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

## VOLUME III

## APPENDICES K – O

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## APPENDIX K

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## SELF-DIRECT PROGRAM

### Program Year 2012 Evaluation Report

Prepared for:  
AEP Ohio



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## Executive Summary

The Self-Direct Program allows qualifying business customers to commit their already completed energy efficiency and summer peak demand reduction resources to AEP Ohio. AEP Ohio accepts projects on a case-by-case basis, and each must be approved by the Public Utility Commission of Ohio (PUCO) through a special arrangement.

The goal of the Self-Direct Program is to educate business customers on all of AEP Ohio's energy efficiency/peak demand reduction (EE/PDR) business sector programs. The Self-Direct Program incentives are a way to 'prime the market' for more energy efficiency projects by providing participants start-up funds for their next project that qualifies for AEP Ohio's Custom or Prescriptive Programs for businesses. The Self-Direct Program is marketed, administered, and delivered as a single program by AEP Ohio. The program is managed by an implementation contractor, DNV KEMA Services Inc., in coordination with AEP Ohio.

### *Program Participation*

The evaluation team analyzed data extracted from AEP Ohio's tracking system on March 25, 2013. As shown in Table ES-1, the 2012 Self-Direct program paid incentives on 227 projects constituting 35,882 MWh of *ex-ante* reported annual energy savings. The majority of reported energy savings come from custom<sup>1</sup> (46%), lighting (33%), and VFD (14%) measures, as shown in Figure ES-1.

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

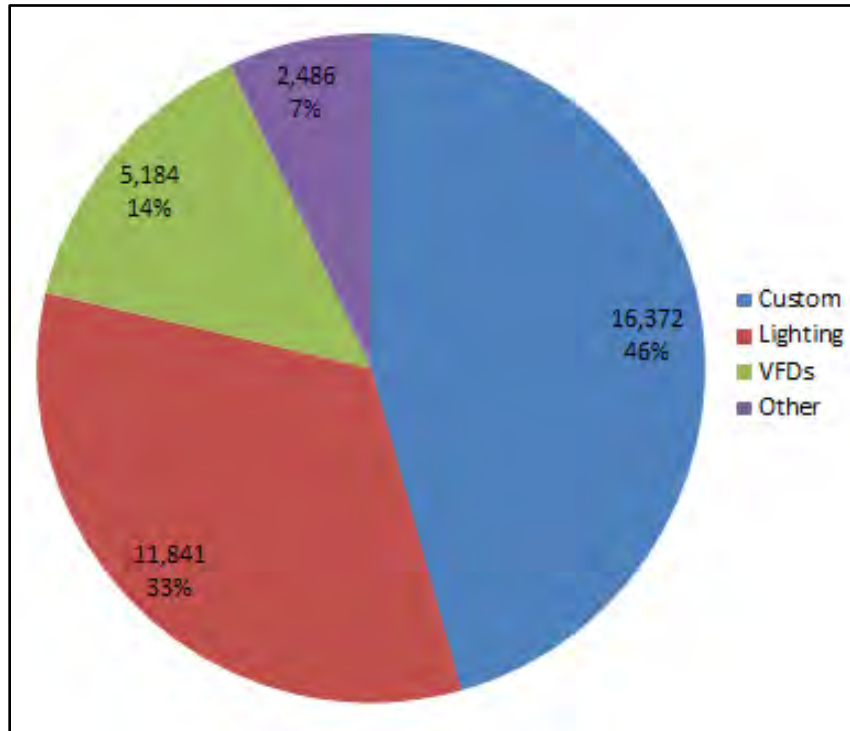
Metric	<i>Ex-Ante</i> Reported Value
Number of Projects	227
Number of Measures	627
Annual Energy Savings (MWh)	35,882 MWh
Electric Peak Demand Savings (kW)	5,742 kW

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

<sup>1</sup> The majority of savings from custom measures come from Process VSDs, Air-Cooled Chillers, HVAC, VFDs for HVAC, and Heat Recovery Systems.



**Figure ES-1. 2012 Reported Energy Savings (MWh) 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 Self-Direct Program impact and process evaluations.

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

Evaluation Effort	Data Collection	Targeted Population	Sampling Unit	Sample Design	Sample Size	Timing
Impact and Process	Collection of Program Tracking Data	Self-Direct projects filed with the PUCO 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
		Self-Direct program implementation staff	Contact from DNV KEMA	NA	4	
Process	CATI Surveys	Self-Direct program participants	Unique contact from tracking database	Census	91	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	Self-Direct projects filed with the PUCO in 2012	Project	Random sampling using stratified ratio estimation	30	October 2012 to April 2013
Impact	On-site Measurement & Verification	Projects with Industrial Lighting measures, or in Large/Medium strata	Project	Random subset of technical review sample	23	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 91 percent of the reported energy savings and 97 percent of the reported demand savings. The relative precision at the two-tailed 90% confidence interval was  $\pm 7.8\%$  for energy and  $\pm 13.6\%$  for demand.

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

Metric	Energy Savings (MWh)	Demand Savings (kW)
Ex-ante Reported Savings	35,882 MWh	5,742 kW
Ex-post Savings	32,710 MWh	5,580 kW
Realization Rate	0.91	0.97
Relative Precision @ 90% Confidence Interval	7.8%	13.6%

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

Other key impact evaluation findings include:

1. The replacement of HID/T12 fixtures with new, standard efficiency T5 or T8 fixtures accounts for a sizable portion of projects (16%), and more than 10 percent of both energy and demand savings. Legislation from 2007 (the Energy Independence and Security Act - EISA) effectively eliminates standard 40w 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 40w T12 fixtures will be reduced.<sup>2,3</sup>

**Recommendation:** AEP Ohio should consider, through the Prescriptive Program, the promotion of reduced wattage and high performance (RW/HP) T8 measures as a better alternative to standard efficiency T8 measures. This may help shift future retrofits that apply for Self-Direct funds from this standard efficiency fixture to its more efficient alternatives (RW/HP T8s), which will increase energy and demand savings.

2. Navigant adjusted the deemed savings inputs for 50 percent of the measures and 28 percent of the reported energy savings from the Self-Direct Program. The categories of adjustment included operating hours, coincidence factors, HVAC interactive effects, T12 baselines, HP/RW fixture

<sup>2</sup> As the installed base of this equipment decreases over the next few years, the baseline for this measure will become more efficient, thus reducing the potential for savings from this measure.

<sup>3</sup> Newly developed high CRI 40w 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.



wattage, and lighting controls. These adjustments led to a 1.5 percent decrease in energy savings and a 2.0 percent increase in demand savings.<sup>4</sup>

**Recommendation:** Navigant recommends that DNV KEMA apply Navigant's adjusted per-unit savings values to Self-Direct Program measures in future years.

3. 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, and index the coincidence factor by building type to determine savings. This was an evaluation adjustment made for 2012 that increased program demand savings by 4.1%.

### Key Process Findings and Recommendations

1. Few customers find the application to be a hurdle to overcome. Only one customer could remember why they were confused by the application. However, customers suggested that the wording could be improved and that the application could be simplified.

**Recommendation:** Retooling the program application for the Web site is an opportunity for AEP Ohio to simplify the prose.

2. When asked why they chose to participate in the Self-Direct Program, customers indicated that:
  - a. Self-Direct Program incentives were higher than other AEP Ohio business sector programs, or that the Self-Direct Program offered rebates for equipment not available through the other programs (however, this is not the case)
  - b. This was the only program they knew about (suggesting messaging and marketing of AEP Ohio's business sector programs needs to be improved),
  - c. That they did not qualify for the Prescriptive Program (and it sounded like they never would).

**Recommendation:** Customers who participate in the Self-Direct Program should be better informed by AEP Ohio on how they can participate in the Custom or Prescriptive Programs. Only 15% of the respondents reported an answer that might be considered logical given Self-Direct marketing activities (i.e. they participated in the Self-Direct Program because the timing of their participation prevented them from participating in these other programs). AEP Ohio should consider delivering a

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<sup>4</sup> A brief description of the Deemed Savings Review process and findings can be found in the Prescriptive Program evaluation report. A thorough discussion of the methods and findings will be provided in a separate deliverable to AEP Ohio.



series of email or direct mail communications with customers during their participation in the Self-Direct Program to inform them about their program choices.

3. The Self-Direct project is fully staffed, and process improvements have increased the processing speed and application approval with the PUCO. If the on-line application becomes operational in 2013 it may further increase satisfaction with the application process for those who are willing to use it.

**Recommendation:** Consider selecting three to five Solution Providers and customers with varied levels of experience with the program to 'test' the online application process before it is offered to all Solution Providers and customers.



## 1. Introduction

This evaluation report chapter covers the Self-Direct Program element of the AEP Ohio business energy efficiency and peak demand reduction programs.

### 1.1 Program Description

The Self-Direct Program allows qualifying business customers to commit their already completed energy efficiency and summer peak demand reduction resources to AEP Ohio. AEP Ohio accepts projects on a case-by-case basis, and each must be approved by the Public Utility Commission of Ohio through a special arrangement. Eligibility for business customers is determined by meeting one of two criteria:

- The customer has energy consumption greater than 700,000 kWh per year from AEP Ohio, or
- The customer is part of a national account involving multiple facilities in one or more states

Submitted projects must have an installation date within three years of the date of acceptance into the program. Each project is required to produce verifiable and persistent energy savings (kWh) and/or peak demand reduction (kW) for at least five years from the date of installation. Projects are also required to have a payback period between one and seven years without the incentive applied, and pass cost-effectiveness tests determined by AEP Ohio.

Participating customers may choose to receive their incentive either as a direct payment, or as an EE/PDR rider exemption. Most customers elect the reduced incentive rather than the EE/PDR rider exemption. Customers choosing the incentive payment would:

- Receive a payment of 75 percent of the calculated incentive under the Prescriptive Program or Custom Program (based on kWh only)
- Continue paying the EE/PDR rider, thus making them eligible to participate in other energy efficiency programs offered by AEP Ohio
- Be encouraged to use energy efficiency credit payments to help fund future energy efficiency and demand reduction projects

Customers choosing the EE/PDR rider exemption would:

- Receive an exemption from the EE/PDR rider for a specified number of months
- Not be eligible to participate in any other energy efficiency programs offered by AEP Ohio during the period of exemption

The goal of the Self-Direct Program is to educate business customers on all of AEP Ohio business sector programs. The Self-Direct incentives are a way to 'prime the market' for more energy efficiency projects





by providing participants start-up funds for their next project that qualifies for AEP Ohio's Custom or Prescriptive Programs.

The Self-Direct Program is marketed, administered, and delivered as a single program by AEP Ohio. The program is managed by an implementation contractor, DNV KEMA Services Inc., in coordination with AEP Ohio.

## 1.2 Self-Direct 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 Self-Direct program paid incentives on 227 projects constituting 35,882 MWh of *ex-ante* reported annual energy savings. The majority of reported energy savings come from custom<sup>5</sup> (46%), lighting (33%), and VFD (14%) measures, as shown in Figure 1-1.

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

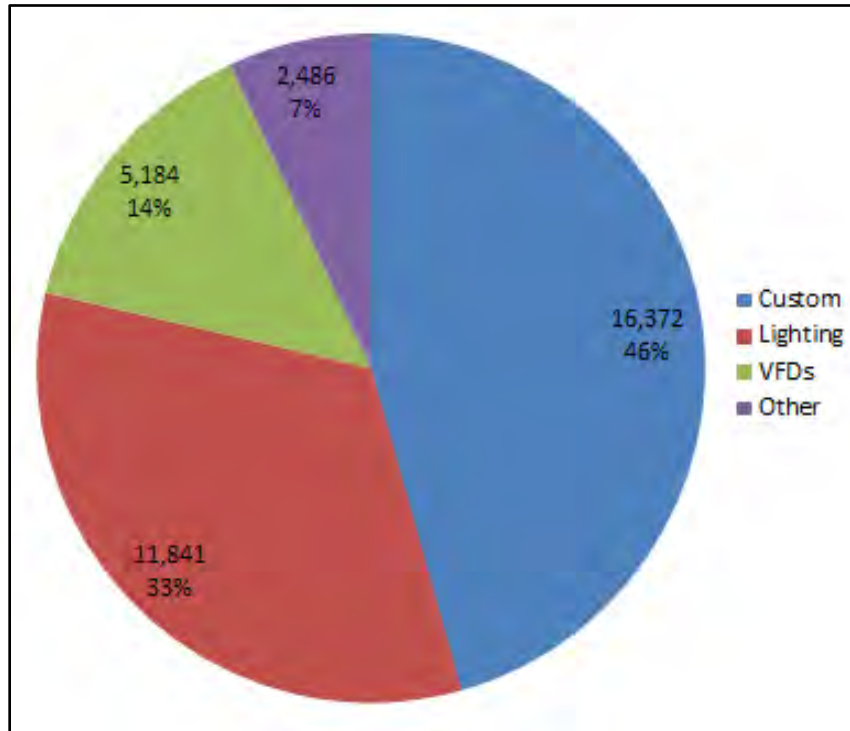
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*Source: Evaluation analysis of AEP Ohio tracking data from March 25, 2013*

<sup>5</sup> The majority of savings from custom measures come from Process VSDs, Air-Cooled Chillers, HVAC, VFDs for HVAC, and Heat Recovery Systems.



**Figure 1-1. Reported Energy Savings (MWh) 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 Self-Direct Program.



## 2. Methodology

The evaluation team conducted impact and process evaluation activities for the Self-Direct Program following the methodologies outlined below.

### 2.1 *Impact Evaluation Methodology*

#### 2.1.1 Overview of Impact Evaluation Approach

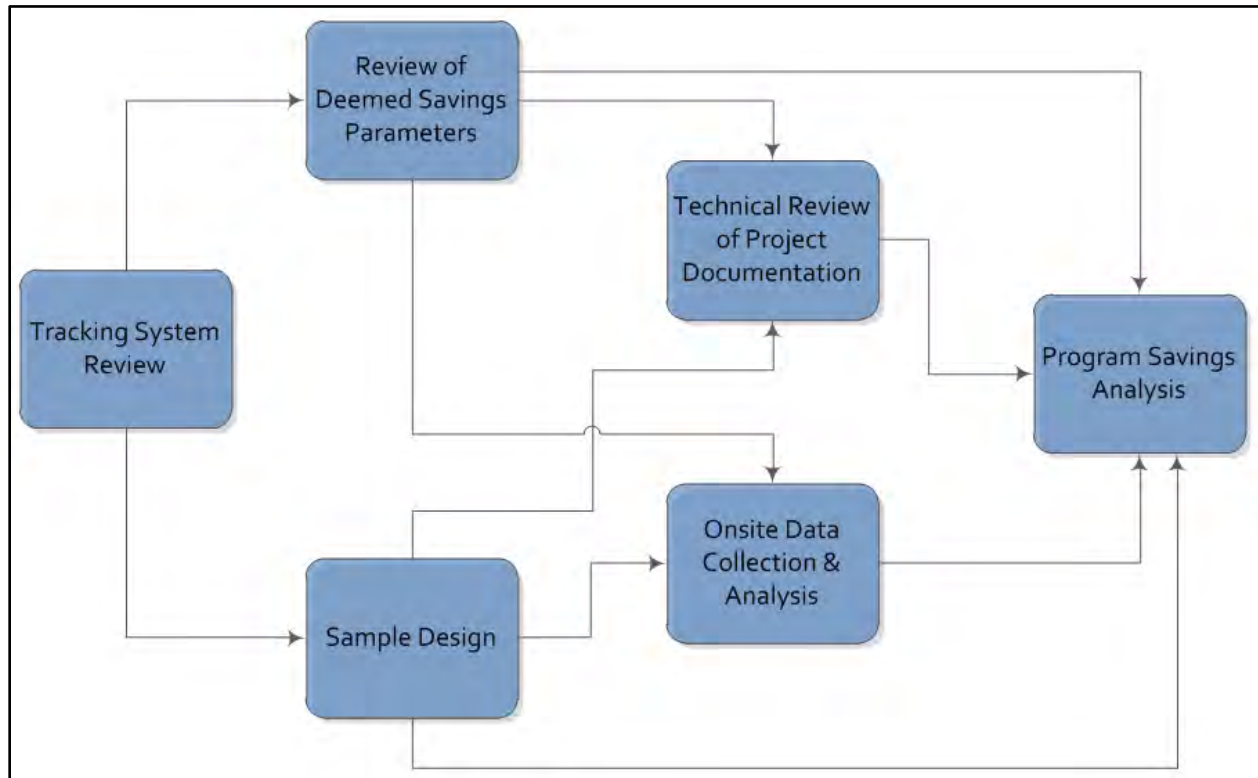
The purpose of the impact evaluation is to determine 2012 *ex-post* annual energy and peak demand savings. The evaluation followed the same multi-step approach as was implemented for the Prescriptive Program evaluation.

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 applied findings from the Deemed Savings Review conducted for the Prescriptive Program to the Self-Direct Program as appropriate.
3. **Sample Design.** The team designed and selected a stratified, random sample of participants to verify program-level impacts with 10% relative precision at the 90% 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 and 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, projects, and measures were targeted during the sample design.

### 2.1.3 Deemed Savings Review

Although the Self-Direct Program accepts Custom Program measures, the savings for the majority of applications are processed using Prescriptive Program measure algorithms and inputs. Navigant leveraged the findings from the Deemed Savings Review for the Prescriptive Program to recalculate savings for Self-Direct measures, as appropriate. A brief overview of the tasks conducted for the Prescriptive Program follows:

1. Assessment of the appropriate measures for review
2. Critical review and adjustment of the algorithms and inputs for the selected measures
3. Systematic recording of adjustments for use in the technical review of project documentation



#### 4. Recalculation of *ex-ante* savings for reviewed measures

Navigant completed only Step 4 of this process for Prescriptive measures included in the Self-Direct Program. A more detailed description of Steps 1-3 can be found in the Prescriptive Program evaluation report.

##### ***2.1.3.1 Recalculation of Ex-ante Savings***

Navigant recalculated the *ex-ante* savings for the measures included in the Deemed Savings 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 a portion of the Self-Direct measures (311 out of 627, or 50%) have a recalculated savings value, while the remaining measures use the existing *ex-ante* values. The two databases are defined as:

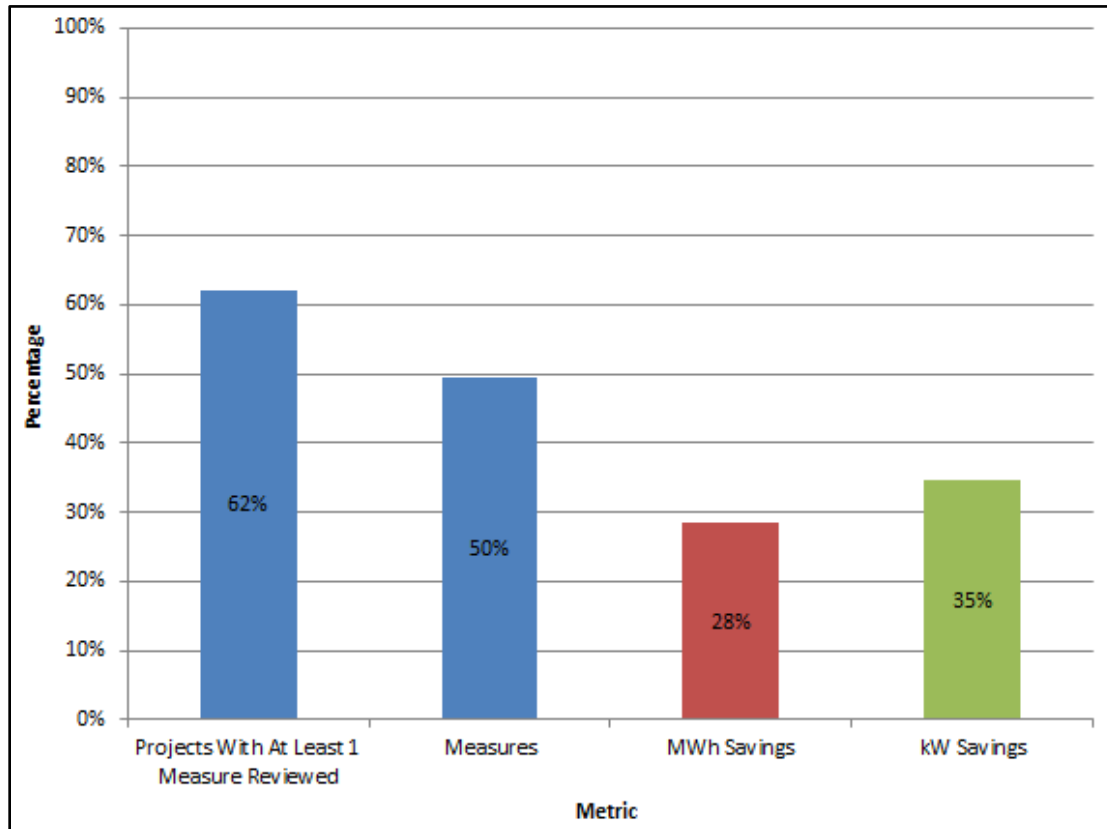
1. **"Audited Savings" database:** savings for the measures recalculated using DNV KEMA's Appendix A inputs
2. **Navigant's "adjusted savings" database:** savings for the measures recalculated using Navigant's adjusted or improved inputs

Navigant ultimately used the adjusted savings database 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.



In the final analysis, as shown in Figure 2-2, the results of the Deemed Savings Review were applied to 28% of the program reported energy savings and 35% of the program reported demand savings.

**Figure 2-2. Percentage of Total Projects, Measures, and Reported Savings Reviewed**



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

#### 2.1.4 Impact Evaluation Sample Design

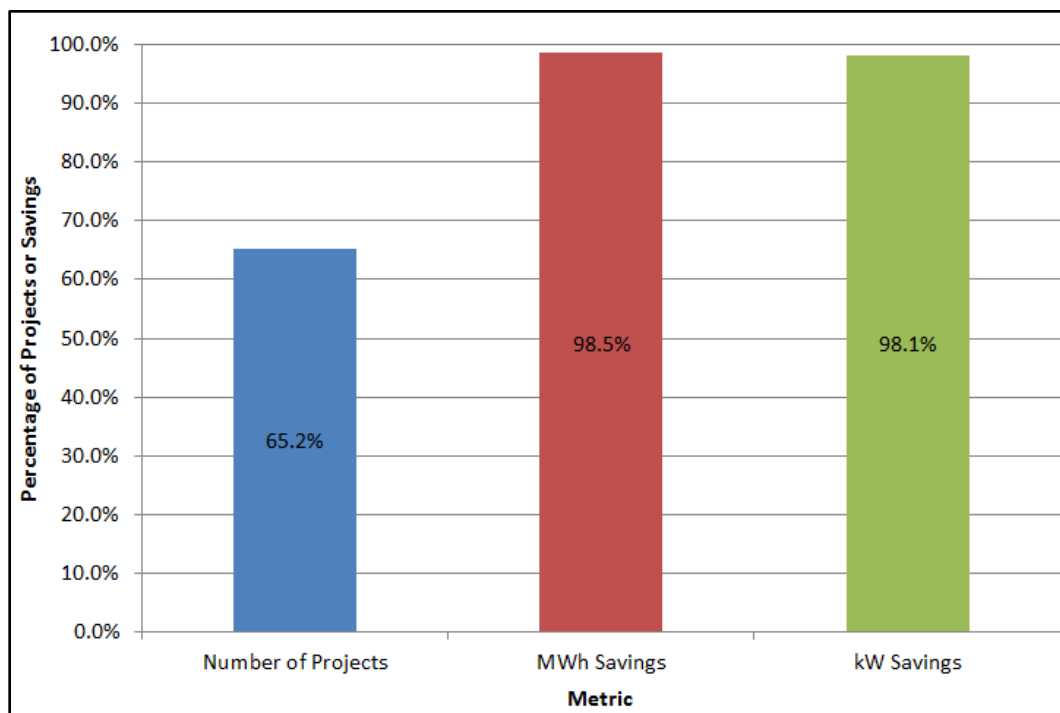
In addition to the adjustment of the *ex-ante* savings, the evaluation team sampled a portion of projects from the *ex-ante* database to verify savings using more robust methods, including a technical review of project documentation (described in Section 2.1.5) and onsite data collection and analysis (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 filed with the PUCO from January 7, 2012 through December 31, 2012. The savings summaries from the Tracking System Review task revealed that the top 55 percent of projects (based on individual project energy savings) accounted for 97 percent of the energy savings, while the top 64 percent of projects (based on individual project demand savings) account for the same proportion (97%) of the demand savings.



The team subsequently set thresholds of 25,000 kWh per project and 5.0 kW per project. If a project met neither criterion, it was removed from the sample frame. This key step increases the sampling efficiency, since the cost of evaluating small savings projects exceeds the value of the information gleaned from them. As shown in Figure 2-3, this task resulted in a final sample frame representing more than 98 percent of the savings with just 65 percent of the projects.<sup>6</sup>

**Figure 2-3. Percentage of the Population Reported Projects and Savings in Sample Frame**



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

Navigant defined the sample strata by the magnitude of reported savings. Stratifying by project size reduces the overall number of required samples by taking advantage of the concentrations of savings when relatively few projects contribute to a large fraction of total impacts. Navigant also created a separate stratum for lighting measures installed in the Industrial/Manufacturing sector to support a secondary objective of determining lighting hours of use in this targeted sector.<sup>7</sup>

<sup>6</sup> The percentage of projects meeting either the kWh or kW criteria (65%) is greater than the percentage of projects meeting just the kWh or just the kW criteria (55% and 64%, respectively).

