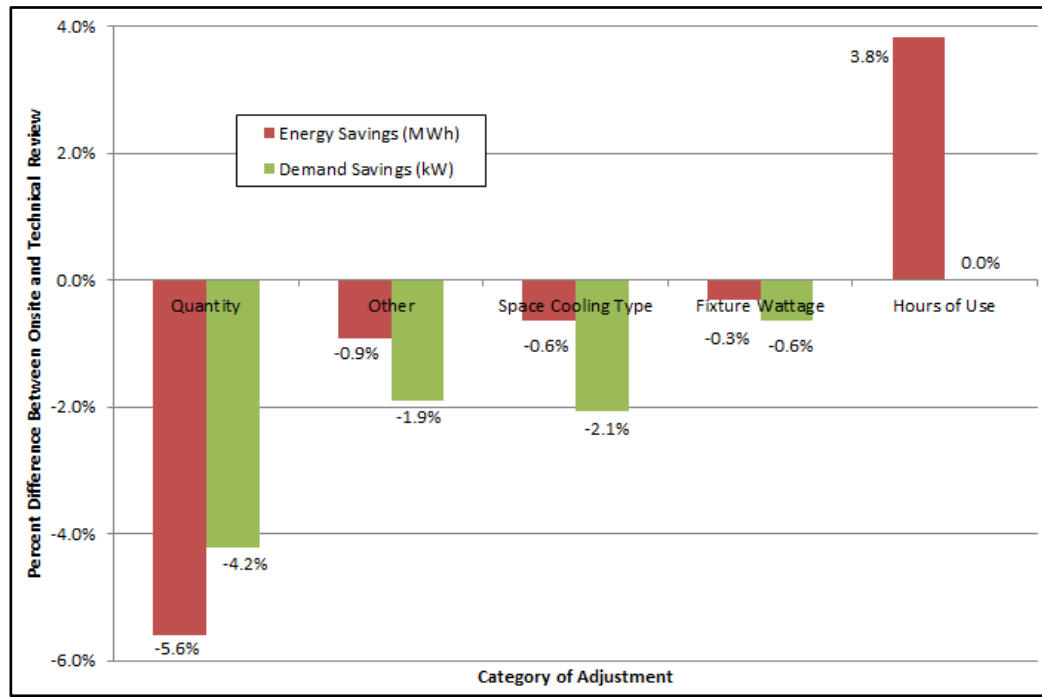
Source: Evaluation data collection and analysis as described in Section 2

As shown in Figure 4-11, the key drivers of differences from the onsite visits and metering came from changes to fixture quantity and changes to operating hours. In particular, Navigant verified fewer fixtures installed and operational than were reported for 7 out of 75 (9%) of the lighting measures reviewed during the onsite visits. The evaluation team also verified greater lighting operating hours in the field on average than default value from the Deemed Savings Review. These operating hours were measured at each site by installing data loggers to determine actual runtimes.

<sup>26</sup> Changes from the "Other" category include correcting typos in the inputs for the per-unit savings, and errors in the technical savings calculations.



**Figure 4-11. Relative Impact of Key Onsite & Metering Adjustments**



Source: Evaluation data collection and analysis as described in Section 2

#### 4.4 Program Savings Analysis

Finally, Navigant combined the results of the Deemed Savings Review with the results of the Technical Review and Onsite Data Collection for the sampled projects to determine program-level *ex-post* energy and demand savings. In the first step, Navigant extrapolated the sample results to the population of program participants using the *adjusted savings* database to determine the *ex-post* savings via ratio estimation.

In this analysis, the ratio estimator is not the same as the realization rate. The realization rate provides the ratio between the *ex-post* savings and the *ex-ante* reported savings. Navigant's analysis includes an interim step, in which the *ex-post* savings for the sample are first compared to the adjusted savings. This crucial step yields improved relative precision over that achieved using the *ex-ante* savings database.<sup>27</sup>

Table 4-2 shows the ratio estimators and relative precision at the two-tailed 90% confidence interval for energy and demand savings. Overall, the relative precision on the sample results was  $\pm 5.3\%$  for energy and  $\pm 3.2\%$  for demand.

<sup>27</sup> For more discussion, see Section 2.1.7.



**Table 4-2. Energy and Demand Ratio Estimators and Relative Precision**

Stratum Number	Stratum Name	Energy Savings Statistics		Demand Savings Statistics	
		Ratio Estimator	Relative Precision @ 90% Conf. Int.	Ratio Estimator	Relative Precision @ 90% Conf. Int.
1	Large Industrial Lighting	0.91	16.6%	0.85	12.4%
2	Medium Industrial Lighting	0.98	24.7%	0.94	5.6%
3	Small Industrial Lighting	0.93	3.5%	0.85	14.0%
4	Large Other	0.87	15.6%	0.91	7.8%
5	Medium Other	1.02	11.9%	0.93	9.1%
6	Small Other	0.97	4.9%	0.97	6.9%
<b>Overall Value</b>		<b>0.96</b>	<b>5.3%</b>	<b>0.92</b>	<b>3.2%</b>

Source: Evaluation analysis of tracking data and sample results

As shown in Table 4-3 and Figure 4-12, the impact evaluation verified 93 of the reported energy savings and 94 percent of the reported demand savings. The relative precision at the two-tailed 90% confidence interval is the same as that on the ratio estimator:  $\pm 5.3\%$  for energy and  $\pm 3.2\%$  for demand.

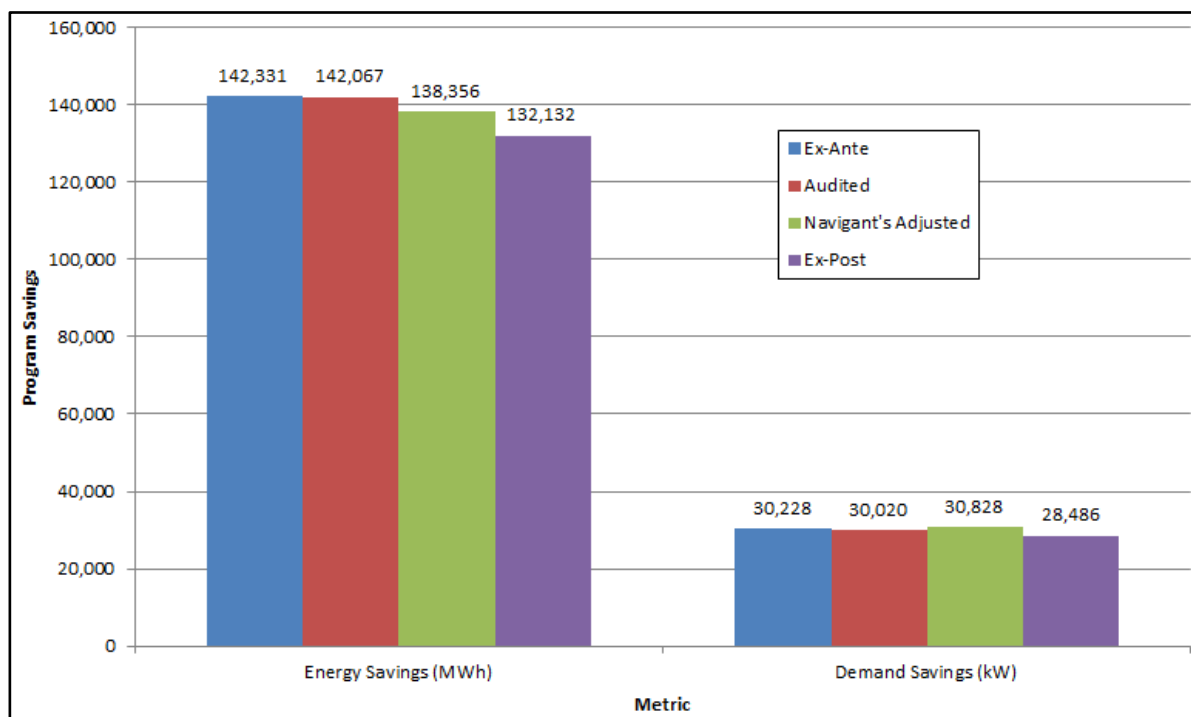
**Table 4-3. Ex-post Savings and Realization Rates**

Metric	Energy Savings (MWh)	Demand Savings (kW)
<i>Ex-ante</i> Reported Savings [A]	142,331 MWh	30,228 kW
<i>Audited</i> Savings [B]	142,067 MWh	30,020 kW
Navigant's Adjusted Savings [C]	138,356 MWh	30,828 kW
Ratio Estimator [RE]	0.96	0.92
<i>Ex-post</i> Savings [D = C * RE]	132,132 MWh	28,486 kW
Realization Rate [RR = D / A]	0.93	0.94
Relative Precision @ 90% Conf. Int.	5.3%	3.2%

Source: Evaluation analysis of tracking data and sample results



**Figure 4-12. Comparison of Ex-post to Ex-ante Reported Savings**

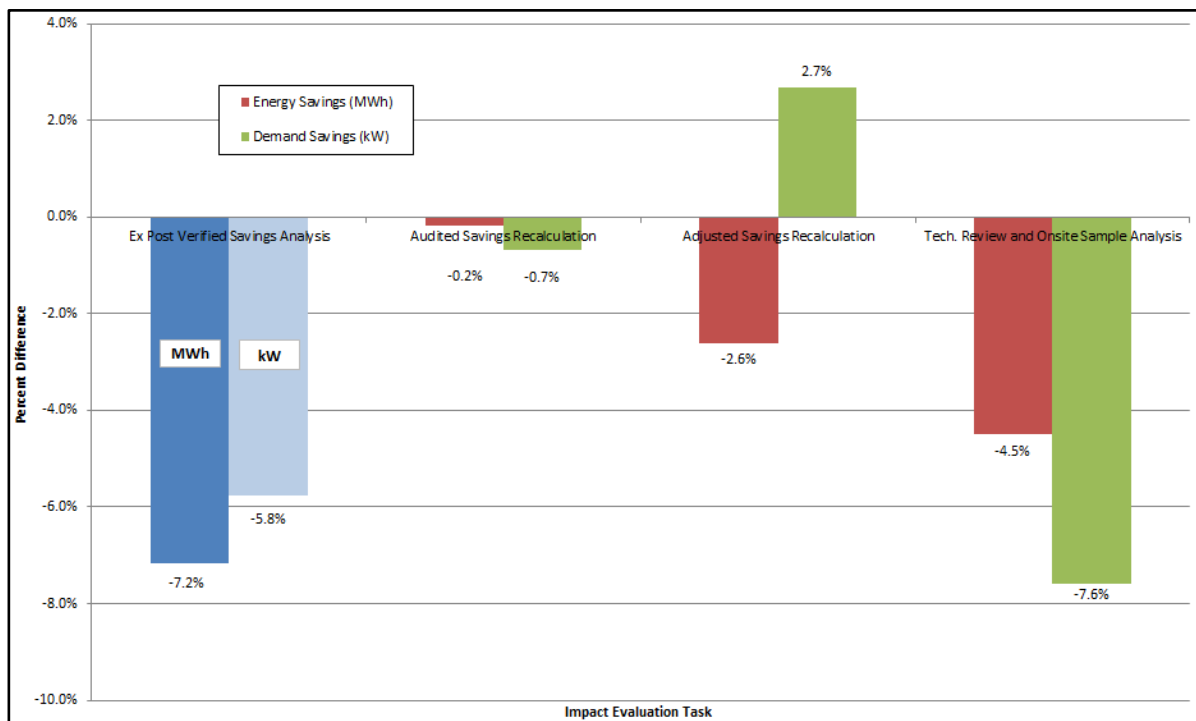


Source: Evaluation analysis of tracking data and sample results



Figure 4-13 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 technical review and onsite data analysis for the sample, which reduced the adjusted savings by 4.5 percent for energy and 7.6 percent for demand. The only evaluation task that showed an increase in savings was the demand recalculation using the adjusted savings inputs, and this increase can be traced almost wholly to occupancy sensors.

**Figure 4-13. Relative Effect of Each Impact Evaluation Task<sup>1</sup>**



Source: Evaluation analysis of tracking data and sample results

<sup>1</sup> 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.



#### 4.5 Cost-Effectiveness Review

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 4-4 summarizes the unique inputs used in the TRC test.

**Table 4-4. Inputs to Cost-Effectiveness Model for Prescriptive Program**

Item	Value
Average Measure Life	11
Projects	2,346
Annual Energy Savings (MWh)	132,132
Coincident Peak Savings (kW)	28,486
Third Party Implementation Costs	3,854,359
Utility Administration Costs	114,268
Utility Incentive Costs	11,194,354
Participant Contribution to Incremental Measure Costs	50,770,853

Based on these inputs, the TRC ratio is 1.3. Therefore, the program passes the TRC test. Table 4-5 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.

**Table 4-5. Cost Effectiveness Results for the Prescriptive Program**

Test Results for Prescriptive	Ratio
Total Resource Cost	1.3
Participant Cost Test	1.8
Ratepayer Impact Measure	0.7
Utility Cost Test	4.3

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.





## 5. Process Evaluation Results

The evaluation team engaged four implementation contractor program staff and three-hundred program participants to explore the issues that were foremost in their minds regarding the Prescriptive Program. Program managers for both AEP Ohio and DNV KEMA provided ideas for the evaluation.

### *5.1 Findings from the Interviews of Program Staff*

Navigant conducted four in-depth interviews with AEP Ohio and DNV KEMA program managers and implementation staff. According to the program staff, the most important goals of the Prescriptive program are to:

- Meet the energy and demand savings targets set for 2012
- 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

#### **5.1.1 Changes in Program Staff for 2012**

The AEP Ohio Program Coordinator manages the program and works closely with DNV KEMA to implement a program that will reach its planning goals. The DNV KEMA Program Manager implements the program with AEP Ohio. In 2012, DNV KEMA hired a new Program Manager, and AEP Ohio viewed this as a positive step in maintaining a good relationship.

#### **5.1.2 Program Staff on the Solution Providers**

The program implementers believe that participating Solution Providers are pleased with the AEP Business programs as a whole.

Both AEP Ohio and DNV KEMA 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. One DNV KEMA manager said that “nurturing the Solution Providers is key to the sustainability of the program.”

According to program managers, Solution Providers have become more knowledgeable and more engaged in the programs. DNV KEMA 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.

##### **5.1.2.1 Solution Provider Participation**

AEP Ohio added about 100 new trade allies in 2012, and it plans to attract more during 2013. AEP Ohio provided customer education through email, bill inserts, and newspaper ads, while DNV KEMA was primarily focused on trade ally relations.



AEP Ohio continued the trade ally bonus in 2012 to encourage Solution Providers to complete the application faster. In 2011, AEP Ohio paid one half cent per kWh saved for the Solution Provider turn in completed applications. The quality of the applications subsequently improved, thus shifting the administration costs from AEP Ohio to the Solution Provider. The deadline for certain incentives in 2011 ended on December 16, which caused a significant incentive processing bubble at the end of the year.

In 2012, Solution Providers received the full bonus if the application was filed within 45 days after the project was completed. If the Solution Providers missed the 45-day deadline, they received only half of the bonus. The purpose of this approach was to prevent the application processing bubble that occurred in 2011, and it appears to have accomplished this goal.

The Solution Provider training was very popular in 2012. Trade allies were “practically hanging from the rafters” during the kick off meetings. The bonus program and an increased number of case studies helped Solution Providers remain interested in the Program.

#### 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 DNV KEMA held seminars for industrial and commercial customers, and provided onsite information and training. They targeted health care, commercial food service, and education customers with sector specific collateral materials and case studies. A direct-mail campaign informing customers about T12 lighting codes and standards changes was sent to all business customers.

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 expanded outreach to trade allies and professional groups, as well as reaching more customers through webinars. Finally, collateral materials were more targeted in 2012 to segments such as water and waste -water, grocery, the polymer industry, data centers, and schools.

The programs are maturing, and exhibiting strengths in the areas of Solution Provider and customer outreach. DNV KEMA has successfully marketed the Prescriptive Program by establishing that the program was valuable for both customers and trade allies.

### 5.1.3 Application Process

The application has been a barrier for program participation, especially for smaller customers. The paperwork required was one of the reasons that some customers choose not participate in the program.



AEP Ohio and DNV KEMA have continued to improve the application process. In 2012, AEP Ohio added graphics to the application to help customers identify qualifying lighting equipment..

#### **5.1.4 Customer Satisfaction**

According to program staff, the program participants appear to be satisfied with the current rebate amounts. AEP Ohio's rebate levels were attractive and have been well received. Discussions with Solution Providers indicate that they are also satisfied with the program.

#### **5.1.5 Program Strengths**

According to program staff, the strengths of the Prescriptive Program included:

- 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; the percentage of non-lighting savings has increased as the program continues to expand its offering of non-lighting measures.

#### **5.1.6 Program Challenges**

Program staff also identified a few challenges with the program:

- For all the business programs, including the Prescriptive Program, one challenge is the difficulty in promoting awareness of the programs.
- Some Solution Providers may have been confused by the number of changes across all Business Programs in the last two years, including:
  - The Prescriptive Program was modified to include additional lighting measures. Solution providers find it simpler to use the Prescriptive application for many applications. AEP Ohio tries to incorporate more custom measures into the prescriptive program every year to simplify the process for customers.
  - AEP Ohio also added variable speed drives to the Prescriptive Program.
  - Changes to the Solution Provider bonus each year. The purpose of the bonus the first year was to encourage Solution Providers to complete applications *correctly*. The next year the bonus encouraged solution providers to complete applications *quickly*, within 45 days of completion of the project, rather than waiting until the end of program year and causing a bottleneck in processing.
- Program staff felt that if a program was working consistently well, and the trade allies were comfortable and happy with it, then participation would be more persistent. Every time a program is changed, momentum is lost.

#### **5.1.7 Barriers to Participation**

AEP Ohio and DNV KEMA staff agreed that barriers to the programs include:

- Lack of capital; customers want to make upgrades and improvements, but don't have the capital available to do so



- Lack of customer awareness
- Lack of customer understanding about energy efficiency technologies
- Connecting with the decision maker
- Training Solution Providers to sell customers on the value of energy efficiency

#### **5.1.8 Navigant Suggestions Based on Program Staff Interviews**

Navigant suggests that AEP Ohio find new ways to use the media to inform customers about the Prescriptive Program. Lack of awareness continues to be an issue with business customers. Local media may be looking for positive community-based stories. .

In addition, although the program aims to help offset the project cost of installing energy efficient equipment through incentives, capital was still hard for customers to find in 2012. AEP Ohio has been looking at financing options to package with program rebate offerings. Navigant suggests that AEP Ohio considers finding a financial partner to provide project financing.

### ***5.2 Findings from the Participant Surveys***

This section presents Navigant's detailed findings from the Prescriptive Program participant surveys.

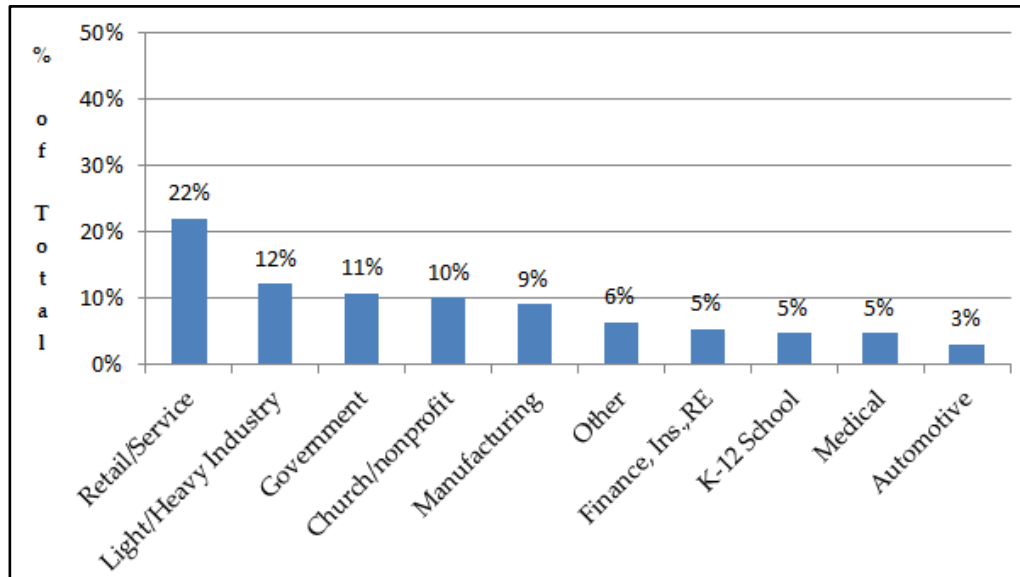
#### **5.2.1 Profile of Participating Survey Respondents**

The quantitative telephone survey started with 1,271 unique customer names. The evaluation team completed surveys with 300 program participants; 137 (11%) of those contacted 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 5-1, the Prescriptive Program was attractive to customers of many business types. The retail and services business type accounted for 22 percent of the program participants. Light and heavy industry, the government, and church or non-profit groups each contributed about 10 percent each.

**Figure 5-1. Business Types**



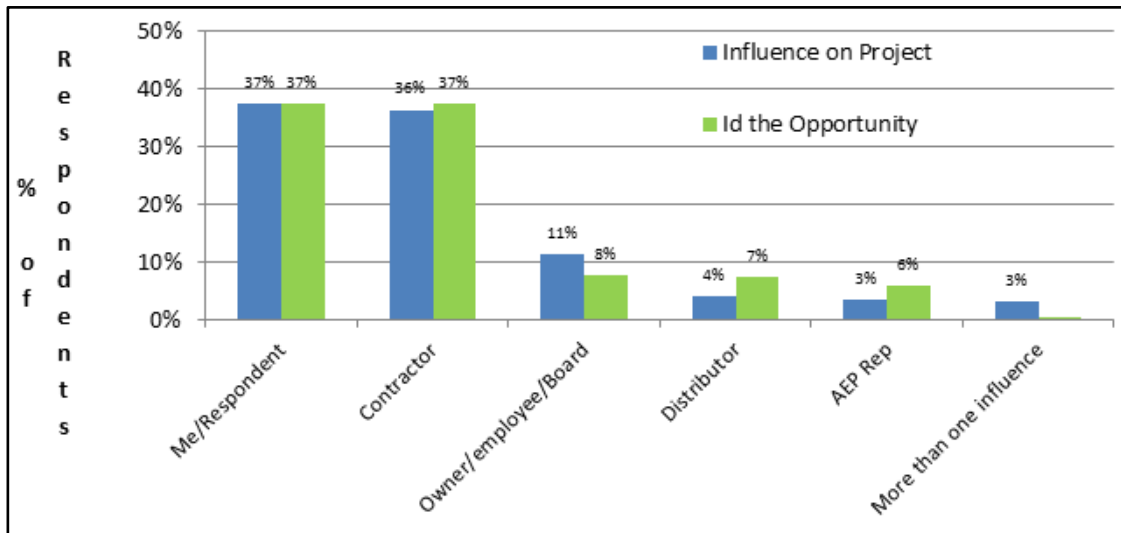
Source: 2012 Participant Survey. N=297.