<sup>7</sup> Lighting measures installed in the Industrial/Manufacturing sector account for large portion of savings for the Prescriptive Program (35% of reported energy savings and 32% of reported demand savings), and a sizable portion of savings in the Self-Direct Program (more than 8% of both energy and demand). Navigant targeted these measures in this sector for 2012 in order to provide more accurate hours of use for future savings calculations. The methods and findings from this research will be presented in a separate deliverable to AEP Ohio.



The sample sizes within each stratum were calculated to provide 10% relative precision at the two-tailed 90% confidence interval (90/10) for Self-Direct program annual energy (MWh) and peak demand (kW) savings.<sup>8</sup> Table 2-1 shows the strata definitions, the number of projects within each stratum, and the calculated sample sizes.

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

Stratum Number	Stratum Name	Lower MWh Threshold	Lower kW Threshold	Sample Frame Projects	Sample Size
1	Industrial Lighting	25	5	15	6
2	Other- Large	1,500	150	9	9
3	Other- Medium	200	50	34	8
4	Other- Small	25	5	89	7
<b>Total</b>				<b>147</b>	<b>30</b>

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

<sup>8</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 *ex-post* to *ex-ante* savings. The final CVs used in the sample design were 0.45 for energy and 0.40 for demand.





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>9</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 reported 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	Industrial Lighting	2,963	1,063	36%	512	177	35%
2	Other- Large	15,141	15,141	100%	2,150	2,150	100%
3	Other- Medium	11,825	3,345	28%	1,697	470	28%
4	Other- Small	5,416	661	12%	1,274	151	12%
<b>Total or Overall Value</b>		<b>35,346</b>	<b>20,210</b>	<b>57%</b>	<b>5,633</b>	<b>2,948</b>	<b>52%</b>

*Note: total may not sum to due to rounding.*

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

### 2.1.5 Technical Review of Project Documentation

Navigant requested the project-specific documentation for each of the 30 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 (if applicable), customer applications, invoices, and equipment specifications. Navigant made adjustments 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 the Deemed Savings Review task in the project-specific analysis.

### 2.1.6 Onsite Data Collection and Analysis

Navigant conducted onsite data collection and analysis for a subset of projects selected from the technical review sample. The team developed project-specific M&V (measurement and verification) plans 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

<sup>9</sup> The categories included Building Type, Measure Category, and broad geographic area.



- 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 evaluation team installed data loggers on the lighting measures for projects in the 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>10</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 the 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 sample results by *first* improving the denominator (i.e., savings against which we compare sample results) used in the ratio estimation technique.<sup>11</sup>

Navigant then extrapolated the sample results to the population of program participants using the adjusted savings database. The extrapolation procedure followed the structure specified in the sample design, and it used stratified ratio estimation to determine program-level *ex-post* (i.e., realized) savings. Finally, the team compared the program-level realized savings to the *ex-ante* program savings to determine the Self-Direct Program realization rate. Figure 2-4 shows the program savings analysis process in graphical form.

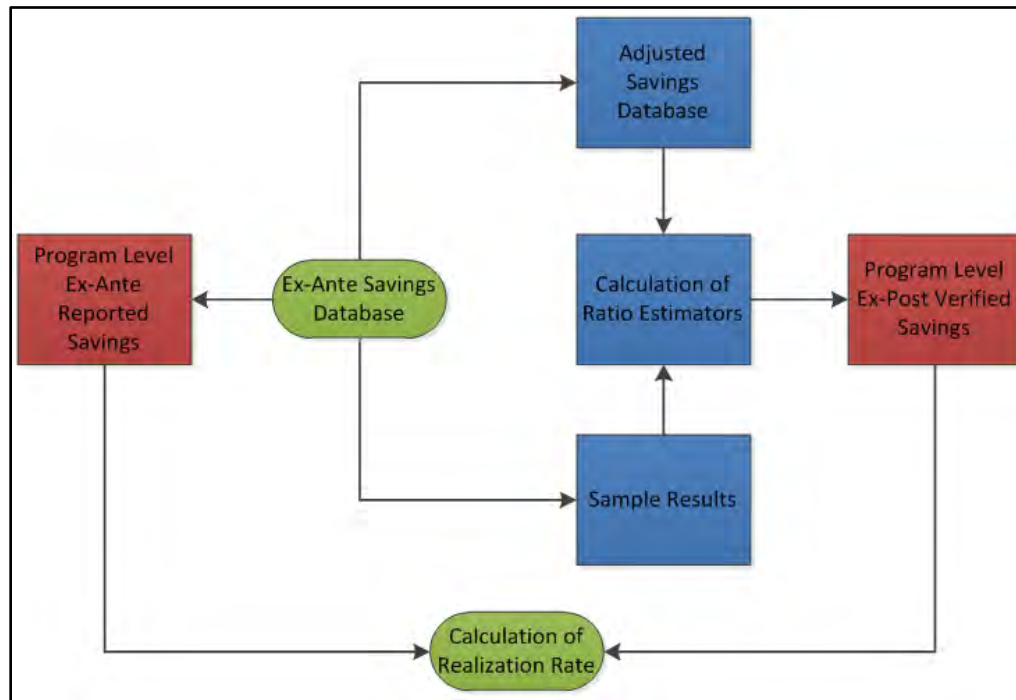
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<sup>10</sup> Navigant also analyzed the logger data across all lighting measures at all Industrial/Manufacturing sites to calculate annual operating hours and coincidence factors for this sector. The methods and findings from this research will be presented in a separate deliverable to AEP Ohio.

<sup>11</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.



**Figure 2-4. Program Savings Analysis Process**



## 2.2 Process Evaluation Methodology

### 2.2.1 Overview of Process Evaluation Approach

The purpose of the process evaluation is to assess the effect of the structure and implementation of the program on its performance and on customer satisfaction. The evaluation team's process efforts provide insights and recommendations to support the continued success of the Self-Direct Program.

Central to the process evaluation for the Self-Direct 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) 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>12</sup>

### 2.2.2 In-Depth Interview 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

<sup>12</sup> The methodology and results behind the Solution Provider surveys are provided in a separate report.



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**

Navigant conducted a handful of in-depth staff interviews as part of this evaluation. The interviewees included:

1. AEP Ohio Self-Direct Program Coordinator
2. DNV KEMA Self-Direct Program Manager
3. DNV KEMA Lead Engineer
4. DNV KEMA Operations Manager
5. DNV KEMA Outreach Manager

These interviews were completed in January and February 2013. The interviews with the AEP Ohio 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.

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

A computer-assisted telephone interview (CATI) survey targeted a population of 91 unique customer contact names drawn from the Self-Direct Program December 27, 2012 tracking system extract. Because of the small number of possible respondents, the evaluation team targeted a census for completion.<sup>13</sup> The survey ultimately finished with 30 completed interviews from the Self-Direct Program participants. 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 A Participant Telephone Survey Instrument.

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<sup>13</sup> Since the team was targeting a census of participants for survey completion, no sample design was required.



### 2.3 Summary of Data Collection Activities

Table 2-3 provides a summary of 2012 data collection activities for the Self-Direct Program impact and process evaluations.

**Table 2-3. Data Collection Activities for 2012 Self-Direct Evaluation**

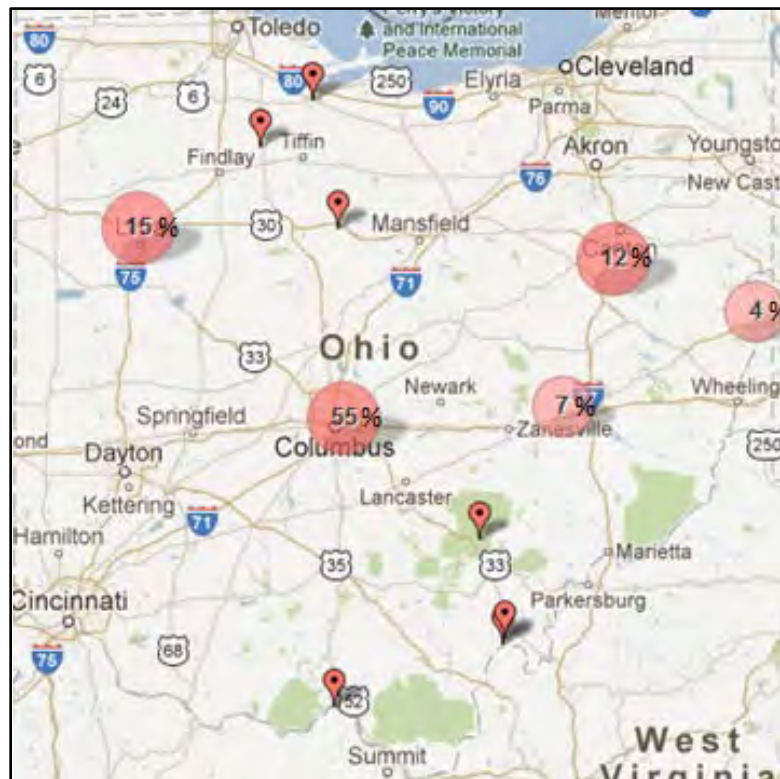
Evaluation Effort	Data Collection	Targeted Population	Sampling Unit	Sample Design	Sample Size	Timing
Impact and Process	Collection of Program Tracking Data	Self-Direct projects filed with the PUCO in 2012	Project	NA	NA	May 2012 to April 2013
Process	In-depth Interviews	AEP Ohio program Staff	Contact from AEP Ohio	NA	1	January 2013 to February 2013
		Self-Direct program implementation staff	Contact from DNV KEMA	NA	4	
Process	CATI Surveys	Self-Direct program participants	Unique contact from tracking database	Census	91	March 2013 to April 2013
Process	CATI Surveys	Business Program Solution Providers	Contact from DNV KEMA	Random sampling using stratified ratio estimation	90	March 2013 to April 2013
Impact	Project Technical Reviews	Self-Direct projects filed with the PUCO in 2012	Project	Random sampling using stratified ratio estimation	30	October 2012 to April 2013
Impact	On-site Measurement & Verification	Projects with Industrial Lighting measures, or in Large/Medium strata	Project	Random subset of technical review sample	23	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 Self-Direct projects installed in selected locations around the state. More than half (55%) of all projects were completed in the Columbus area, while 15 percent of the projects were completed around Lima.

**Figure 3-1. Percentage of Projects Installed in Selected Locations**

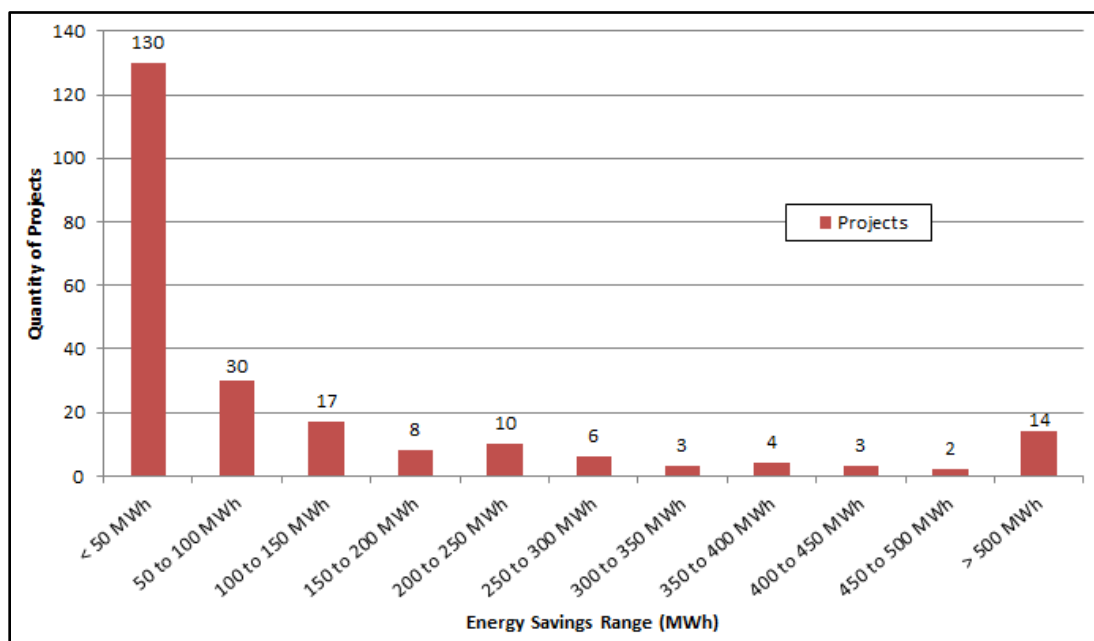


Source: Evaluation analysis of AEP Ohio tracking data from March 25, 2013

Figure 3-2 and Figure 3-3 show histograms of project quantity by savings range (energy and demand, respectively). As is typical with business sector programs, the number of projects is concentrated at the lower end of the savings spectrum, with 130 projects (57%) reporting less than 50 MWh of energy savings. The 25 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 beverage machine controls.

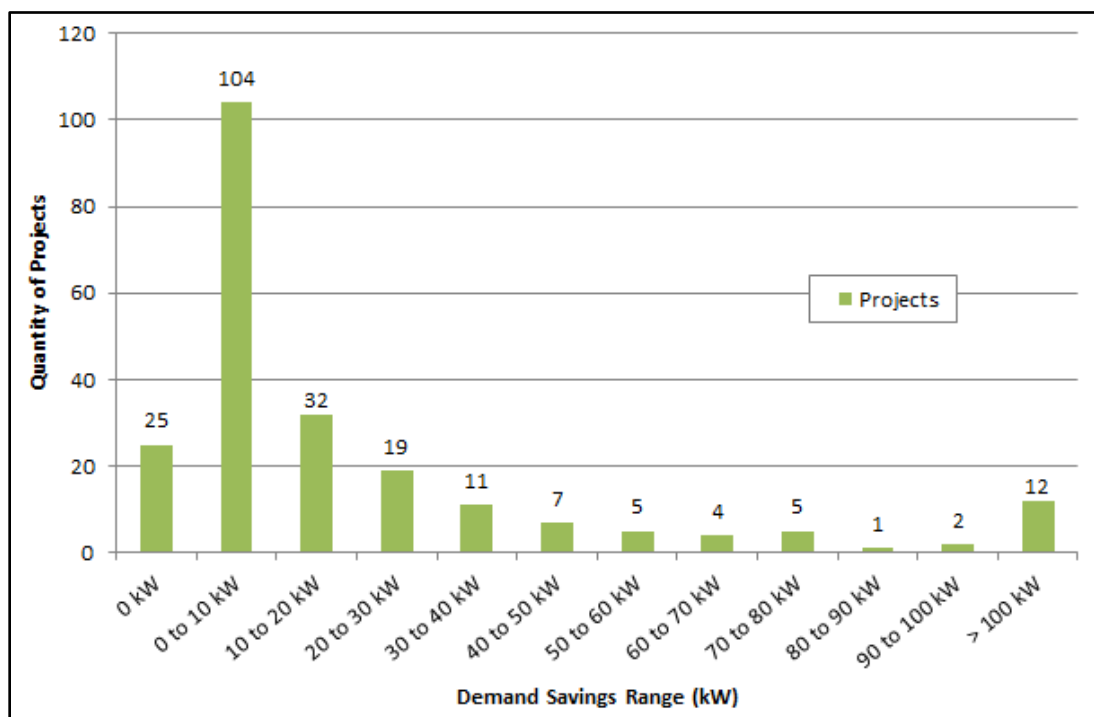


**Figure 3-2. Quantity of Projects by Energy Savings Range**



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

**Figure 3-3. Quantity of Projects by Demand Savings Range**

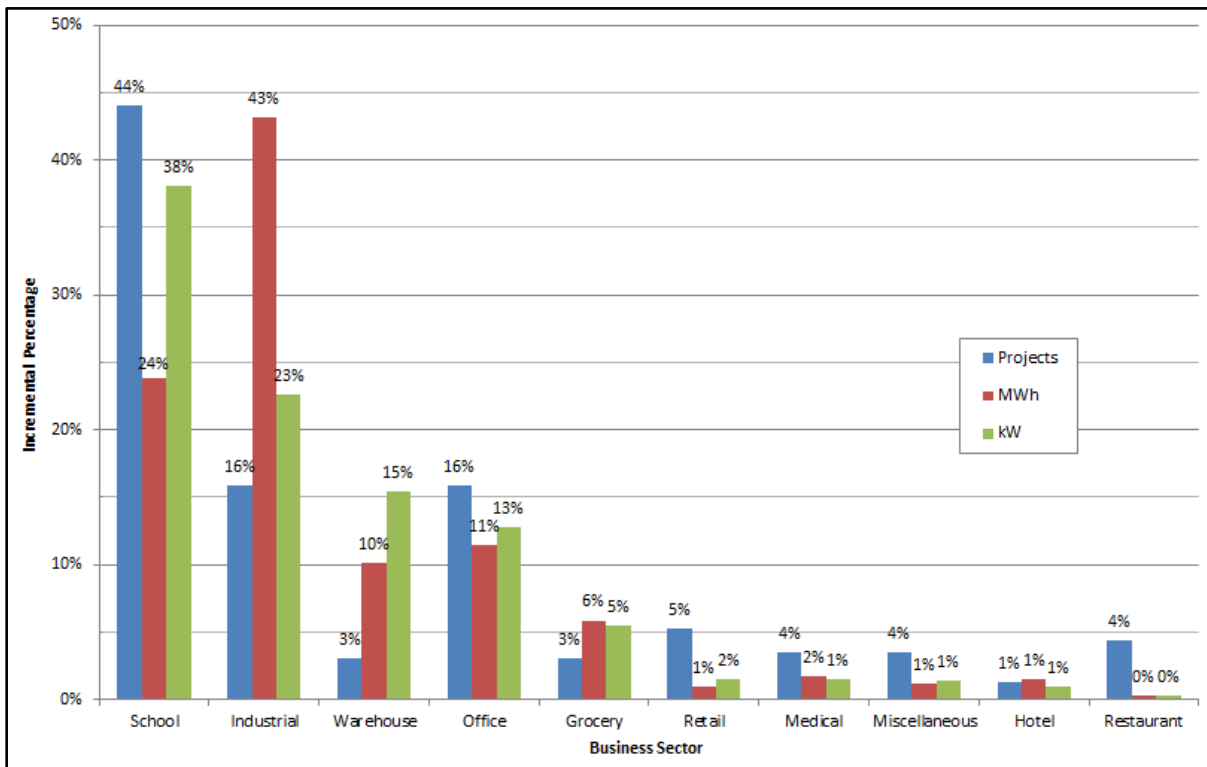


Source: Evaluation analysis of AEP Ohio tracking data from March 25, 2013



As seen in Figure 3-4, nearly half of the project applications (44%) came from the Schools sector, while nearly half of the reported energy savings (43%) came from the Industrial/Manufacturing sector. The Warehouse and Industrial/Manufacturing sectors had the greatest concentration of energy savings, with 520 MWh per project and 431 MWh per project, respectively (see Figure 3-5).

**Figure 3-4. Percentage of Reported Projects and Savings by Business Sector**

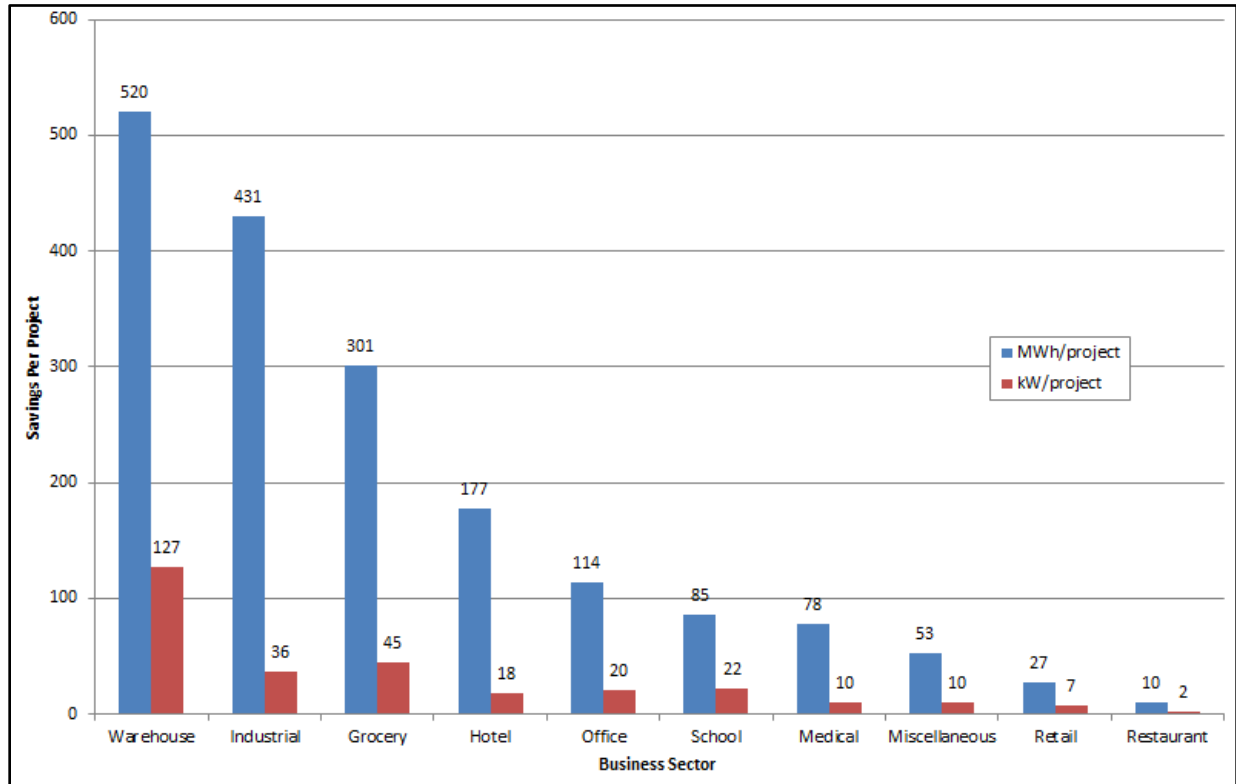


Source: Evaluation analysis of AEP Ohio tracking data from March 25, 2013





**Figure 3-5. Average Savings Per Project By Business Sector**

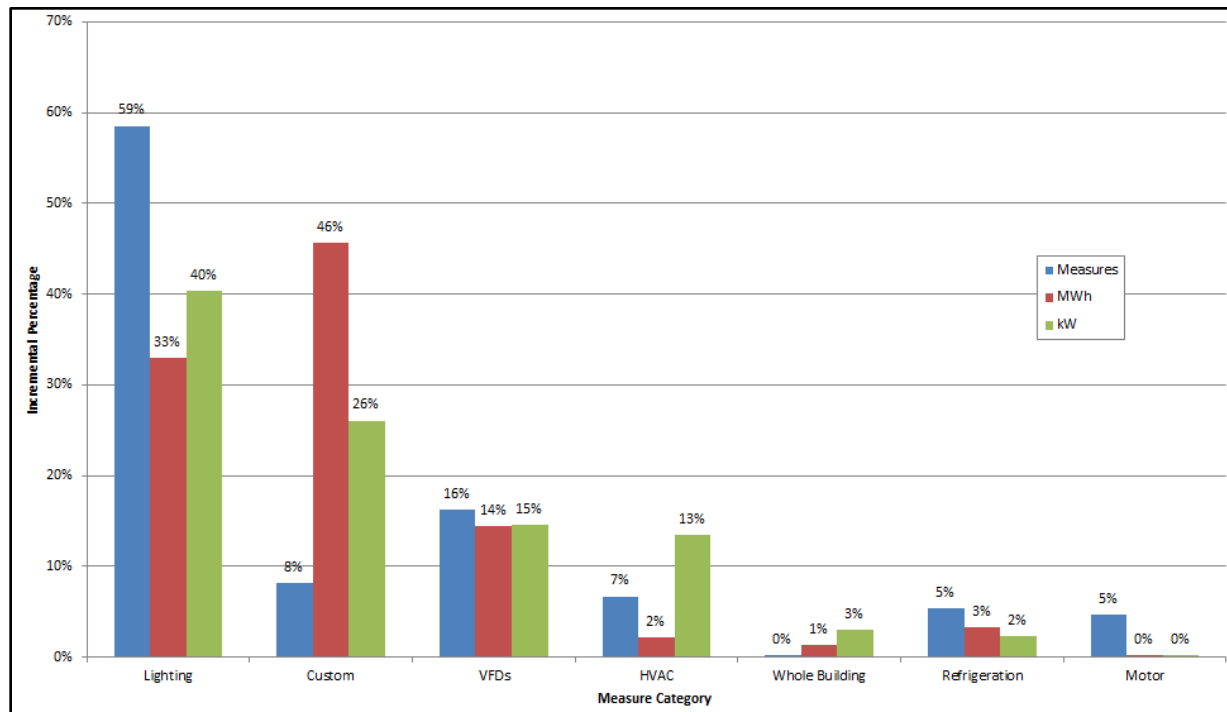


Source: Evaluation analysis of AEP Ohio tracking data from March 25, 2013



As seen in Figure 3-6, lighting measures constituted 59% of the installed measures, 33% of the program reported energy savings, and 40% of the program reported demand savings. Custom measures<sup>14</sup> accounted for the highest proportion of energy savings (46%). Variable frequency drives (VFDs) also played a significant role in the 2012 Self-Direct Program with 16% of projects and 14% of reported energy savings.