### 5.2.2 Influencing the Project Decision

As shown in Figure 5-2, the survey respondents reported that both they themselves and the contractor played an important role in identifying the opportunity and planning the energy efficiency project. Others parties, such as the owner, Board of Directors, distributors, and the AEP Ohio account representatives, were less influential in both aspects of the decision making process.

**Figure 5-2. Who Influenced the Project/Who Identified the Project**



Source: 2012 Participant Survey. Multiple responses accepted; Base N=292, 295.

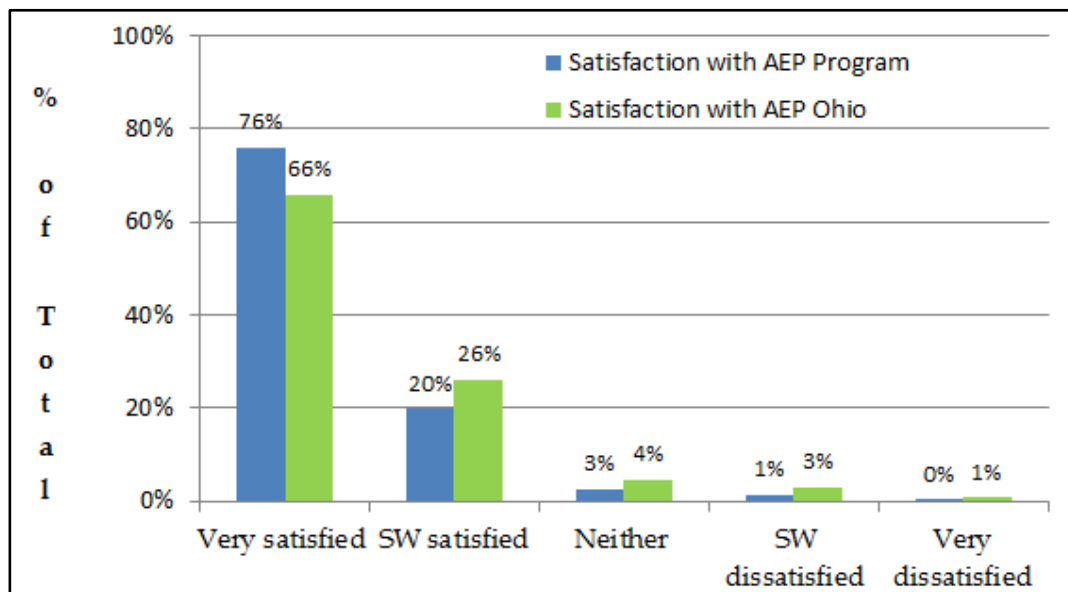


### 5.2.3 Overall Satisfaction with the Program and with AEP Ohio

As shown in Figure 5-3, approximately three-fourths of program participants (76%) were *very satisfied* with the AEP Ohio Prescriptive Program. Two-thirds of respondents (66%) indicated they were *very satisfied* with AEP Ohio. Overall, satisfaction levels with the Prescriptive Program and with AEP Ohio were similar with 96 percent reporting they were very or somewhat satisfied with the Prescriptive Program and 92 percent reporting they were very or somewhat satisfied with AEP Ohio.

Sixty-three percent of Prescriptive Program participants planned to participate in the program again (not shown).

**Figure 5-3. Satisfaction with the Prescriptive Program and AEP Ohio**



Source: 2012 Participant Survey. Base N=300.

### 5.2.4 Satisfaction with Specific Program Attributes

For six of the nine program attributes asked about, 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; see Figure 5-4). These program attributes included:

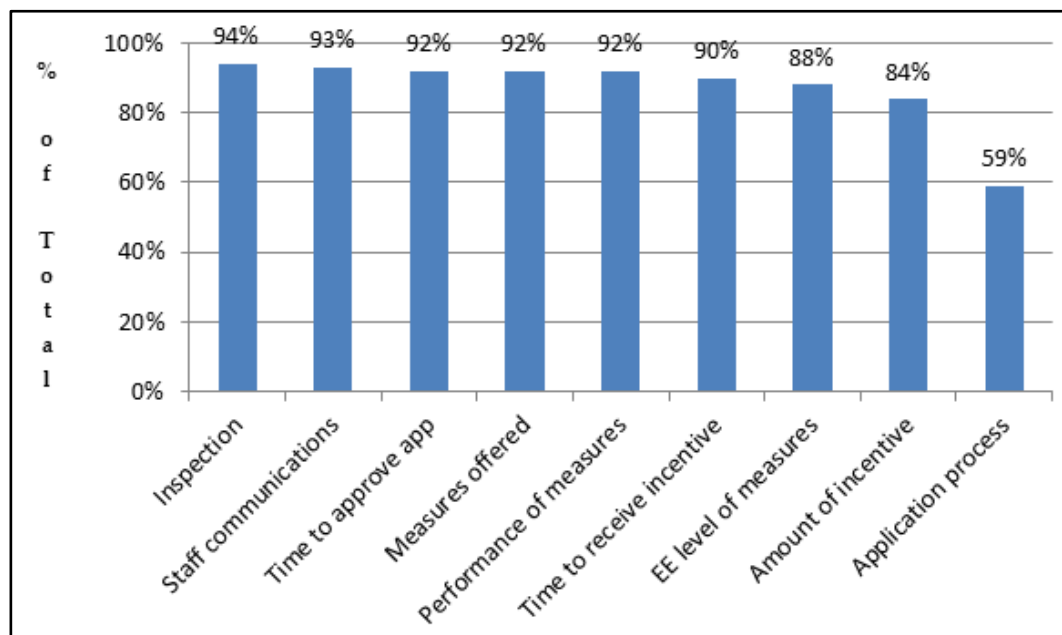
- Post-installation inspection (asked only of those receiving a post inspection) (94%)
- Staff communications (asked only of those who communicated with staff) (93%)
- Time to approve the application (92%)
- Measures offered (92%)
- Performance of the measures (92%)
- Timeliness of the incentive (90%)



Slightly fewer survey respondents were satisfied with the energy efficiency level of the measures (88%) and the amount of the incentives (84%). A significantly lower number of respondents (59%) were satisfied with the application process. The following selection of comments from survey respondents who rated the application a three or less (on the 0 to 10 point scale) shows the range of reasons for this low level of satisfied participants:

- “There were some confusing issues and variables. I didn’t have all the specs and the AEP staff helped with the clarifications.”
- “It was very cumbersome. There were a lot of technical questions. I had no idea what they meant. It took many phone calls before I could complete the application.”
- “It was not necessarily intuitive for the non-electrical person. The calculations. If I didn’t have a contact at \_\_\_\_\_ Electrical, I wouldn’t know what to do.”

**Figure 5-4. Satisfaction with Program Attributes**



Source: 2012 Participant Survey, N=294-297

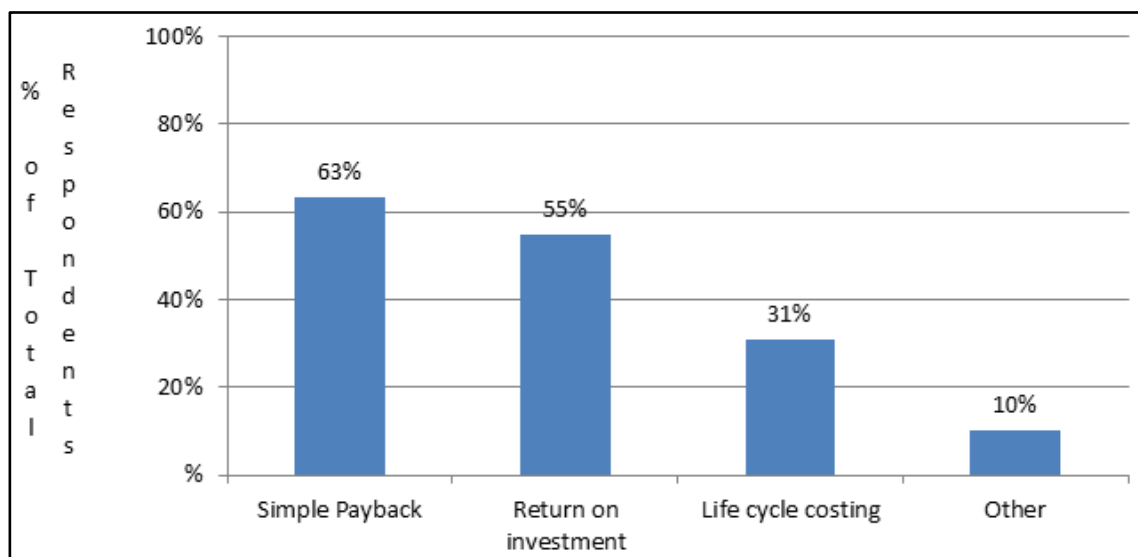
### 5.2.5 Financial Criteria for Energy Efficiency Decisions

As shown in Figure 5-5, more than half of respondents indicated their organizations were most likely to use simple payback (63% of respondents) and/or return on investment (55% of respondents) when considering investing their dollars in energy efficient equipment. Fewer respondents claimed to use life cycle costing (31%) in their financial decision-making. Some survey respondents reported they depend on “common sense” or their accountant when making these decisions.





**Figure 5-5. Preferred Decision-Making Criteria**



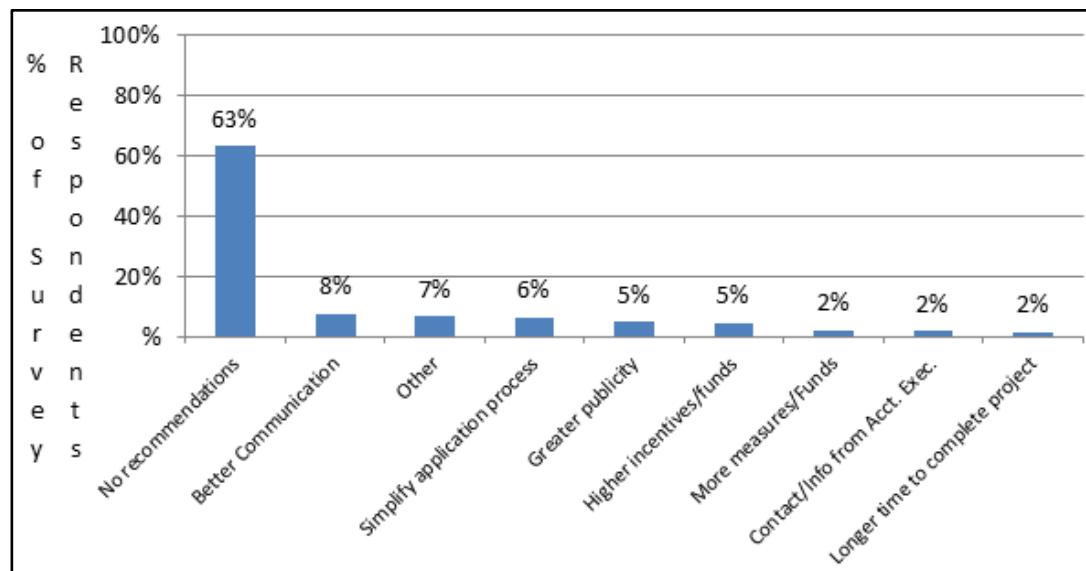
*Source: 2012 Participant Survey. Multiple responses accepted; N=260.*



### 5.2.6 Participant Suggestions for Improving the Program

As shown in Figure 5-6, nearly two-thirds of respondents (63%) did not have any suggestions for improving the program. For those that did have suggestions, the most cited were better communication (8%) and a simplified application process (6%). Also mentioned were recommendations for greater publicity, higher incentives, more measures and funds, more contact from an account representative, and a longer time to complete the project.

**Figure 5-6. Suggestions for Improving the Program**



Source: 2012 Participant Survey. N=295



## 6. Key Findings & Recommendations

This section presents the key findings and recommendations from the 2012 Prescriptive program impact and process evaluations.

### 6.1 Key Impact Findings and Recommendations

1. The 2012 realization rate (defined as *ex-post* savings divided by *ex-ante* reported savings) 0.93 for energy savings and 0.94 for demand savings. The relative precision at the two-tailed 90% confidence interval was  $\pm 5.3\%$  for energy and  $\pm 3.2\%$  for demand. Overall, DNV KEMA is doing a good job estimating the savings resulting from the Prescriptive Program.
2. Participation was highest within the Office and Retail sectors, which accounted for 23 percent and 21 percent of project submissions overall. The Industrial/Manufacturing sector provided the greatest savings, accounting for 39 percent of the reported energy savings and 35 percent of the reported demand savings.
3. Lighting dominated the program with 94 percent of the submitted measures, 87 percent of the reported energy savings, and 86 percent of the reported demand savings. The largest non-lighting end-uses were VFD's and HVAC.
4. More than 40 percent of program savings come from replacing HID or T12 fixtures with new, standard efficiency T5 or T8 fixtures. Legislation from 2007 (the Energy Independence and Security Act- EISA) effectively eliminates standard 40-Watt T12 lamps and ballasts from being manufactured or imported in the United States. As the full effect of EISA 2007 is realized in the coming years, the installed base of standard 40-Watt T12 fixtures will be reduced.<sup>28,29</sup>

**Recommendation:** AEP Ohio should consider ways to reduce its dependency for savings on this single measure type. One way of mitigating this risk is to place greater emphasis on reduced wattage and high performance T8 measures, which accounted for 8 percent and 7 percent (respectively) of reported program energy savings in 2012, and which provides more savings per measure than standard efficiency fixtures.

5. Navigant found differences of -0.2 percent for energy savings and -0.7 percent for demand savings when comparing the savings calculated using the DNV KEMA's stated methods and inputs to the savings recorded in the database. At the measure level, the vast majority of differences were due to truncation of the per-unit savings values at one decimal place for energy and three decimal places for demand. A smaller percentage of the differences were a result of incorrect per-unit savings values in the project calculations. One possible cause is that these

<sup>28</sup> As the installed base of this equipment dwindles over the next few years, the baseline for this measure will get more efficient, thus reducing the potential for savings from this measure.

<sup>29</sup> Newly developed high CRI 40-Watt lamps (CRI at least 87) are exempt from the federal efficacy requirements, but they are relatively expensive, and unlikely to replace the 34w energy-efficient alternative.



projects were reserved early when DNV KEMA was determining savings with previous versions of their savings calculator.

**Recommendation:** Navigant recommends that DNV KEMA consider less truncation of per-unit savings values. This is especially important for the demand savings values, where the relatively small magnitude of values amplifies the impact of truncation.

**Recommendation:** Navigant recommends that the DNV KEMA review a sample of the records where the incorrect per-unit savings values were used to determine whether this concern is likely to persist in future program years.<sup>30</sup> If so, DNV KEMA should consider cost-effective ways to reduce the likelihood of great differences between versions of the calculators.

6. Navigant found that the DNV KEMA used an average of the HVAC interactive effects in DEER 2008 across all 16 California climate zones, including those in coastal and desert areas. The evaluation team's research suggests that DEER 2008 is a reasonable source, but that climate zone 11 is more appropriate for Ohio than any other.

**Recommendation:** Navigant recommends that DNV KEMA use the HVAC interactive effects for climate zone 11 going forward. This was an evaluation adjustment for 2012, and it decreased the *ex-ante* reported program savings by 6.4 percent for energy and 4.1 percent for demand.

7. The evaluation team found the baseline wattage for lighting measures with a T12 baseline to include Magnetic Standard ballasts. These ballasts have been banned as of 1990, and their use slightly inflates the reported savings.

**Recommendation:** Navigant recommends that DNV KEMA recalculate appropriate baseline fixture wattages using Efficient Magnetic ballasts that were manufactured after 1990. This evaluation adjustment decreased program savings by 1.3 percent for both energy and demand.

8. Navigant found the range of fixtures meeting the requirements of the HP/RW measure to have a lower overall input wattage than assumed by DNV KEMA. This lower wattage results in savings that are underreported.

**Recommendation:** Navigant suggests that DNV KEMA update its fixture wattage assumption for HP/RW measures based on Navigant's research for the range of qualifying fixtures reported by CEE. This evaluation adjustment increased program savings by 5.2 percent for energy and 6.4 percent for demand. This increase represents savings left "off the table".

9. As in previous years, Navigant found the demand savings for occupancy sensors to be underreported by 2 to 32 times the actual savings. This is a result of mistakes in the calculation methodology for the per-unit demand savings, in which (a) the same coincidence factor of 0.15 is

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<sup>30</sup> Navigant will provide AEP Ohio and DNV KEMA the full list of measures with audited savings greater than 5% from the *ex-ante* savings in a separate deliverable.



used for all building types, and (b) the coincidence factor is applied *twice*, resulting in a squared value that significantly underestimates savings.

**Recommendation:** Navigant recommends that DNV KEMA make the simple correction to the squared term in the per-unit savings algorithm as originally suggested in 2011, and index the coincidence factor by building type to determine savings. This was an evaluation adjustment for 2012, and it increased the program demand savings by 2.7 percent.

10. In the technical review of project documentation for the sampled projects, Navigant frequently found that fixtures installed as a HP/RW measure had ballast factors greater than allowed in the measure definition (0.85). This resulted in an increase to energy efficient fixture wattage, and a subsequent reduction to savings.

**Recommendation:** In future program years, DNV KEMA should consider more closely examining this particular aspect of application-submitted fixture specifications to ensure that the measure requirements are met.

## 6.2 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 and the utility.
2. Satisfaction with specific attributes of the program was generally high, ranging from 84 percent for the incentive to 94 percent for the inspection. However, just 59 percent of those who completed the application themselves said they were satisfied with the process.
3. Survey respondents were most likely to prefer to be contacted by e-mail (37%), direct mail (29%) and bill inserts (23%). DNV KEMA and AEP Ohio are using these channels to reach business customers.
4. Over 60 percent of survey respondents report no program drawbacks, and a similar proportion cannot recommend any improvements for the program to consider.
5. Interviews with program staff suggest that Solution Providers may be getting confused by the number of changes across all Business Programs in the last two years. Recent modifications to the Prescriptive program include:
  - Adding new lighting and LED prescriptive measures
  - Increasing Exterior and Interior LED incentives
  - Adding Agriculture application
  - Expanding HVAC prescriptive menu
  - Adding an EMS measure to the Prescriptive program
  - Adding a Compressed Air worksheet

**Recommendation:** Consider keeping the Prescriptive Program offerings stable for one year. Customers and Solution Providers do value consistency and 'taking a break' from



adding new technologies may provide customers and trade allies time to consolidate and integrate the changes that have been implemented in recent years.

6. AEP Ohio identified a number of target segments for 2013. They included over 20 percent of AEP Ohio Customers and over 50 percent of AEP Ohio's 12 month aggregated kWh billing. DNV KEMA and AEP Ohio developed targeted messaging and case studies to help Solution Providers market to customers in these targeted segments.

**Recommendation:** AEP Ohio and DNV KEMA should continue working with the target segments and consolidating program participation with targeted messaging and case studies for the next few years.

7. Most customers use payback and/or return on investment to make their financial decisions about energy efficiency projects. Two to three years was the most common acceptable payback period (reported by 29 percent of respondents).
8. Prescriptive program participants still report that lack of capital was a major reason customers are unable to proceed with a planned improvement project.

**Recommendation:** Consider how AEP Ohio can help Prescriptive program participants for whom lack of capital is a major reason for postponing an improvement project. Navigant suggests that AEP Ohio considers finding a financial institution or bank partner to provide financing of projects.

9. The increase in participation levels from 2011 to 2012 may be a result of the increased number of technologies added to the Prescriptive Program from the Custom Program, the Solution Provider bonus for timely applications and, possibly, reaching a critical mass in educating business customers about the existence of the programs. The latter, lack of knowledge of the program, was named as a barrier to program participation by customers.

**Recommendation:** AEP Ohio should look for ways to use local media to boost both program awareness and customer satisfaction.

10. 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 cannot improve the program, suggests that most of major issues (excluding the application) have been reduced to minor issues.

**Recommendation:** Navigant suggests that AEP Ohio and DNV KEMA continue working with trade allies, offering the trade ally bonus and developing new case studies and targeted messages. 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.

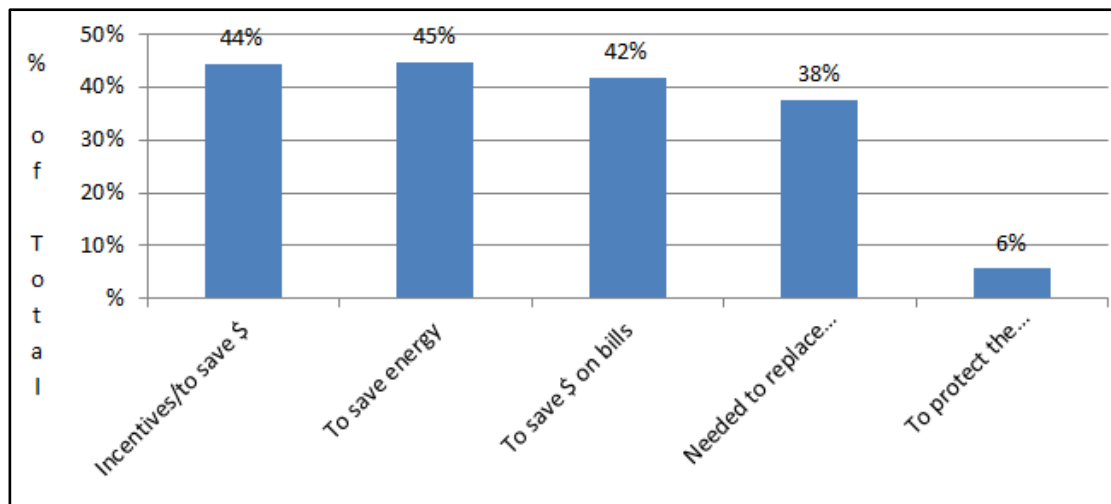


## Appendix A. Detailed Process Evaluation Results

### A.1 Reasons for Program Participation

As seen in Figure A-1, the most cited reasons for participating in the Prescriptive Program were saving money or receiving the incentive (44%), saving energy (45%), and saving on the bill (42%). Another reason for participating, cited by 38 percent of respondents, was the need to replace aging or non-working equipment. A few survey respondents also participated for environmental reasons (6%).

**Figure A-1. Reasons for Program Participation**



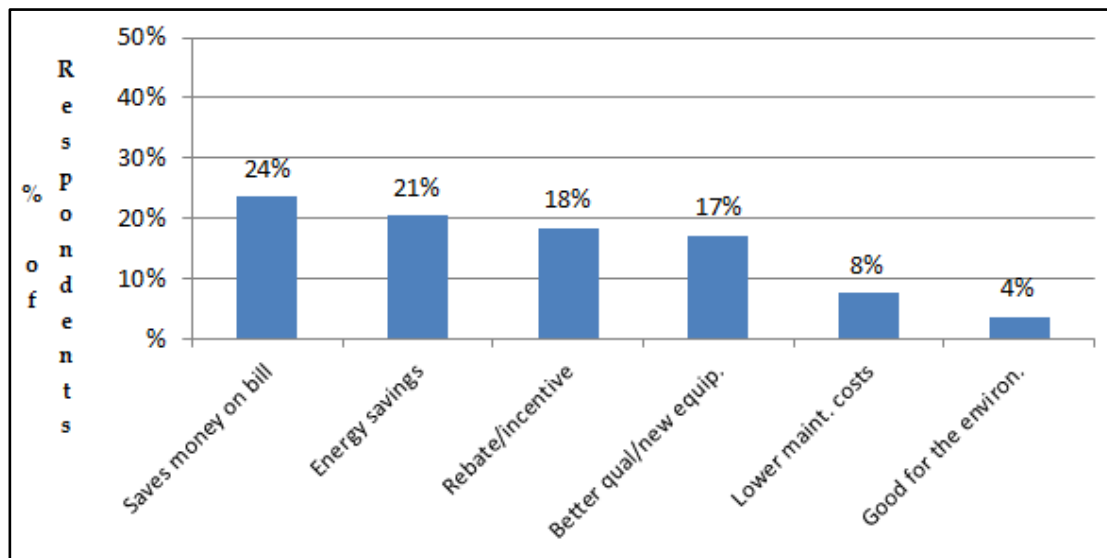
Source: 2012 Participant Survey. Multiple responses accepted; N=295.



## A.2 Benefits of Program Participation

Prescriptive Program participants had financial considerations at the top of their minds again in 2012, as shown in Figure A-2. Customers mentioned saving money on the bill (24%), saving energy (21%), and the rebate incentive (18%) more than other program benefits.

**Figure A-2. Major Benefits of Program Participation**



Source: 2012 Participant Survey. Multiple responses accepted; Base N=296.

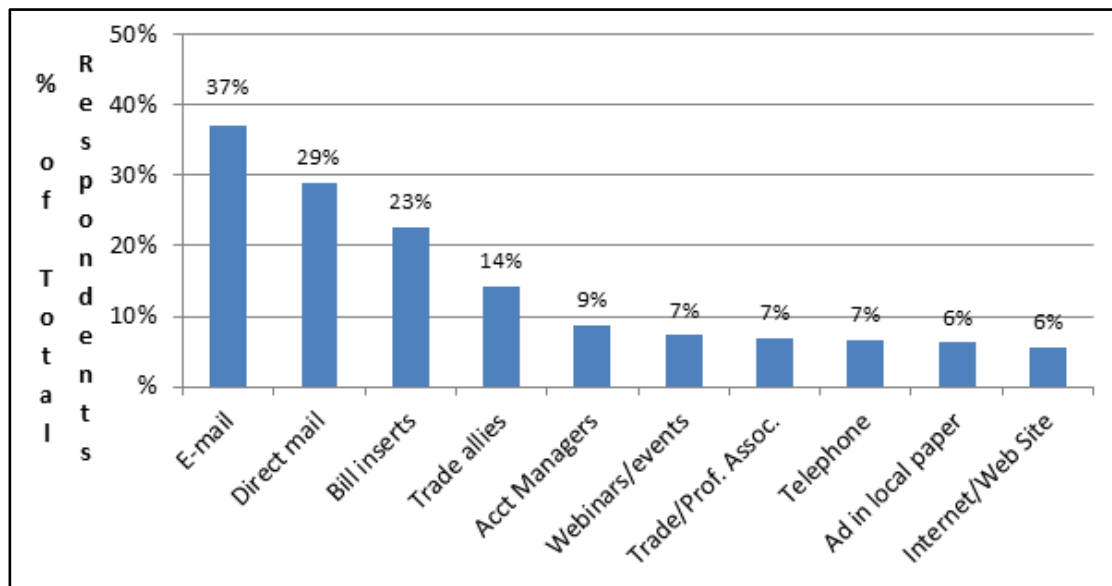




### A.3 Preferred Method of Contact

As shown in Figure A-3, survey respondents most frequently preferred e-mail (37%), direct mail (29%) and bill inserts (23%) contact. Some preferred a personal visit or contact from a trade ally (14%) or an AEP Ohio account manager or representative (9%).

**Figure A-3. Preferred Method of Contact**



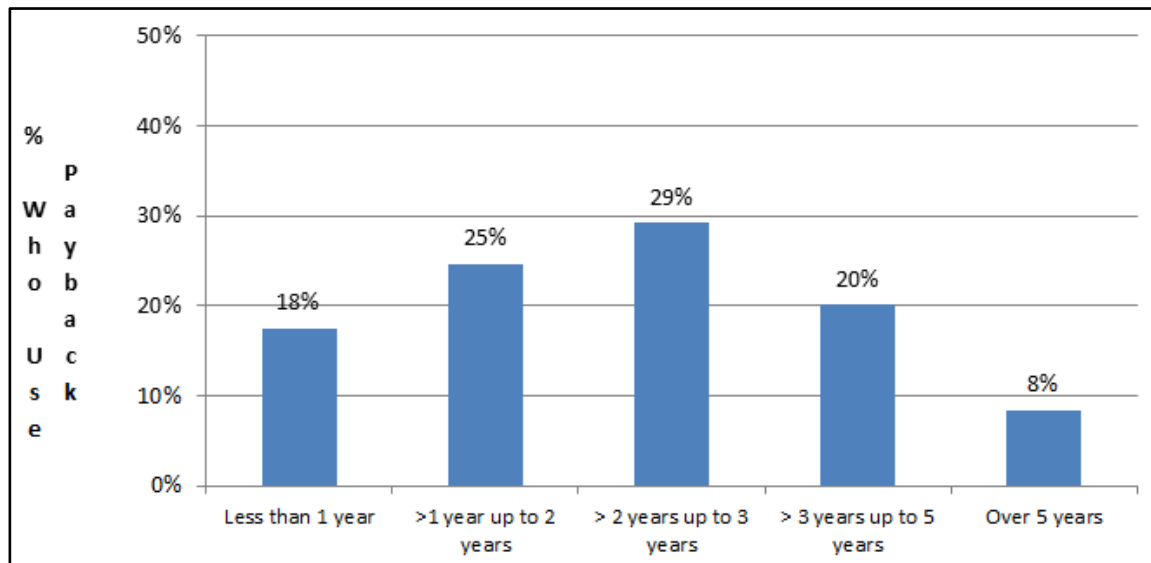
Source: 2012 Participant Survey. Multiple responses accepted; N=287.



#### A.4 Acceptable Length of Payback

Survey respondents who used simple payback for decision making were then asked how many years payback they accepted for energy efficiency decisions. As shown in Figure A-4, the most common response was two to three years (29%). However, a similar proportion (28%) was willing to accept a simple payback of more than 3 years for energy efficiency investments. One-quarter of the respondents needed a payback of one to two years, and 18 percent required a payback of less than one year.

**Figure A-4. Accepted Simple Payback Length for Energy Efficient Decisions**



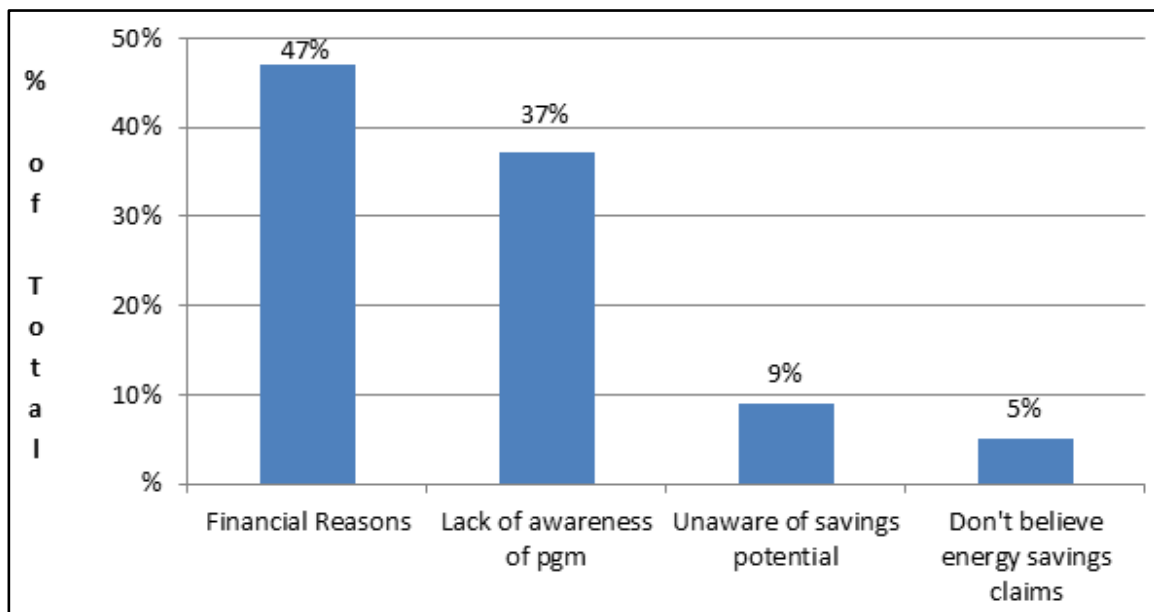
Source: 2012 Participant Survey. Multiple responses accepted; N=154.



### ***A.5 Reasons Why “Companies Like Mine” Do Not Participate***

As seen in Figure A-5, the reasons most often cited by participating customers for companies like theirs not participating in the program were financial (47% of respondents). More than one-third (37%) of respondents indicated lack of awareness as a reason why other companies do not participate. A few survey respondents said that others do not participate because they were unaware of the savings potential (9%), or did not believe the savings claims (5%).

**Figure A-5. Reasons Why “Companies Like Mine” Do Not Participate**



Source: 2012 Participant Survey. N=253

### ***A.6 Drawbacks to the Program***

Sixty-one percent of survey respondents reported no drawbacks to the Prescriptive Program, while just 12 percent said that the cost of the equipment was a drawback to the program. Other reported drawbacks include the paperwork, the time commitment that the program was not worth the incentive, and the necessity for completing the participant survey.



## Appendix B. Participant Telephone Survey

### AEP OHIO BUSINESS PROGRAMS – PRESCRIPTIVE PROGRAM PARTICIPANT SURVEY – Prescriptive PROJECTS March 7, 2013

#### INTRODUCTION

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 <PaymentApprovalDate> and received an incentive of <PaymentAmount> from AEP Ohio. We are calling to do a follow-up survey about <OrganizationName>'s participation in this program, which is called the "AEP Ohio Prescriptive Program". This is not a sales call, and all responses will be kept anonymous. 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 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. This is not a sales call, and all responses will be kept anonymous.

[IF NEEDED] Our records show that <OrganizationName> purchased energy efficient <MeasureCategory>, which was installed prior to <PaymentApprovalDate> and received an incentive of <PaymentAmount> from AEP Ohio. We are calling to do a follow-up survey about <OrganizationName>'s participation in this program, which is called the "AEP Ohio Prescriptive Program". This is not a sales call, and all responses will be kept anonymous. 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 20 minutes. Is now a good time? [If no, schedule call-back]

#### SCREENING QUESTIONS

- A1. Just to confirm, in 2012 did <OrganizationName> participate in AEP Ohio's Prescriptive Program at <SERVICEADDRESS>? (IF NEEDED: This is a program where your business received an incentive for installing one or more energy-efficient <MeasureCategory1> products. You may have participated in the program with projects at more than one site. We are discussing only the facility at <SERVICEADDRESS>)
- READ LIST 1-3



- 1 Yes, participated as described
- 2 Yes, participated but at another location
- 3 No, did not participate in program
- 97 OTHER, SPECIFY
- 98 DON'T KNOW
- 99 REFUSED

[IF A1=1 OR 2, SKIP A2]

A2. Is it possible that someone else dealt with the energy-efficient <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 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 <MeasureCategory1> you installed and received an incentive for through the AEP Ohio Prescriptive Program at <SERVICEADDRESS> in 2012.

#### *Communications*

S0 How did you first hear about the AEP Ohio Prescriptive program?

(ALPHEBATIZE LIST)

[DO NOT READ LIST, SINGLE RESPONSE]

- 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 planning the details of the energy efficient project you completed through the AEP Ohio Prescriptive Program?

[DO NOT READ LIST; 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 LIST; 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 ANSWERS]

1. BECAUSE OF THE INCENTIVES/TO SAVE MONEY ON EQUIPMENT PURCHASE
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

#### **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 RESPONSE

- 1. Very useful
- 2. Somewhat useful
- 3. Not very useful
- 4. Not at all useful
- 98. DON'T KNOW
- 99. REFUSED

[ASK MK1c IF MK1b=3, 4]

MK1c What would have made the materials more useful to you?

[READ LIST -MULTIPLE RESPONSE, UP TO 3]

- 1. More detailed information
- 2. Where to get additional information
- 3. Never saw any marketing materials
- 97. OTHER, SPECIFY
- 98. DON'T KNOW
- 99. REFUSED

MK2 In general, what is the best way of reaching companies like yours to provide information about energy efficiency opportunities like the AEP Ohio Prescriptive Program? (ALPHABETIZE LIST)

[DO NOT READ LIST - MULTIPLE RESPONSES, UP TO 3]

- 1. BILL INSERTS
- 2. ADVERTISEMENT IN TRADE/PROFESSIONAL PUBLICATION
- 3. ADVERTISEMENT IN LOCAL NEWSPAPER
- 3. E-MAIL
- 4. TELEPHONE
- 5. AEP OHIO ACCOUNT MANAGER
- 6. WEBINARS/ROUNDTABLES/EVENTS
- 7. THROUGH TRADE OR PROFESSIONAL ASSOCIATIONS
- 8. TRADE ALLIES/CONTRACTORS
- 9. SOCIAL NETWORKING INTERNET SITE (LINKEDIN, TWITTER, FACEBOOK)
- 97. OTHER, SPECIFY
- 98. DON'T KNOW
- 99. REFUSED



B2 What do you think are the reasons other companies may not participate in this program?

[DO NOT READ LIST - MULTIPLE RESPONSES, UP TO 3]

1. LACK OF AWARENESS OF THE PROGRAM
2. FINANCIAL REASONS
3. DO NOT BELIEVE CLAIMS OF ENERGY SAVINGS
4. NOT AWARE OF SAVINGS/DON'T REALIZE THE SAVINGS
97. OTHER, SPECIFY
3. NONE
98. DON'T KNOW
99. REFUSED

N3 Think of the degree of importance as being shown 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 measure at this time.

[FOR N3A-N, RECORD 0 TO 10; 96=NOT APPLICABLE; 98=DON'T KNOW; 99=REFUSED]  
(RANDOMIZE LIST)

(If needed: How important in your DECISION to implement the project was...)

- N3a. The age or condition of the removed equipment
- N3b. Availability of the PRESCRIPTIVE PROGRAM incentive
- N3c. Information provided through the technical assistance you received from AEP Ohio staff
- N3d. Recommendation from a lighting vendor or contractor that helped you with the choice of the equipment
- N3e. Previous experience with the energy efficient <Measure Category1>
- 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. Endorsement or recommendation by an account manager of AEP Ohio
- N3l. Corporate policy or guidelines
- N3m. Payback on the investment

(N3I) Recommendation from a design or consulting engineer

N3n. Were there any other factors we haven't discussed that were influential in your decision to install this energy efficient <MeasureCategory1>?

[DO NOT READ LIST, SINGLE RESPONSE]

- 97 [RECORD VERBATIM]
- 96 NOTHING ELSE INFLUENTIAL
- 98 DON'T KNOW
- 99 REFUSED





**PAYBACK BATTERY**

[ASK N8-N9 IF N3m>5 AND <11]

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 an energy efficiency project like this one?

[READ LIST, MULTIPLE RESPONSE]

- 1 Simple Payback
- 2 Return on investment
- 3 Life cycle costing
- 4 Other (SPECIFY)
- 8 DON'T KNOW
- 9 REFUSED

[ASK N9 IF N8 = 1]

N9 What is the payback cut-off point <ORGANIZATIONNAME> uses before deciding to proceed with this type of an investment/capital improvement project? Would you say...?

[READ LIST, SINGLE RESPONSE]

- 1 0 to 6 months
- 2 More than 6 months to up to 1 year
- 3 More than 1 year to up to 2 years
- 4 More than 2 years to up to 3 years
- 5 More than 3 years to up to 5 years
- 6 Over 5 years
- 8 DON'T KNOW
- 9 REFUSED

**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**

*Final Application*

S2a In 2012 did YOU fill out the final paper application for the project?

[DO NOT READ LIST, SINGLE RESPONSE]

- 1. YES



- 2. NO
- 8. DON'T KNOW
- 9. REFUSED

[ASK S2d IF S2a=2]

S2d Who filled out the final paper 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

[ASK S2b IF S2a=1 ELSE SKIP TO S2c2]

S2b How would you rate the process for submitting the final paper 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]

(IF S2b=REFUSED, SKIP TO S2c2)

S2c Why did you rate it that way?

[RECORD VERBATIM]

- 98 DON'T KNOW
- 99 REFUSED

S2c2 How satisfied were you with the time it took for AEP Ohio to approve the final application? Please use a scale of 0 to 10 where 0 is "very dissatisfied" and 10 is "very satisfied". [SCALE 0-10; 98=DON'T KNOW, 99=REFUSED]



*State-Wide Evaluator Non-Residential Participation Process and Program Satisfaction Module*

*Satisfaction with Program Attributes*

- 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 "very dissatisfied" and 10 is "very satisfied"? [SCALE 0-10; 98=DON'T KNOW, 99=REFUSED]

(ASK IF E5≤4)

- E 6. What would have made you more satisfied?

[RECORD VERBATIM]

98 DON'T KNOW

99 REFUSED

(ASK IF E5>OR=4)

- E6A. What is the primary reason you provided that satisfaction rating?

[RECORD VERBATIM]

98 DON'T KNOW

99 REFUSED

- E 7. How satisfied were you with the amount of the incentive? Please use a scale from 0 to 10, where 0 is "very dissatisfied" and 10 is "very satisfied"? [SCALE 0-10; 98=DON'T KNOW, 99=REFUSED]

(ASK IF E7≤4)

- E 7a. What would have made you more satisfied with the measures?

[RECORD VERBATIM]

98 DON'T KNOW

99 REFUSED

(ASK IF E7>or=4)

- E7aa. What is the primary reason you provided that satisfaction rating?

[RECORD VERBATIM]

98 DON'T KNOW

99 REFUSED



- E 8. How satisfied were you with the measures offered by the program? Please use a scale from 0 to 10, where 0 is “very dissatisfied” and 10 is “very satisfied”? [SCALE 0-10; 98=DON'T KNOW, 99=REFUSED]

(ASK IF E8≤4)

- E 9. What would have made you more satisfied with the measures?

[RECORD VERBATIM]

98 DON'T KNOW

99 REFUSED

(ASK IF E8> or =4)

E9A. What is the primary reason you provided that satisfaction rating?

[RECORD VERBATIM]

98 DON'T KNOW

99 REFUSED

- S11 How satisfied were you with the performance of the measures. Please use a scale of 0 to 10, where 0 is ‘very dissatisfied and 10 is ‘very satisfied’.

[SCALE 0-10; 98=Don't know, 99=Refused]

(ASK IF S11≤4)

- E 10. What would have made you more satisfied with the performance of the measures?

[RECORD VERBATIM]

98 DON'T KNOW

99 REFUSED

(ASK IF S11> or =4)

E10A. What is the primary reason you provided that satisfaction rating?

[RECORD VERBATIM]

98 DON'T KNOW

99 REFUSED

### *Satisfaction with Communication*

I would like to get some information on the account manager that may have helped you with the implementation of this equipment.



V4 Did your AEP Ohio account manager assist you with the project that you implemented through AEP Ohio Prescriptive program?

[DO NOT READ LIST, SINGLE RESPONSE, PROBE IF NECESSARY]

IF NO, PROBE "Is that because you don't have an AEP Ohio account manager, or do you have one, but they weren't involved?"

- 1 YES
- 2 NO, DON'T HAVE AN AEP OHIO ACCOUNT MANAGER
- 3 NO, HAVE AN AEP OHIO ACCOUNT MANAGER BUT THEY WEREN'T INVOLVED
- 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?

[DO NOT READ]

- |    |                    |          |
|----|--------------------|----------|
| 1  | NEVER              | E 14     |
| 2  | ONCE               | CONTINUE |
| 3  | 2 OR 3 TIMES       | CONTINUE |
| 4  | FOUR TIMES OR MORE | CONTINUE |
| 88 | REFUSED            | CONTINUE |
| 99 | DON'T KNOW         | CONTINUE |

PE 11. How did you contact them? [DO NOT READ]

[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 |
| 88 | REFUSED      | CONTINUE |
| 99 | DON'T KNOW   | CONTINUE |

E11A-D. Were there any other ways you contacted them?

[RECORD VERBATIM]

- 98 DON'T KNOW
- 99 REFUSED



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 “very dissatisfied” and 10 is “very satisfied”?  
[SCALE 0-10; 98=DON'T KNOW, 99=REFUSED]

(ASK IF E12<4)

E 13. What would have made you more satisfied?

[RECORD VERBATIM]

98 DON'T KNOW

99 REFUSED

(ASK If E12> OR =4)

E 13a. What is the primary reason you provided that satisfaction rating? [OPEN END]

[RECORD VERBATIM]

98 DON'T KNOW

99 REFUSED

S8 During the course of your participation in the program, did you place any calls to the AEP Ohio Call Center or to DNV KEMA at the phone number from the application form?

[DO NOT READ LIST, PROBE IF NECESSARY] (SINGLE PUNCH)

1. YES – AEP BUSINESS CALL CENTER
2. YES – DNV KEMA AT THE PHONE NUMBER FROM THE APPLICATION FORM
3. NO, NEITHER
4. BOTH
8. DON'T KNOW
9. REFUSED

[ASK S8a IF S8=1 OR 4]

S8a On a scale of 0 to 10, where 0 is “very dissatisfied” and 10 is “very satisfied;” how would you rate your satisfaction with the Call Center’s ability to answer your questions?

[SCALE 0-10; 98=DON'T KNOW, 99=REFUSED]

S8b What is the primary reason you provided that satisfaction rating? [OPEN END]

[RECORD VERBATIM]

98 DON'T KNOW

99 REFUSED

S8aa On a scale of 0 to 10, where 0 is “very dissatisfied” and 10 is “very satisfied;” how would you rate your satisfaction with the ability of the representative at the DNV KEMA number to answer your questions?