**Figure 3-6. Percentage of Reported Measures and Savings by Measure Category**



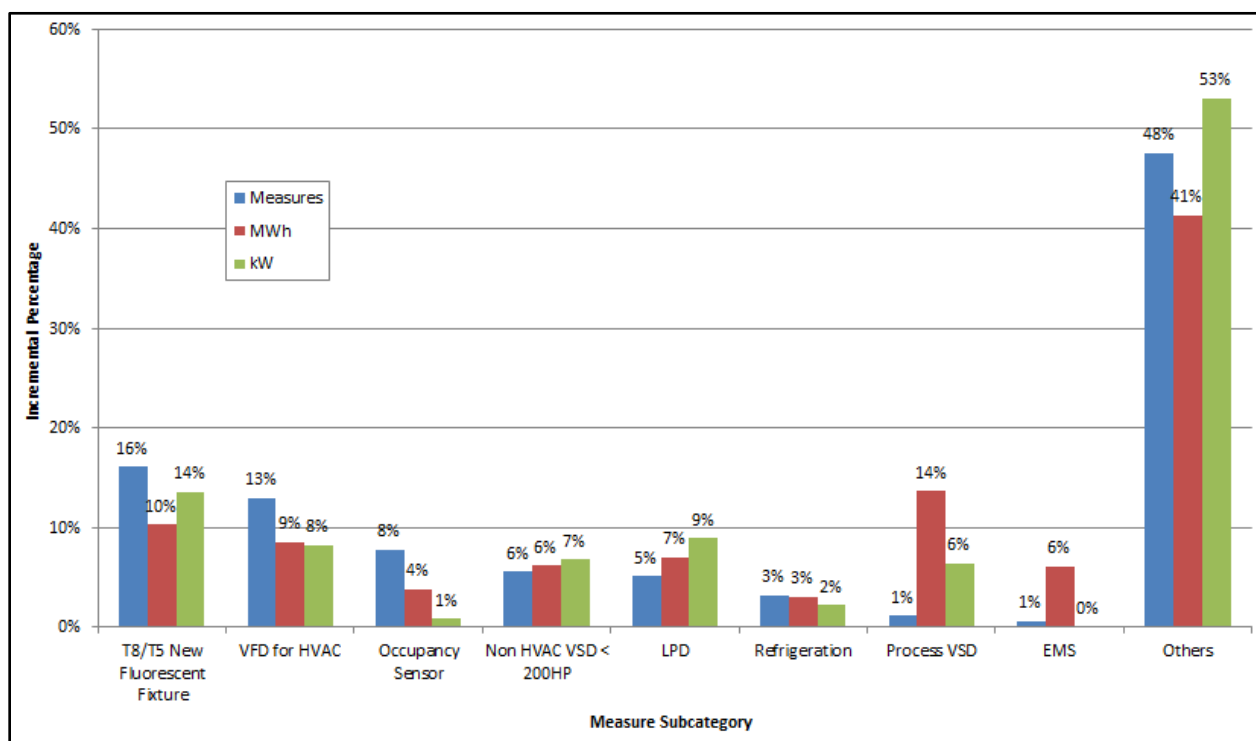
Source: Evaluation analysis of AEP Ohio tracking data from March 25, 2013

<sup>14</sup> The majority of savings from custom measures come from Process VSDs, Air-Cooled Chillers, HVAC, VFDs for HVAC, and Heat Recovery Systems.



As shown in Figure 3-7, no single measure type accounted for more than 14% of the reported energy or demand savings for the Self-Direct Program. The replacement of HID/T12 fixtures with new, standard efficiency T5 or T8 fixtures accounts for a sizable portion of projects (16%), and more than 10 percent of both energy and demand savings. In the coming years, the Energy Security and Independence Act of 2007 (EISA 2007) will significantly reduce the savings potential of this measure.<sup>15</sup> The promotion of reduced wattage and high performance (RW/HP) T8 measures as a better alternative to standard efficiency T8 measures through the Prescriptive Program may help shift this standard retrofit to its more efficient alternatives (RW/HP T8s), which will increase energy and demand savings.

**Figure 3-7. Percentage of Lighting Projects and Savings by Measure Subcategory**



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

<sup>15</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 decreases over the next few years, the baseline for this measure will get more efficient, thus reducing the potential for savings from this measure. Newly developed high CRI 40w 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
5. Cost-effectiveness review

Section 4.1 through Section 4.5 explains each part in more detail.

### 4.1 Savings Summary

As shown in Table 4-1, the impact evaluation verified 91 percent of the reported energy savings and 97 percent of the reported demand savings. The relative precision at the two-tailed 90% confidence interval was  $\pm 7.8\%$  for energy and  $\pm 13.6\%$  for demand.

**Table 4-1. 2012 Ex-post Savings and Realization Rates**

Metric	Energy Savings (MWh)	Demand Savings (kW)
Ex-ante Reported Savings	35,882 MWh	5,742 kW
Ex-post Savings	32,710 MWh	5,580 kW
Realization Rate	0.91	0.97
Relative Precision @ 90% CI	7.8%	13.6%

*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

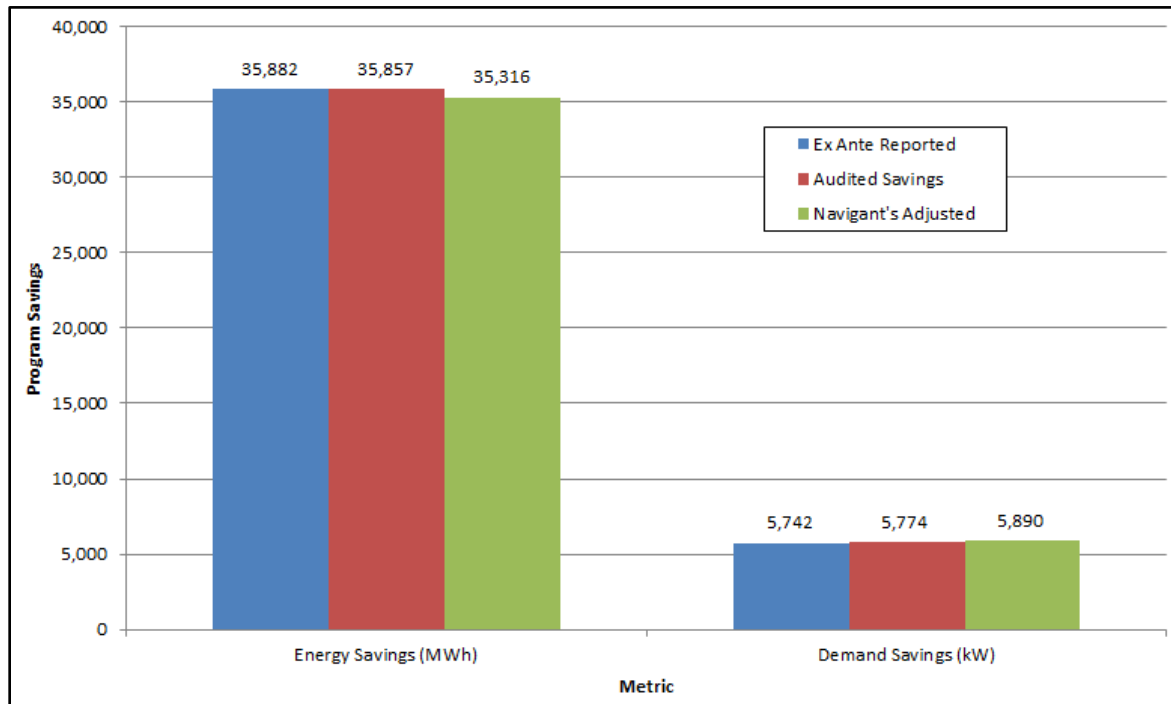
The following sections of this report provide a summary of key findings for these outputs.



#### 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 1.6 percent and increase the demand savings by 2.6 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

Navigant conducted a critical review and adjustment of the per-unit savings values for selected lighting measures. The categories of adjustment included:

1. **Operating Hours:** adjustments to lighting hours of use for all reviewed measures
2. **Coincidence Factors:** adjustments to lighting coincidence factors for all reviewed measures
3. **HVAC Interactive Effects:** adjustments to lighting HVAC interactive effects for all reviewed measures
4. **T12 Baseline:** adjustments to baseline wattage assumption for measures with a T12 lamp/ballast baseline
5. **HP/RW T8s:** adjustments to the energy efficient wattage assumption for the high performance and reduced wattage T8 measures



6. **Controls:** adjustments to lighting controls savings factors
7. **Other:** minor adjustments to other measures with a smaller overall impact

A brief description of the Deemed Savings Review methodology and findings is provided in the Prescriptive Program evaluation report.<sup>16</sup> Navigant recommends that DNV KEMA apply these adjusted per-unit savings values to Self-Direct Program measures in future years.

#### 4.2.3 Calculation of the Audited Savings

As described in Section 2.1.3, Navigant recalculated<sup>17</sup> the *ex-ante* savings for 50 percent (311 records out of 627 total) of the reported Self-Direct measure installations using DNV KEMA's Appendix A inputs (the "audited" savings). For the remaining 50 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 the 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 -0.1 percent for energy and 0.6 percent for demand.<sup>18</sup>

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<sup>16</sup> A more detailed discussion of methods and findings will be provided to AEP Ohio in a separate deliverable.

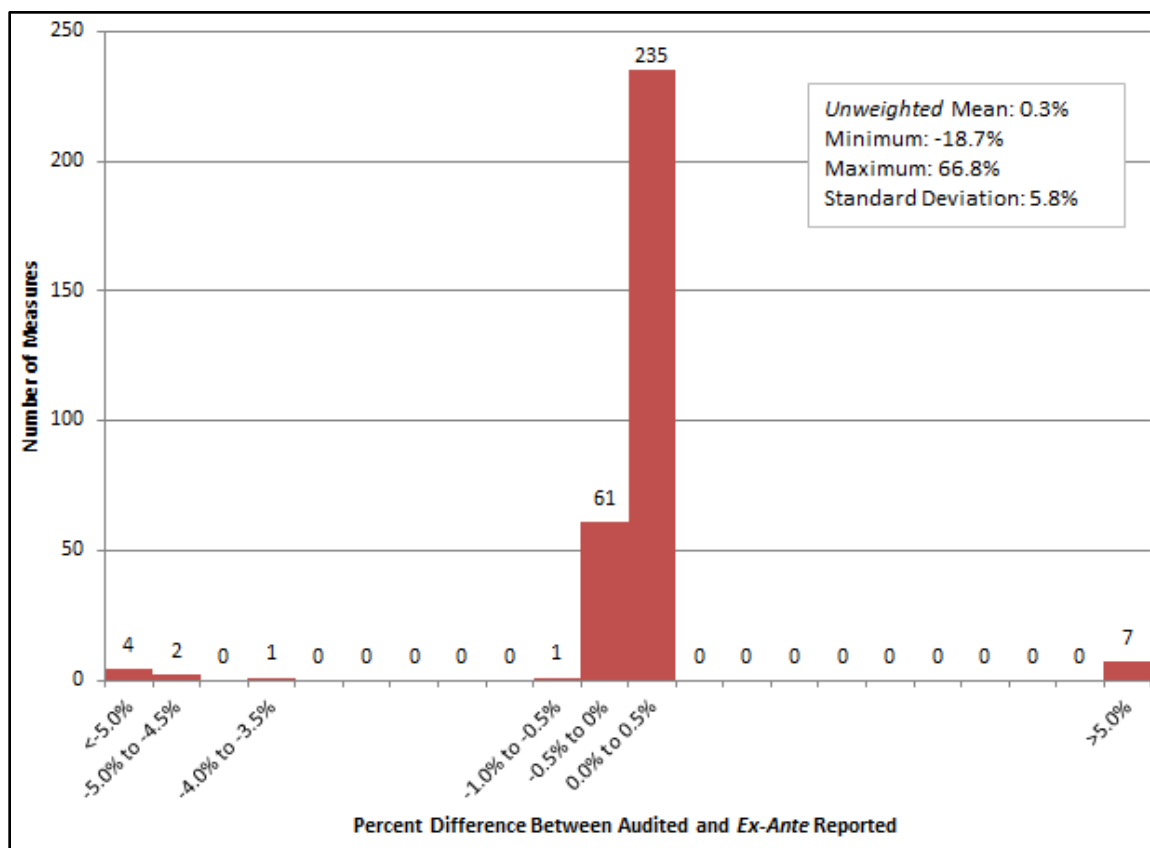
<sup>17</sup> DNV KEMA's methodology for determining savings from lighting measures is to multiply the per-unit savings value from DNV KEMA's Appendix A by the operating hours and energy HVAC interactive effects (for energy), or the coincidence factor and demand HVAC interactive effects (for demand). 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>18</sup> A negative percentage indicates that *ex-ante* savings are slightly *over-reported*, while a positive percentage indicates savings that slightly *under-reported*.



Figure 4-2 shows a histogram of the percentage difference between the audited and the *ex-ante* reported energy savings for the 311 measures that were recalculated; Figure 4-3 shows the same information for the demand savings. Nearly all of the recalculated measures (95%) show a difference of less than 0.5 percent between the audited and *ex-ante* energy savings. On the demand side, 76 percent of the measures show a difference of less than 1.0 percent for the demand savings.

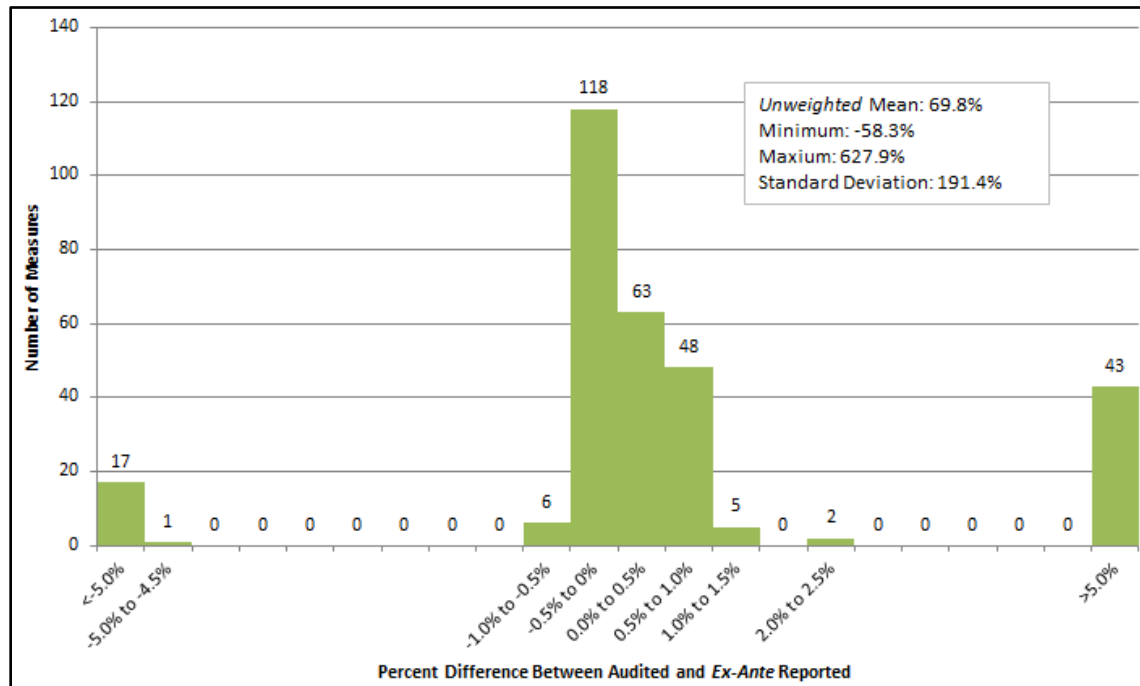
**Figure 4-2. Histogram of Percent Difference Between Audited and Reported Energy Savings**



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 percent bin<sup>19</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 percent is less clear. For energy, the differences greater than 5 percent account for just 11 out of 311 records (3.5%); for demand, these differences accounts for nearly one-fifth (19%) 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 DNV KEMA's Appendix A. One possible cause is that these projects were reserved early when DNV KEMA was determining savings with previous versions of its 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>20</sup>

<sup>19</sup> The percentage differences for this bunch of values around zero range from -1.0% to 0.5% for energy, and -1.0% to 2.5% for demand.

<sup>20</sup> Navigant will provide AEP Ohio and DNV KEMA the full list of measures with audited savings greater than 5 percent from the *ex-ante* savings in a separate deliverable.



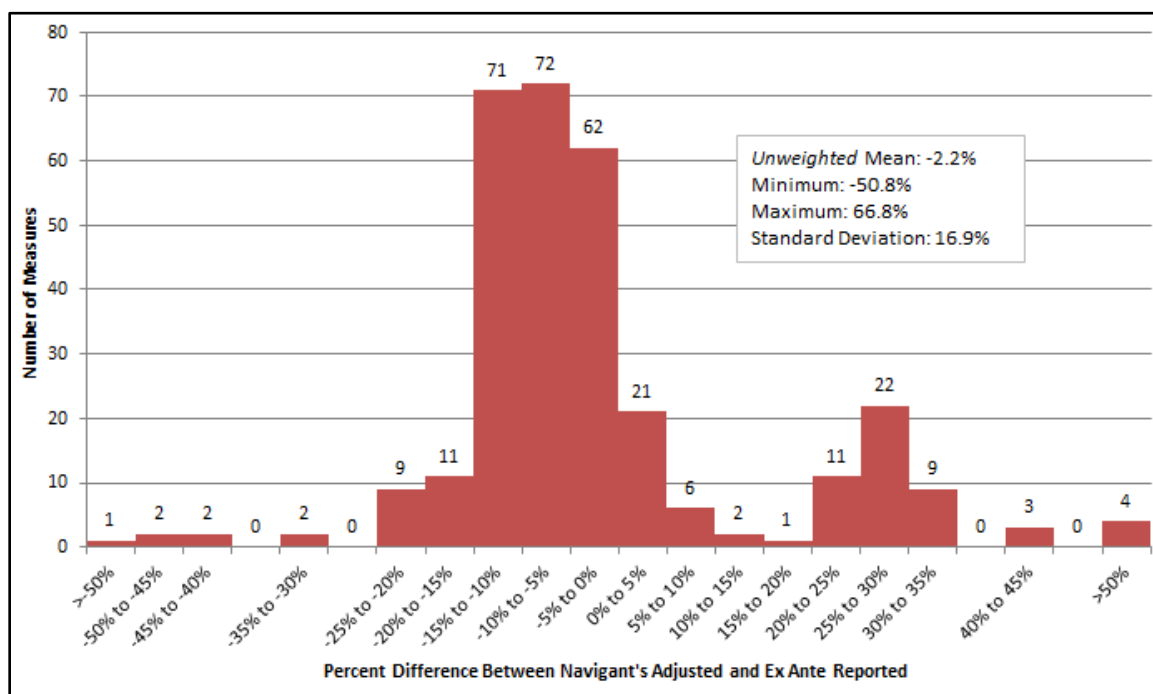


#### 4.2.4 Calculation of Navigant's Adjusted Savings

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 (50% of the total) as the audited savings calculations, and the remaining 50 percent of measures not recalculated 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 *ex-ante* reported 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, 205 out of the 311 recalculated records (66%) have a difference between -15 percent and 0 percent. The dispersion of values is much wider for demand, with 56 measures (18%) having a difference of greater than 50 percent, and maximum difference of 3,100 percent.

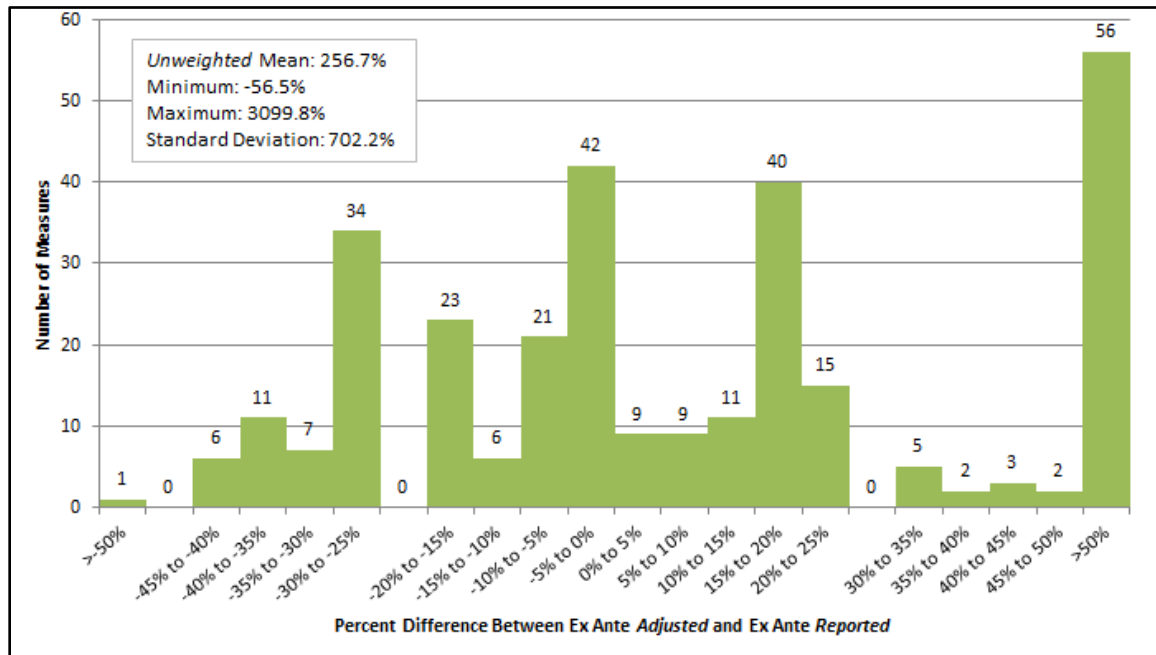
**Figure 4-4. Histogram of Percent Difference Between Adjusted and *Ex-ante* Reported Energy Savings**



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



**Figure 4-5. Histogram of Percent Difference Between Adjusted and *Ex-ante* Reported Demand Savings**



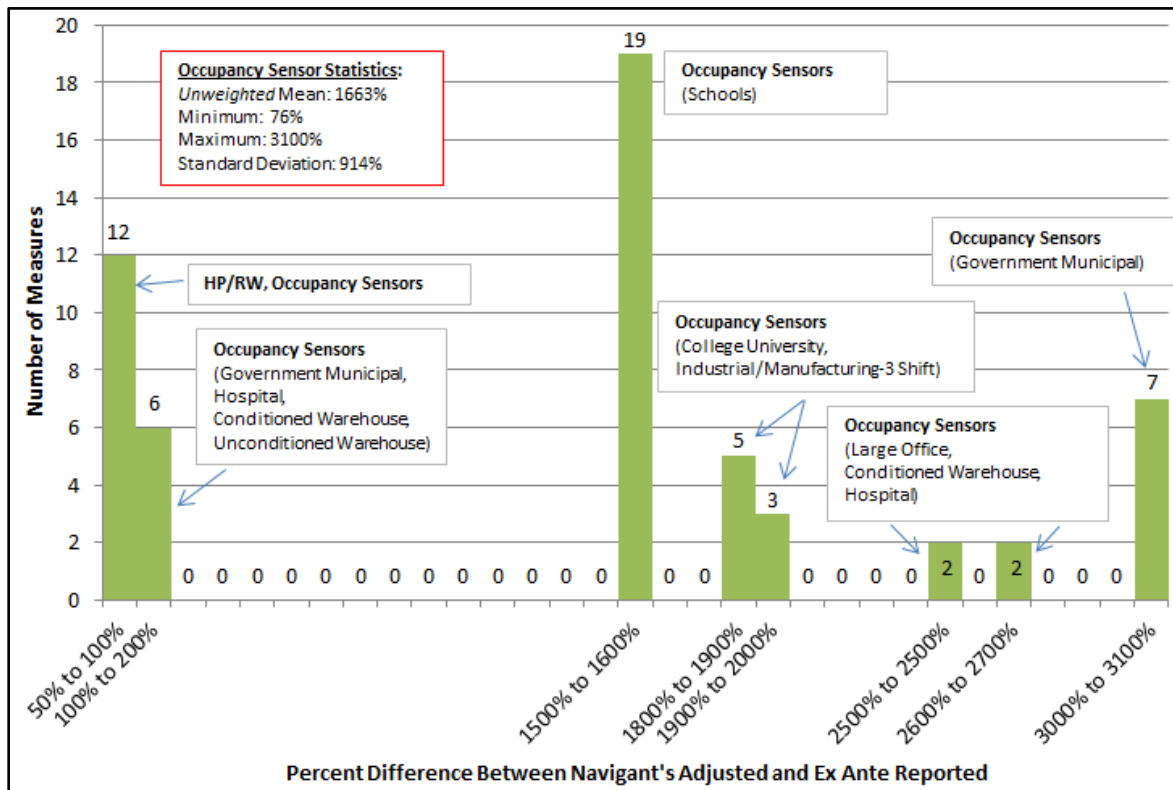
Source: Evaluation data collection and analysis as described in 2

Of the 56 records showing greater than +50% difference on the demand savings (Figure 4-5), 47 (84%) 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*.

**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

The differences are also tightly grouped by business sector, where the Government/Municipal sector shows the greatest difference (between 3,000% and 3,100%), and the Schools sector shows the greatest concentration of measure differences (19) in the 1,500 to 1,600 percent bin. The unweighted mean difference is 1,663 percent; the overall weighted impact on occupancy sensors alone is an increase of 749 percent on the demand savings (not shown).