[SCALE 0-10; 98=DON'T KNOW, 99=REFUSED]

S8bb What is the primary reason you provided that satisfaction rating? [OPEN END]

[RECORD VERBATIM]

98 DON'T KNOW

99 REFUSED

*Processing the Application*

E 14. From the time you had [MEASURETYPE] installed and submitted the application, about how many weeks did it take to receive your incentive? \_\_\_\_\_RECORD # of WEEKS

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 "very dissatisfied" and 10 is "very satisfied"? [SCALE 0-10; 98=DON'T KNOW, 99=REFUSED]

(ASK IF E15<4)

E15A. What would have made you more satisfied?

[RECORD VERBATIM]

98 DON'T KNOW

99 REFUSED

(ASK IF E15> OR =4)

E 15aa. What is the primary reason you provided that satisfaction rating?

[RECORD VERBATIM]

98 DON'T KNOW

99 REFUSED



E 16. Did AEP Ohio or its contractors conduct a post-installation inspection of the equipment you installed through the Prescriptive Program?

- |    |            |           |
|----|------------|-----------|
| 1  | YES        | CONTINUE  |
| 2  | NO         | GO TO E19 |
| 88 | REFUSED    | GO TO E19 |
| 99 | DON'T KNOW | GO TO E19 |

E 17. How satisfied were you with the inspection? Please use a scale from 0 to 10, where 0 is "very dissatisfied" and 10 is "very satisfied"?

[SCALE 0-10; 98=DON'T KNOW, 99=REFUSED]

(ASK IF E17<4)

E 18. What would have made you more satisfied with the inspection?

[RECORD VERBATIM]

- |    |            |
|----|------------|
| 98 | DON'T KNOW |
| 99 | REFUSED    |

(ASK IF E17> OR =4)

E 18a. What is the primary reason you provided that satisfaction rating?

[RECORD VERBATIM]

- |    |            |
|----|------------|
| 98 | DON'T KNOW |
| 99 | REFUSED    |

E 19. Have you noticed lower electricity bills since you installed your new energy efficient equipment?

- |    |            |             |
|----|------------|-------------|
| 1  | YES        |             |
| 2  | NO         | GO TO E 21. |
| 88 | REFUSED    |             |
| 99 | DON'T KNOW |             |

E 20. Would you say your bill savings are...[READ LIST]

- |    |                         |
|----|-------------------------|
| 1  | About what you expected |
| 2  | More than you expected  |
| 3  | Less than you expected  |
| 98 | DON'T KNOW              |
| 99 | REFUSED                 |

E 21. 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                     |           |
| 2  | Somewhat satisfied                 |           |
| 3  | Neither satisfied nor dissatisfied |           |
| 4  | Somewhat dissatisfied              |           |
| 5  | Very dissatisfied                  |           |
| 88 | Refused                            | Go to B1a |
| 99 | Don't know                         | Go to B1a |

E 22. Why do you give it that rating?

[RECORD VERBATIM]

- |    |            |
|----|------------|
| 98 | DON'T KNOW |
| 99 | REFUSED    |



*Benefits and Barriers*

B1a. What do you see as the main benefits to participating in the Business Prescriptive Program? (DO NOT READ LIST) (RANDOMIZE LIST)

[MULTIPLE RESPONSES, UP TO 3]

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
98. DON'T KNOW
99. REFUSED

B1b. What do you see as the drawbacks to participating in the program? (DO NOT READ LIST) (RANDOMIZE 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
6. Poor Communication
7. Time Consuming
8. Underfunded/Ran out of money
5. No drawbacks (MAKE EXCLUSIVE AND ANCHOR HERE)
00. OTHER, SPECIFY
98. DON'T KNOW
99. REFUSED



*Feedback and Recommendations*

R1. Do you plan to participate in the Prescriptive 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)  
(ALPHABETIZE LIST)

[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 \_\_\_\_\_
96. NO RECOMMENDATIONS
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  |
| 88 | REFUSED                            | GO TO F 1 |
| 99 | DON'T KNOW                         | GO TO F 1 |

E22. Why do you give it that rating?



[RECORD VERBATIM]

98 DON'T KNOW

99 REFUSED

*Firmographics*

Finally, I'd like to ask you few general questions about your company, specifically at [SERVICEADDRESS]. (DO NOT READ) (ALPHABETIZE LIST)

F 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) \_ \_)

88 REFUSED 99 DON'T KNOW

F1a. What is <COMPANY>'s business sector?

[READ LIST IF NECESSARY. SINGLE RESPONSE]

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 efficient equipment was installed in the same sector?

[DO NOT READ LIST, SINGLE RESPONSE]

1. YES



- 2. NO
- 8. DON'T KNOW
- 9. REFUSED

B 2. What is the principal business activity /(type of business [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? (ALPHABETIZE LIST)

[DO NOT READ LIST. RECORD SINGLE 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 ASSOCIATION/APARTMENT MANAGEMENT
- 77 MISCELLANEOUS [RECORD VERBATIM]
- 88 REFUSED
- 99 DON'T KNOW



B 3. Does your organization own or lease the space at [SITE\_ADDRESS]?

- 1 OWN
- 2 LEASE
- 3 OWN PART AND LEASE PART
- 99 DON'T KNOW

B 4. What is the total square footage of the portion of the facility that you occupy at this location?  
Your best estimate will be fine.

- # SQUARE FEET
- 88 REFUSED
- 9 DON'T KNOW

F4a How old is this facility?

[NUMERIC OPEN END, 0 TO 150; 98=DON'T KNOW, 99=REFUSED]

(RECORD IN YEARS)

[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
- 88. DON'T KNOW
- 99. 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
- 88. DON'T KNOW
- 99. REFUSED

B 7. About how many full-time equivalent employees work at the facility at [SITE\_ADDRESS]?

- 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 REFUSED
- 99 DON'T KNOW

Those are all the questions I have for you today. Thank you and have a great afternoon/evening.

---

## APPENDIX J

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## CUSTOM PROGRAM

### Program Year 2012 Evaluation Report

Prepared for:  
AEP Ohio



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May 9, 2013



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## Executive Summary

This document presents a summary of the findings and results from the evaluation of the 2012 Custom Program implemented by AEP Ohio for the program year January 1, 2012 through December 31, 2012.<sup>1</sup> 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 include: 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 2012 the Custom Program paid incentives on 192 projects including 528 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 counted though the Custom Program. These prescriptive measures included in the Custom Program are evaluated as though they were submitted through the Prescriptive Program. More than ninety percent of prescriptive co-submitted savings is for lighting end-uses. Table ES-1 provides a summary of 2012 Custom Program results.

**Table ES-1. 2012 Custom Program Projects, Measures, and Reported Savings**

Metric	Custom	Prescriptive Co-Submitted	Custom Program Reported Value
Number of Projects	192	83	192
Number of Measures	233	295	528
Annual Energy Savings (MWh)	21,652	4,327	25,979
Electric Peak Demand Savings (kW)	2,590	780	3,370

*Source: Evaluation analysis of AEP Ohio tracking data from January 22, 2013*

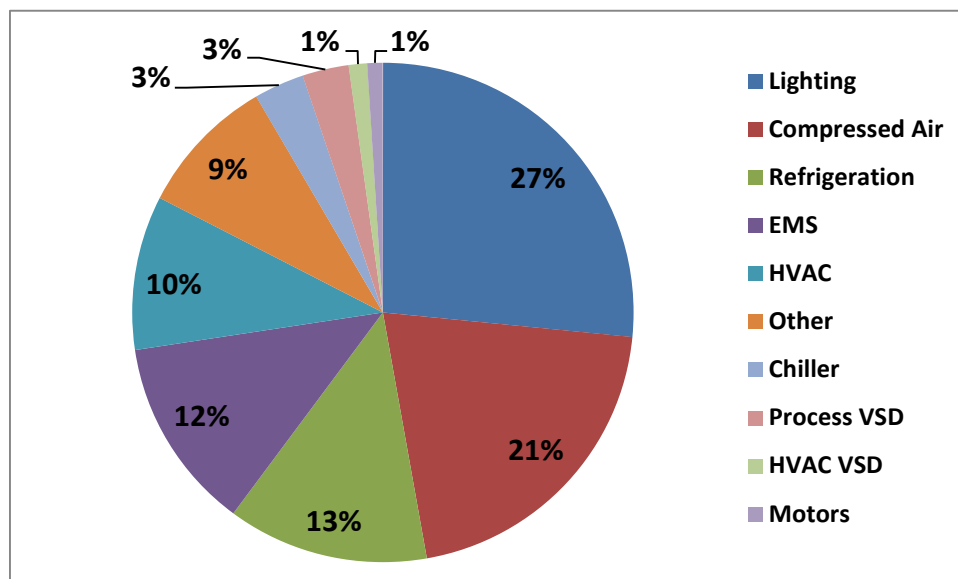
Measures submitted through the Custom Program reflect a broad variety of energy efficiency and conservation measures. Lighting is the largest savings category, but more than 50 percent of this total comes from prescriptive measures submitted with custom projects. The category “other” includes efficient UPS systems for data centers and process-specific measures, among others. Figure ES-1 shows program energy savings by end-use with lighting at 27 percent, followed by compressed air at 21 percent,

<sup>1</sup> Program Year 2012 participation is based on an implementation contractor payment mailed date between January 1, 2012 and December 31, 2012.



and then refrigeration (13%), energy management systems (EMS) with 12 percent, HVAC at 10 percent and all other end uses at 3 percent or less.

**Figure ES-1. 2012 Custom Program Energy Savings by End-Use**







### ***Data Collection Activities***

Table ES-2 provides a summary of 2012 data collection activities for the Custom Program impact and process evaluations.

**Table ES-2. Data Collection Activities for 2012 Custom Program Evaluation**

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 2012	Project	census	NA	May 2012 to April 2013
Process	In-depth Interviews	AEP Ohio program Staff	Contact from AEP Ohio	NA	1	January 2013 to February 2013
		Custom program implementation staff	Contact from DNV KEMA	NA	4	
Process	CATI Surveys	Business program Solution Providers	Contacts from tracking database	Random Sample	122	February to April 2013
		Business unique program participants	Unique contact from tracking database	Census	77	March 2013 to April 2013
Impact	Project Technical Reviews	Custom projects paid in 2012	Project	Random sampling using stratified ratio estimation	30	July 2012 to April 2013
	On-site Verification	Sample of Technical Review Projects	Project	Key issue sites	3	March 2013 to April 2013

*Source: Evaluation activities conducted from July 2012 through April 2013.*



## Key Evaluation Findings and Recommendations

### Key Impact Findings and Recommendations

The impact results for the 2012 Custom Program are shown in Table ES-3.

**Table ES-3. Savings Estimates for the 2012 Custom Program**

Program	Program Goals		Ex-ante Reported Savings		Ex post Savings	
	MWh	MW	MWh	MW	MWh	MW
Total	66,463	8.86	25,979	3.37	27,018	3.81

Source: AEP Ohio EE-PDR 2012 Performance Report 11-8-2012. Evaluation analysis of AEP Ohio tracking data from January 22, 2013.

1. **Finding:** The 2012 *ex post* savings fell well short of goals. Lack of program participation seems to be the cause of this shortfall.

**Recommendation:** Examine processes to emphasize measures and projects that would be submitted through a custom approach. Develop case studies of successful projects to promote applications through the program.

2. **Finding:** More than 40 percent of applications were submitted by three retailers or groceries with multiple locations. This finding suggests both that many opportunities exist in these market segments and a reliance on these types of customers.

**Recommendation:** Consider methods for promoting similar successful projects among other customers 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 simulations are used to determine savings, realization rates were highly variable. Baselines were ill-defined or poorly documented in some cases.

**Recommendation:** Require more pre-installation documentation – either trend logs or inspections and screen captures to demonstrate the existing conditions. Require executable simulations that accurately reflect existing and proposed equipment and operating conditions.

4. **Finding:** Where vendor calculations form the basis of *ex-ante* savings, Navigant found instances of inaccuracies, calculation errors and poor assumptions contributing to estimates.

**Recommendation:** Apply more rigor to savings estimates submitted by vendors to ensure assumptions are accurate. On complex or non-traditional projects use subject-matter experts and/or document redundant checks and verification.



5. **Finding:** Observations from the evaluator verification experience were that DNV KEMA and AEP Ohio have a quality control approach that appears sufficient to reduce most inaccuracies, processes applications in a fair and timely manner, and ensures that rebate payments are appropriate.

#### Process Evaluation Findings and Recommendations

1. **Finding:** In 2012, 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 76 percent. Most customers (90%) planned on participating in the program again.  
**Recommendation:** Although based on a small number of survey respondents, these results suggest the program delivery and contact worked well in 2012. The only area for improvement would be the incentive processing time. All other aspects of the program seem to be meeting customer expectations.
2. **Finding:** Customers appear to be comfortable with the application form. Most of them say it is either easy to complete or that the form has improved over time. Others have their Solution Provider or trade ally complete the form for them.  
**Recommendation:** Expectations for the introduction of the online form should be carefully managed internally and externally. The online form may take additional time now that customers and trade allies have some level of comfort with the paper application. Adequate training will be the key to the migration to the Web. Expect less computer savvy participants to send office staff for training or to require keyboarding training. Internally, expect the online application to need improvements as customers find 'nits' that will need to be fixed.  
**Recommendation:** Contract with an outside firm to conduct usability testing with customers before the roll out of the online application. Information technology (IT) staff may prefer to test with employees but a change of this magnitude should be approached more carefully. Video tape the customers as they use the online application for sharing with those that cannot watch in real time.
3. **Finding:** Lack of customer knowledge and more complex marketing challenges caused by increased segmentation were mentioned as two of the major barriers of the program. Other program issues were the complexity of the savings calculations and the time investment that customers or trade allies need to submit the paperwork. Lack of capital was still an issue in 2012, especially with larger customers (a prime target for the Custom Program).  
**Recommendation:** AEP Ohio should continue to identify industry and commercial groups that would benefit from the program offering in an approach that capitalizes on the specialized needs of customer segments. Some customer segments have online industry groups or targeted magazines that simplify marketing and advertising purchases. Online ads targeting specific industry or commercial groups could be explored. AEPOhio.com could also be tested to ensure it is used most effectively for offering energy efficiency program information.



## 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. 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, Business 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, DNV KEMA, in coordination with AEP Ohio.

### 1.2 Key Program Elements

The goals of the 2012 Custom 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.

**Performance Incentive.** Custom incentives are available based on both the project's first year kilowatt-hour (kWh) and kilowatt (kW) savings. Table 1-1 presents the incentive parameters of the program.

**Table 1-1. Incentive Parameters**

Energy Incentive	Demand Incentive	Incentive Cap
\$0.08 / kWh	\$100 / kW	50% of project cost (materials + external labor)

**Incentive Caps.** Incentives for 2012 may not exceed \$300,000 per project, or \$1,200,000 per business entity per year.

**Incentive Limits.** Project incentives cannot exceed 50 percent of the project incremental cost. Larger projects may be subject to varying incentive payment rates.

**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. DNV KEMA reviews final applications for eligibility and completeness.

**Final Inspection.** DNV KEMA 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.

### 1.2.1 Measures and Incentives for 2012

The 2012 program application forms listing measures, eligibility criteria, and incentive levels are provided in Appendix B. Eligible equipment includes lighting retrofits, HVAC measures such as VFDs, equipment controls, variable speed air compressors, 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 population. Lighting projects are also eligible for custom incentives when the hours of operation are exceptional and/or when non-standard equipment is installed.

### 1.2.2 Solution Provider Participation

AEP Ohio and DNV KEMA 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. During 2012, DNV KEMA began identifying more experienced solution providers. Through 2012, over 400 Solution Providers have been trained or approved to market the AEP Ohio business sector programs. In addition, other trade allies can participate in a program without registering with AEP Ohio. Solution Providers were surveyed via a Computer-Assisted Telephone Interview (CATI) system for the 2012 evaluation which is included in an appendix of a separate report for Solution Providers.

## 1.3 2012 Custom Program Participation Summary

The evaluation team analyzed data delivered by AEP Ohio on January 22, 2013. As shown in Table 1-2, the 2012 Custom Program paid incentives on 192 projects constituting 25,979 MWh of *ex-ante* reported annual energy savings. Almost 17 percent of Custom Program savings are from Prescriptive Program



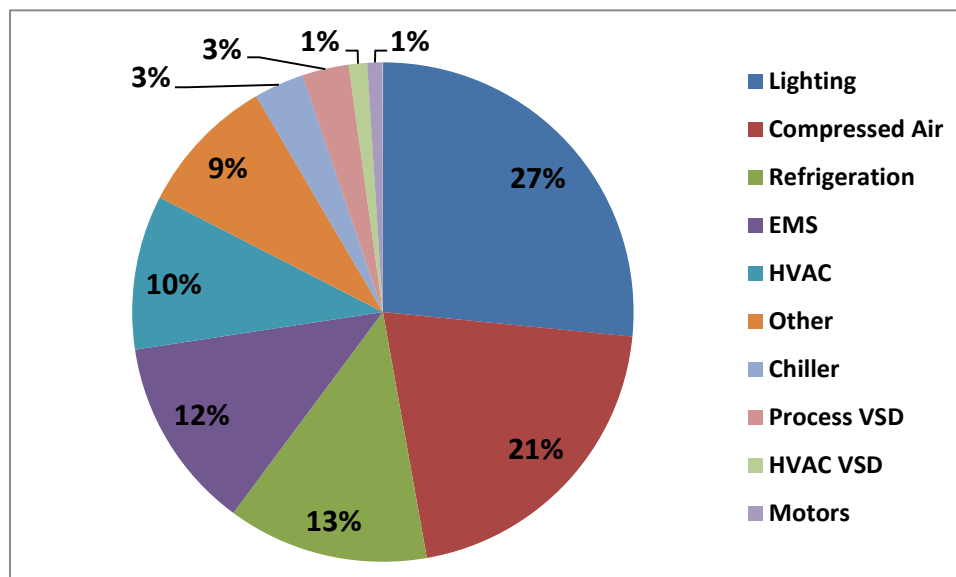
measures submitted on the same application. Among the prescriptive measures, almost 85 percent are lighting. The Custom Program overall demonstrates greater diversity than the prescriptive measures in involved end-uses. The distribution of savings among end-uses is shown in Figure 1-1.

**Table 1-2. 2012 Custom Program Projects, Measures, and *Ex ante* Savings**

Metric	Custom	Prescriptive Co-Application	Custom Program Reported Value
Number of Projects	192	83	192
Number of Measures	233	295	528
Annual Energy Savings (MWh)	21,652	4,327	25,979
Electric Peak Demand Savings (MW)	2.59	0.78	3.37

*Source: Evaluation analysis of AEP Ohio tracking data from January 22, 2013*

**Figure 1-1. 2012 Custom Program Energy Savings by End-Use**



*Source: Evaluation analysis of AEP Ohio tracking data from March 25, 2013*

Figure 1-1 shows program energy savings by end-use with lighting at 27 percent, followed by compressed air at 21 percent, and then refrigeration (13%), energy management systems (EMS) with 12 percent, HVAC at 10 percent and all other end uses at 3 percent or less.

Table 1-3 and Figure 1-2 provide a profile of 2012 Custom Program participation at the market segment level. Among 2012 Custom Program participants, three customers with multiple facilities were well-represented. A grocery store chain had projects at 52 sites; a pharmacy had projects at 25 sites, and a retailer had projects at 5 sites. Combined, these three customers account for 43 percent of all Custom Program applications but only ten percent of program kWh savings.



Outside of these three customers, participation was highest within the Industrial and Manufacturing sector, which accounted for 44 percent of program reported energy savings and 48 percent of the reported demand savings. The retail sectors and schools combine to contribute another 28 percent of program energy savings.

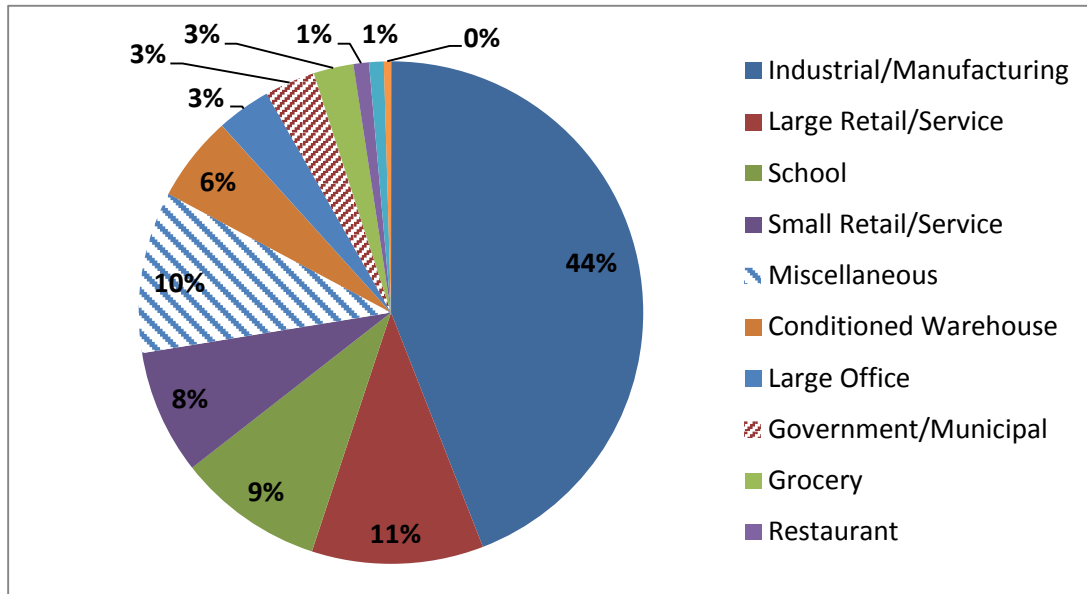
**Table 1-3. 2012 Custom Program Participation by Business Type**

Business Type	Project Count		Ex-ante Reported Savings, MWh		Ex-ante Reported Savings, kW	
Assembly	4	2%	242	1%	24.13	1%
Conditioned Warehouse	2	1%	1,431	6%	226.58	7%
Government/Municipal	9	5%	844	3%	150.62	4%
Grocery	54	28%	666	3%	82.95	2%
Industrial/Manufacturing	35	18%	11,449	44%	1,627.37	48%
Large Office	10	5%	901	3%	154.10	5%
Large Retail/Service	16	8%	2,861	11%	236.15	7%
Miscellaneous	7	4%	2,706	10%	422.86	13%
Restaurant	10	5%	260	1%	15.65	0%
School	10	5%	2,431	9%	174.04	5%
Small Office	4	2%	120	0%	2.89	0%
Small Retail/Service	31	16%	2,070	8%	255.91	8%
<b>Total</b>	<b>192</b>	<b>100%</b>	<b>25,979</b>	<b>100%</b>	<b>3,373.26</b>	<b>100%</b>

*Source: Evaluation analysis of tracking data from AEP Ohio database exports from January 22, 2013.*



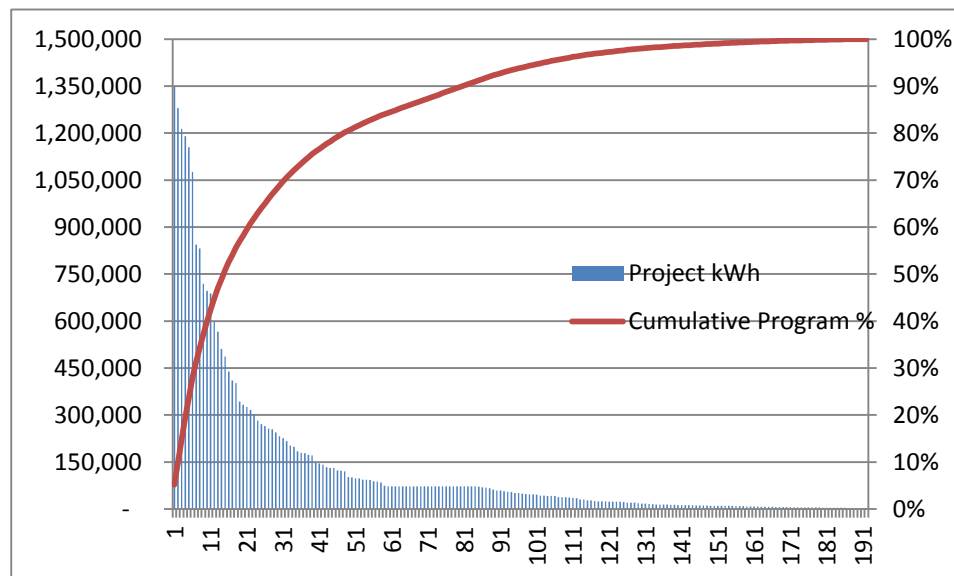
**Figure 1-2. 2012 Custom Program *Ex-ante* MWh Savings by Business Type**



Source: Evaluation analysis of tracking data from AEP Ohio database exports from January 22, 2013.

Figure 1-3 shows that only 10 percent of the projects account for 57 percent of program savings and 20 percent of the projects encompass 75 percent of the savings. The 50 percent of projects that are the smallest comprise only six percent of program savings.

**Figure 1-3. 2012 Distribution of Savings by Project**







## 2 Methodology

For Custom Program participants, Navigant conducted impact and process evaluation activities following the methodologies outlined below.

### 2.1 Analytical Methods

#### 2.1.1 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 measures<sup>2</sup>. 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 *ex post* by DNV KEMA or custom calculations based on measured data and pre-installation and/or post-installation inspections performed by DNV KEMA.

Application Documentation Technical Review was conducted on a sample of projects randomly selected from the operating company customer participant populations. For each selected project, an in-depth review of project documentation was performed to assess the engineering methods, parameters and assumptions used to generate all *ex-ante* reported savings. When available, measure specifications and

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<sup>2</sup> For example custom lighting measures may include non-standard equipment or operating hours.



quantities were *ex post* by reviewing the accompanying inspection and specification documents as well as installation invoices.

For each custom measure in the sampled project, Navigant estimated *ex post* savings based on the review of project documentation and engineering analysis. Adjustments to *ex post* 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 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:

- » Building type
- » 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

When possible, measure quantities were verified by comparing them to invoices from contractors or suppliers. If a post-inspection 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. Engineering-based energy and demand reduction algorithms were followed to compute *ex-post* savings.

#### **2.1.1.1 On-site Data Collection**

In the Custom Program evaluation plan, Navigant projected 15 on-site inspections based on 282 program participants, with sites selected from the application documentation review sample. Due to lower actual participation, Navigant conducted only three on-site inspections, concentrating on projects with large *ex-ante* savings or projects that were similar at several sites. 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. *Additional* on-site research does not contribute much value for these sites.

A site-specific M&V plan was developed for each project scheduled for on-site data collection. Each plan explains the general impact approach used (including monitoring plans), 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.



During the on-site assessment, data identified in the analysis plan was collected, including monitoring records (such as instantaneous spot watt measurements for relevant equipment, data from equipment logs and EMS/SCADA system downloads), equipment nameplate data, system operation sequences and operating schedules, and a detailed description of site conditions that might contribute to baseline selection. During the assessment, the engineer met with a building representative who was knowledgeable about the facility's equipment and operation, and asked questions regarding operating schedules, location of equipment, and equipment operating practices.

After all of the field data was collected, including any monitoring data, 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 hard copy application review and on-site gathered information.

#### **2.1.1.2 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.

#### **2.1.2 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, DNV KEMA, 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 CATI survey with participating customers to better understand customer satisfaction and perceptions related to the program. Finally, the evaluation team conducted a CATI survey with Solution Providers to identify their perspectives on the program. The Solution Provider results are presented in a separate report.

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 2012 Custom Program was gathered during a number of activities including:

- » In-depth telephone interviews with AEP Ohio program coordinators and the implementation contractor (DNV KEMA 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.

**Table 2-1. Data Collection Activities for 2012 Evaluation**

Data Collection	Targeted Population	Sample Frame	Sample Design	Sample Size	Timing
Tracking Data Analysis	Custom Program projects approved for payment for 2012	AEP Ohio Tracking Database	-	All	May 2012 to April 2013
In-depth Interviews	AEP Ohio Program Staff	Contact from AEP Ohio	Business Programs Manager and Custom Program Manager	2	January 2013 to February 2013
	Custom Program Implementers	Contact from AEP Ohio	KEMA Program Implementation Staff	5	
CATI Survey	Business program Solution Providers	Contacts from tracking database	Random Sample	N=596 Targeted = 122 Completed = 90	March 2013 to April 2013
	Custom Program Participants	Tracking Database	Census of Custom Program Participants	N=77 Targeted = 35 Completed = 25	March 2013 to April 2013
Application File Review	Tracking Database	Stratified Random Sample by Project-Level kWh	Stratified Random Sample by Project-Level kWh	30	December 2012 to April 2013
On-site Verification	Application File Review Sample	Application File Review Sample	Key issue sites	3	March 2013 to April 2013

### 2.2.1 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 DNV KEMA. Program samples for the Computer Assisted Telephone Interview (CATI) participating customer phone sample were drawn from a January 22, 2013 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.

Navigant conducted the tracking system review and sample design for application file review using database exports of the tracking system. Sample design and selection for the 2012 Custom Program was



done in two waves with one sample drawn in July 2012, and a second sample wave drawn after the close of the program year, using the January 22, 2013 extract. The early sample was drawn to prepare for summer monitoring for PJM filings. Ultimately the PJM-related monitoring was not undertaken, but the projects were included in the year-end evaluation sample.

### **2.2.2 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 DNV KEMA (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 CD.

Navigant also reviewed program materials developed by DNV KEMA and AEP Ohio, including: two versions of the DNV KEMA technical reference manual documenting prescriptive savings (Appendix A of the operations manual), application forms and checklists, and program materials available from the program website.

### **2.2.3 Program and Implementer Staff Interviews**

Two in-depth interviews with key program representatives were conducted 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 members of the DNV KEMA Services, Inc. implementation staff were interviewed for the Prescriptive and Custom Programs, combined. The interviews were completed over the phone in January and February of 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.

### **2.2.4 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 conducted with a census of 2012 Custom Program participants. This Computer-Assisted Telephone Interview (CATI) survey focused on estimating the program impacts and supporting the process evaluation. The questionnaire used for the survey is included in Appendix Section Appendix A.

## **2.3 Sampling Plan**

### **2.3.1 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 for each operating company. The program-level Custom *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, Stratum 2 to medium-sized projects, and Stratum 3 to the smallest projects. This approach resulted in a total sample of 30 projects to be selected for application documentation and engineering review. In the end, Navigant sampled 47 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.

**Table 2-2. Profile of the Impact M&V Sample by Strata**

Population Summary			Sample		
Sampling Strata	Number of Projects (N)	<i>Ex-ante</i> Savings, MWh	n	<i>Ex-ante</i> MWh	Sampled % of Population
Strata 1 large	23	16,079	16	10,887	68%
Strata 2 medium	62	7,625	8	1,063	14%
Strata 3 small	107	2,275	6	210	9%
Total or Overall Value	192	25,979	30	12,161	47%

*Source: Evaluation analysis of program tracking data*

### 2.3.2 Process Sample

The CATI survey targeted a population of 77 unique customer contact names with paid projects in the 2012 Custom Program, drawn from the January 22, 2013 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.

#### 2.3.2.1 Profile of Participating Customer Survey Respondents

Most of the business customers in our 2012 sample of Custom Program participants own their own facility (88 percent). The average age of their facilities is 37 years old with a range of three years to 100 years. The average size of the facility is about 200,000 square feet.

Over two-thirds of the businesses in our sample have more than one location (68 percent). The remaining businesses were evenly split between those that have only one location and those who were headquartered in Ohio (16 percent each).

The survey respondent sample can also be grouped by number of employees. About one-third of the respondents had from 1 to 25 employees; about one-third had from 26 to 75 employees and about one-third had from 100 to over 500 employees. Customers in the survey were involved in a broad range of



businesses ranging from other industrials, data centers, retail, schools, grocery, restaurant, health care, churches and not-for-profit groups, and various industrial organizations.





### 3 Detailed Evaluation Findings

#### 3.1 Impact Results

This section presents the results of the impact and process evaluations of the 2012 Custom Program.

##### 3.1.1 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 DNV KEMA 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 2011 impact evaluation have been addressed in the 2012 program, as represented in Table 3-1.

**Table 3-1. 2011 Recommendations and Status**

2011 Recommendations	Status
Increase rigor of pre- and post- inspection reports to gather more baseline and operational data	Pre-and post-inspection reports contain more thorough information.
Document pre-installation conditions more thoroughly for building automation projects.	This class of projects still needs more pre-installation detail. Controls projects had the greatest variation in realization rates – possibly due to poorly defined baselines.
Interactive impacts for small lighting projects were frequently not applied.	All reviewed projects had interaction factors applied.
Projects with savings based on billing analysis often did not have adequate post-installation data needed for accurate estimates.	Post-installation billing data is still sparse in many cases. These larger projects may take longer to implement, thus lack of post-installation billing data persists.
Apply more rigor to vendor-supplied savings estimates.	Navigant encountered fewer vendor calculations used for <i>ex-ante</i> savings; however, small errors persist in some that are accepted.

Further refinements to these recommendations and 2012 Evaluation observations and recommendations are provided in Table 3-2.



**Table 3-2. 2012 Impact Observations and Recommendations**

2012 Issue/Observation	2012 Recommendation
When applying HVAC interactive effects for lighting, DNV KEMA uses average values from the literature <sup>3</sup> . These factors should be specific by business-type and climatically similar.	If using the California Database of Energy Efficient Resources, use climate zone 11 <sup>4</sup> HVAC interaction factors as the most representative CA climate zone for Columbus.
In instances where building simulation models were used to estimate <i>ex-ante</i> savings, the documentation was frequently inadequate to verify inputs to the models for pre- and post-installation model runs. This concern occurred mostly with Energy Management System installations.	Require more details regarding model inputs, up to requiring the executable models themselves for projects submitted with model-based savings estimates. Model baselines should be demonstrated – for example equipment on/off schedules. Where possible, the proposed control sequences and/or scheduled should be documented with screen captures and/or trend logs.
Where billing comparison is used to calculate savings, there were some instances where insufficient data were available for the post-installation period. Additional post-installation data available for the evaluation were used to modify project savings.	The implementation contractor should finalize savings for those projects based on billing comparison only after sufficient post-installation data are available – at least six months for a single-site billing comparison.
Savings calculations performed by DNV KEMA were mostly accurate and supported by nameplate or measure data. Some savings estimates were based solely on vendor calculations. These calculations did not always apply appropriate factors for loading and/or efficiency.	Apply more scrutiny to calculations made by vendors. Establish default values or ranges to use when vendor data are incomplete, for example, average motor loading, motor efficiency and drive efficiency.

### 3.1.2 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.<sup>5</sup> 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 program<sup>6</sup>. 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 104 percent for energy savings, and 113 percent for demand reduction. In general, the project-level 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

<sup>3</sup> Program Year 2012 Evaluation Report – Prescriptive Program, AEP Ohio. Prepared by Navigant Consulting May 2013.

<sup>4</sup> Climate Zone 11 corresponds to the Red Bluff region: 40.09 degrees north latitude, 2800-4400 HDD and 600-1900 CDD. Columbus, OH ranges from 2009-2012 4400-5350 HDD and 850-1450 CDD.  
<https://www.aepnationalaccounts.com/save/calculate/weather/>

<sup>5</sup> A full discussion of separate ratio estimation can be found in Sampling: Design and Analysis, Lohr, 2010 2<sup>nd</sup> Edition, pp. 144-145.

<sup>6</sup> 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.



and acceptance of flawed vendor-provided estimates. Building automation installations verified by billing analysis found the widest variation in realization rates – between 0 to 203 percent. All sampled projects, with *ex-ante* savings determined by billing analysis, had inadequate post-installation data to accurately estimate savings.

The relative precision at a 90% confidence level for the 2012 Custom Program projects in the sample is  $\pm 11\%$  for the energy realization rate and  $\pm 21\%$  for the demand realization rate. The relatively high relative precision values reflect extra-ordinary realization rates – between 0% and 200% - among a couple high-impact projects.

### 3.1.3 Program Impact Results

Based on the impact parameter estimates described in the previous section, Navigant estimated the *ex post* program impacts resulting from the 2012 Custom Program, as shown in Table 3-3. No further adjustments were made to *ex post* savings.

**Table 3-3. Savings Estimates for 2012 Custom Program**

Program	<i>Ex-ante</i> Reported Savings		<i>Ex post</i> Savings	
	MWh	MW	MWh	MW
Total	25,979	3.37	27,018	3.81

The Custom Program fell well short of its 2012 goals of 66,463 MWh energy savings and 8.86 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.

**Table 3-4. 2012 Custom Program Participation and Savings by Measure**

Measure End-Use	Measure Count	Ex ante Reported Savings	
		MWh	MW
Lighting	339	6,901.35	1.168
Compressed Air	23	5,359.07	0.717
Refrigeration	104	3,365.71	0.491
EMS	9	3,235.29	0.154
HVAC	20	2,591.12	0.207
Other	9	2,339.00	0.287
Chiller	2	840.57	0.120
Process VSD	3	779.25	0.146
HVAC VSD	16	310.25	0.054
Motors	3	257.74	0.029
<b>Total</b>	<b>528</b>	<b>25,979</b>	<b>3.37</b>

*Source: Program tracking database, January 22, 2013. Measure participation is greater than program participants (192) because participants can install more than one measure of the same or different end-use for each application.*

### 3.2 Process Evaluation Results

AEP Ohio's 2012 Custom Program offers incentives designed to encourage implementation of energy-efficiency 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 2012 Custom Program Evaluation Plan.



### 3.2.1 Marketing and Outreach Practices

Marketing and outreach activities for the Custom Program have improved every year in terms of approach. In 2012, marketing and outreach efforts included:

- Solution Provider meetings
- Blitz efforts targeting large customers in 2012
- Customer education seminars
- Expo with customers and trade allies together attended by 165 customers. These offered a drawing entry for an iPad if they visited all seven trade allies.

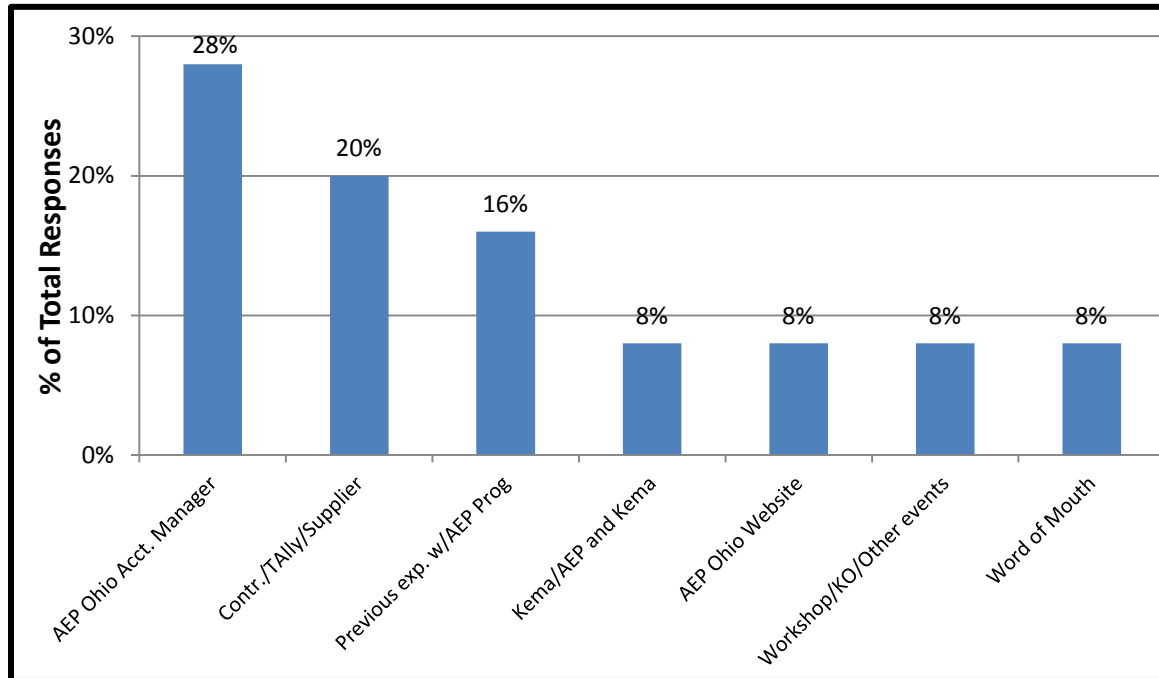
In 2012, AEP Ohio introduced or continued a number of methods to market all the programs. Those most helpful in marketing the Custom Program include:

- » The Solution Provider Network was expanded. More Solution Providers were trained at the Solution Provider workshops.
- » AEP Ohio continued the Customer blitz, a week-long geographic-based partnership with account managers focused mainly on larger customers in 2012
- » AEP Ohio continued with the Water/Waste Water Customer Group. They met to discuss their challenges and successes using the AEP Ohio Custom Program rebates to upgrade their equipment.
- » A modified bonus program for Solution Providers that requires a minimum participation level and accurate and timely applications was successful in 2012.
- » The Online Application planned for 2012 launch should launch in 2013 instead. The application will direct the customer to the appropriate program. Eventually, the customer will be educated on the measures specific to his/her business type. After launch, there will be a significant need for training for customers, trade allies and customer service staff.

The custom program continued to grow from a basic lighting program to include more sophisticated equipment such as variable speed drives and compressed air systems. Targeted segments with special needs such as data centers, water/waste water facilities and polymer industrial plants have become more central to the Custom Program marketing plan.

### 3.2.2 Program Participant Source of Information

Customers mentioned their AEP Ohio Account Manager as the first source of information about the program (28%). Contractors, trade allies and suppliers as a group were the second source of information in 2012 (20%). Previous program experience also played a role as an information source. Experience with potential multiple projects has, itself, become a source of information for 16 percent of customers. Eight percent of survey respondents reported that AEP Ohio or DNV KEMA staff, workshops or events and word of mouth were sources of program information. These results are presented in Figure 3-1.

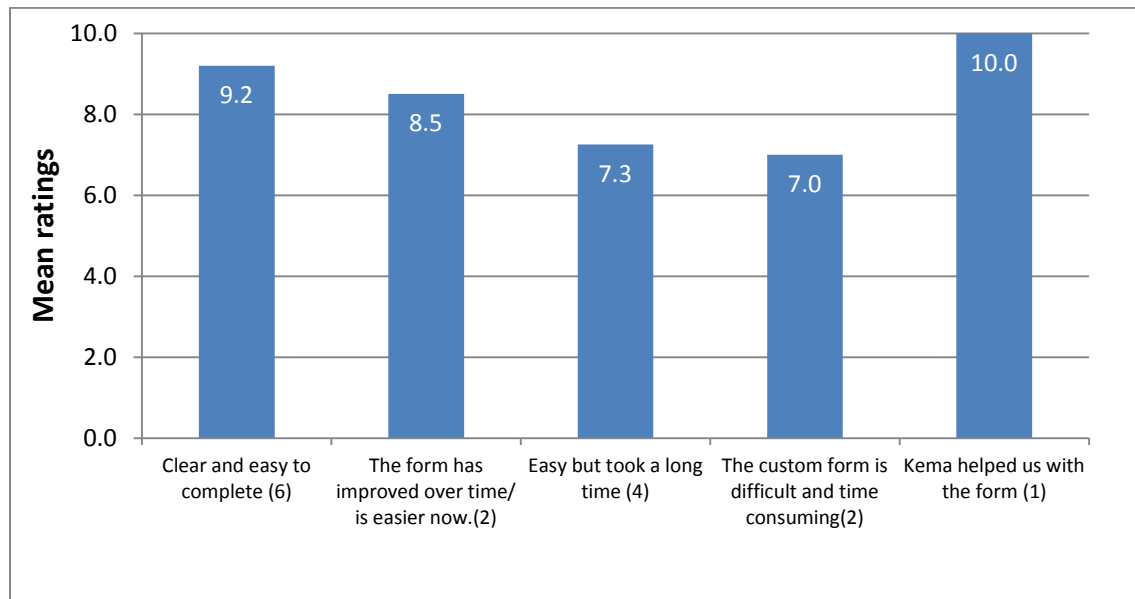
**Figure 3-1. Source of Information about the Program**

Over one-third of the survey respondents said they were responsible for their company's participation in the program (36 percent). AEP Ohio representatives also played an important role in influencing customer participation in the Custom Program (16 percent). Most of the customers, 60 percent, went to the website to download the application. A much smaller group received the application from their contractor (16 percent). In addition, 60 percent of respondents completed the application for the program on their own. Another 28 percent of respondents turned to their contractor or Solution Provider for help with the application form.

The 15 survey respondents who said they completed the application for the program on their own were asked to rate their satisfaction with the application and then to say why they gave that rating. All of the ratings were between 6 and 10 on the 0 to 10 scale. Survey respondents who gave a mean rating of over 9.0 said the form was clear and easy to complete compared to those who rated the form a 7.0 and said the form was difficult and time consuming. The only customer to give the form a rating of 10.0 had help from DNV KEMA. These mean ratings are presented in Figure 3-2.