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>21</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

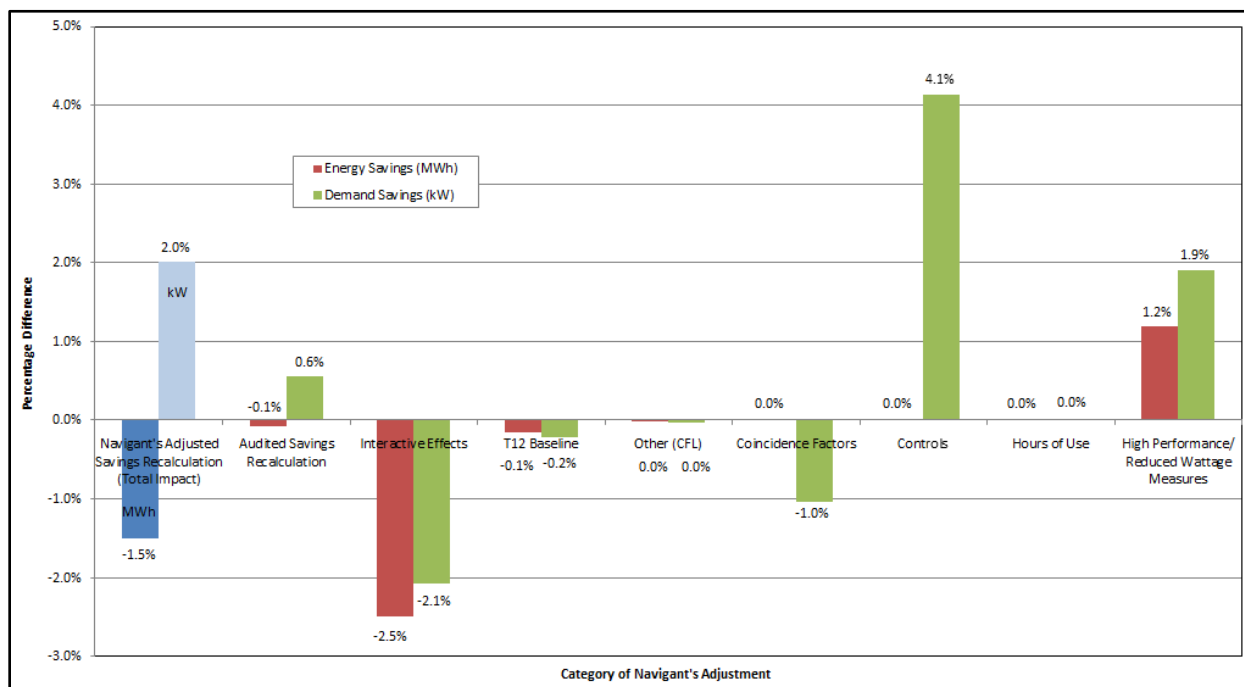
<sup>21</sup> For more discussion of Navigant's findings surrounding the deemed per-unit savings values for occupancy sensors, see the Prescriptive Program evaluation report.



make this simple correction to the per-unit occupancy sensor savings in order to avoid evaluation divergences on demand savings in future years.

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 DNV KEMA Appendix A stated inputs. The recalculated values were then compared to the audited savings to determine the percentage difference. This exercise was then repeated for the next category of adjustments until the impact of every adjustment was quantified against the audited savings.<sup>22</sup>

**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 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.

Overall, Navigant's adjustments as a result of the Deemed Savings Review reduced the energy savings by 1.5% and increased the demand savings by 2.0%. Navigant's adjustments to the HVAC interactive effects had the greatest downward effect, while Navigant's adjustments to the HP/RW T8 measures had the

<sup>22</sup> The bars representing the audited recalculation differences are compared to the *ex-ante* reported savings. All other adjustments are compared to the audited savings.

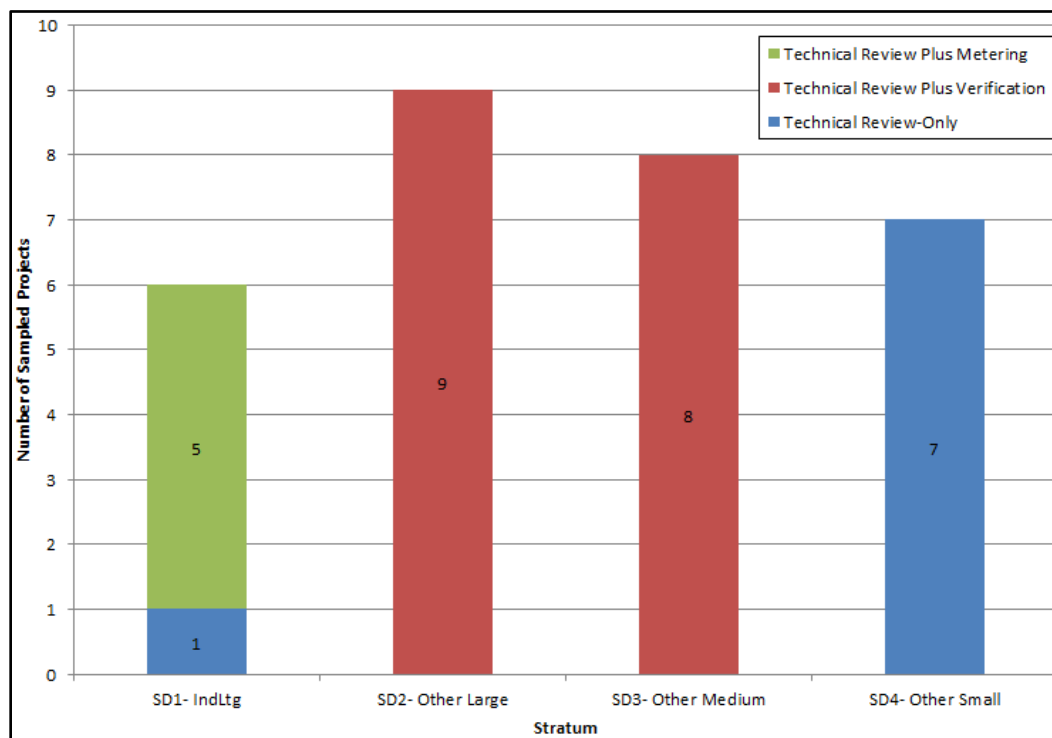


greatest upward impact on energy savings. Navigant's adjustments to controls measures (primarily occupancy sensors) had no impact on the energy savings, but increased the demand savings by 4.1 percent.

### 4.3 Findings from Technical Review and Onsite Data Collection

Navigant conducted a technical review of project documentation for a total of 30 projects selected from the sample. The evaluation team also completed 23 onsite verification visits, five of which included the installation of data loggers to measure lighting operating hours. Figure 4-8 shows the sample disposition by stratum.

**Figure 4-8. Sample Disposition by Completed Task and Stratum**

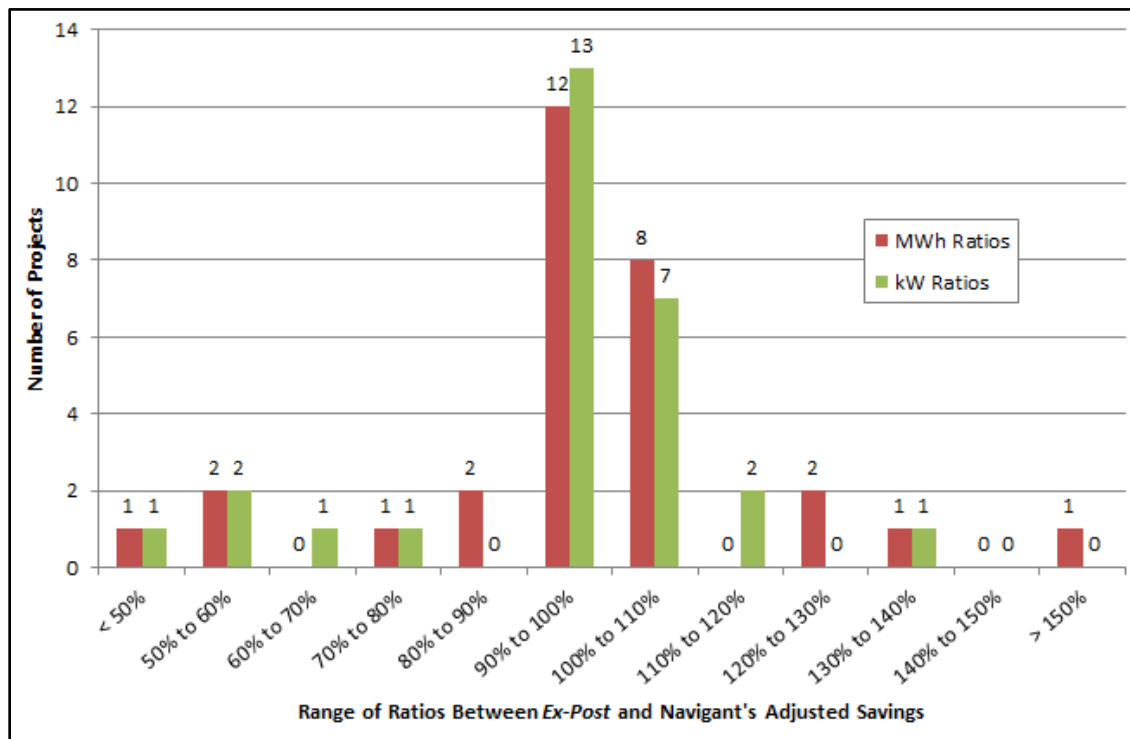


Source: Evaluation data collection and analysis as described in Section 2



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 110 percent. Outside of this range, the distribution was relatively flat.

**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

The following bullets provide a summary of the primary reasons why energy and demand savings ratios at the project level may not equal 1.0.

1. Verified fixture wattages, either through specification sheets or onsite observations, were lower than those assumed in the Deemed Savings Review.
2. The visually verified fixture quantities were lower than those in project documentation.
3. In some cases, Navigant identified different building types than entered by DNV KEMA.
4. Onsite measured and verified operating hours were different from those assumed in the project documentation.
5. Differences were observed in calculation methodologies.

#### 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* verified 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>23</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  $\pm 7.8\%$  for energy and  $\pm 13.6\%$  for demand.

**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	Industrial Lighting	1.19	7.8%	0.83	29.1%
2	Other- Large	0.92	0.0%	1.01	0.0%
3	Other- Medium	0.89	13.8%	0.98	30.1%
4	Other- Small	0.90	46.8%	0.87	52.6%
<b>Overall Value</b>		<b>0.93</b>	<b>7.8%</b>	<b>0.95</b>	<b>13.6%</b>

Source: Evaluation analysis of tracking data and sample results

<sup>23</sup> For more discussion, see Section 3.1.7.



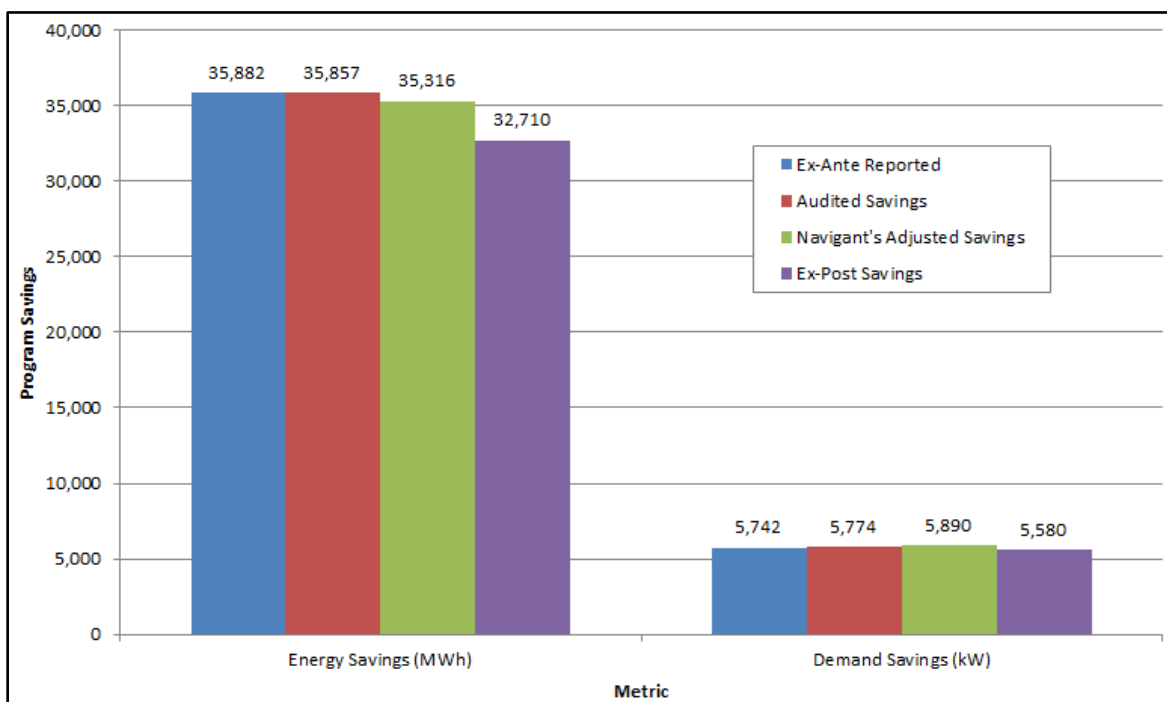
As shown in Table 4-3 and Figure 4-10, the impact evaluation verified 91 percent of the reported energy savings and 97 percent of the reported demand savings. The relative precision at the two-tailed 90% confidence interval is the same as that on the ratio estimator:  $\pm 7.8\%$  for energy and  $\pm 13.6\%$  for demand.

**Table 4-3. Ex-post Savings and Realization Rates**

Metric	Energy Savings (MWh)	Demand Savings (kW)
Ex-ante Reported Savings [A]	35,882 MWh	5,742 kW
Audited Savings [B]	35,857 MWh	5,774 kW
Navigant's Adjusted Savings [C]	35,316 MWh	5,890 kW
Ratio Estimator [RE]	0.93	0.95
Ex-post Savings [D = C * RE]	32,710 MWh	5,580 kW
Realization Rate [RR = D / A]	0.91	0.97
Relative Precision @ 90% Conf. Int.	7.8%	13.6%

Source: Evaluation analysis of tracking data and sample results

**Figure 4-10. Comparison of Ex-post to Ex-ante Reported Savings**



Source: Evaluation analysis of tracking data and sample results





Figure 4-11 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 7.4 percent for energy and 2.8 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 4-11. 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 Self Direct 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 Self Direct Program**

Item	Value
Average Measure Life	13
Projects	227
Annual Energy Savings (MWh)	32,710
Coincident Peak Savings (kW)	5,580
Third Party Implementation Costs	949,668
Utility Administration Costs	64,928
Utility Incentive Costs	1,657,797
Participant Contribution to Incremental Measure Costs	8,843,659

Based on these inputs, the TRC ratio is 1.6. Therefore, the program does pass 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 Self Direct Program**

Test Results for Self Direct	Ratio
Total Resource Cost	1.9
Participant Cost Test	2.6
Ratepayer Impact Measure	0.8
Utility Cost Test	7.1

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 five implementation contractor program staff and 30 program participants to explore the issues that were foremost in their minds regarding the Self-Direct Program. Program managers for both AEP Ohio and DNV KEMA provided their input for the evaluation.

### *5.1 Findings from the Interviews of Program Staff*

The primary paths the evaluation team used to explore the program was through the CATI survey of 30 program participants, in-depth interviews with program management staff, and a review of program materials. The findings from these evaluation tasks are combined and summarized below.

#### **5.1.1 Roles of AEP Ohio and Implementation Contractor**

AEP Ohio retained DNV KEMA as its program administrator, responsible for day-to-day operations for most of the Business Programs. AEP Ohio's Prescriptive, Custom, New Construction and Self-Direct Program Coordinators report to an overall Business Program Manager. AEP Ohio staff persons support outreach and marketing, planning, evaluation, and reporting. For the 2012 Self-Direct evaluation, Navigant staff interviewed the Self-Direct Program Coordinator, the Program Manager, and members of DNV KEMA program staff.

DNV KEMA is responsible for program implementation on a day-to-day basis. It collects the applications, tracks the data, prepares the documents for filing with the commission, and provides the engineering staff for Self-Direct projects with custom measures. DNV KEMA provides the first level of application review and processing, and calculates the appropriate Self-Direct incentive. It may conduct a peer engineering review of more complex projects.

AEP Ohio reviews the applications a second time and handles all submission of Self-Direct projects to the Public Utility Commission of Ohio (PUCO). DNV KEMA prepares the documents for submittal and AEP Ohio's Legal Department files the joint application on the PUCO's public docket. Once the PUCO approves the application, DNV KEMA releases the project for payment and mails the incentive check. The PUCO has 90 days to approve the incentive payment. If no objection is raised within that time, the project is considered approved.

DNV KEMA provides the project and measure-tracking system, conducts pre- and post-installation metering and inspections, and issues checks after the project is approved. DNV KEMA handles customer communication regarding application processing and approvals, working through the AEP Ohio Customer Service Representatives as needed. DNV KEMA also play a large role in marketing the program by providing informational presentations at AEP Ohio sponsored seminars and meetings, and also at trade organization meetings and events.



### **5.1.2 Communication**

Both DNV KEMA and AEP Ohio agreed that they work collaboratively on the Self-Direct Program. Program managers and AEP Ohio program coordinators may discuss details of the program numerous times a day. Team meetings are held weekly to coordinate program issues. DNV KEMA participates in AEP Ohio's quarterly seminars for customers and/or Solution Providers.

### **5.1.3 Marketing Strategy**

AEP Ohio program coordinators, DNV KEMA staff, and Customer Service staff share responsibility for promoting the Self-Direct Program. AEP Ohio staff and DNVKEMA and partner to present informational presentations at trade shows/expos/seminars, and to community groups such as the Chamber of Commerce and the Ohio Manufacturers Association.

One of the successful marketing efforts conducted in 2011 was the 'customer blitz,' which was continued in 2012. Under this marketing effort, program coordinators and DNV KEMA staff joined account representatives to present the details of all the business programs to large, non-participating customers. In addition to identifying opportunities for these large customers to participate in the Self-Direct, Custom, or Prescriptive Programs, program coordinators used the 'customer blitz' to model the sales process for account representatives. AEP Ohio continued to implement the 'customer blitz' model in 2012 by targeting large customers in specific business types across the service area.

### **5.1.4 Changes in Marketing Segmentation**

AEP Ohio and DNV KEMA primarily focused on lighting measures in 2012 because of the pending phase-out of T12 fixtures due to EISA 2007. In 2012, AEP Ohio also began exploring the market for advanced lighting controls.

Variable Speed Drives (VSDs), which can be used in a variety of motor applications, will be the focus of the training and marketing efforts in 2013. Solution Providers have found some resistance from customers about the savings potential with the installation of a VSD, and they are looking to AEP Ohio to provide expertise in this technology arena. DNV KEMA subsequently developed a number of technical sheets to explain the variable speed drive and compressed air opportunities.

AEP Ohio also focused marketing efforts on the water/wastewater function of municipalities. Most of this equipment is old and obsolete; municipalities can achieve significant savings with the installation of variable speed drives. This effort was sustained throughout 2012 and will continue into 2013.

In 2011, AEP Ohio expanded its marketing focus to efficiency projects for customers with data centers, a group of customers identified as a fertile market for energy efficiency programs, and a segment that has consistently under-performed. AEP Ohio launched a program tailored for data centers in 2012.

### **5.1.5 Customer Satisfaction**

Customers have generally been giving positive feedback about the Self-Direct program to AEP Ohio staff. Customer complaints about the rebate are few, even though some HVAC incentives were slightly



reduced. In some cases, customers are asking AEP Ohio to conduct 'incentive check ceremonies', and to issue press releases to local media. AEP Ohio plans to continue rewarding customers who participated in the program in 2012, and to recognize Solution Providers that are top performers.

#### 5.1.6 Changes to the Program in 2012

AEP Ohio and DNV KEMA staff program staff discussed a number of noteworthy changes that were implemented in 2012.

1. DNV KEMA assigned a staff member to work directly with Solution Providers. Keeping the Solution Providers motivated is a challenge, and often neither the Solution Provider nor the customer want to complete the application.
2. Roles changed at DNV KEMA during 2012. The outreach and marketing manager position was split into two positions, and a marketing manager was hired. The outreach manager meets with end users, account managers and contractors. She hired five staff to geographically represent AEP Ohio's energy efficiency programs at local events and to develop program leads. The marketing manager creates the fact sheets, case studies, advertising and other collateral material used by the outreach team. Another team member provides outreach support to Solution Providers.
3. DNV KEMA also hired a new Operations Manager during 2012. His main duties are to manage the office that pays the rebates and reviews every application to verify the program savings. He is supported by an assistant operations manager that oversees the day-to-day office tasks.
4. Program changes were also made internally at AEP Ohio. The account managers were realigned, causing some confusion with outreach to the managed accounts. AEP Ohio added a person to the core team to help with new programs implemented in 2012 and hired a new person to oversee the Self-Direct Program.
5. AEP Ohio also launched a Continuous Improvement program (CEI) which may find and identify eligible Self Direct projects although this is not the primary program purpose. One of the program objectives is that customers will use the rebate to fund future projects. Recent survey evidence suggests that some customers are making the decision to fund new projects. In answer as to why Self-Direct Program participants did not choose the Custom or Prescriptive Program to receive a higher rebate, Ohio manufacturing firms indicated they are busy running their businesses and will complete the program forms at their own convenience.
6. AEP Ohio modified the method of transferring the completed application to their internal legal team. In the past, AEP Ohio attached the protocols to every case and the packet was large. Now DNV KEMA files the protocols separately and emails the application packet to the legal department rather than burning the file to a DVD. This change streamlined the process considerably.
7. AEP Ohio hired a consultant called Event Marketing Strategies, which makes event reservations, sets the event dates, and sets up the booths. It received a list of who is attending specific events for 2013 at the beginning of the year.



8. A clarification in the interpretation of the definition of a “mercantile customer” has cut down on the number of customers that are eligible for the program.<sup>24</sup>

#### **5.1.7 Program Challenges**

Program staff and managers indicated several challenges with the Self-Direct Program:

1. The structure of the program is a disadvantage, since all projects and payments must be approved by the PUCO, a process which takes up to 90 days.
2. Additional challenges include lack of awareness, the amount of time it takes to fill out the application, and the split nature of the incentive.

### ***5.2 Findings from the Participant Surveys***

This section presents Navigant’s detailed findings from the Self-Direct program participant surveys.

#### **5.2.1 Profile of Participating Survey Respondents**

The telephone survey effort began with 91 unique contact names, and the evaluation team was able to complete surveys with 30 program participants, a response rate of 33 percent. The team could not make contact with the remaining potential respondents either because of repeated calls with no answer, an answering machine, or a person who screened incoming phone calls.

One-third (10) of the survey respondents are engaged in some type of manufacturing or industrial process. Thirty percent (nine) of survey respondents come from educational facilities, either schools or colleges and universities. The remaining survey respondents come from sectors including a grocery store, a restaurant, a hotel, and a warehouse.

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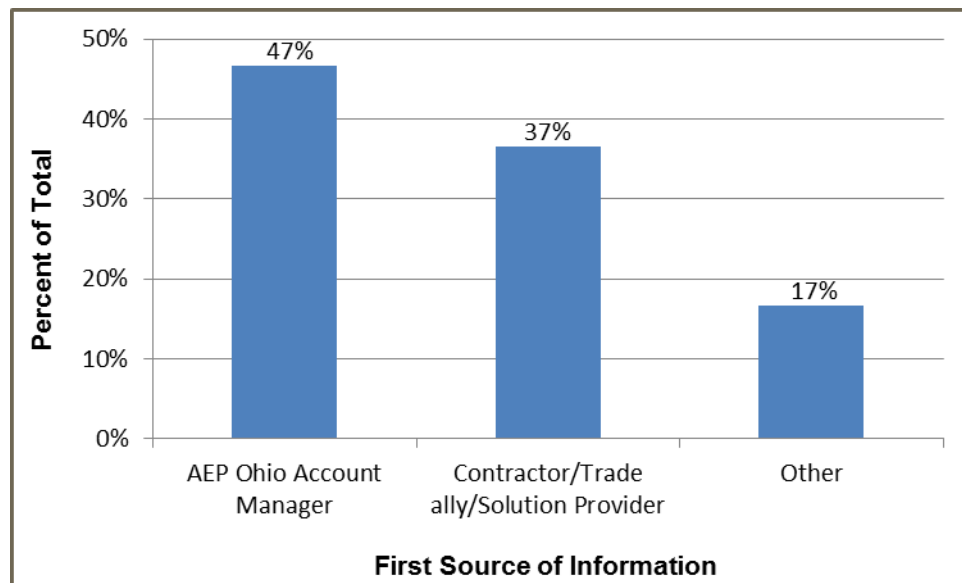
<sup>24</sup> In the Ohio Revised Code, the term “national account” in the definition of a mercantile customer is undefined. The clarification of how “national accounts” are defined for purposes of aggregation and record keeping reduced the number of customers eligible for the program.



### 5.2.2 Learning About The Program

As seen in Figure 5-1, Self-Direct Program survey respondents first heard about the program primarily through their AEP Ohio account manager (47%) or their contractor (37%).