**Figure 3-2. Mean Rating of Satisfaction with Application by Reason for Rating**



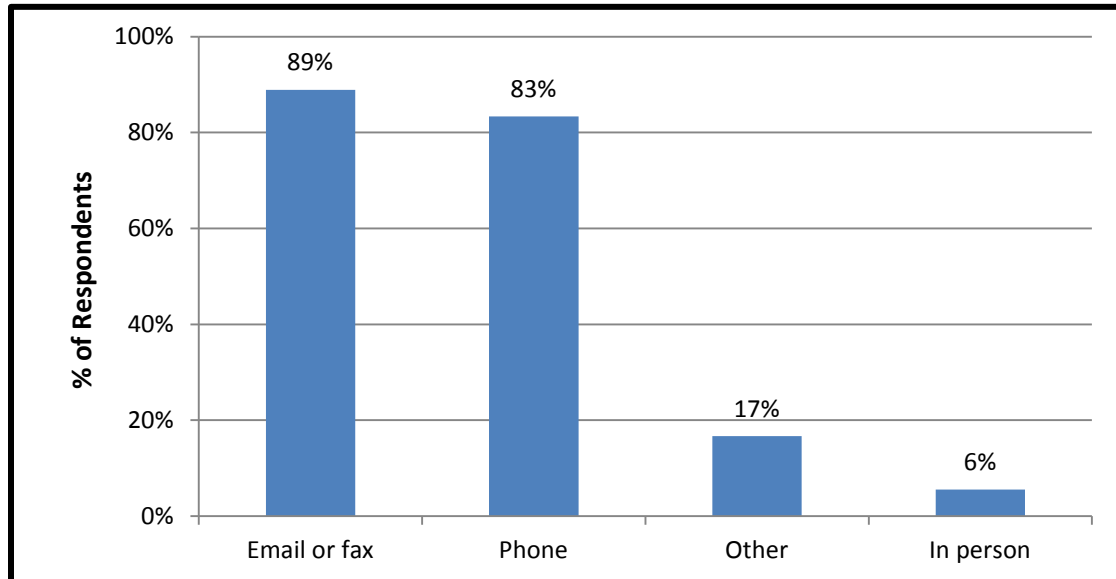
Only two of the respondents who had the contractor complete the form knew whether he was affiliated with the program. Both rated the contractor '9' on the 0 to 9 point scale. They also said they would recommend their contractor to others.

Over 25 percent of customers said that they did not contact the utility or program staff (44%) during their program participation after they completed the application. Most of the other customers contacted the utility or program staff two or three times (32%) or four or more times (36%).

Customers tended to contact the utility or program staff using email or fax (89%) or phone (83%). They were less likely to meet with staff in person (6%). Email communication is slowly overtaking communication via telephone. These results are shown in Figure 3-3.



**Figure 3-3. Mean Rating of Satisfaction with Application by Reason for Rating**



### 3.2.3 Program Incentives

Customers reported that rebate processing can take a long time. Over 30 percent of respondents (36%) received their incentive in six weeks or less. Another 40 percent received their incentive check in 6 or 8 weeks. Less than one quarter of them received the incentive checks between 10 and 14 weeks. Over 20 percent did not remember how long it took for their incentive to arrive. These results are presented in Table 3-5.

**Table 3-5. Number of Weeks to Process the Incentive**

Number of weeks	Frequency	Percent
3	1	4%
4	2	8%
6	6	24%
8	4	16%
10	1	4%
12	4	16%
14	1	4%
Don't know	6	24%
Total	25	100%

Eighty six percent of customers said they were satisfied with the incentive amount (rating of 7 through 10 on the rating scale).

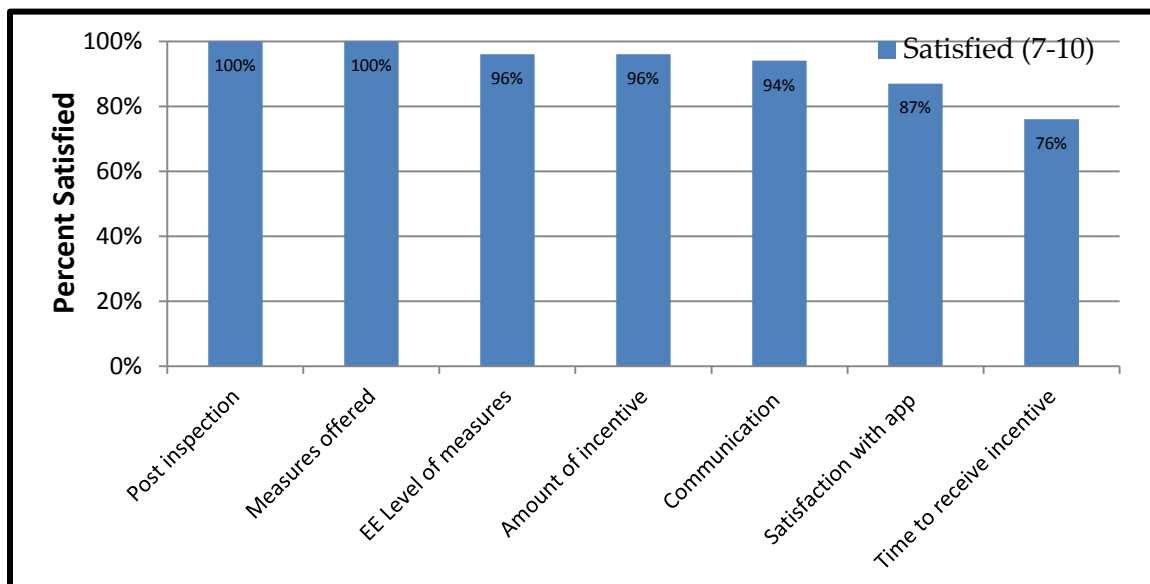




### 3.2.4 Customer Satisfaction

Custom Program survey participants rated several metrics of customer satisfaction on the 0 to 10 satisfaction scale. Navigant defined satisfaction as the percentage of customers who rated their satisfaction level 7, 8, 9, or 10 on the 0 to 10 scale. Over 90 percent of program participants in the survey were satisfied with the post inspection (100%), the measures offered (100%) as well as with the energy efficiency level of the measures (96%), the incentive amount (96%) and communication with program staff (94%). Customers also rated their satisfaction with the application (87%) high. The lowest satisfaction level reported was with the time it took to receive the incentive, at 76 percent. The satisfaction scores are presented in Figure 3-4.

**Figure 3-4. 2012 Custom Survey Satisfaction Scores**



2012 Custom Program Survey Data n=25.

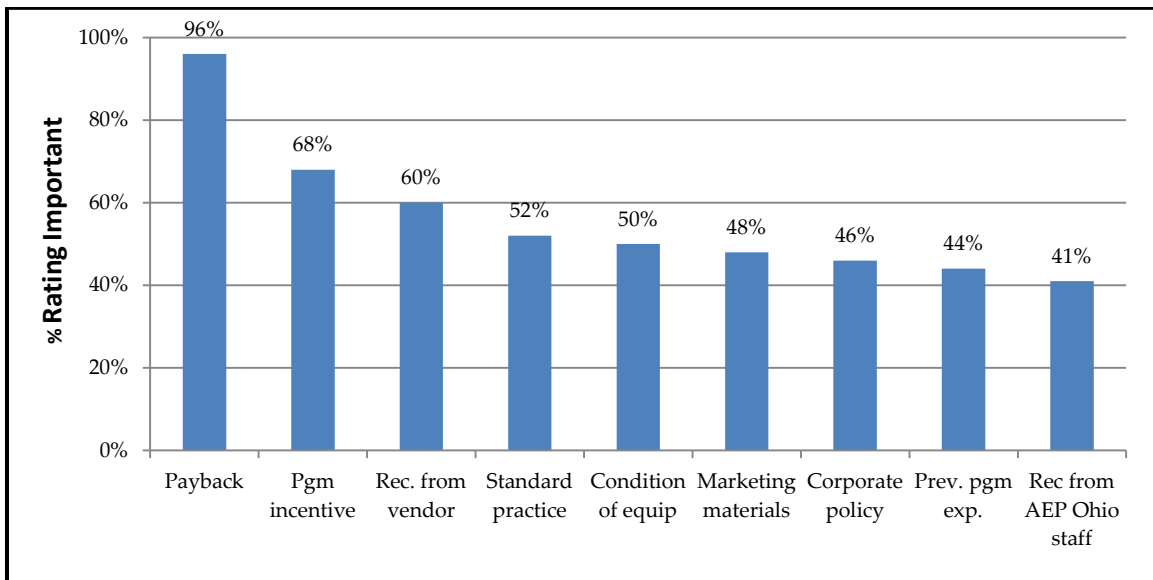
Satisfaction with AEP Ohio was measured on a five point satisfaction metric in 2012. Respondent options were very satisfied, satisfied, neutral, dissatisfied, and very dissatisfied. In 2012, 60 percent of program participants reported they were very satisfied with AEP Ohio and 32 percent were somewhat satisfied with AEP Ohio. Only one person said they were dissatisfied with AEP Ohio. He said: "There have been some issues with Tariff raises that have really impacted the school bills recently. We're really happy with the rebate program and I'm glad to have that".

### 3.2.5 The Importance of Payback and Standard Practice

Survey respondents were asked about the importance of a number of influences on their decision to participate in the Custom Program. They said that payback was the most important influence (96%) along with the program incentive (68%). These results are shown in Figure 3-5. Survey respondents who answered a 6 or higher on importance were asked follow-up questions on payback criteria and corporate policies.



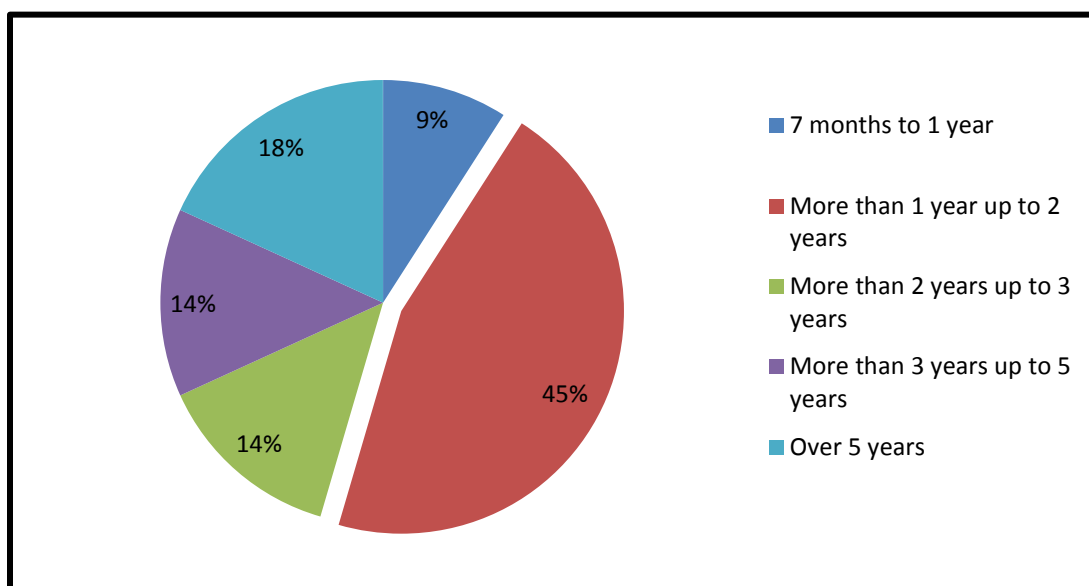
**Figure 3-5. 2012 Custom Survey: Importance of Program and Non-Program Influences**



When asked directly about what financial criteria they used, 47 percent said they used payback, 42 percent said they used rate of return and 11 percent said they used cost benefit analysis.

Survey respondents were also asked about what criteria they accepted for energy efficient projects. The most common answer was 1 to 2 years. They were almost equally likely to accept 2 to 3 years (14%), 3 to 5 years (14%) and over 5 years (18%). Payback criteria are presented in Figure 3-6.

**Figure 3-6. 2012 Custom Survey: Payback Criteria for Energy Efficient Projects**





Excluding the outlier, the program incentive reduced the project payback from an average of 26.8 months to 19.0 months. Nine survey respondents said their organization had a specific environmental policy to reduce emissions or energy use. Six of the nine indicated their policy was to reduce energy use. One each said their policies were focused on cutting energy costs and reducing their carbon footprint. One respondent did not know of a specific policy.

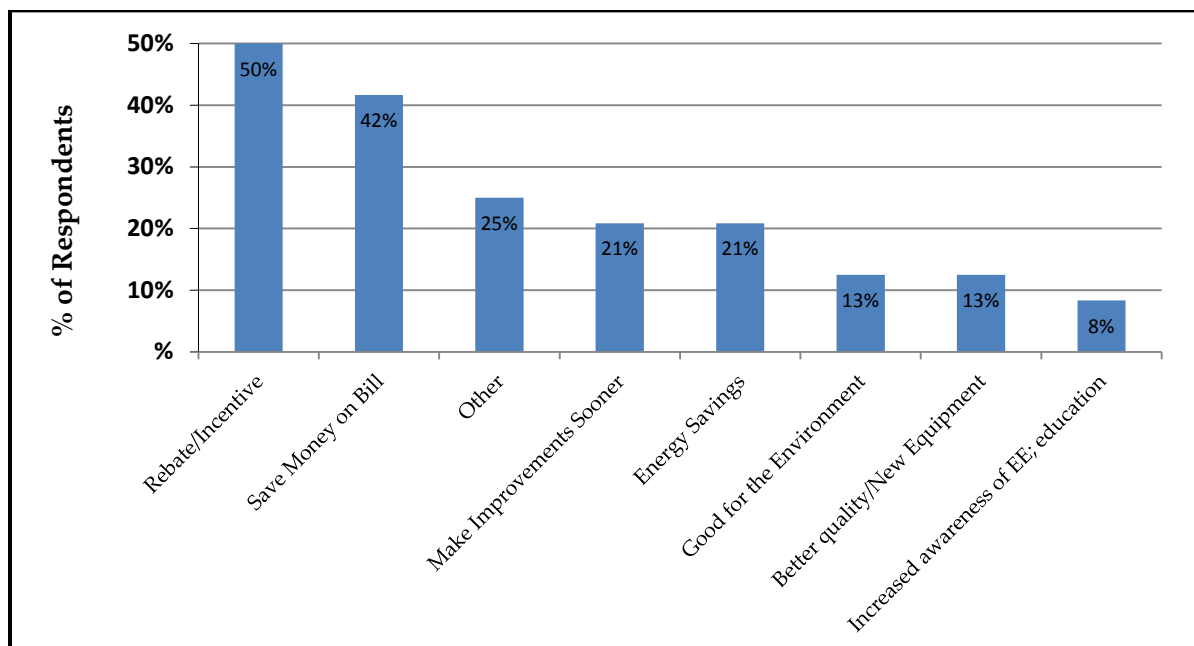
Eight of the nine respondents reported that their corporate policy caused them to install energy efficient equipment at this facility before participating in the AEP Ohio program. Four of the respondents received an incentive for these projects.

### 3.2.6 Benefits to the Program

Based on multiple responses, survey respondents' main benefits to participating in the Custom Program were financial, as shown in Figure 3-7.

- » Half of them cited the rebate as a benefit of the program. The Program Coordinator agreed that the rebate of 8 cents per kWh saved is considered a good incentive by customers.
- » Over 40 percent said saving money on their bill was a benefit to the program.
- » One in five mentioned the ability to make improvements sooner and saving energy as program benefits.
- » Other benefits included helping the environment, the benefits of new equipment and increased awareness of energy efficiency.

**Figure 3-7. 2012 Benefits of the Custom Program**

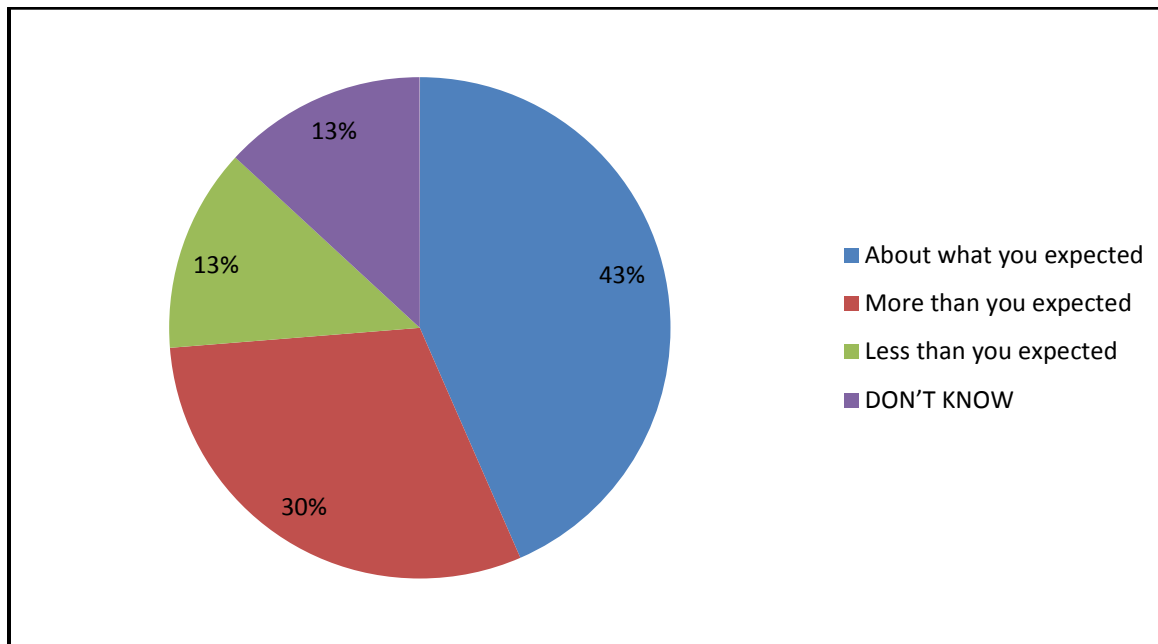


Over 80 percent of survey respondents planned to participate in the program again (84%) and the remaining 16 said they might participate in the program again.



When asked about bill savings, 80 percent of respondents said they noticed lower electricity bills since they installed the energy efficient equipment. Of those who noticed lower bills, 43 percent said their bill savings were about what they expected, 30 percent said savings were more than they expected and 13 percent said savings levels were less than expected. Bill expectation data is presented below in Figure 3-8.

**Figure 3-8. Have Bill Savings Met Expectations?**



### 3.2.7 Barriers to Custom Program Participation

According to the Program Coordinator, lack of customer knowledge was a barrier to participation. For instance, while introducing the compressed air program, they held seminars and attended expos to publicize the program. Another issue was the long sales cycle for compressed air equipment.

### 3.2.8 Drawbacks to Custom Program Participation

Over half of the 25 survey respondents who answered the question did not mention any drawbacks to the program (56%). The major drawbacks mentioned by customers were that the program was too time consuming (24%) and the paperwork was too burdensome (12%). Eight percent provided other drawbacks to the program.

The Program Coordinators also defined a few weaknesses of the Custom Program. For instance, it was more difficult for customers and Solution Providers to understand the incentive calculations of the Custom Program compared to the per-unit incentives of the Prescriptive Program. Also, the marketing of Custom measures is more difficult because some Custom measures are segment-specific (i.e., Injection Molding Machine Initiative).



Current economic conditions were still affecting the Custom Program in 2012 because customers, particularly large industrials that are more likely to take advantage of the Custom Program, are unwilling or unable to make major capital investments.

### 3.2.9 Suggestions for Improving the Program

The Program Coordinator believes they will see significant improvements in Custom Program results in 2013 as the compressed air program and injection molding machine initiatives take off and more customers install VSDs on large motors. He also thinks it would be helpful to list Custom Program-specific Solution Providers on the website to help customers identify the appropriate solution provider.

Over 70 percent of the survey respondents could not say how to improve the program. Some participants provided ideas for improving the program including:

- Simplify the application process (3 mentions)
- Not enough AEP Ohio representatives (2 mentions)
- Greater publicity (1 mention)

### 3.3 Cost Effectiveness Review

This section addresses the cost effectiveness of the 2012 Custom Program. Cost effectiveness is assessed through the use of the Total Resource Cost (TRC) test. Table 3-6 summarizes the unique inputs used in the TRC test.

**Table 3-6. Inputs to Cost-Effectiveness Model for AEP Ohio Custom Program**

Item	2012
Measure Life	14
Participants	192
<i>Ex Post</i> Annual Energy Savings (MWh)	27,018
<i>Ex post</i> Coincident Peak Savings (kW)	3,810
Third Party Implementation Costs	922,099
Utility Administration Costs	204,442
Utility Incentive Costs	1,650,826
Participant Contribution to Incremental Measure Costs	8,639,230

A clarification on participant counts is worth noting regarding Table 3-6. 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 2.5 and the program passes the TRC test for the program in its entirety. Table 3-7 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.

**Table 3-7. Cost-Effectiveness Results for Custom Program**

Test Results for Custom Program	2012
Total Resource Cost	1.6
Participant Cost Test	2.0
Ratepayer Impact Measure	0.9
Utility Cost Test	5.8

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 Evaluation Findings and Recommendations

### 4.1 Impact Evaluation Findings and Recommendations

1. **Finding:** The 2012 *ex post* savings fell well short of goals. Lack of program participation seems to be the cause of this shortfall.  
**Recommendation:** Examine process to emphasize measures and projects that would be submitted through a custom approach. Develop case studies of successful projects to promote applications through the program.
2. **Finding:** More than 40 percent of applications were submitted by three retailers or groceries with multiple locations. This suggests both that many opportunities exist in these market segments and a reliance on these types of customers.  
**Recommendation:** Consider methods for promoting similar successful projects among other customers 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 simulations are used to determine savings, realization rates were highly variable. Baselines were ill-defined or poorly documented in some cases.  
**Recommendation:** Require more pre-installation documentation – either trend logs or inspections and screen captures to document the existing conditions. Require executable simulations that accurately reflect existing and proposed equipment and operating conditions.
4. **Finding:** Where billing data comparison is used to determine savings, some projects were finalized with inadequate post-installation data. This will happen more frequently at the end of the program cycle.  
**Recommendation:** Projects based on billing data comparisons should have at least 6 months of data before being finalized – preferably up to 12 months.
5. **Finding:** Where vendor calculations form the basis of *ex-ante* savings, Navigant found instances of inaccuracies, calculation errors and poor assumptions contributing to estimates. Most of these calculations were sufficiently transparent to understand the logic behind them.  
**Recommendation:** Apply more rigor to savings estimates submitted by vendors to ensure assumptions are accurate. On complex or non-traditional projects use subject-matter experts and/or document redundant checks and verification.



6. **Finding:** Observations from the evaluator verification experience were that DNV KEMA and AEP Ohio have a quality control approach that appears sufficient to reduce most inaccuracies, processes applications in a fair and timely manner, and ensures that rebate payments are appropriate.