**Figure 5-1. First Source of Program Information**

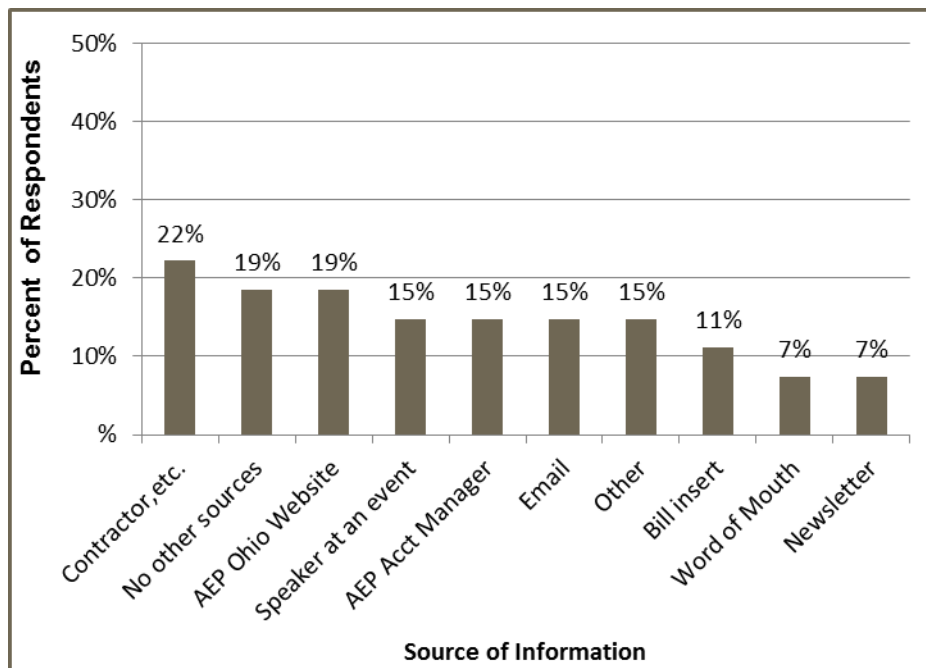


Source: 2012 AEP Ohio Self-Direct Survey, N=30.



Survey respondents were then asked about sources of information for the program after they first became aware of it. As shown in Figure 5-2, no single source represented more than one-quarter of the responses. The most cited source was contractors, trade allies, or Solution Providers (22%). Other frequently cited sources included the AEP Ohio website (19%), event speakers (15%), email (15%), and an AEP Ohio account manager (15%).

**Figure 5-2. Secondary Sources of Information about the Self-Direct Program**



*Source: 2012 AEP Ohio Self-Direct Survey, N=30. Multiple responses accepted.*



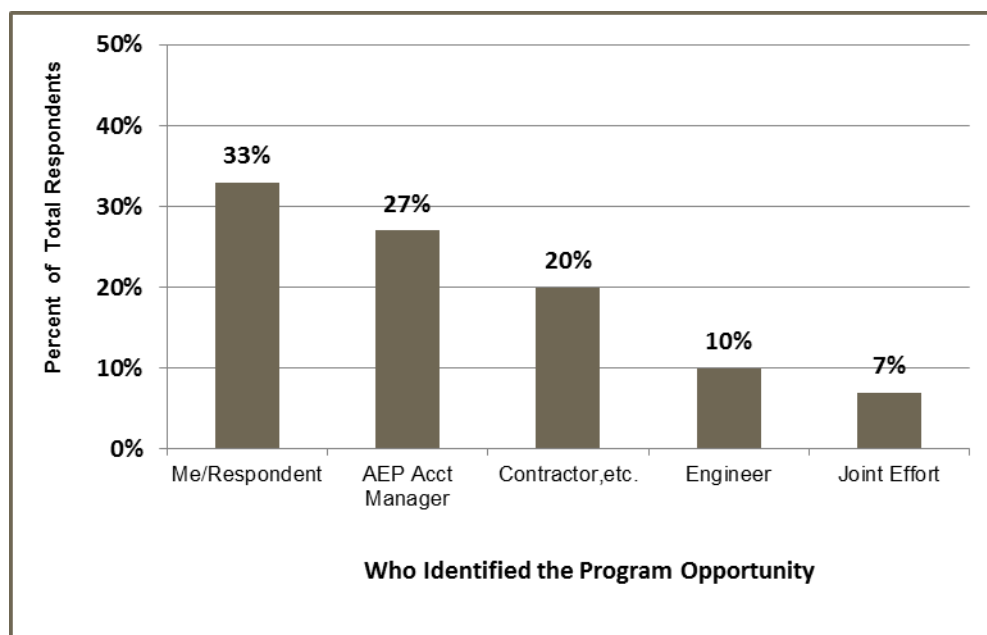


### 5.2.3 Identifying the Program Opportunity

As seen in Figure 5-3, the respondent themselves (33%) and the AEP Ohio Account Manager (27%) were the two people most likely to identify the Self-Direct opportunity. Respondents also reported the contractor<sup>25</sup> (20%), the engineer (10%), and a joint effort by multiple parties (7%).

Eight of the respondents participated in the Self-Direct Program twice during the last three years. One-third of those surveyed participated in 2009 and 2010. Ninety percent of the respondents plan to participate in the program again.

**Figure 5-3. Person Responsible for Identifying Program Opportunity**



Source: 2012 AEP Ohio Self-Direct Survey, N=30.

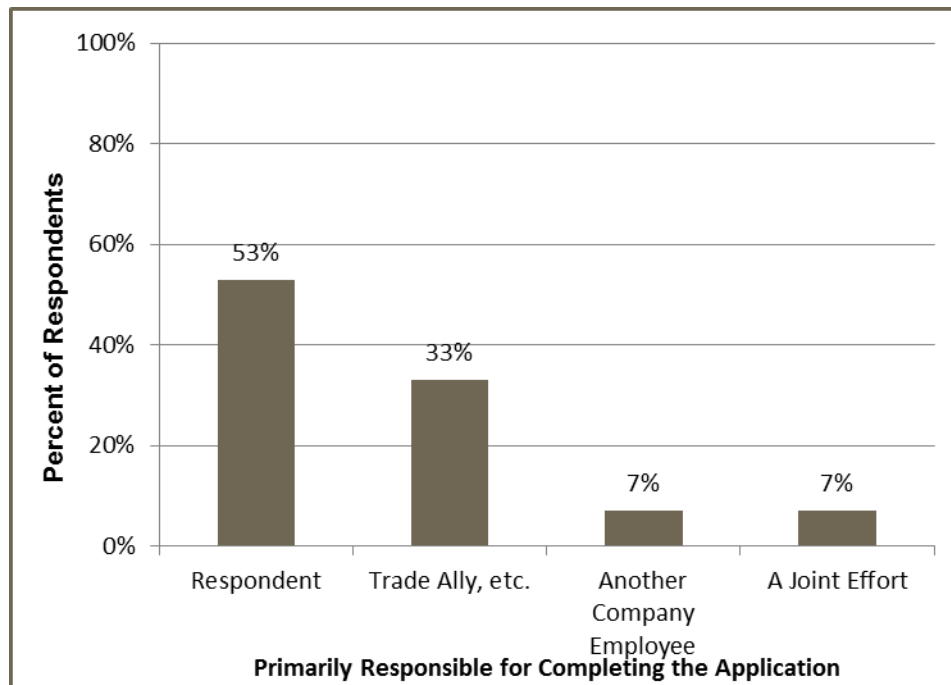
<sup>25</sup> The most frequently cited contractors were lighting or electrical contractors, and energy consultants.



### 5.2.4 Application Process

As seen in Figure 5-4, more than half of the survey respondents (53%) said they completed the Self-Direct application, while one-third (33%) of respondents reported that a trade ally or Solution Provider did it. A few applications were completed jointly (7%).

**Figure 5-4. Who Completed the Program Application**



Source: 2012 AEP Ohio Self-Direct Survey, N=30.

Respondents who completed the application were then asked to rate the application process on a 0 to 10 point scale, where 0 was very difficult and 10 was very easy. Most of the respondents (69%) were satisfied with the process (defined as 7+ on the 10-point scale). No respondents rated the application process higher than eight. Most of the remainder (25%) rated the difficulty of the application process from 4-6. In addition, 88 percent of respondents who completed the application said it was clear what they needed to do to submit the application.

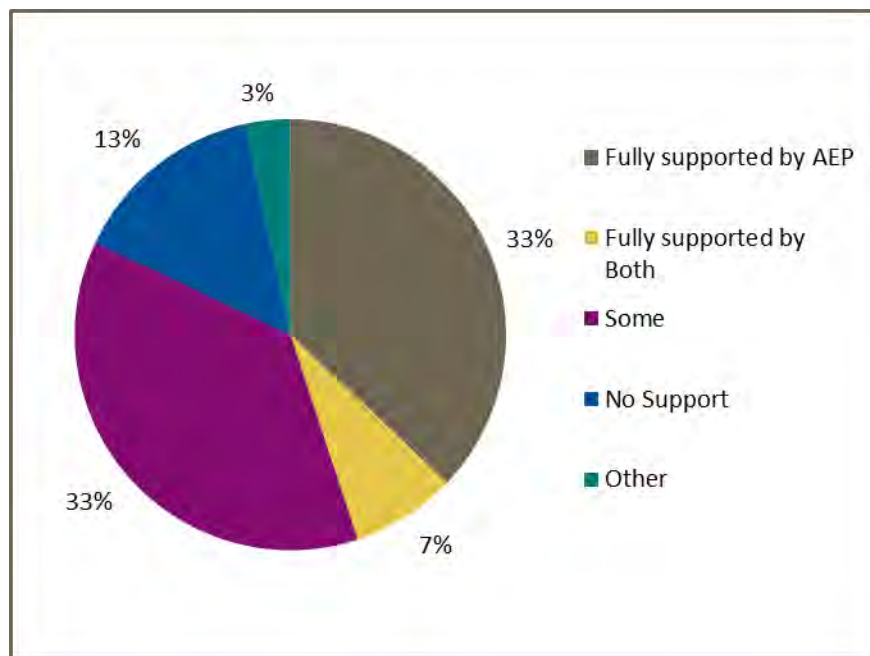
Five respondents experienced delays with the application processing. Two respondents indicated that the application confused them. One of them could not remember why he was confused, while the other said:

“Just lots of things we weren't sure we needed, a lot of gray areas we tried to sort out on lamps and ballasts and motors, what would qualify and what didn't.”



As seen in Figure 5-5, 40 percent of respondents said they were fully supported by AEP Ohio, or by AEP Ohio and DNV KEMA. Another one-third reported they received some support from AEP Ohio while completing the application. Thirteen percent did not feel they were supported.

**Figure 5-5. How Supported Customers Felt During the Application Process**



Source: 2012 AEP Ohio Self-Direct Survey, N=30.

### 5.2.5 Reasons for Selecting Self-Direct Over Other Programs

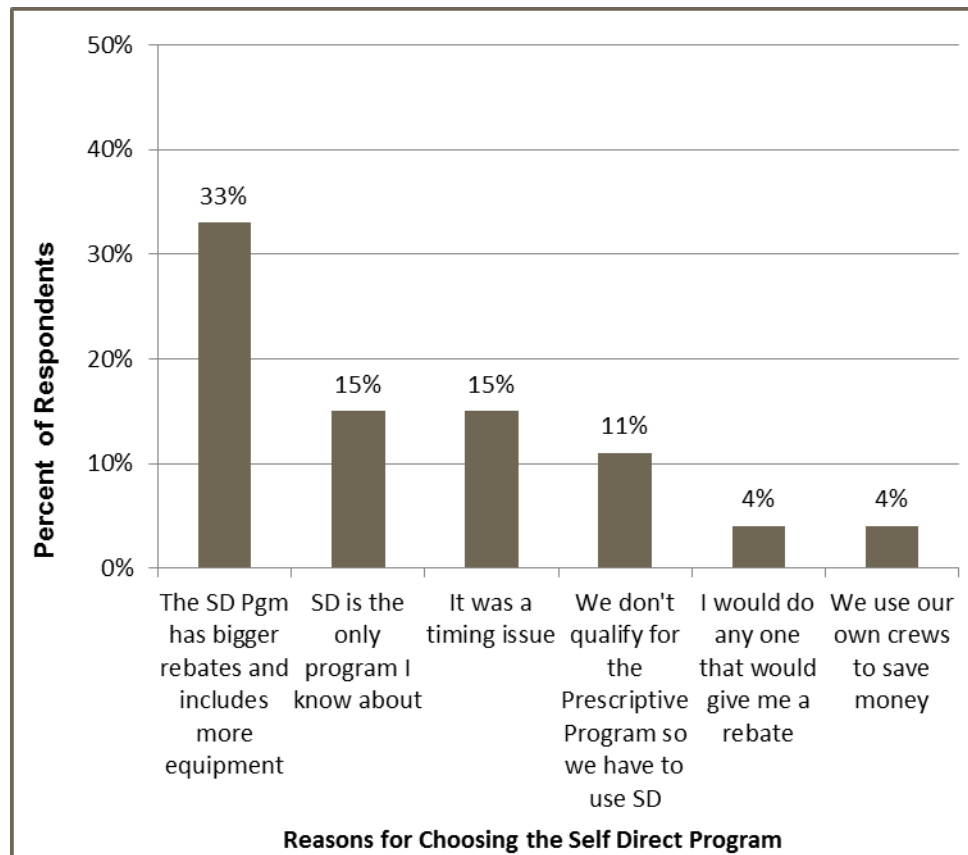
Respondents provided a number of reasons for choosing the Self-Direct Program (where they receive only 75% of the rebate) over the Prescriptive or Custom Programs. The results were remarkable (see Figure 5-6):

- The most cited reason, given by 10 respondents (33%), was the misconception that the Self-Direct Program has the largest rebate, or that it includes equipment not available in the other programs.
- Eleven percent said they would not qualify for other programs.
- Fifteen percent said that this was the only program they knew about.
- One respondent said he would participate in any program to get the rebate.



These findings indicate a basic lack of knowledge among participants with respect to how the Self-Direct Program differs from other program offerings.

**Figure 5-6. Reasons for Choosing the Self-Direct Program**



Source: 2012 AEP Ohio Self-Direct Survey, N=30.

Almost two-thirds (63%) of respondents indicated they will use the incentive to fund other energy efficiency projects. Those who say they will not use the rebate to fund other projects reported that they either used it to pay for the current project, or they have to put the rebate in the general fund (usually a government or school). One respondent did not think it had any equipment left to upgrade.

### 5.2.6 Communications

Slightly more than half (53%) of survey respondents were satisfied with their communications with DNV KEMA. Another one-third did not have any communications with DNV KEMA, while one survey respondent gave their communications with DNV KEMA an unsatisfactory rating.



Over 75 percent of survey respondents were informed that final payment for the project required approval by the PUCO. Over 60 percent were informed about the progress of their project during their program participation.

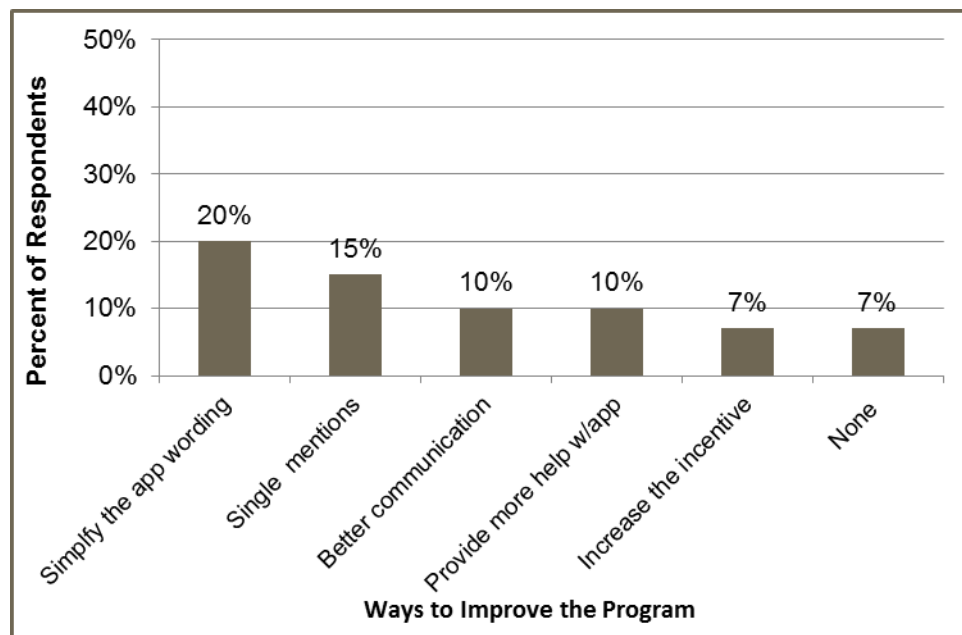
Almost half of the survey respondents (47%) said they were visited by DNV KEMA after the equipment was installed to verify the installation of the equipment. One-third of the respondents did not know if DNV KEMA had visited their site or not.

Survey respondents who received a site visit were asked to report their satisfaction with the visit on a 10-point scale. Of the fourteen respondents, 12 were satisfied (defined as 7+ on the 10-point scale), one was dissatisfied (gave a rating of 4), and one did not know.

### 5.2.7 Satisfaction with the Self-Direct Program

**More than 90 percent of the survey respondents said they were satisfied with the Self-Direct Program.** These respondents reported that simplifying the wording (20% of respondents), better communications (10%), providing more help with the application (10%), and increasing the program incentives (7%) were improvements that could be made to the Self-Direct Program (see Figure 5-7).

**Figure 5-7. Ways to Improve the Self-Direct Program**



Source: 2012 AEP Ohio Self-Direct Survey, N=30.

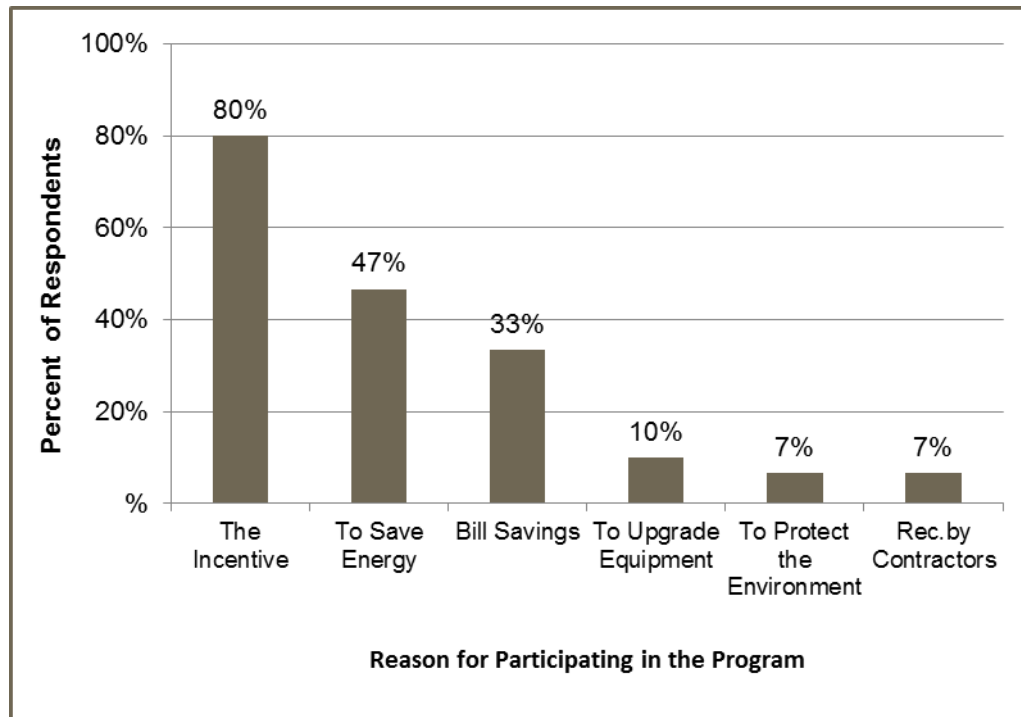
### 5.2.8 Reasons for Participating in the Program

The Self-Direct Program pays incentives for projects that have already been completed by the customer. It is no surprise that the most cited reason for participation was the program incentive, reported by 80



percent of the respondents (see Figure 5-8). Other reasons included: to save energy (43% of respondents) and bill savings (33% of respondents).

**Figure 5-8. Reasons for Participation**



*Source: 2012 AEP Ohio Self-Direct Survey, N=30. Multiple responses accepted.*

Eight of the 30 survey respondents (27%) said that the economy will prevent them from participating in other AEP Ohio programs. Three respondents explained that governments and schools have no money right now. A for-profit firm said they do not have the resources right now, and another firm said they don't have the employee resources they need to participate.



## 6. Key Findings and Recommendations

This section presents the key findings and recommendations from the 2012 Self-Direct program impact and process evaluations.

### 6.1 Key Impact Findings and Recommendations

1. The 2012 realization rate (defined as *ex-post* savings / *ex-ante* reported savings) for the Self-Direct program was 0.91 for energy savings and 0.97 for demand savings. The relative precision at the two-tailed 90% confidence interval was  $\pm 7.8\%$  for energy and  $\pm 13.6\%$  for demand. Overall, DNV KEMA is doing a good job estimating the savings resulting from the Self-Direct program.
2. Participation was highest within the Schools sectors, which accounted for 44 percent of project submissions overall, and 38 percent of the *ex-ante* reported demand savings. The Industrial/Manufacturing sector provided the greatest energy savings, with 43 percent of the *ex-ante* reported.
3. Custom and lighting measures provided the majority of *ex-ante* reported energy savings for the program (46% and 33%, respectively).
4. The replacement of HID/T12 fixtures with new, standard efficiency T5 or T8 fixtures accounts for a sizable portion of projects (16%), and more than 10 percent of both energy and demand savings. Legislation from 2007 (the Energy Independence and Security Act - EISA) effectively eliminates standard 40w 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 40w T12 fixtures will be reduced.<sup>26,27</sup>

**Recommendation:** AEP Ohio should consider, through the Prescriptive Program, the promotion of reduced wattage and high performance (RW/HP) T8 measures as a better alternative to standard efficiency T8 measures. This may help shift future retrofits that apply for Self-Direct funds from this standard efficiency fixture to its more efficient alternatives (RW/HP T8s), which will increase energy and demand savings.

5. Navigant found differences of -0.1% for energy savings and 0.6% for demand savings when comparing the savings calculated using 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 projects were reserved early

<sup>26</sup> As the installed base of this equipment decreases over the next few years, the baseline for this measure will become more efficient, thus reducing the potential for savings from this measure.

<sup>27</sup> Newly developed high CRI 40w 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.



when DNV KEMA may have been 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 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>28</sup> If so, DNV KEMA should consider cost-effective ways to reduce the likelihood of significant differences between versions of the calculators.

6. Navigant adjusted the deemed savings inputs for 50 percent of the measures and 28 percent of the reported energy savings from the Self-Direct program. The categories of adjustment included operating hours, coincidence factors, HVAC interactive effects, T12 baselines, HP/RW fixture wattage, and lighting controls. These adjustments led to a 1.5 percent decrease in energy savings and a 2.0 percent increase in demand savings.<sup>29</sup>

**Recommendation:** Navigant recommends that DNV KEMA apply Navigant's adjusted per-unit savings values to Self-Direct Program measures in future years.

7. 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, and index the coincidence factor by building type to determine savings. This was an evaluation adjustment made for 2012 that increased program demand savings by 4.1 percent.

## 6.2 Key Process Findings and Recommendations

1. Few customers find the application to be a hurdle to overcome. Only one customer could remember why he was confused by the application. However, customers suggested that the wording could be improved and that the application could be simplified.

**Recommendation:** Retooling the program application for the Website is an opportunity for AEP Ohio to simplify the language.

2. When asked why they chose to participate in the Self-Direct program, customers indicated that:

<sup>28</sup> Navigant will provide AEP Ohio and the IC the full list of measures with *ex-ante* prime savings greater than 5% from the *ex-ante* savings in a separate deliverable.

<sup>29</sup> A more detailed description of the entire Deemed Savings Review methodology and findings is provided in the Prescriptive Program evaluation report.





- a. The incentives were higher than the other programs or offered rebates for equipment not available through the other programs (not true),
- b. This was the only program they knew about (suggesting messaging and marketing of AEP Ohio's business sector programs needs to be improved.)
- c. That they did not qualify for the Prescriptive program (And it sounded like they never would)

**Recommendation:** Customers who participate in the Self-Direct program should be better informed by AEP Ohio on how they can participate in the Custom or Prescriptive programs in the future. Only 15 percent of the respondents reported an answer that might be considered logical given Self-Direct marketing activities (i.e. they participated in the Self-Direct program because of the timing of their participation prevented them from participating in these other programs). AEP Ohio and DNV KEMA should consider delivering a series of email or direct mail communications to customers during their participation in the Self-Direct Program to inform them about their program choices.

3. The Self-Direct project is fully-staffed, and process improvements have increased the processing speed and application approval with the PUCO. If the on-line application becomes operational in 2013 it may further increase satisfaction with the application process for those who are willing to use it.

**Recommendation:** Consider selecting three to five Solution Providers and customers with varied levels of experience with the program to 'test' the online application process before it is offered to all Solution Providers and customers.

4. The program is exceeding its kWh goals and a few customers are actually using the incentive to fund other energy efficiency projects, thereby helping AEP Ohio achieve one of its qualitative program goals.
5. Some customers still indicate frustration with the length of time needed for processing projects.

**Recommendation:** The program is, overall, running quite smoothly. AEP Ohio and DNV KEMA investigate a more efficient process for reviewing the Self-Direct program applications.



## Appendix A. Participant Telephone Survey Instrument

### AEP Ohio Evaluation for the Self Direct Program

#### Customer Participant Survey

March 21, 2013

INTRODUCTION. Hello, this is <INTERVIEWER NAME> calling from Blackstone Group on behalf of AEP Ohio. This is not a sales call. May I please speak with <APPLICATIONCONTACTNAME>?

[IF NEEDED]: My understanding is that <APPLICATIONCONTACTNAME> is responsible for making energy-related decisions for your firm at <SERVICE ADDRESS> and was listed as the primary contact when <ORGANIZATION NAME> participated in AEP Ohio's Self Direct Program. May I please speak with him/her?

**1. NO, THIS PERSON NO LONGER WORKS HERE → IS THERE SOMEONE ELSE THAT IS INVOLVED WITH FACILITY IMPROVEMENTS OR BUILDING OPERATIONS THAT MIGHT BE FAMILIAR WITH <ORGANIZATIONNAME>'S PARTICIPATION IN AEP OHIO'S SELF DIRECT PROGRAM? [REPEAT INTRODUCTION WITH NEW CONTACT]**

**2. NO, THIS PERSON IS NOT AVAILABLE RIGHT NOW [ASK WHEN AVAILABLE OR LEAVE MESSAGE. SCHEDULE CALL BACK]**

**3. YES – SKIP TO Q2**

**97 NO, OTHER REASON (THANK & TERMINATE)**

**98. DON'T KNOW (THANK & TERMINATE)**

**99. REFUSED (THANK & TERMINATE)**

Q2. Hello, my name is <INTERVIEWER NAME> calling from Blackstone Group on behalf of AEP Ohio. We're calling to do a follow-up survey about your firm's participation in the Self Direct program. Do you recall participating in the Self Direct Program on or about <ACTUALPROJECTCOMPLETIONDATE>?

**1 YES → CONTINUE TO Q3**

**2 NO → [DESCRIBE PROGRAM = *the self-direct program provides rebates for energy efficient projects completed within the previous three years and ask if they were involved.* IF STILL NO RECALL → MAY I SPEAK WITH SOMEONE WHO IS LIKELY TO BE RESPONSIBLE FOR FACILITY IMPROVEMENTS?] [REPEAT INTRODUCTION WITH NEW CONTACT]**

**3 THERE IS NO ONE HERE WITH INFORMATION ON THAT ADDRESS/WRONG ADDRESS – (THANK & TERMINATE)**

[IF NEEDED] Blackstone Group is an independent consulting firm hired by AEP Ohio to learn about customer experiences with its Self Direct program and to help AEP Ohio improve its programs for the future.



[IF NEEDED] This is a very important fact-finding survey with companies that have recently participated in an energy efficiency program sponsored by AEP Ohio. We are NOT interested in selling anything, and we are primarily interested in gaining your feedback on the Self Direct program to help AEP Ohio improve the services it provides to its customers in the future. Your responses will not be connected with your firm in any way and will be summarized with responses we get from other businesses that we talk with.

**Q3.** Great. Are you the person responsible or were you involved with your company's decision to participate in the program, or were you the main point of contact with AEP Ohio?

**1** Yes → Great. We would like to ask you some questions about this program, which should only take about 15 to 20 minutes.

**2** No → Ask for contact name and repeat introduction in Q2.

Now I'd like to ask you some questions about the project you submitted.



### Introduction

Q4. How did you first hear about the financial incentives available through the Self-Direct program? (SINGLE PUNCH) (DO NOT READ LIST)

1. AEP OHIO ACCOUNT MANAGER
2. AEP OHIO WEBSITE
3. WORKSHOP/GREEN RIBBON KICKOFF EVENT
4. CONTRACTOR/TRADE ALLY/SOLUTION PROVIDER
5. EMAIL
6. FRIEND/COLLEAGUE/WORD OF MOUTH
7. BILL INSERT
8. WEBINAR
9. SPEAKER/PRESENTATION AT AN EVENT
10. NEWSLETTER
11. VENDOR
14. SUPPLIER
17. SALES REPRESENTATIVE
00. OTHER, SPECIFY \_\_\_\_\_
98. DON'T KNOW
99. REFUSED

5. Since then, from what other sources have you heard about the program? (MULTIPLE RESPONSES ACCEPTED) (DO NOT READ LIST)

1. AEP OHIO ACCOUNT MANAGER
2. AEP OHIO WEBSITE
3. WORKSHOP/GREEN RIBBON KICKOFF EVENT
4. CONTRACTOR/TRADE ALLY/SOLUTION PROVIDER
5. EMAIL
6. FRIEND/COLLEAGUE/WORD OF MOUTH
7. BILL INSERT
8. WEBINAR
9. SPEAKER/PRESENTATION AT AN EVENT
10. NEWSLETTER
11. VENDOR
14. SUPPLIER
17. SALES REPRESENTATIVE
18. HAVEN'T HEARD FROM ANY OTHER SOURCES (MAKE EXCLUSIVE)
00. OTHER, SPECIFY \_\_\_\_\_
98. DON'T KNOW
99. REFUSED

### Role of Solution Provider

6. Who identified the opportunity for the AEP Ohio Self-Direct Program incentive in 2012? [DO NOT READ; SINGLE RESPONSE]



1. ME/RESPONDENT
2. CONTRACTOR/TRADE ALLY/SOLUTION PROVIDER
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

Ask Q7 and Q8 if Q6 = 2; OTHERWISE SKIP TO Q9

7. What type of solution provider/contractor told you about the program? [DO NOT READ; SINGLE RESPONSE]

1. LIGHTING CONTRACTOR
2. HVAC CONTRACTOR
3. ELECTRICAL CONTRACTOR
4. GENERAL CONTRACTOR
5. ENGINEER
6. ARCHITECT
97. OTHER, SPECIFY \_\_\_\_\_
98. DON'T KNOW
99. REFUSED

8. What role did the solution provider or contractor play in your decision to participate in the program?

- OPEN ENDED RESPONSE \_\_\_\_\_
98. DON'T KNOW
  99. REFUSED

***Participation in the Self-Direct Program***

9. What were the primary reasons your company participated in the AEP Ohio Self-Direct Program?

[DO NOT READ ; ACCEPT MULTIPLE ANSWERS] (SP TEAM: ALPHABETIZE LIST)

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

10. Did you participate in the Self Direct Program in 2009, 2010, or 2011? (ACCEPT MULTIPLE RESPONSES)

- 1. 2009
- 2. 2010
- 3. 2011
- 98. DON'T KNOW
- 99. REFUSED



### ***A.1 Spillover Module (New)***

Thank you for discussing your participation in the Self-Direct Program. Next, I would like to discuss any energy efficient equipment you might have installed outside of the program.

SP1 Since your participation in the AEP Ohio Self-Direct program, did you implement any **additional** energy efficiency projects at this facility or at your other facilities within AEP Ohio's service territory that did **not** receive incentives through any utility or government program?

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

[ASK SP2-SP5i IF SP1=1, ELSE SKIP TO Q11]

SP2 What type of projects did you implement (DO NOT READ, PROBE FROM LIST, IF NECESSARY.)  
(MULTIPUNCH) (SP TEAM: ALPHABETIZE LIST)

- 1 LIGHTING
- 2 HVAC
- 3 REFRIGERATION
- 4 MOTORS
- 5 VARIABLE SPEED DRIVES (VSD)
- 6 CONTROL/OCCUPANCY SENSORS
- 7 COMPRESSED AIR: AIR DRYER
- 00 OTHER, SPECIFY \_\_\_\_\_
- 96 DIDN'T IMPLEMENT ANY MEASURES (MAKE EXCUSE)
- 98 DON'T KNOW
- 99 REFUSED

[SKIP TO Q11 IF SP2=96, 98, 99]

### ***A.2 SPILLOVER PROJECT***

SP5 I have a few questions about the projects that you installed. (IF NEEDED, READ BACK MEASURE:  
<SP2 RESPONSE>) [OPEN END]

a. Why did you install this project without an incentive through an AEP Ohio Business Program?  
[OPEN END]

- 98 DON'T KNOW
- 99 REFUSED

b. How many projects did you install without an incentive? [NUMERIC OPEN END]

- 98 DON'T KNOW
- 99 REFUSED

SP5f. Was this project specifically recommended by a program related audit, report or program technical specialist?



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

SP5g. How significant was your experience in the AEP Ohio Program in your decision to implement this project outside the program, using a scale of 0 to 10, where 0 is not at all significant and 10 is extremely significant?

- 00. NOT AT ALL SIGNIFICANT
- 01.
- 02.
- 03.
- 04.
- 05.
- 06.
- 07.
- 08.
- 09.
- 10. EXTREMELY SIGNIFICANT
- 98. DON'T KNOW
- 99. REFUSED

[SKIP SP5h IF SP5g = 98, 99]

SP5h. Why do you give it this rating?

- 00. [OPEN END]
- 98. DON'T KNOW
- 99. REFUSED

SP5i. If you had not participated in the AEP Ohio program, how likely is it that your organization would still have implemented this project? Using a 0 to 10, scale where 0 means you definitely WOULD NOT have implemented this project and 10 means you definitely WOULD have implemented this project.

- 00. DEFINITELY WOULD NOT HAVE IMPLEMENTED THIS PROJECT
- 01.
- 02.
- 03.
- 04.
- 05.
- 06.
- 07.
- 08.
- 09.
- 10. DEFINITELY WOULD HAVE IMPLEMENTED THIS PROJECT
- 98. DON'T KNOW
- 99. REFUSED





### *A.3 Consistency Checks for Spillover*

[ASK CC1a IF SP5g<4 AND SP5i <4]

CC1a When you answered ...<SP5g RESPONSE> ... for the question about the influence of the AEP Ohio Program on your decision to install this project, I would interpret that to mean the Program was not very important to your decision. However, when you answered the previous question, it sounds like it was very likely that you would not have installed the project without your participation in the AEP Ohio Program. Can you please explain the role the program made in your decision to implement this project?

- 00 [RECORD VERBATIM]
- 98 DON'T KNOW
- 99 REFUSED

[ASK CC1b IF SP5g>7 AND SP5i >7]

CC1b When you answered ...<SP5g RESPONSE> ... for the question about the influence of the AEP Ohio Program on your decision to install this measure, I would interpret that to mean the Program was quite important to your decision. However, when you answered the previous question, it sounds like it was very likely that you would have installed this measure had you not participated in the AEP Ohio Program. Can you please explain the role the program made in your decision to implement this measure?

- 00 [RECORD VERBATIM]
- 98 DON'T KNOW
- 99 REFUSED

### *The Application*

11. Who was primarily responsible for preparing the incentive application (including the required supporting documentation)? (DO NOT READ, SINGE PUNCH)

- 1. RESPONDENT
- 2. TRADE ALLY/SOLUTION PROVIDER
- 3. ANOTHER COMPANY EMPLOYEE
- 4. OTHER \_\_\_\_\_
- 98. DON'T KNOW
- 99. REFUSED

(ASK Q12 AND Q13 IF Q11=1)

12. How would you rate the process for completing the Self-Direct application? Please use a scale of 0 to 10 where 0 is "very difficult" and 10 is "very easy".

00. VERY DIFFICULT

- 01.
- 02.
- 03.
- 04.
- 05.
- 06.
- 07.



- 08.
- 09.
- 10. VERY EASY
- 98. DON'T KNOW
- 99. REFUSED

**13.** Was it clear to you what you needed to submit to qualify for the Self-Direct Program?

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

ASK Q14 IF Q13 = 2

**14.** What was unclear to you?

- 00. (OPEN END)
- 98 DON'T KNOW
- 99 REFUSED

**15.** Did your organization experience any delays in preparing the Self-Direct incentive application?

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

**16.** What level of support was provided by AEP Ohio?

- 00.(OPEN END)
- 98 DON'T KNOW
- 99 REFUSED

**17.** Do you plan to participate in the Self-Direct program in the future?

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

(If Q17 = 1, ASK Q18, ELSE SKIP TO Q19)

**18.** Why do you choose to participate in the Self-Direct Program rather than the Prescriptive or Custom Programs?

READ DESCRIPTION IF NEEDED: AEP Ohio's Prescriptive Incentive Program offers businesses set financial incentives for the implementation of energy-efficient improvements and technologies that reduce energy consumption.



READ DESCRIPTION IF NEEDED: The Custom Program is designed to address any cost-effective electricity saving measure not addressed or offered yet through other AEP Ohio programs, including prescriptive incentives. Projects in the Custom Program are more complex and address a system or process, often requiring unique design and technology solutions for each participant.

- 00. (OPEN END)
- 98 DON'T KNOW
- 99 REFUSED

#### *The Incentive Level*

19. Are you satisfied with the level of incentives offered through the Self Direct program?

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

20. Will the incentive payment be used to conduct future energy efficiency projects?

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

(ASK Q21 IF Q20=2)

21. Why not?

- 00. (OPEN END)
- 98 DON'T KNOW
- 99 REFUSED

#### *Communications*

22. How would you rate the communications between your organization and AEP Ohio during your program participation? Please use a scale of 0 to 10 where 0 is "very difficult" and 10 is "very easy".

00. VERY DIFFICULT

- 01.
- 02.
- 03.
- 04.
- 05.
- 06.
- 07.
- 08.
- 09.

10. VERY EASY

97. DID NOT HAVE ANY DIRECT COMMUNICATIONS

98. DON'T KNOW



99. REFUSED

23. How would you rate the communications between your organization and the implementer, KEMA, during your program participation? Please use a scale of 0 to 10 where 0 is "very difficult" and 10 is "very easy".

00. VERY DIFFICULT

01.

02.

03.

04.

05.

06.

07.

08.

09.

10. VERY EASY

97. DID NOT HAVE ANY DIRECT COMMUNICATIONS

98. DON'T KNOW

99. REFUSED

24. Were you informed that final payment required approval by the Public Utility Commission before you received your incentive payment?

1 YES

2 NO

98 DON'T KNOW

99 REFUSED

25. Were you informed about the progress of your project during your program participation?

1 YES

2 NO

98 DON'T KNOW

99 REFUSED

26. Did a representative of KEMA visit your facility to verify the installation of the equipment for which you received an incentive?

1 YES

2 NO

98 DON'T KNOW

99 REFUSED

(ASK Q27 IF Q26 = 1)

27. How would you rate your satisfaction with the site visit from KEMA?

Please use a scale of 0 to 10 where 0 is "very dissatisfied" and 10 is "very satisfied".

00. VERY DISSATISFIED



- 01.
- 02.
- 03.
- 04.
- 05.
- 06.
- 07.
- 08.
- 09.
- 10. VERY SATISFIED
- 98. DON'T KNOW
- 99. REFUSED

(ASK IF Q27 = LESS THAN 4)

28. Why do you say that?

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

#### *Program Improvements*

29. Overall, on a scale from 0 to 10, how satisfied were you with the Self Direct Program? Please use a scale of 0 to 10 where 0 is "very dissatisfied" and 10 is "very satisfied".

- 00. VERY DISSATISFIED
- 01.
- 02.
- 03.
- 04.
- 05.
- 06.
- 07.
- 08.
- 09.
- 10. VERY SATISFIED
- 98. DON'T KNOW
- 99. REFUSED

30. How do you think the program can be improved?

- 31.
- 00. (OPEN END)
- 98 DON'T KNOW
- 99 REFUSED

32. Are the current economic conditions affecting your ability to participate in other AEP Ohio energy efficiency programs?



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

(IF Q31 = 1 ASK Q32)

33. Can you tell me which program and how economic conditions are affecting you?

- 00 OPEN END
- 98 DON'T KNOW
- 99 REFUSED

#### *A.4 Customer Background*

We are almost finished. I'd just like to get some general background information about <COMPANY> and your responsibilities there. (DO NOT READ, SINGLE PUNCH)

34. What is your title at your company?

- 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) \_\_\_\_
- 98 DON'T KNOW
- 99 REFUSED

35. What is <ORGANIZATIONNAME>'s primary business activity at this particular facility at (<SERVICE ADDRESS>)? [RECORD ONE] (DO NOT READ LIST) (SP TEAM: ALPHABETIZE LIST)

- 1 OFFICE
- 2 RETAIL (NON-FOOD)
- 3 COLLEGE/UNIVERSITY
- 4 SCHOOL
- 5 GROCERY STORE
- 6 RESTAURANT
- 7 HEALTH CARE
- 8 HOSPITAL
- 9 HOTEL OR MOTEL
- 10 WAREHOUSE/DISTRIBUTION
- 11 CONSTRUCTION
- 12 COMMUNITY SERVICE/CHURCH/TEMPLE/ MUNICIPALITY
- 13 INDUSTRIAL PROCESS/ MANUFACTURING/ ASSEMBLY – TYPE?



- 14 CONDO ASSOC./APARTMENT MGMT.
- 15 OTHER (PLEASE SPECIFY) \_\_\_\_\_
- 98 DON'T KNOW
- 99 REFUSED

36. About how many full-time employees work at this location? (RANGE 0-5000)

&EMP # OF EMPLOYEES

- 98 DON'T KNOW
- 99 REFUSED

37. Does <ORGANIZATIONNAME> own or lease this facility?

- 1 OWN
- 2 LEASE
- 98 DON'T KNOW
- 99 REFUSED

(ASK IF Q36=2 ASK Q37)

38. Do you pay the electric bill?

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

39. Is the company headquarters in Ohio or elsewhere?

- 1 HQ IN OHIO
- 2 HQ ELSEWHERE, OUTSIDE OF OH
- 98 DON'T KNOW
- 99 REFUSED

40. Do you have any other comments or suggestions for us?

RECORD VERBATIM ANSWER\_\_\_\_\_

- 98 DON'T KNOW
- 99 REFUSED

Those are all the questions I have for you today. Thank you so much for your time, your insights are extremely valuable to AEP Ohio.

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## APPENDIX L

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# NON-RESIDENTIAL NEW CONSTRUCTION PROGRAM

## Program Year 2012 Evaluation Report

Prepared for:  
AEP Ohio



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May 6, 2013



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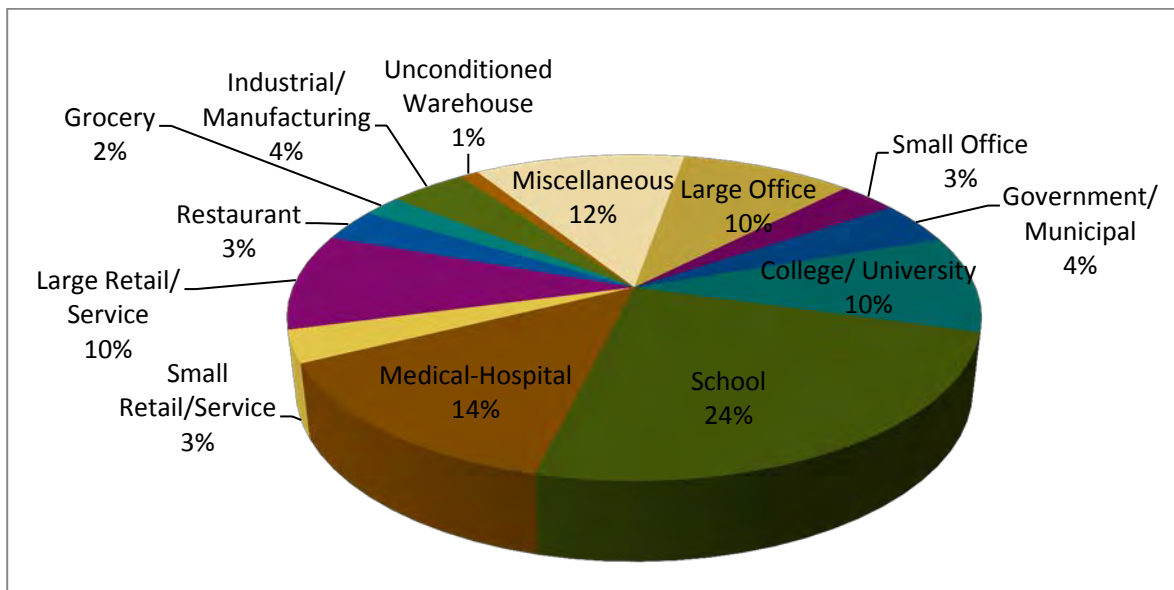
## Executive Summary

AEP Ohio's Non-Residential New Construction (NRNC) Program provides support for customers building a new facility or undertaking a major renovation to incorporate higher levels of energy efficiency in their building design. The program is divided into three approaches, 1) Prescriptive, 2) Custom, and 3) Whole Building, which are intended to meet the needs of buildings of varying size and complexity. The Prescriptive and Custom Approaches in the NRNC Program are similar to the AEP Ohio Prescriptive and Custom Programs, with the exception that lighting measures are based on Lighting Power Density calculations relative to energy code allowances. The Whole Building Approach is a comprehensive approach utilizing building energy modeling simulations for customers with larger and more complex buildings who want to maximize the energy efficiency of their new building. The program is delivered by DNV KEMA, an implementation contractor, on behalf of AEP Ohio.

### *Program Participation*

The 2012 program year is the second year of operation for the New Construction program and the second year in which Navigant has evaluated its operation. Ninety-four projects were completed at 78 unique buildings, involving the implementation some 230 measures and 11 million square feet of new or renovated buildings. A number of customers who participated in the program completed multiple projects. Sixty-two different organizations from a variety of sectors, ranging from School Boards and Hospitals to private companies and industries completed projects during the year. This compares with 86 projects completed in 2011, the program's first year of operation.

**Figure ES-1. Program Participation by Business Type**





Of the 78 participating buildings, 62 (78% of total) were for projects in new buildings while 16 were for projects involving energy efficiency improvements as part of major renovations. Figure ES-1 illustrates the number of projects tracked within each building type. Schools, college/universities and hospitals accounted for almost half (48%) of all projects completed during the year with the balance of projects being spread across a wide variety of customer sectors.

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

All participant contacts, a total of 62 unique participants, were solicited for the participant process survey. Where one contact was responsible for multiple NRNC projects, the participant was questioned regarding the largest project from an energy savings perspective. Thirty-three participants responded to the survey, 21 prescriptive participants, five custom participants and seven whole building participants. Additionally in-depth interviews were conducted with AEP Ohio program staff, DNV KEMA implementation staff, and Solution Providers that were involved in 2012 participating projects.

As part of the impact study, 82 percent of the *ex-ante* energy savings claimed projects had an engineering review of the project file savings claim. Seventy-one percent of the *ex-ante* energy savings claimed projects went through both an engineering review and an on-site verification. Table ES-1 represents the stratified population and the level of review within each stratum.

**Table ES-1. Impact Sampling Strata and Achieved Sampling**

Stratum by Approach and Energy Savings	Number of Buildings	Strata weight by Energy	Number of Desk Reviews	Number of On-Site Reviews
Whole Building Large (>1 GWh)	2	35%	2	2
Whole Building Med (>150 MWh, < 1GWh)	8	12%	6	3
Custom/Rx Large (>1 GWh)	3	26%	3	3
Custom/Rx Medium (>150 MWh, < 1GWh)	9	13%	6	3
Small (>15 MWh, <150 MWh)	42	13%	9	4
Very Small (<15 MWh)	14	1%	2	0
<b>Total</b>	<b>78</b>	<b>100%</b>	<b>28</b>	<b>15</b>





## *Key Evaluation Findings and Recommendations*

### **Key Process Findings and Recommendations**

Overall, participants were satisfied with the program. On a scale of 0-10 they gave the program an average overall score of 8.4. Twenty-four percent of surveyed participants were very satisfied, rating the program at 10 out of 10; 87 percent of respondents rated the program at 8.0 or higher. The pattern of high ratings continued into the sub-categories including ease of finding information, level of documentation required and application process. Table ES-2 summarizes the average responses of key categories surveyed.

**Table ES-2. Respondent Satisfaction with the Program**

Category	Rating (33 respondents)
Ease of Finding Information	7.8
Application Process	6.8
Level of Documentation	7.4
Overall Satisfaction	8.4

Other key process findings and recommendations include:

1. Solution Providers have made progress enrolling projects early in the design phase. Early involvement provides an opportunity to encourage high levels of energy efficiency in the project design and is important for the NRNC Program to be effective. Navigant encourages this trend.
2. The program has established a strong presence, particularly in the institutional and medical areas. Navigant believes one of the key challenges for the program lies in building awareness and understanding of the program among other types of buildings.
  - a. **Recommendation:** Increase outreach and education targeted at Solution Providers in the private building sector.
  - b. **Recommendation:** Investigate if there are particular barriers among non-participants such as flexibility or time required to participate in AEP Ohio NRNC Program. These barriers can be especially critical in design/build buildings.
3. Prescriptive NRNC projects tend towards interior lighting power density-only savings and are not reaching the potential of the prescriptive approach. Exterior lighting, lighting controls, HVAC and refrigeration are common measure categories that should have better representation in the prescriptive approach.



- a. **Recommendation:** Navigant recommends improving savings comprehensiveness through a combination of project reviews during design, and education of Solution Providers.
4. Whole Building projects use energy modeling to determine savings beyond energy code compliance. DNV KEMA reported that some Engineering firms are not willing to provide executable files to DNV KEMA in order to verify building energy simulation results. Of the 11 modeled projects Navigant sampled, eight either did not have a complete set of executable files or the executable files were not provided at all. Navigant asserts that without executable files, a comprehensive review is not possible and when errors are found it is difficult to adjust savings with accuracy. Comparing evaluations of projects with executable files available, Navigant typically finds more errors when the executable models are provided than if only input and output files are available.
  - a. **Recommendation:** Require fully executable building energy models as a requirement to obtain an incentive, including the overall incentive, the design bonus and Solution Provider incentive, from AEP Ohio. Both the baseline and the as-built model need to be provided. This recommendation was also made in 2011.
  - b. **Recommendation:** Provide a small modeling incentive, payable to either the firm that does the modeling (preferred) or the building owner. The incentive would pay for interfacing time between modeler and DNV KEMA. This will improve the efficiency of reviewing the models and help build trust between the modeling community and the NRNC Program.
  - c. **Recommendation:** Develop a confidentiality MOU letter that explains the model will only be shared among AEP Ohio, DNV KEMA, and evaluators if sampled for impact evaluation.
  - d. **Recommendation:** That Navigant be advised to deduct energy savings off of any 2013 Whole Building projects where both the baseline and as-built executable models are not provided.