## **4.2 Process Evaluation Findings and Recommendations**

### **4.2.1 Satisfaction with the Custom Program**

1. **Finding:** In 2012, 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 76 percent. Most customers (90%) planned on participating in the program again.  
**Recommendation:** Although based on a small number of survey respondents, these results suggest the program delivery and contact worked well in 2012. The only area for improvement would be the incentive processing time. All other aspects of the program seem to be meeting customer expectations.

### **4.2.2 Program Growth**

1. **Finding:** Customers appear to be comfortable with the application form. Most of them say it is either easy to complete or that the form has improved over time. Others have their Solution Provider or trade ally complete the form for them.

**Recommendation:** Expectations for the introduction of the online form should be carefully managed internally and externally. The online form may take additional time now that customers and trade allies have some level of comfort with the paper application. Adequate training will be the key to the migration to the Web. Expect less computer-savvy participants to send office staff for training or to require keyboarding training. Internally, expect the online application to need tweaking as customers find 'nits' that will need to be fixed.

**Recommendation:** Contract with an outside firm to conduct usability testing with customers before the roll out of the online application. Information technology (IT) staff may prefer to test with employees but a change of this magnitude should be approached more carefully. Videotape the customers as they use the online application for sharing with those that cannot watch in real time.

### **4.2.3 Reducing Barriers to Program Participation**

1. **Finding:** Lack of customer knowledge and more complex marketing challenges caused by increased segmentation were mentioned as two of the major barriers of the program. Other program issues were the complexity of the savings calculations and the time investment that customers or trade allies need to submit the paperwork. Lack of capital was still an issue in 2012, especially with larger customers (a prime target for the Custom Program).  
**Recommendation:** AEP Ohio should continue to identify industry and commercial groups that would benefit from the program offering approach that capitalizes on the specialized needs of customer segments. Some customer segments have online industry groups or targeted magazines that simplify marketing and advertising purchases. Online ads targeting specific industry or commercial groups could be explored. AEPOhio.com could also be tested to ensure it is used most effectively for offering energy efficiency program information.





## Appendix A Participant Telephone Survey

The following survey instrument was used to conduct the participant phone interviews.

2012 AEP OHIO BUSINESS PROGRAMS – **CUSTOM** PROGRAM PARTICIPANT SURVEY

March 20, 2013

### A.1 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 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 <**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 2012 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 AND 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 <MEASURECATEGORY1> 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
- 98. 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 first 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
- 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 most 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



- 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
- 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	<b>GOTO E3</b>
2	Someone else in your organization	<b>GOTO LOGIC BEFORE LIGHTING MODULE</b>
3	Contractor/vendor/other trade ally	<b>CONTINUE WITH S4A</b>
4	AEP Ohio staff	<b>GOTO LOGIC BEFORE LIGHTING MODULE</b>
5	KEMA, the program implementer	<b>GOTO LOGIC BEFORE LIGHTING MODULE</b>
6	OTHER [RECORD]_[OPEN END]_____	<b>GOTO LOGIC BEFORE LIGHTING MODULE</b>
98	DON'T KNOW	<b>GOTO LOGIC BEFORE LIGHTING MODULE</b>
99	REFUSED	<b>GOTO LOGIC BEFORE LIGHTING MODULE</b>

## ***A.2 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 registered 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 contractor'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 contractor 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]



### ***A.3 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.

02.

03.

04.

05.

06.

07.

08.

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?

RECORD VERBATIM

98. DON’T KNOW

99. REFUSED

### ***A.4 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”.]

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, OR 2012 DK, REF]

L1 Please tell me what were the types of lighting projects installed through the Custom Program during 2012.  
[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]

### A.5 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 AND 2012; 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]



## A.6 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]

### 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]

## A.7 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 AND 2012]

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 ORN26]

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? Were they...

- 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]

## A.8 Motors Module

[ASK IF MEASURECATEGORY1, 2, 3 = 'MOTOR' ELSE SKIP TO NEXT MEASURE MODULE OR GOTO N3]



## A.9 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]

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 NO
- 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]

M2c 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 M2d-f IF M2c=1]

M2d 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]

M2e And how many days per week? [NUMERIC OPEN END, 0 TO 7; 98=DON'T KNOW, 99=REFUSED]



M2f 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]

### ***A.10 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 "EPA 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, EPA 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 EPA 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]

M3c Had 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]

### ***A.11 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 AND 2012; 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

## ***A.12 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 PY3 NET-TO-GROSS MODULE]
- 98 DON'T KNOW
- 99 REFUSED



[SKIP EM3 AND EM4 IF EM2=96, 98, 99]

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]

### ***A.13 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 AND 2012]

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]

## ***A.14 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 (HP)
- 2 Smaller HP (replacement increased capacity)
- 3 Larger HP (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 N26]

### ***A.15 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.

OT0 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 AND 2012; 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 \_\_\_\_\_

96 NOTHING, EQUIPMENT ADDED NOT REPLACED [END OF MEASURE LOOP; GO TO NEXT MEASURE OR PY3 NET-TO-GROSS MODULE] (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]

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 implement the measure 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
- N3l. Corporate policy or guidelines
- N3m. Payback on the investment



## A.16 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 a MEASURE like this one?

[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

[CREATE VARIABLE FINCRIT1. SET FINCRIT1 = BLANK IF: N9=98, 99 OR N10b=998,999. SET FINCRIT1 = 1 IF: (N9=1 AND N10b<7) OR (N9=2 AND N10b<13) OR (N9=3 AND N10b<25) OR (N9=4 AND N10b<37) OR (N9=5 AND N10b<61) OR (N9=6). ELSE, SET FINCRIT1 = 0.]

[ASK N10c IF FINCRIT1=1]

N10c Even without the incentive, the <MEASURECATEGORY 1> project met <ORGANIZATIONNAME>'s financial criteria. Would you have gone ahead with it even without the incentive?



1 YES  
2 NO  
3 MAYBE  
98 DON'T KNOW  
99 REFUSED

[CREATE VARIABLE FINCRIT2. SET FINCRIT2 = BLANK IF: N9=8, 9 OR N10a=98,99. SET FINCRIT2 = 1 IF: (N9=1 AND N10a<7) OR (N9=2 AND N10a<13) OR (N9=3 AND N10a<25) OR (N9=4 AND N10a<37) OR (N9=5 AND N10a<61) OR (N9=6). ELSE, SET FINCRIT2 = 0.

[ASK N10d IF FINCRIT2=1 AND FINCRIT1=0 AND N3b<5]

N10d The incentive seemed to make the difference between meeting your financial criteria and not meeting them, but you are saying that the incentive didn't have much effect on your decision, why is that?

00 [RECORD VERBATIM]

98 DON'T KNOW  
99 REFUSED

[ASK N10e IF FINCRIT2=0 AND N3b>7]

N10e. The incentive didn't cause this <MEASURECATEGORY 1> project to meet <ORGANIZATIONNAME>'s financial criteria, but you said that the incentive had an impact on the decision to install the <MEASURECATEGORY 1>. Why did it have an impact?

00 [RECORD VERBATIM]

98 DON'T KNOW  
99 REFUSED

## ***A.17 Corporate Policy Battery***

[ASK N11-N17 IF N3L>5]

N11 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

### ***A.18 Standard Practice Battery***

[ASK N18-N22 IF N3j>5]

N18 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 <PROGRAM>, versus this standard industry practice in influencing your decision to install the <MEASURECATEGORY 1>? Would you say the <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

### ***A.19 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



## ***A.20 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 measures 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 measures?

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	<b>E 14</b>
2	Once	<b>continue</b>
3	2 or 3 times	<b>continue</b>
4	Four times or more	<b>continue</b>
98	DON'T KNOW	<b>continue</b>
99	REFUSED	<b>continue</b>

**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	<b>continue</b>
2	EMAIL OR FAX	<b>continue</b>
3	LETTER	<b>continue</b>
4	IN PERSON	<b>continue</b>
97	OTHER [OPEN END] _____	<b>continue</b>
98	DON'T KNOW	<b>continue</b>
99	REFUSED	<b>continue</b>

**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	<b>continue</b>
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	<b>Continue</b>
2	NO	<b>E 21.</b>
8	DON’T KNOW	<b>Continue</b>



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

- 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

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	<b>continue</b>
2	SOMEWHAT SATISFIED	<b>continue</b>
3	NEITHER SATISFIED NOR DISSATISFIED	<b>continue</b>
4	SOMEWHAT DISSATISFIED	<b>continue</b>
5	VERY DISSATISFIED	<b>continue</b>
8	DON'T KNOW	F 1
9	REFUSED	F 1

E22. Why do you give it that rating?

RECORD VERBATIM \_\_\_\_\_

8. DON'T KNOW
9. REFUSED





## A.21 Firmographics

Now I'd like to ask you few general questions about your company, specifically at [SITE\_ADDRESS].

**What is your job title or role?**

- |    |   |          |
|----|---|----------|
| 1  | FACILITIES MANAGER  | CONTINUE |
| 2  | BUILDING MANAGER  | CONTINUE |
| 3  | ENERGY MANAGER  | CONTINUE |
| 4  | OTHER FACILITIES MANAGEMENT/MAINTENANCE POSITION CONTINUE |          |
| 5  | CHIEF FINANCIAL OFFICER                                   | CONTINUE |
| 6  | OTHER FINANCIAL/ADMINISTRATIVE POSITION                   | CONTINUE |
| 7  | PROPRIETOR/OWNER  | CONTINUE |
| 8  | PRESIDENT/CEO   | CONTINUE |
| 00 | (OTHER (SPECIFY) [OPEN END]_ __)                          | CONTINUE |
| 88 | DON'T KNOW  | CONTINUE |
| 99 | REFUSED   | CONTINUE |

[RECORD RESPONSE]

**What is the principal business activity of business [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  | CONTINUE |
| 2  | RETAIL (NON-FOOD)                                   | CONTINUE |
| 3  | COLLEGE/UNIVERSITY                                  | CONTINUE |
| 4  | SCHOOL  | CONTINUE |
| 5  | GROCERY STORE                                       | CONTINUE |
| 6  | CONVENIENCE STORE                                   | CONTINUE |
| 7  | RESTAURANT  | CONTINUE |
| 8  | HEALTH CARE/HOSPITAL                                | CONTINUE |
| 9  | HOTEL OR MOTEL                                      | CONTINUE |
| 10 | WAREHOUSE   | CONTINUE |
| 11 | PERSONAL SERVICE                                    | CONTINUE |
| 12 | COMMUNITY SERVICE/ CHURCH/ TEMPLE/MUNICIPALITY      | CONTINUE |
| 13 | INDUSTRIAL ELECTRONIC & MACHINERY                   | CONTINUE |
| 14 | INDUSTRIAL MINING, METALS, STONE, GLASS, CONCRETE   | CONTINUE |
| 15 | INDUSTRIAL PETROLEUM, PLASTIC, RUBBER AND CHEMICALS | CONTINUE |
| 16 | OTHER INDUSTRIAL                                    | CONTINUE |
| 17 | AGRICULTURAL  | CONTINUE |
| 18 | CONDO ASSOC/APARTMENT MGMT                          | CONTINUE |
| 77 | MISCELLANEOUS [OPEN END]                            | CONTINUE |
| 98 | DON'T KNOW  | CONTINUE |
| 99 | REFUSED   | CONTINUE |



**Does your organization own or lease the space at [SITE\_ADDRESS]?**

1	OWN	<b>continue</b>
2	LEASE	<b>continue</b>
3	OWN PART AND LEASE PART	<b>continue</b>
99	DON'T KNOW	<b>continue</b>

**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 [SITE\_ADDRESS]?

- |    |                                 |
|----|---------------------------------|
| 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!




## Appendix B Custom Program Application Forms

The following pages are the 2012 Custom Program application form. The Prescriptive Program and the Custom Program use the same application.



2012 Prescriptive  
Custom Application.xl



**AEP OHIO**  
A lot for forward thinking folks

**Prescriptive & Custom Program  
Project Application**

**Jan 2012 - Dec 2012**

**RETROFIT APPLICATION**

**Step 1: Check Project, Equipment, and Customer Eligibility**

- ✓ Project must be a new facility improvement with a permanent reduction in electrical energy usage (kWh).
- ✓ All installed equipment must meet or exceed the specifications given in the application and be installed in facilities served by AEP Ohio in the State of Ohio.
- ✓ Customer must have a valid AEP Ohio account number on an eligible AEP Ohio non-residential rate (see terms and conditions for eligibility requirements).

**Step 2: Submit Pre-Approval Application to Reserve Funds \***

- ✓ Strongly recommend submitting a pre-approval application to determine qualification and reserve program funds for project.
- ✓ Pre-approval is required for some prescriptive measures and for all custom measures. Check the specifications page for details. For some projects, a pre-installation inspection will be required, and you will be contacted to schedule it.
- ✓ Submit a Pre-approval Application. The Pre-Approval Application is the same form as the Final Application. Complete the left-hand side of the checklist page and attach the documentation listed: completed customer information sheet, a proposed scope of work (type, quantity and wattage of old and new equipment), and specification sheets for all equipment installed showing that it meets the program specifications. You may submit the application via mail, fax, or e-mail.

**Step 3: Install Equipment or Perform Project Work**

- ✓ Incentive funds are reserved for 90 days, so you have 90 days to complete your project. Contact the AEP Ohio Business Incentives program team for specific questions regarding funding reservations and extensions.
- ✓ Be sure that the equipment installed meets or exceeds the specifications and requirements found on the Specifications page.

**Step 4: Submit Final Application**

- ✓ Submit a final application as soon as possible after the project is completed (it must be submitted within 60 days of project completion). The final application is the same form as the pre-approval application. Complete the right-hand side of the checklist page and attach the documentation listed: a signed Final Payment Agreement, a scope of work (type, quantity and wattage of old and new equipment), dated and itemized invoices for the purchase and installation of all equipment installed and specification sheets for all equipment installed showing that it meets the program specifications.
- ✓ The program team will review your Final Application. For some projects, a final inspection will be part of the final review, and you will be contacted to schedule it.

**Step 5: Receive Incentive Payment**

- ✓ The program team will send incentive payment four to six weeks after the final project has been approved, all measures are verified and the project is approved.

Submit your application to:  
Email: [aepohioincentives@kema.com](mailto:aepohioincentives@kema.com)

AEP Ohio Business Incentives Program  
2740 Airport Drive Suite 100  
Columbus, OH 43219  
Cell: (677) 937-3739  
Fax: (677) 607-0740

Visit our web site at [aepohio.com/incentives](http://aepohio.com/incentives)

\*Pre-approval Application for Prescriptive & Custom Projects  
Please use the above contact information if you have any questions on the Prescriptive & Custom Program or need assistance in preparing your application. A Pre-approval Application is not a guarantee of an incentive; the actual incentive will be based on the energy savings and equipment installed as determined in the Final Application. Funds will be reserved for 90 days, unless an applicant is granted an extension. The program team reserves the right to contact the customer before the reservation expiration date to ensure that the project is moving forward. If the project is not underway, the reservation may be cancelled. Funds that have been reserved are not transferable to other project, facilities, and/or customers. A waiting list will be established if funds become fully subscribed.

If you are viewing this document in Microsoft Excel, please note that each section of the application is accessible through the tabs at the bottom of the Excel window. Highlighted cells are for inputting information.



## INCENTIVE APPLICATION CHECKLIST

Self-Direct Projects require a separate **SELF-DIRECT APPLICATION FORM**

PRE-APPROVAL APPLICATION	FINAL APPLICATION
<b>Required Attachments</b> <input type="checkbox"/> <a href="#">Customer/Contractor Information (Completed and Signed)</a> <input type="checkbox"/> <a href="#">Completed Incentives Requested Section</a> <input type="checkbox"/> Proposed Scope of Work <input type="checkbox"/> Equipment Specifications  <b>Incentives Worksheets*</b> <input type="checkbox"/> <a href="#">Lighting</a> <input type="checkbox"/> <a href="#">HVAC</a> <input type="checkbox"/> <a href="#">Motors and VFD</a> <input type="checkbox"/> <a href="#">Compressed Air</a> <input type="checkbox"/> <a href="#">Refrigeration/Food Service</a> <input type="checkbox"/> <a href="#">Agriculture/Misc</a> <input type="checkbox"/> <a href="#">Custom</a>  <b>Application Date:</b> _____ <b>Estimated Project Cost:</b> _____ <b>Expected Completion Date:</b> _____  <small>Project funds will only be reserved for 90 days from date of reservation.            *Please complete forms for checked boxes.</small>	<b>Required Attachments</b> <input type="checkbox"/> <a href="#">Customer/Contractor Information (Completed and Signed)</a> <input type="checkbox"/> <a href="#">Completed Incentives Requested AND Signed Agreement Page</a> <input type="checkbox"/> <a href="#">Completed Payment Release Section (if applicable)</a> <input type="checkbox"/> Itemized Invoices <input type="checkbox"/> Equipment Specifications <input type="checkbox"/> Updated scope if project changed <input type="checkbox"/> W-9 (LLC, Individual, Partnership, Property Management Companies)  <b>Incentive Worksheets*</b> <input type="checkbox"/> <a href="#">Lighting</a> <input type="checkbox"/> <a href="#">HVAC</a> <input type="checkbox"/> <a href="#">Motors and VFD</a> <input type="checkbox"/> <a href="#">Compressed Air</a> <input type="checkbox"/> <a href="#">Refrigeration/Food Service</a> <input type="checkbox"/> <a href="#">Agriculture/Misc</a> <input type="checkbox"/> <a href="#">Custom</a>  <b>Application Date:</b> _____ <b>Final Project Cost:</b> _____ <b>Final Completion Date:</b> _____  <small>Incomplete applications will delay processing and incentive payment.            *Please complete forms for checked boxes.</small>

*Please complete below if this is a revised submittal.*

<b>SUBMITTAL DATE:</b>	_____
<b>APPLICATION NUMBER (IF KNOWN):</b>	_____

For Program Application questions or assistance, please contact:

**AEP Ohio Business Incentives Program**  
**2740 Airport Drive Suite 160**  
**Columbus, OH 43219**

Phone: (877) 607-0739  
 Fax: (877) 607-0740  
[aepohioincentives@kema.com](mailto:aepohioincentives@kema.com)  
[www.aepohio.com/incentives](http://www.aepohio.com/incentives)

Rev June/2012

Page 1 of 1





## TERMS AND CONDITIONS

AEP Ohio is offering prescriptive and custom incentives under the AEP Ohio Business Incentives program to facilitate the implementation of cost-effective energy efficiency improvements for non-residential (commercial and industrial) customers.

Please note that funds are limited and subject to availability.

### Program Effective Dates

AEP Ohio Business Incentives program incentives are offered until approved funds are exhausted or November 18th of each program year, whichever comes first. The effective dates of the current AEP Ohio Business Incentives program and application submittal requirements are as follows:

- Projects with a final completion date before January 1, 2012 must apply on a Self-Direct Application.
- All 2012 AEP Ohio Business Incentives program projects must be completed and Final Applications received no later than November 18, 2012 in order to qualify for incentives identified in this application.
- Subsequent program year budgets and plans will be made available towards the end of the existing program year. AEP Ohio currently has filed with the FUCO to offer this program through the 2014 program year.

### Program and Project Eligibility

The AEP Ohio Business Incentives program offers both prescriptive incentives for some of the more common energy efficiency measures and custom incentives for those eligible improvements not included on the list of prescriptive measures. Program incentives are available under the AEP Ohio Business Incentives program to include non-residential accounts served on AEP Ohio's regulated retail rates. Qualifying projects must be installed in a facility in AEP Ohio's electric service territory in Ohio. These incentives are available to all non-residential customers who pay into the Energy Efficiency and Peak Demand Response (EE/PDR) rider and receive their electricity over AEP Ohio wires, regardless from which retail electric supplier the customer has chosen to purchase power. A customer may neither apply for nor receive incentives for the same product, equipment or service from more than one utility.

Custom projects must involve measures which result in a reduction in electric energy usage due to an improvement in system efficiency. Projects that result in reduced energy consumption without an improvement in system efficiency are not eligible for a custom incentive. The project simple payback prior to the incentive payment generally should fall between 1 to 7 years, or pass cost effectiveness test(s) determined by AEP Ohio to qualify for an incentive. Incentives are calculated based on first-year energy savings and peak demand reduction. Peak demand reduction is defined as the reduction in average load over the Performance Hours by the replacement of existing electrical equipment with more efficient electrical equipment. Peak Performance Hours is defined as the time between June 1st and August 31st on weekday, non-holidays, between the hours 3:00 PM and 6:00 PM Eastern Time.

Projects involving measures covered by the prescriptive incentive portion of the program are not eligible for a custom incentive. However, the applicant has the option to apply for a custom incentive for whole building integrated projects or systems, even if they include prescriptive measures. The prescriptive elements may be capped at the deemed savings and/or incentive level.



## Prescriptive & Custom Program Project Application

### TERMS AND CONDITIONS

Project requirements under the AEP Ohio Business Incentives program include the following:

- Projects must involve a new facility improvement that results in a permanent reduction in electrical energy usage (kWh). Existing/old equipment must be functional and in operation.
- Projects that are NOT eligible for an incentive include the following:
  - Fuel switching (e.g. electric to gas or gas to electric)
  - Changes in operational and/or maintenance practices or simple control modifications not involving capital costs
  - On-site electricity generation
  - Projects involving gas-driven equipment in place of or to replace electric equipment (such as a chiller)
  - Projects focused primarily on power factor improvement
  - Projects that involve peak-shifting (and not kWh savings)
  - Renewables (Please visit [www.gridsmartohio.com](http://www.gridsmartohio.com) for Renewables Program)
- Any measures installed at a facility must be sustainable and provide 100% of the energy benefits as stated in the Application for a period of at least five (5) years or for the life of the product, whichever is less. If the Customer ceases to be a delivery service customer of AEP Ohio or removes the equipment or systems at any time during the 5-year period or the life of the product, the Customer may be required to return a prorated amount of incentive funds to AEP Ohio.
- Used or rebuilt equipment is generally NOT eligible for an incentive.
- All installed equipment must meet state, federal, and local codes and requirements.
- Projects must be installed on the AEP Ohio electric account in Ohio served by an eligible electric rate type listed on the application.
- Equipment must be purchased, installed, and operating (or capable of operating in the case of seasonal uses) prior to submitting a final application for an incentive.
- AEP Ohio will issue incentive payments in the form of checks, not utility bill credits.
- The incentive is paid as a one-time, one-program offer and cannot be combined with incentive payments from other AEP Ohio programs. The customer may be eligible to participate in other programs offered by AEP Ohio, as long as no project receives more than one incentive.

#### **Incentive Payment Limits**

The total incentive payment shall be the lesser of: 1) The calculated incentive as approved by AEP Ohio, or 2) 50% of Total Project Cost (not including internal labor).