### Key Impact Findings and Recommendations

As summarized in Table ES-3, the verified energy savings exceeded the 2012 targets of 10 GWh and 1.23 MW coincident demand reduction. The largest project had a realization rate of 0.79 for energy, driven by a modeling input error. This loss was offset primarily by lighting savings not captured in the reported energy savings claim. Realization rates on demand reduction were lower than optimal, primarily due to projects in the Whole Building Approach reporting site peak reduction rather than summer coincident reduction.



**Table ES-3. Impact Savings, Realization Rate and Precision of Sample**

Metric	<i>Ex Ante</i>	<i>Ex-post</i>	Realization Rate	Overall Relative Precision at 90% Confidence
Annual Energy Savings (MWh)	19,305	20,406	1.06	5.8%
Coincident Peak Reduction (MW)	5.31	2.98	0.56	20.2%

Other key impact findings and recommendations include:

1. New Construction project files can be considerable and complex with several design modifications over time. Without intimate knowledge of the project the details can be confusing and there exists uncertainty as to which document is the current revision.
  - a. **Recommendation:** It is suggested that all project files include an overview or summary sheet that briefly states what happened over the course of the design and construction of the building, which may span multiple years.
  - b. **Recommendation:** All project files should include a general drawing that lets the reviewer know the size, configuration and use of the buildings.
2. Large modeled projects represent both technical challenges in determining energy savings and represent significant contributions to program energy savings. Navigant found a baseline model input error on the program's largest project that was responsible for overstating energy savings.
  - a. **Recommendation:** On the largest and most complex projects, provide thorough engineering reviews by senior level engineers to challenge modeler assertions were applicable.
3. On Whole Building projects, the reported demand reduction does not appear to take into consideration coincidence with the summer peaking period.
  - a. **Recommendation:** Obtain energy models and run with the coincident peak period. Check that demand savings equals the reported coincident demand reduction.
4. Per energy code, most spaces require either a method of uniformly reducing light levels by at least 50 percent or the inclusion of occupancy control. This can be achieved cost effectively by allowing for manual bi-level switching. Occupancy control in lieu of manual light reduction represents energy savings beyond code minimum.



- a. **Recommendation:** Specify that DNV KEMA calculate the difference in energy savings between minimally complying with energy code (bi-level switching) and the as-built lighting controls which may include occupancy sensors.



## 1 Introduction and Purpose of Study

### 1.1 Program Overview

AEP Ohio's Non-Residential New Construction (NRNC) Program provides support for customers building a new facility or undertaking a major renovation to incorporate higher levels of energy efficiency in their building design. The program is divided into three approaches, 1) Prescriptive, 2) Custom, and 3) Whole Building, which are intended to meet the needs of buildings of varying size and complexity. The Prescriptive and Custom approaches in the NRNC Program are similar to AEP Ohio's Prescriptive and Custom Programs, with the exception that lighting measures are based off of Lighting Power Density calculations relative to energy code allowances. The Whole Building approach is a comprehensive approach utilizing building energy modeling simulations for customers with larger or more complex buildings that want to maximize the energy efficiency of their new building. The program is delivered by DNV KEMA, an implementation contractor, on behalf of AEP Ohio.

### 1.2 Evaluation Objectives

This report presents the findings from the impact and process evaluations of the AEP Ohio Non-Residential New Construction Program (NRNC) for 2012. The objectives of the evaluation were to: (1) quantify energy and summer peak demand savings impacts at the meter 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. Specific process evaluation questions are summarized in section 3.3 (Process Findings).

### 1.3 Evaluation Methods

For this report, program impacts for the NRNC Program were evaluated in terms of energy and demand savings. A portion of the completed project population was sampled with the intention of achieving 90% confidence and a 10% precision on both the program energy and demand savings.

The *ex-post* energy and demand savings of the sampled projects were determined by engineering review of the project files, engineering review of the *ex-ante* savings analysis, inspection of the building energy models and/or site verification of the installed components of the energy efficiency measures designed for the subject buildings. Summer coincident peak savings is determined by engineering analysis of the savings potential during the peak period or by adjusting demand savings with a published coincidence factor for summer peak demand.

Data collection activities are summarized in Table 1-1. Primary data collection efforts included in-depth telephone interviews with program staff at AEP Ohio, DNV KEMA (the program implementer) and a group of Solution Providers involved in whole building projects. A telephone survey was conducted with the program participants who were willing to answer the survey.



A program logic model was not developed by AEP Ohio or DNV KEMA during the development of the Non-Residential New Construction Program. Consequently, Navigant interviewed staff from AEP Ohio and DNV KEMA, reviewed program materials and reviewed strategy documents to gain an understanding of program logic, expected inputs, outputs and outcomes for the program.

**Table 1-1. Summary of Data Collection Activities**

Data Collection Type	Targeted Population	Supported Evaluation Activities
Review of Program Documentation	Program documentation and marketing materials new for 2012	Process Evaluation
Secondary Literature Review	Publicly-available evaluations of other utility non-residential new construction programs; reports of construction practices in absence of utility programs	Impact and Process Evaluation
In-depth Telephone Interviews	AEP Ohio Program staff	Process Evaluation
	DNV KEMA staff	Process Evaluation
Telephone Surveys	Program Participants	Impact and Process Evaluation
Trade Ally Interviews	Solution Providers involved in Whole Building projects.	Process Evaluation
Project File Review	Sample of completed projects	Impact and Process Evaluation
On-site Verification	Sample of completed projects	Impact and Process Evaluation
Tracking Data Review	All program participants	Impact and Process Evaluation



## 2 Methodology

This section describes the methodology used to conduct the process and impact evaluations. A high-level overview of the steps taken to collect and analyze the data for this evaluation is described in section 2.1. This is followed by a discussion of the research questions that guided the evaluation and the tasks completed as part of the process evaluation; including the review of tracking data, the marketing activities and participation. Finally, the methods used for primary data collection tasks and in analyzing the impact and process data are discussed.

### 2.1 *Overview of Approach*

This evaluation was driven by three overarching objectives: (1) quantify energy and summer coincident 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. To meet these objectives, the evaluation team undertook the following activities.

1. **Evaluation Questions.** Established key evaluation questions as part of developing the 2012 evaluation plan with AEP Ohio staff.
2. **Tracking Data Review.** Reviewed the program tracking data collected by DNV KEMA and provided to the evaluation team by AEP Ohio.
3. **Review of Marketing Activities.** Reviewed the overall marketing activities and approach as implemented by DNV KEMA.
4. **Review of Participation.** Reviewed program participation by building type, program approach, completion date, and geographic location.
5. **Primary Data Collection.** Performed primary data collection, including: in-depth interviews with program staff, the implementation team, interviews with solution providers, telephone surveys of program participants, file review for a subset of randomly selected projects, and on-site verification for a randomly selected subset of the file reviewed projects.
6. **Methods Used to Analyze Impact Data.** Quantified energy and demand reduction savings by reviewing project files. File reviews included verifying engineering calculation and building model simulations. On-site visits included verification of equipment specifications and quantities for a subset of randomly selected projects.
7. **Methods Used to Analyze Process Data.** Assessed the effectiveness of the program processes by analyzing program documents, the results of in-depth interviews with program staff at AEP Ohio and DNV KEMA, program tracking data, and participant survey data.



## 2.2 Key Evaluation Questions

Navigant examined the following key questions regarding the NRNC program:

### Program Impacts

- *What program impacts were realized in the 2012 NRNC program? What realization rates were documented and what were the principal factors driving those rates?*
- *Cost Effectiveness – What were the costs and benefits of the 2012 program?*
- *What steps can be taken to improve the realization rates or cost effectiveness of the program?*

### Program Process

- *What program changes were made in 2012 in response to 2011 evaluation findings or to other assessments of the program's effectiveness? What additional changes are needed?*
- *Has the program marketing been effective in bringing participants into each of the program approaches? Are there changes that should be initiated to further optimize marketing effectiveness?*
- *How satisfied are participants and Solution Providers with current program processes, including the application and review processes, program incentives, support for emphasizing more energy efficiency enhancements in LEED-oriented and other projects?*
- *Does the program collect all necessary project data in the program tracking database? Does the database lend itself to appropriate analyses, through appropriate structures and transparency of key fields and other database aspect?*

## 2.3 Tracking Data Review

Program tracking data is critical for determining the impacts of the New Construction Program. A copy of the program tracking data collected by DNV KEMA was provided by AEP Ohio to the evaluation team.

- » The evaluation team reviewed all of the fields recorded on the application forms and cross checked the collected data fields against the fields recorded in the tracking database to identify data fields essential for consideration in the impact and process evaluations.
- » Key data fields in the database were reviewed to identify missing, incomplete, or inconsistent data.
- » The data collected was also reviewed to identify any additional information that would be helpful in evaluating program performance.

## 2.4 Review of Marketing Activities

Marketing collateral, application forms and other materials available from the AEP Ohio website were reviewed and additional marketing material was requested from AEP Ohio and DNV KEMA. Information on marketing, communications and outreach efforts was also obtained from both AEP Ohio and DNV KEMA.





## **2.5 Review of Participation**

The evaluation team used the program tracking data to analyze participation by a number of key factors including building type, completion date, program approach (Whole Building, Prescriptive and Custom), and geographic location. The analysis focused on metrics such as number of participants and impact results. The results of this analysis are presented, in part, in the discussion of program activity in section 3.

## **2.6 Primary Data Collection**

Primary data collection included in-depth interviews with program actors and trade allies (solution providers), surveys of program participants and review of program tracking data. Marketing activities, application forms and other program inputs were also analyzed.

In-depth qualitative interviews were completed with AEP Ohio, DNV KEMA and Solution Providers involved in the program. Telephone surveys were conducted with participating customers to better understand customer satisfaction and perceptions related to the Non-Residential New Construction Program. The interviews and surveys were informed by prior review of relevant program tracking databases, documents, and other materials to understand how the program worked and how it has been marketed for 2012.

Discussion guides were developed allowing a structured but open-ended interview. A free-flowing discussion resulted between interviewer and respondent and real time interviewing flexibility was achieved. Staff experienced in new building programs and program evaluations were used to perform the interviews. Interviews were conducted by telephone in order to provide flexibility to the respondents' schedules.

The participant surveys were developed with a combination of short answer questions and open-ended discussions allowing for quantitative analysis and qualitative evaluation of the program. Blackstone Group conducted the survey with executive interviews capable of asking follow-up questions depending on the direction of the survey. Interviews were conducted by telephone in order to provide flexibility to the respondents' schedules.

### **2.6.1 Population and Sampling for Process Study**

As discussed in section 3.1, a total of 94 projects at 78 unique premises were completed during 2012. All participant contacts, a total of 62 unique participants, were solicited for response. Where one contact was responsible for multiple NRNC projects, the participant was questioned regarding the largest project from an energy savings perspective. Thirty-three participants responded to the survey, 21 prescriptive participants, five custom participants and seven whole building participants.

The respondent of the survey was identified as the decision maker who is the most knowledgeable about the customer's decision to participate and resulting interaction with the program. Some participants had multiple projects and/or premises. The survey focused on the largest individual project for clarity.



Survey data was analyzed to determine the number and proportion of responses to each question or possible response. Verbatim responses were also reviewed to obtain an overall sense of participant perceptions of the program and to identify feedback or suggestions that were not anticipated in closed questions. The survey instrument is included in Appendix B.

## **2.6.2 Sampling Error/ Expected Precision**

In selecting the sample for the participant survey, participants with multiple projects were only added to the sample once. As a result, each unique participant might represent multiple projects. The number of responses obtained from participants in the survey represents a 53 percent response rate from these selected 'unique' participants. This sample size provides a +/-10% margin of error at a confidence level of 90%<sup>1</sup>.

## **2.7 Methods Used to Analyze Impact Data**

Completed projects were divided into six strata based on *ex-ante* energy savings and program approach. A random sample was selected from each stratum to be analyzed. Desk reviews were conducted on all sampled projects which included engineering calculations of energy savings claims and verification of baseline and as-built assumptions. Energy modeled projects were reviewed for model inputs on the baseline and as-built models. Additionally, a further random sample of desk reviewed projects was conducted to determine which projects would receive site verification. Site visits inspected equipment specifications and quantity, verified hours of operation and answered any outstanding questions. Results of on-site and desk reviews were statistically applied to the entire population to determine *ex-post* savings.

### **2.7.1 Impact Sample of Project Files**

The impact sample for 2012 was chosen to achieve a 90/10 level of confidence and relative precision for the engineering documentation review. Navigant used the stratified ratio estimation protocol based on premise size and program approach to design the sample. There were some buildings that had multiple projects within the program year. Since these buildings underwent one efficiency effort for the building, but were divided by milestones or components of the building, Navigant decided to evaluate at the premise level rather than at the project level.

This method of stratified ratio estimation tended to select a census of the largest premises, nearly two thirds of the medium sized projects and a comparable number of smaller projects. The stratification ensured that a large proportion of premise savings is evaluated and that both energy-modeled and non-energy-modeled buildings are considered. The on-site visit sample consisted of a subset of the documentation reviewed sample and targeted more complex measures and those with large impacts. Table 2-1 summaries the sampling level conducted in 2012.

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<sup>1</sup> Number of target completes were calculated using the Raosoft web tool at <http://www.raosoft.com/samplesize.html>.



Overall, 82 percent of the *ex-ante* energy savings claimed projects went through an engineering review of the project file savings claim. Seventy-one percent of the *ex-ante* energy savings claimed projects went through both an engineering review and an on-site verification.

**Table 2-1. Impact Sampling Strata and Achieved Sampling**

Stratum	Number of Buildings	Strata weight by Energy	Number of Desk Reviews	Number of On-Site Reviews
Whole Building Large (>1 GWH/yr)	2	35%	2	2
Whole Building Medium (>150 MWH/yr, < 1GWH/yr)	8	12%	6	3
Custom/Rx Large (>1 GWH/yr)	3	26%	3	3
Custom/Rx Medium (>150 MWH/yr, < 1GWH/yr)	9	13%	6	3
Small (>15 MWH/yr, <150 MWH/yr)	42	13%	9	4
Very Small (<15 MWH/yr)	14	1%	2	0
<b>Total</b>	<b>78</b>	<b>100%</b>	<b>28</b>	<b>15</b>

### 2.7.2 Ex-post Energy Savings Calculation

Energy savings calculations were conducted in accordance with published methodologies such as regional Technical Reference Manuals (TRM) and accepted engineering approaches as appropriate. Energy modeled buildings were evaluated in accordance to ASHRAE 90.1 – Appendix G. The baseline was determined using the appropriate energy code for the building as reported by DNV KEMA project files. Since the Ohio energy code changed in November of 2011, if Navigant could not determine the appropriate energy code to apply, we assumed any building that was completed by December 31, 2011 as being subject to the older code, International Energy Conservation Code (IECC) 2006 or ASHRAE 90.1-2004. Buildings completed in 2012 were assumed to be subject to IECC 2009 or ASHRAE 90.1-2007. Lighting was analyzed via lighting power density calculations using the area method. Standard approaches were taken with HVAC, shell, appliances, and other equipment.

Prescriptive and custom projects used regional published TRM coincidence factors to determine summer coincident peak, where possible. When executable energy models were available, the models were analyzed for run hours during the actual peak period.

### 2.7.3 Realization Rates Calculation Method

Realization rates for each stratum were calculated with the following equation:

$$RR = \frac{\sum_{sampled} E_{ex-post}}{\sum_{sampled} E_{ex-ante}}$$

Where:

E = the energy savings or demand reduction for each project in the stratum



Realization rates in each stratum were applied to the project population of that stratum with the following equation:

$$E_{i,ex-post} = RR_{stratum} * E_{i,ex-ante}$$

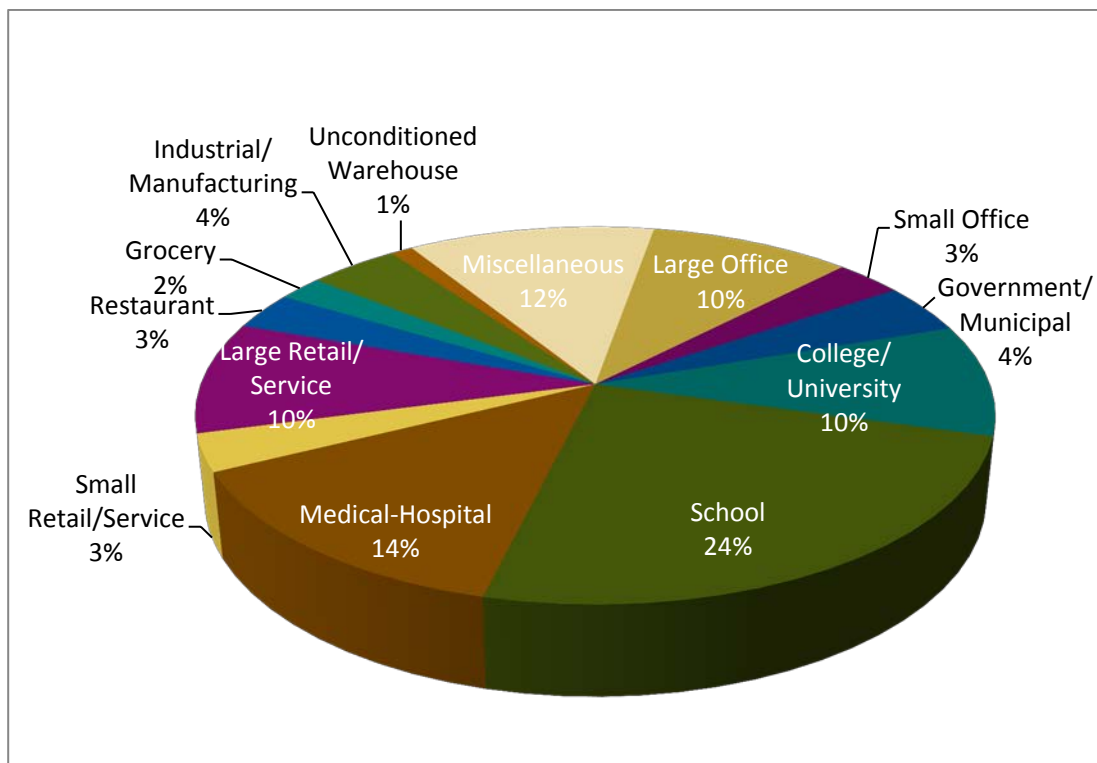
The above equations were used with the claimed savings as the *ex-ante* values and the desk reviews as the *ex-post* values to determine desk verified savings for all projects. The process was repeated to determine field verified *ex-post* savings, where desk verified savings serve as the *ex-ante* value in the above equations.

## 2.8 Methods Used to Analyze Process Data

In addition to estimating the level of confidence associated with the survey results, Navigant compared the characteristics of the respondents with the demographics of the population of projects in 2012. A number of the survey respondents were responsible for multiple projects under the program. Overall, the survey respondents represented projects that accounted for approximately 38 percent of the *ex-ante* program savings.

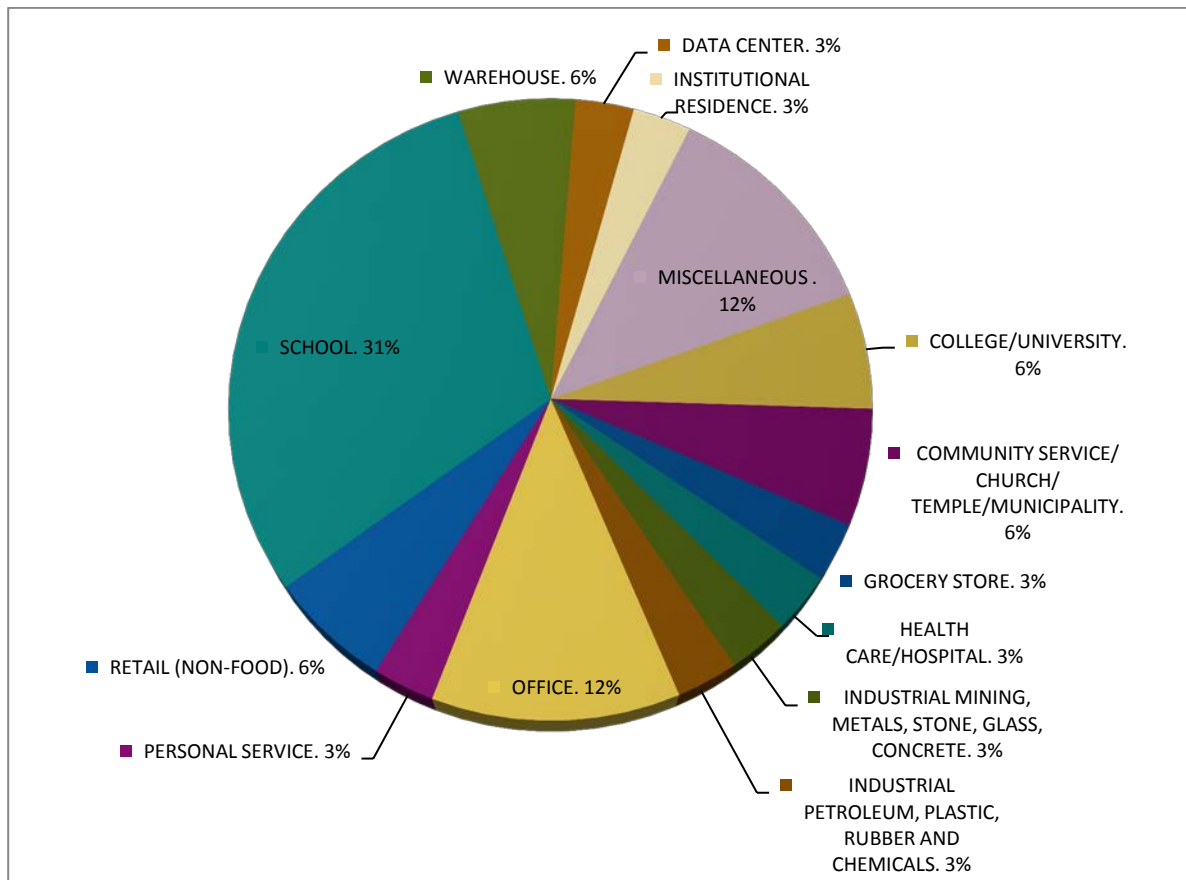
As Figure 2-1 and Figure 2-2 illustrate, the sample population over-represents schools, and colleges and universities, while under-representing retail and offices. Schools actually comprise almost 60 percent of the whole building approach, among those surveyed.

**Figure 2-1. Program Participation by Business Type**





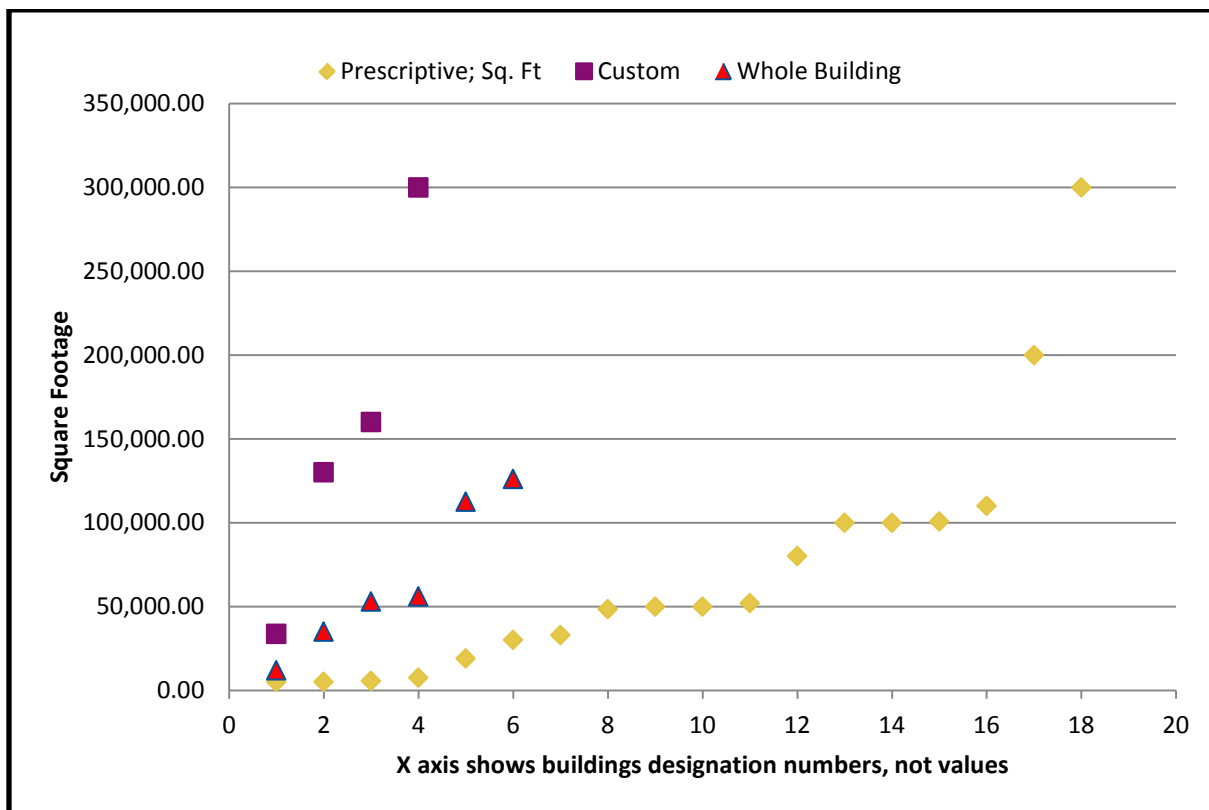
**Figure 2-2. Survey Respondents by Business Type**



The estimated average floor area for the population of projects included in the 2012 program was about 53,000 square feet. The estimated average size of projects for respondents to the survey was 72,000 square feet for prescriptive participants and 186,000 square feet for whole building/custom participants, using the largest participant project as the survey reference. Given the relatively small number of projects included in the sample, the difference between the population and the respondents is not surprising. The averages somewhat mask the distribution of building sizes among the surveyed respondents. Floor area for five projects was not available. Figure 2-3 shows the distribution of building sizes. The x-axis shows the individual buildings, for visual clarity only.