## TERMS AND CONDITIONS

### Incentive Limits and Tiering

- The cap for each project is \$300,000
- The limit for each business entity (corporation, LLC, partnership, etc) is based on their tariff, indicated below.

TARIFF	LIMIT PER BUSINESS ENTITY
General Service Tariffs 1, 2, 3 & 4	\$1,200,000 per year

- The total incentive paid for any retrofit application cannot exceed 50% of the total project cost (not including internal labor). In addition to the above project cost limit, incentive payment rates vary when a customer's calculated incentive exceeds the tiers listed below:
- **Tier 1** \$0 - \$100,000 = 100% of eligible calculated incentive value
- **Tier 2** \$100,001 - \$300,000 = 50% of eligible calculated incentive value
- **Tier 3** \$300,001 - \$500,000 = 25% of eligible calculated incentive value
- **Tier 4** \$500,001 - Beyond = 10% of eligible calculated incentive value

### Application Review Process

Applications are not a guarantee of program acceptance and incentive payment. AEP Ohio will review applications for eligibility and completeness. Completed applications will be reviewed in the order received. Funds are reserved for the project when AEP Ohio receives a complete pre-approval application and determines that the project meets the program eligibility requirements. Applicants who submit incomplete applications will be notified of deficiencies upon review of the application, and may lose their place in line in the review process until all requested information is received. Applicants are encouraged to call the program hotline if they have any questions about documentation requirements.

### Pre-approval Application

- Prescriptive projects requiring Pre-approval: NEW T8/T5 fixtures, Delamping, LED, Induction, Lighting Controls, Guestroom Energy Management System, VSD on HVAC Chiller, EMS, Air-Side Economizers, Toilet Room Exhaust Occupancy Sensor, Window Film, Compressed Air Measures.
- ALL Custom projects require Pre-approval

### Final Application

The Final Application must be submitted within 60 days of project completion. Project documentation, such as (but not limited to) copies of dated invoices for the purchase and installation of the measures, equipment specification sheets, energy savings analysis, complete application, W-9 forms (LLC, individual, Partnership, Property Management Companies), is required.

The location or business name on the invoice must be consistent with the application information. Final Applications and all required supporting documentation must be received by Nov 16, 2012 to be applicable for the 2012 program year.

The invoice should provide sufficient detail to separate the project cost from the costs of other services not related to the energy efficiency project and other repairs. AEP Ohio reserves the right to request additional supporting documentation as deemed necessary to ensure measure eligibility and verify that the expected energy savings will occur. Confidential information contained in any documents associated with this application will be protected from public filings. However, this information may be disclosed to the Public Utilities Commission of Ohio (PUCO) and the evaluators. Requested information could include: equipment purchase dates, installation dates, proof that the equipment is operational, manufacturer specifications, savings calculation documentation, monitoring data, warranty information, and proof of customer co-payment.



## TERMS AND CONDITIONS

### Inspections

AEP Ohio reserves the right to inspect all projects to verify compliance with the program rules and verify the accuracy of project documentation. This may include pre-installation and/or post-installation inspections, detailed lighting layout descriptions, metering, data collection, interviews, and utility bill or monitoring data analyses. The customers are required to allow access to project documents and the facility where the measures were installed for a period of five years after receipt of incentive payment by AEP Ohio.

### Tax Liability

Incentives are taxable and, if more than \$600, will be reported to the IRS unless the customer is exempt. AEP Ohio is not responsible for any taxes that may be imposed on your business as a result of your receipt of payment. W-9 (for LLC, individual, Partnership, Property Management Companies) must be provided along with all applications.

### Requirements for Custom Project Electricity Savings Calculation

The annual electricity savings must be calculated for custom projects using industry-accepted engineering algorithms or simulation models. The applicant may estimate the annual electricity usage of both the existing and proposed equipment based on the current operation of the facility. Where equipment is replaced prior to the end of its rated service life in order to achieve energy savings, the existing equipment performance may be used as the baseline in the energy savings calculations. Where equipment is replaced due to failure or for other reasons (such as obsolescence or a need for more capacity), the baseline performance used in the savings calculation should be either the minimum performance that would be required by code for that equipment type and application (where a code applies) or the performance of the equipment that would have been selected as the customer's "standard practice" when a code does not apply.

The applicant must be able to clearly describe the method used to calculate the savings. The applicant must provide all assumptions used in the calculations and document the sources for these assumptions. If no savings analysis is provided by the customer/contractors, AEP Ohio reserves the right to utilize their approved methodology and analysis to determine energy savings.

The method and assumptions used by the applicant to calculate the annual savings will be reviewed by AEP Ohio. AEP Ohio is solely responsible for the final determination of the annual energy savings and peak demand reduction to be used in calculating the incentive amount. AEP Ohio also reserves the right to require specific measurement and verification activities including monitoring both before and after the retrofit to determine the incentive.

AEP Ohio may need to conduct inspections both before and after retrofit projects to verify equipment and operating conditions. For custom projects, the applicant is required to submit a Pre-approval Application while the existing equipment is still in operation in order to allow AEP Ohio the opportunity to verify the existing equipment.

### Disclaimer

AEP Ohio does not guarantee the energy savings and does not make any warranties associated with the measures eligible for incentives under this program. AEP Ohio has no obligations regarding and does not endorse or guarantee any claims, promises, work, or equipment made, performed, or furnished by any contractors or equipment vendors that sell or install any energy efficiency measures. AEP Ohio is not responsible for the proper disposal/recycling of any waste generated as a result of this project. AEP Ohio is not liable for any damage caused by the operation or malfunction of the installed equipment.





<b>AEP OHIO</b> <small>Akron Energy Electric Power</small>		<b>Prescriptive &amp; Custom Program Project Application</b>	
<b>Important: Please read the terms and conditions before signing and submitting this application. You must complete all information and provide required additional documentation to avoid processing delays.</b>			
<b>CUSTOMER INFORMATION</b>			
<b>Business Type (select one)</b> <div style="display: flex; flex-direction: column; gap: 5px;"> <div><input type="checkbox"/> LARGE OFFICE</div> <div><input type="checkbox"/> SMALL OFFICE</div> <div><input type="checkbox"/> SCHOOL</div> <div><input type="checkbox"/> SMALL RETAIL/SERVICE</div> <div><input type="checkbox"/> LARGE RETAIL/SERVICE</div> <div><input type="checkbox"/> HOTEL/MOTEL</div> <div><input type="checkbox"/> MEDICAL - Hospital</div> <div><input type="checkbox"/> MEDICAL - Nursing Home</div> <div><input type="checkbox"/> ASSEMBLY/MEETING PLACE</div> <div><input type="checkbox"/> RESTAURANT</div> <div><input type="checkbox"/> GROCERY</div> <div><input type="checkbox"/> CONDITIONED WAREHOUSE</div> <div><input type="checkbox"/> UNCONDITIONED WAREHOUSE</div> <div><input type="checkbox"/> INDUSTRIAL/MANUFACTURING</div> <div><input type="checkbox"/> COLLEGE/UNIVERSITY</div> <div><input type="checkbox"/> GOVERNMENT/MUNICIPAL</div> <div><input type="checkbox"/> OTHER/MISCELLANEOUS</div> </div>	<b>Tax Status (from W9)</b> <div style="display: flex; flex-direction: column; gap: 5px;"> <div><input type="checkbox"/> CORPORATION (Inc., PC, Etc.)</div> <div><input type="checkbox"/> Government Agency</div> <div><input type="checkbox"/> Individual</div> <div><input type="checkbox"/> Partnership</div> <div><input type="checkbox"/> Exempt</div> <div><input type="checkbox"/> OTHER (may receive 1099) _____</div> </div>	<b>How Did You Hear?</b> <div style="display: flex; flex-direction: column; gap: 5px;"> <div><input type="checkbox"/> AEP Account Representative</div> <div><input type="checkbox"/> Contractor</div> <div><input type="checkbox"/> Distributor</div> <div><input type="checkbox"/> Website</div> <div><input type="checkbox"/> Other</div> </div>	
		<b>Operating Days</b> <div style="display: flex; flex-direction: column; gap: 5px;"> <div><input type="checkbox"/> Seven days/week</div> <div><input type="checkbox"/> Five days/week</div> </div>	
		<b>Square Footage</b> <div style="display: flex; flex-direction: column; gap: 5px;"> <div>Attached Area S.F. _____</div> </div>	
		<b>Operating Hours</b> <div style="display: flex; flex-direction: column; gap: 5px;"> <div><input type="checkbox"/> Low Hours (&lt;6h/day)</div> <div><input type="checkbox"/> One shift (6h/day)</div> <div><input type="checkbox"/> Two shifts (16h/day)</div> <div><input type="checkbox"/> Three shifts (24h/day)</div> <div><input type="checkbox"/> Building Operating Hours _____</div> <div><input type="checkbox"/> Equipment Operating Hours _____</div> </div>	
NAME OF APPLICANT'S BUSINESS _____		PROJECT NAME (IF APPLICABLE) _____	
NAME AS IT APPEARS ON UTILITY BILL _____	AEP OHIO ACCT # _____	APPLICANT TAXPAYER ID # (SSN/FEDERAL ID) _____	
MAILING ADDRESS _____		CITY _____	STATE _____ ZIP _____
INSTALLATION ADDRESS _____		CITY _____	STATE _____ ZIP _____
<b>CUSTOMER CONTACT</b>			
Please provide all contacts we may need to process for this project. The business contact should be the project decision maker, the technical contact at:			
NAME OF CONTACT PERSON - Preferred Contact for Documentation _____		TITLE OF CONTACT _____	
CONTACT PHONE # _____	EXT. _____	CONTACT FAX # _____	CONTACT EMAIL ADDRESS _____
<b>SOLUTION PROVIDER/CONTRACTOR INFORMATION**</b>			
NAME OF CONTRACTING COMPANY _____			
NAME OF CONTACT PERSON _____		TITLE OF CONTACT PERSON _____	
CONTACT PHONE # _____	EXT. _____	CONTACT FAX # _____	CONTACT EMAIL ADDRESS _____
MAILING ADDRESS _____		CITY _____	STATE _____ ZIP _____
If there are questions about the application who should we contact? <div style="display: flex; justify-content: space-around; margin-top: 5px;"> <span>Customer <input type="checkbox"/></span> <span>Contractor <input type="checkbox"/></span> </div>			
As an eligible customer, I verify the information is correct and request consideration for participation under this program.			
CUSTOMER SIGNATURE (AEP OHIO CUSTOMER) _____		PRINT NAME _____	
TOTAL INCENTIVE REQUESTED*** _____		DATE _____	
ESTIMATED COMPLETION DATE _____		ESTIMATED PROJECT COST _____	

\* AEP Ohio Account Number where measure is installed.

\*\* Solution Provider/Contractor - Party involved in incentive application submittal (i.e. scope of work, etc.)

\*\*\* Incentive cannot exceed 50 percent of the total project cost or other cap described in the Terms and Conditions.



## FINAL PAYMENT AGREEMENT

I understand that once the energy efficiency project is completed, I will resend the Application with any As-Built changes along with signed Final Payment Agreement. I understand that the location or business name on the invoice must be consistent with the application information. I understand that AEP Ohio or their representatives have the right to ask for additional information at any time. AEP Ohio's Business Incentives program will make the final determination of incentive levels for this project.

As an eligible AEP Ohio customer, I certify that decisions to acquire and install the indicated energy efficiency measures, which will be demonstrated with supporting documentation required by AEP Ohio, were made and that work was completed on this project on or after Jan 1, 2012. The energy efficiency measures are for use in my business facility and not for resale. Project documentation, including copies of dated invoices for the purchase and installation of the measures and product specification sheets, is included.

I agree to verification by the utility or their representatives of both sales transactions and equipment installation.

I understand that these incentives are available to all non-residential customers who pay into the Energy Efficiency and Demand Response (EE/PDR) rider and receive their electricity over AEP Ohio wires regardless from which retail electric supplier the customer has chosen to purchase power.

I certify that the information on this application is true and correct, and that the Taxpayer ID Number, tax status, and W-9 are the applicant's.

I agree that if: (1) I do not install the related product(s) identified in my application, or (2) I remove the related product(s) identified in my application before a period of 5 years or the end of the product life, whichever is less, then I shall refund a prorated amount of incentive funds to AEP Ohio based on the actual period of time in which the related product(s) were installed and operating (or the full amount if the product was never installed). This is necessary to assure that the project's related energy benefits will be achieved.

I understand that the program may be modified or terminated without prior notice.

AEP Ohio reserves the right to refuse payment and participation if the customer or contractor violates Program rules and requirements. AEP Ohio is not liable for incentives promised to customers as a result of misrepresentation of the Program.

I agree to be responsible to comply with any applicable codes or ordinances.

All submissions become the property of AEP Ohio. It is recommended for you to keep a copy for your records.

I understand that this project must involve a facility improvement that results in improved energy efficiency. I also understand that all materials removed, including lamps and PCB ballasts, must be permanently taken out of service and disposed of in accordance with local codes and ordinances. I understand it is my responsibility to be aware of any applicable codes or ordinances. Information about hazardous waste disposal can be found at: <http://www.epa.gov/epawaste/hazard/index.htm>

The program has a limited budget. Applications will be processed until allocated funds are reserved or spent. Final applications should be received by Nov 16, 2012 to be eligible for funding under the current program period.

I understand that AEP Ohio does not guarantee the energy savings and does not make any warranties associated with the measures eligible for incentives under this program, and, further, that AEP Ohio has no obligations regarding promises, work, or equipment made, performed, or furnished by any contractors or equipment vendors that sell or install any energy efficiency measures and does not endorse or guarantee same.

I understand that in the event the application received pre-approval and funds were reserved based upon the application, such pre-approval or reservation, including the specific dollar amount of reservation, does not represent a guarantee that such funds will be paid. Payment of incentives will be based upon the final review of the application and program terms and conditions, as well as the availability of funds.

Any and all energy savings generated by the project described in this application are hereby committed to AEP Ohio in order to count against its respective companies' benchmark requirements in S.B. 221.





 <small>A Unit of American Electric Power</small>	<b>Prescriptive &amp; Custom Program Project Application</b>
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## FINAL PAYMENT AGREEMENT

### INCENTIVES REQUESTED AGREEMENT

I have read and understand the program requirements, measure specifications, and Terms and Conditions set forth in this application and agree to abide by those requirements. Furthermore, I concur that I must meet all eligibility criteria in order to be paid under this program.

FOR FINAL APPLICATIONS, SIGN AND SUBMIT ONLY AFTER ALL EQUIPMENT HAS BEEN INSTALLED AND OPERATIONAL. A CUSTOMER SIGNATURE IS REQUIRED FOR PAYMENT. SIGNED APPLICATIONS RECEIVED BY FAX OR EMAIL WILL BE TREATED THE SAME AS ORIGINAL APPLICATIONS RECEIVED BY MAIL.

AEP Project Number:

TOTAL PROJECT COST	TOTAL INCENTIVES REQUESTED*	
CUSTOMER SIGNATURE (AEP Ohio CUSTOMER)		
PRINT NAME	DATE	ACTUAL COMPLETION DATE

### THIRD PARTY PAYMENT RELEASE AUTHORIZATION (OPTIONAL)

Complete this section **ONLY** if incentive payment is to be paid to an entity other than the AEP Ohio customer listed on the Applicant Information page.

I am authorizing the payment of the incentive to the third party named below and I understand that I will not be receiving the incentive payment from AEP Ohio. I also understand that my release of the payment to a third party does not exempt me from the program requirements outlined in the measure specifications, Terms & Conditions, and Final Payment Agreement.

Authorized by:		
CUSTOMER SIGNATURE (AEP Ohio CUSTOMER)	PRINT NAME	
Check should be made payable to:		
PAYEE COMPANY	Attention To:	
MAILING ADDRESS 1		
MAILING ADDRESS 2		
CITY	STATE	ZIP
CONTACT PHONE NUMBER		
TAXPAYER ID# (OWNER OF PAYEE)	TAX STATUS Corporation (inc., PC, Etc.), Government Agency, Partnership, Tax Exempt, Individual, Other (May receive 1099)	

\*AEP Ohio will pay the lesser of 1) The calculated incentive as approved by AEP Ohio 2) 50% of the total project cost of the project (not including internal labor).



**AEP OHIO**  
OHIO POWER SERVICE CORPORATION

**Prescriptive & Custom Program  
Project Application**

**CUSTOM INCENTIVES WORKSHEET**

All Custom Applications Require a Pre-Approval Application

Prior to submitting application, please contact the AEP Ohio Business Incentives program staff.

CUSTOM PROGRAM INCENTIVES		
Incentive Levels	First Year kWh Savings	\$0.05/first year kWh
	Peak Demand Reduction	\$100/peak kW
Payback Period	Maximum	7 years
	Minimum	1 year***
Caps	% of Total Incremental Cost	50%
	Per Project	\$300,000

Measure Description				
System Description		kWh Savings		Subtotal
Measure Category:			\$/kWh	
Before Retrofit	After Retrofit	On-Peak kW Savings	\$0.00	
		Measure Cost*		Customer's Cost per kWh
		Measure Life	On-Peak \$/kW	
		Annual Oper. Hrs	\$100.00	
				Simple Payback

Measure Description				
System Description		kWh Savings		Subtotal
Measure Category:			\$/kWh	
Before Retrofit	After Retrofit	On-Peak kW Savings	\$0.00	
		Measure Cost*		Customer's Cost per kWh
		Measure Life	On-Peak \$/kW	
		Annual Oper. Hrs	\$100.00	
				Simple Payback

**Calculation Methodology:**

Please select which calculation methodology is used to estimate the savings for this project.

☐ Bin Analysis
 ☐ Engineering Formulae  
☐ Billing Data
 ☐ Load Profiles  
☐ Modeling Software
 ☐ Pre & Post M&V

Total Custom Project Cost:

Total Custom Incentives\*\*:

\* Measure Cost is the cost to implement rebated efficiency measure less all costs incurred to achieve other project benefits. The Measure Cost may be the increment required to deliver an efficiency improvement over the base case efficiency.

\*\* Total Custom Incentive may not exceed 50% of the total incremental cost.

\*\*\*The project simple payback prior to the incentive payment generally should be greater than one year and be less than seven years, or pass cost effectiveness test(s) determined by AEP Ohio to qualify for an incentive.



## CUSTOM PROJECTS SPECIFICATIONS

*All Custom Applications Require a Pre-Approval Application*

### Qualification for Custom Projects

Custom project incentives are based on first year energy (kWh) savings and average on-peak demand savings. Eligible projects must result from a permanent facility improvement that results in a permanent reduction in electrical (kWh) energy usage due to an improvement in system efficiency. On-peak demand savings occur during the Peak Hours which are defined as the time between June 1st and August 31st on weekday, non-holidays, between the hours of 3:00 PM and 6:00 PM. Projects involving measures covered by the prescriptive incentive portion of the program are not eligible for a custom incentive.

### Equipment Information Submittals

- \* A list of the present and proposed equipment and components to be installed, including manufacturer's catalog/model number
- \* Manufacturer's specification sheets showing capacities and performance for all major components

All equipment purchased for custom projects must be new.

The applicant is required to submit a Pre-approval application for all custom projects while the existing equipment is still in operation in order to allow AEP Ohio the opportunity to verify the existing equipment.

Project payback equals the ratio of the project cost divided by the annual energy bill savings.

Project payback must be greater than or equal to one year and less than or equal to seven years to be eligible for a custom incentive.

### Projects that are NOT eligible for a custom incentive include the following:

- Fuel switching (e.g. electric to gas or gas to electric)
- Changes in operational and/or maintenance practices or simple control modifications not involving capital costs
- On-site electricity generation
- Projects that involve peak-shifting (and not kWh savings)
- Renewable energy

### Energy Savings Calculations

Custom applications must be accompanied by detailed engineering calculations using industry standard engineering algorithms or simulation models that document the annual total energy savings and on-peak demand savings. The applicant must submit calculations and methods used to derive the savings. The applicant must provide all assumptions used in the calculations and document the source for these assumptions. AEP Ohio will review the submittal. AEP Ohio is solely responsible for the final determination of the annual energy savings to be used in calculating the incentive amount. AEP Ohio may need to conduct inspections both before and after the retrofit projects to verify equipment and operation conditions. AEP Ohio also reserves the right to require specific measurement and verification activities including monitoring both before and after the retrofit and to base the incentive payment on the results of these activities.

The following serves as guidelines for the minimum required documentation. The program team may be able to assist in calculating savings. Please contact the team for more details.

Calculations may be performed by "hand," but spreadsheet analysis or more rigorous modeling is preferred. All analysis should be provided in electronic format. All assumptions such as operating hours, existing and proposed equipment operational details must be presented. Engineering algorithms and procedures from recognized technical organizations such as ASHRAE, SMACNA, ANSI, etc. must be used. Use rated performance factors tested under accepted procedures specified by recognized rating agencies such as AHRI, ANSI, ASTM, etc. Provide an explanation when equipment performance rating conditions vary from standard conditions.





## CUSTOM PROJECTS SPECIFICATIONS

In support of the calculations, extensive documentation must be provided that provides the basis for the savings estimates. The documentation must provide information on the equipment operating schedule, daily and seasonal load profile, and baseline AND energy efficient equipment performance at the operating loads. Typical documentation for custom projects often includes:

- Baseline/existing and proposed equipment make and model number including operating voltage and rated full load amps.
  - Existing equipment condition and age
  - Engineering or architectural drawings and "equipment schedule" sheets
  - Component specification sheets that include part load efficiency or performance factors
  - Spreadsheet calculations or input/output files and results from system modeling or other engineering analysis using accepted engineering algorithms and practices
  - Log sheets, trend logs from a building management system, or other operating documentation that are often necessary to document operating hours and equipment loading, and used as a basis for the calculations. (In some cases, short term monitoring may be required to document the load profile)
  - Control sequence of operations that are necessary where controls play a part in the savings equation
- Additional documentation, other than that described in the application, may be required for program participation. Larger projects may also require pre and post project sub-metering, or monitoring of loads and/or power input as part of another measurement and verification activity to demonstrate the actual energy savings realized.

### Baseline for Custom Analysis

Where equipment is replaced prior to the end of its rated service life (more than 5 years) in order to achieve energy savings, the existing equipment performance may be used as the baseline in the energy savings calculations. Where equipment is replaced due to failure or for other reasons (such as obsolescence or a need for more capacity), the baseline performance used in the savings calculation should be either the minimum performance that would be required by federal or local energy code for that equipment type and application (where a code applies) or the performance of the equipment that would have been selected as the customer's "standard practice" when a code does not apply.



**This foregoing document was electronically filed with the Public Utilities**

**Commission of Ohio Docketing Information System on**

**5/15/2013 10:19:26 AM**

**in**

**Case No(s). 13-1182-EL-EEC**

Summary: Report -Annual Portfolio Status Report (Part 2 of 3) electronically filed by Mr. Steven T Nourse on behalf of Ohio Power Company