**Figure 2-3. Distribution of Building Area by Building and Program Approaches (n=28)**





### 3 Detailed Evaluation Findings

#### 3.1 Program Activity

The 2012 program year represents the second year of operation for the New Construction program and the second year in which Navigant has evaluated its operation. Ninety-four projects were completed at 78 unique buildings, involving the implementation of 230 measures, involving 11 million square feet<sup>2</sup> of new or renovated buildings. A number of customers who participated in the program completed multiple projects. Sixty-two different organizations from a variety of sectors, ranging from School Boards and Hospitals to private companies and industries completed projects during the year.

Of the 78 participating buildings, 62 (79% of total) were for projects in new buildings while 16 were for projects involving energy efficiency improvements as part of major renovations. Schools, college/universities and hospitals accounted for almost half (48%) of all projects completed during the year with the balance of project being spread across a wide variety of economic sectors. However when analyzing by participating buildings, school, retail and offices buildings were the most common, comprising over 50 percent of the premises. “Miscellaneous” projects accounted for 12 percent of total projects. On closer examination it appears that some of these projects could be identified within specific business type categories already categorized. Table 3-1 summarizes the key program indicators.

**Table 3-1. Program Summary**

	Total	Average per Reporting Project	No. of Projects Reporting
Total Project Cost	\$6,640,814	\$70,647	94
Floor Area (estimated. sq. ft.)	11,002,248	150,716	73
Amount of Incentives	\$1,715,596	\$18,251	94
Energy Savings Reported to Program (MWh)	19,305	205	94
Demand Savings Reported to Program (MW)	5.31	0.057	94

Total energy savings reported for the program amounted to 19,305 MWh, while the reported demand reduction totaled 5.31 MW (see Table 3-1 above). This substantially exceeds the target of 10,000 MWh and 1.23 MW set for 2012.

Over \$1.7 million in incentives were paid out to program participants, for an average contribution of \$18,251 per project. Almost half of the energy savings reported came from the health and education sectors, while another third of savings were from the “miscellaneous” sector. One single project, classed

<sup>2</sup> Some double counting of building area may have occurred where multiple projects were completed at the same premise; additionally since some projects did not report building area there is some square footage of new or renovated buildings unaccounted for.



as part of the ‘miscellaneous’ group accounted for roughly one-quarter of all *ex-ante* energy savings. Somewhat surprisingly, large offices accounted for 10 percent of projects but only 2 percent of energy savings. All of the large offices used the prescriptive approach; but one used a combination of custom and prescriptive. There were six unique buildings split up over 10 projects.

Table 3-2 below shows the number of projects, incentives and savings by sector, based on information reported in the tracking database.

**Table 3-2. Summary of Savings by Sector**

Sector	No. of Projects	Calculated Values from Tracking Database			Incentives	
		Incentives	<i>Ex-ante</i> Energy Savings (MWh)	<i>Ex-ante</i> Demand Savings (MW)	\$/MWh	\$/kW
Large Office	9	\$24,316	185	0.06	131	433
Small Office	3	\$9,909	88	0.09	112	104
Government/Municipal	4	\$25,037	129	0.07	195	332
College/University	9	\$99,328	759	0.23	131	440
School	23	\$569,463	4,879	1.96	117	291
Medical- Hospital	13	\$389,514	3,918	1.25	99	312
Small Retail/Service	9	\$19,215	165	0.05	117	353
Large Retail/Service	3	\$14,183	124	0.04	115	372
Restaurant	3	\$6,652	55	0.02	122	420
Grocery	2	\$7,713	102	0.02	76	390
Industrial/Manufacturing	4	\$123,073	2,238	0.32	55	385
Unconditioned Warehouse	1	\$35,745	325	0.07	110	541
Miscellaneous	11	\$391,447	6,339	1.15	62	340
<b>Total</b>	<b>94</b>	<b>\$1,715,596</b>	<b>19,305</b>	<b>5.31</b>	<b>89</b>	<b>322</b>





Figure 3-1 shows the distribution of all 2012 NRNC projects by business type with strong representation of Schools, Medical/Hospital, Miscellaneous, Large Offices and College/University in that order.

**Figure 3-1. Projects by Business Type**

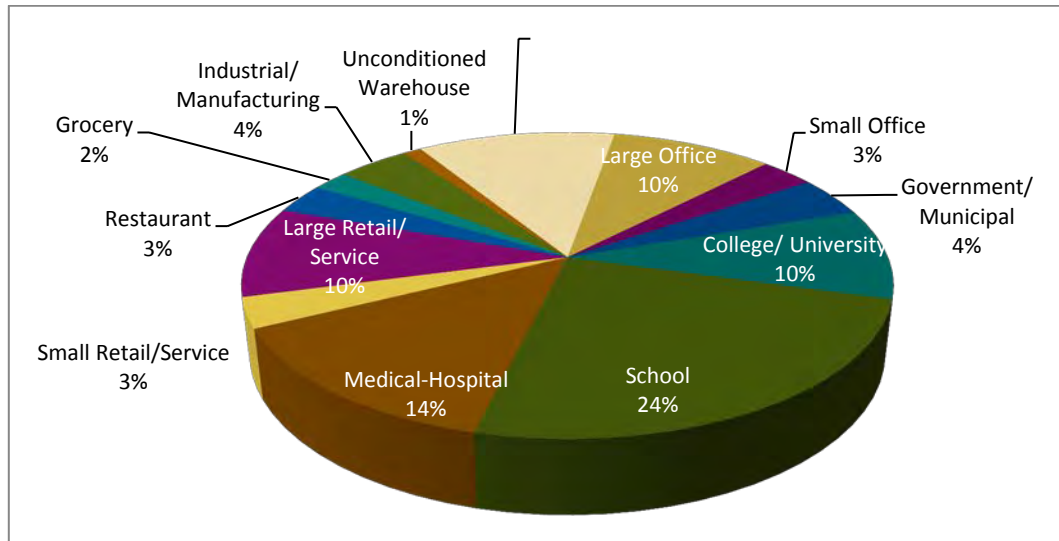
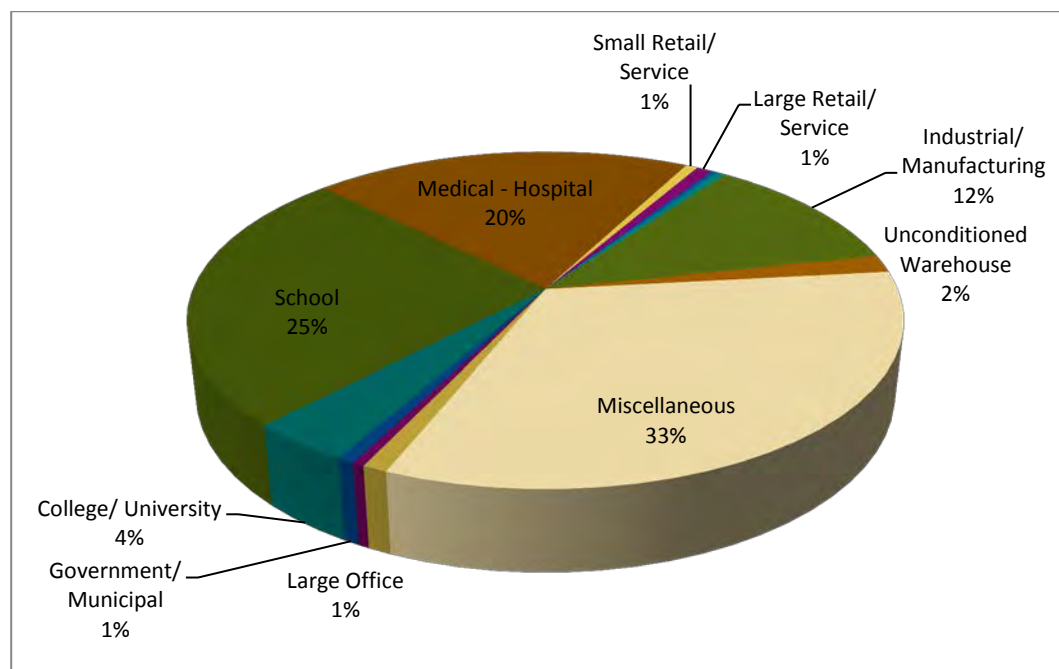


Figure 3-2 shows the distribution of 2012 savings by building type, with the largest savings coming from Miscellaneous, Schools, Hospitals and Industrial manufacturing, in that order.

**Figure 3-2. Ex-ante Energy Savings by Business Type**





The majority of projects completed in 2012 followed the Prescriptive approach; however, the largest ex-ante savings came from participants in the Whole Building approach.

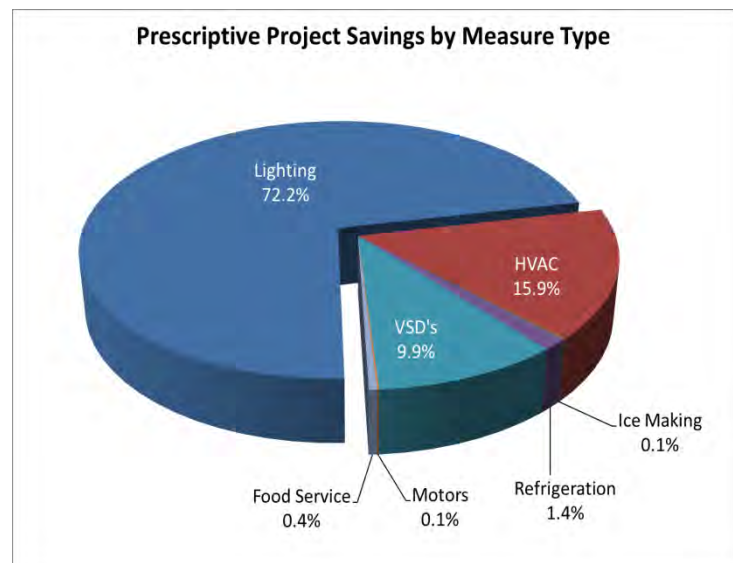
**Table 3-3. Program Activity and Ex-ante Savings by Program Approach**

Program Approach	Prescriptive	Custom	Whole Building	Total for Program
No. of Projects	53	24	17	94
% of Projects	56%	26%	18%	100%
Ex-ante Energy Savings (MWh)	9,067	706	9531	19,305
% of Savings	47%	4%	49%	100%

The range of prescriptive measures covered in the program was expanded slightly in 2012. The breakdown of energy savings by measure category is shown in Table 3-4. Not surprisingly the majority of the energy savings reported from prescriptive measures related to lighting efficiency (72%), followed by HVAC related measures and variable speed drives. In 2012, all other measure categories accounted less than 1.5 percent of energy savings. This is an indication that projects using the prescriptive approach are not approaching the efficiency opportunities holistically. More savings are available but are not being pursued.

**Table 3-4. Prescriptive Measure Ex-ante Savings**

Prescriptive Savings by Measure Type:		
Measure Category	Ex-ante Energy Savings (kWh)	% of Total
Lighting	6,566,443	72.2%
HVAC	1,450,932	15.9%
Ice Making	8,811	0.1%
Refrigeration	127,064	1.4%
VSD's	899,208	9.9%
Motors	8,364	0.1%
Food Service	39,492	0.4%
<b>Total</b>	<b>9,100,313</b>	<b>100.0%</b>



Lighting measures completed under the program were divided into three sub-categories, as shown in Table 3-5. Lighting Power Density reductions accounted for 97.8 percent of reported energy savings, while interior daylighting sensor controls accounted for 0.2 percent and interior occupancy sensors comprised 1.9 percent. This is an indication that Solution Providers have not adopted lighting controls sufficiently and the program is not collecting all the savings opportunities.

**Table 3-5. Lighting Measures by Category**

Lighting Prescriptive Measures	No. of Projects	Incentives	<i>Ex-ante</i> Energy Savings (kWh)	<i>Ex-ante</i> Demand Savings (kW)
LPD	59	\$537,001	6,435,772	1,250.3
Interior Daylight Sensor Controls	4	\$1,852	14,889	5.9
Interior Occupancy Sensor	11	\$14,923	127,334	1.4
<b>Total</b>	<b>74</b>	<b>\$553,776</b>	<b>6,577,995</b>	<b>1,258</b>

Note: Total lighting savings shown above include lighting savings from one project not included in Table 3-4, resulting in slight (11,552 kWh) difference between the figures shown in the two tables.

### 3.2 *Impact Findings*

This section includes a summary and discussion of the evaluation-calculated energy and demand savings for the 2012 Non-Residential New Construction Program. Annual electricity savings were calculated using the data collected through document reviews and field visits for the sample of sites.

#### 3.2.1 **Summary of Impact Findings**

The *ex-post* energy and summer coincident demand savings for 2012 were 20,406 MWh and 2.98 MW, respectively. This exceeded the 2012 goal of 10,000 MWh and 1.23 MW coincident demand reduction. These results are shown in Table 3-6 and exhibit strong growth in the program performance.

**Table 3-6. Impact Savings, Realization Rate and Precision of Sample**

Metric	<i>Ex-ante</i>	<i>Ex-post</i>	Realization Rate	Overall Relative Precision at 90% Confidence
Annual Energy Savings (MWh)	19,305	20,406	1.06	5.8%
Coincident Peak reduction (MW)	5.31	2.98	0.56	20.2%

#### 3.2.2 **Driving Factors of Realization Rate**

Data analysis revealed that certain factors are driving the realization rate between claimed savings and verified savings. Energy savings and demand savings will be discussed individually.

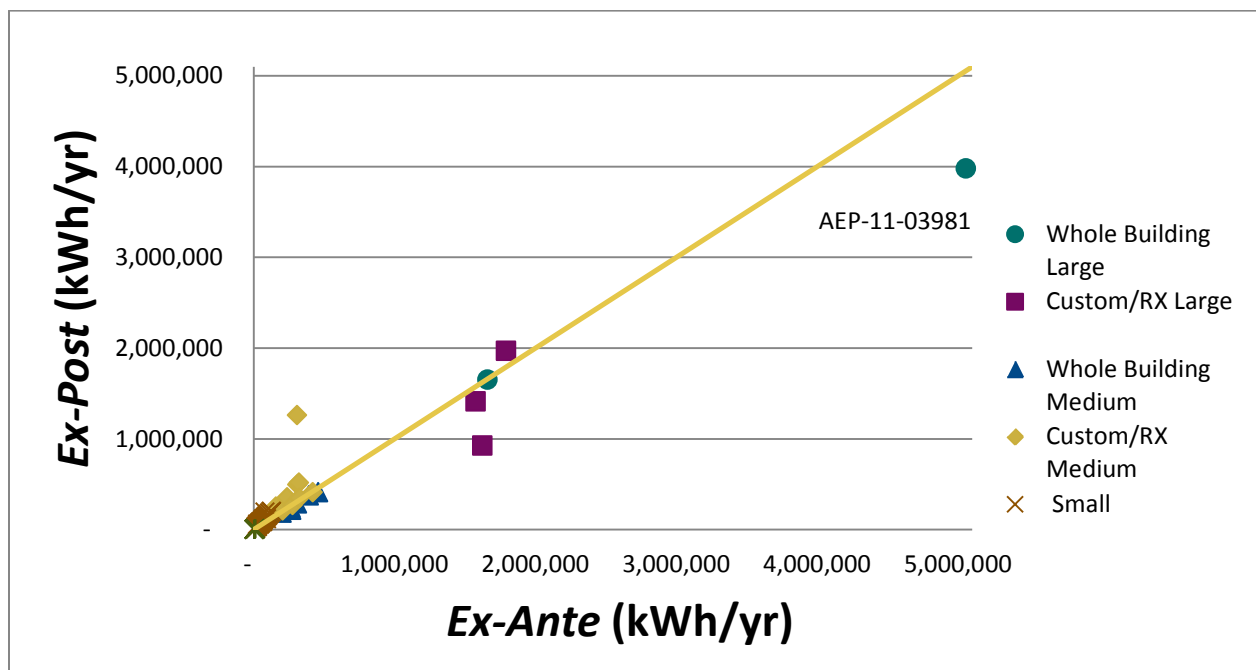
##### 3.2.2.1 *Energy Considerations*

Organizing the data by the size of the energy savings claim, one “miscellaneous” project, AEP-11-03981, was substantially larger than the rest and accounted for 27 percent of the overall program energy savings claim. This project had a realization rate of 0.79, and had it been removed, then the overall program realization rate would have been 1.15.



The large miscellaneous project used the Whole Building approach and was therefore modeled to determine *ex-ante* savings. Ninety-six percent of the energy savings claim for this project consisted of a chiller plant and a variable speed, primary-only efficient chilled water loop pumping system. The baseline chilled water plant was correctly configured in the *ex-ante* model, as constant speed primary and variable speed secondary per ASHRAE 90.1-2007; however the minimum speed of the secondary pump was set at 100 percent speed in the model. The hourly outputs showed that this error resulted in the secondary pump behaving the same as a constant speed secondary, increasing the baseline energy use above what energy code allowed. The higher baseline energy translated to a higher energy savings claim and accounts for the low realization.

**Figure 3-3. Ex-Ante vs. Ex-Post Energy Savings**



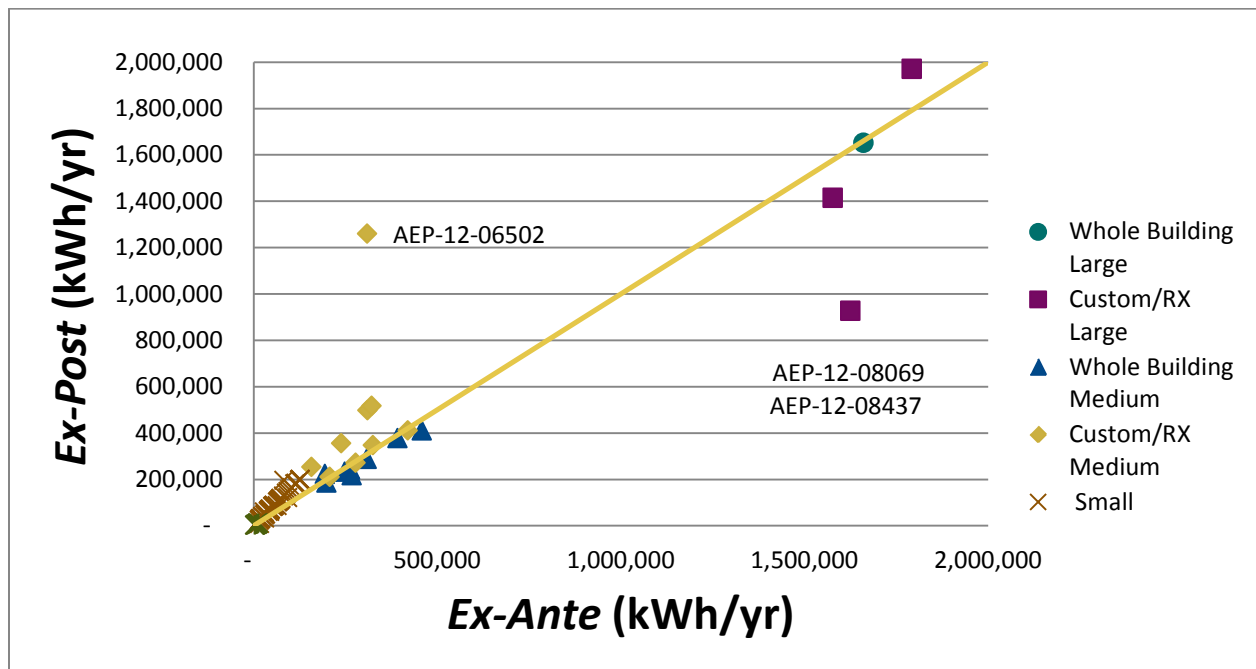
Modeling input errors were not found to be systemic; in fact overall the whole building projects had a strong realization rate. However projects of this size do warrant extra scrutiny. Figure 3-3 contains a blue line which represents the ideal realization rate of one. The scatter plot illustrates where the sampled projects in the impact analysis fell with regard to realization. Points in the lower right half have realization rate less than one, while the upper left represents the opposite.

Enlarging the area of Figure 3-3, by removing the large miscellaneous project, results in Figure 3-4. Project AEP-12-06502 was a warehouse lighting project that included daylight controls. The project application included the daylight controls, but the DNV KEMA calculations did not include any savings associated with the daylight controls. Daylight controls alone accounted for roughly half of the field verified savings. Additionally the DNV KEMA formula for calculating savings from lighting power density undervalued the field verified lighting power density savings at this site.



Projects AEP-12-08069 and AEP-12-08437 were in the same building and premise and were therefore analyzed as one efficiency effort. The building was appropriately classified as Medical/Hospital and was primarily (98%) a lighting power density reduction effort. The low realization rate, 57%, is due to a combination of operation hours and lighting power associated with the fixtures. It is unclear how DNV KEMA arrived at the fixture lighting power used, but Navigant based this on the lighting layout schedule which was field verified. Lighting operation hours were also verified by Navigant and used to determine energy reduction.

**Figure 3-4. Ex-Ante vs. Ex-Post Energy Savings without the Very Large Project**



### 3.2.2.2 Demand Considerations

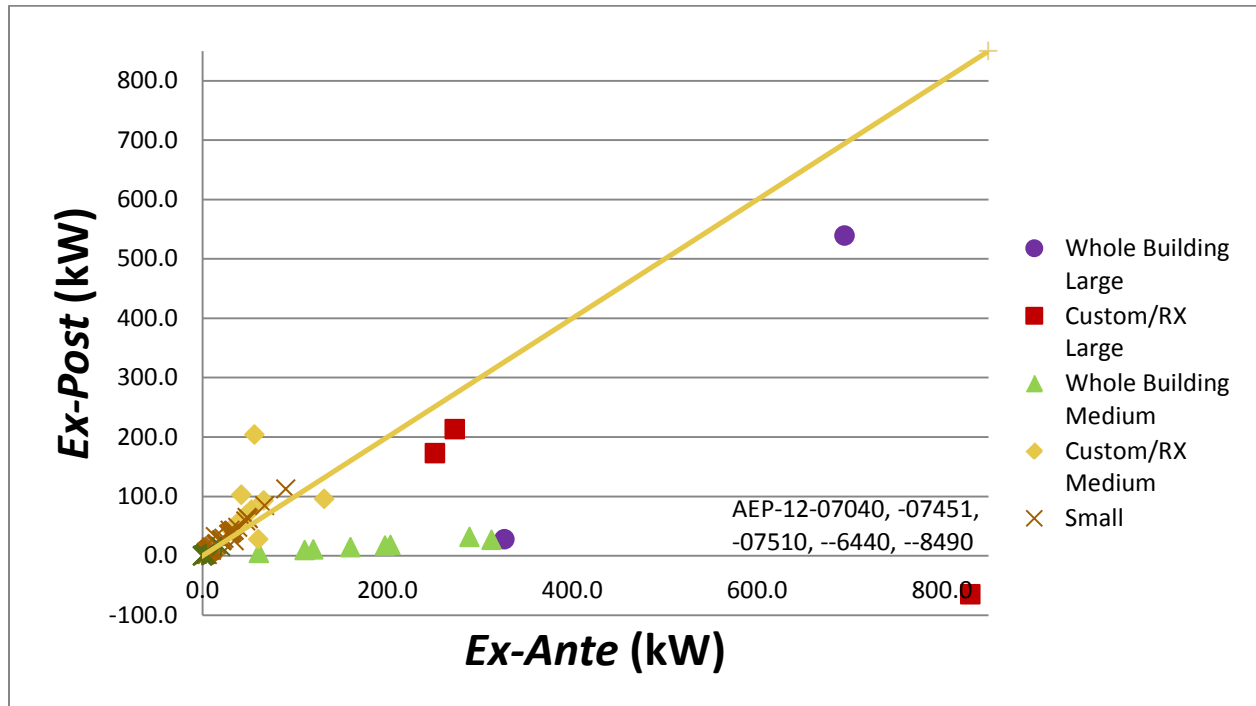
Figure 3-5 illustrates the relationship of *ex-ante* demand reduction relative to the ideal realization rate of one for the sampled projects. As before, the projects are categorized by the magnitude of energy savings rather than demand reduction for consistency with the prior section. The figure also clearly demonstrates the low realization rate, 0.56, and the poor precision result.

Five projects, AEP-12-07040, -07451, -07510, -06440, -08490, were all at the same premise and building and were therefore analyzed as one effort. The demand savings claim was dominated by two 2,250 ton chillers used for space cooling. Navigant investigated and field verified the model performance. While the installed chillers provided significant energy savings as determined by Integrated Part Load Value efficiency levels, the peak efficiency does not meet energy code. The energy code was reported in the project files to be the older 2006 IECC or ASHRAE 90.1 – 2004 for the subject building, and Navigant used this older code for the analysis. Since chiller peak performance is below code the selection has a negative effect on coincident peak demand savings. This is represented by a negative realization rate, -



0.08. Overall the effort had an *ex-ante* demand reduction claim of 831 kW, but a verified coincident demand increase of 65 kW.

**Figure 3-5. *Ex-ante* vs. *Ex-post* Summer Coincident Demand Reduction**



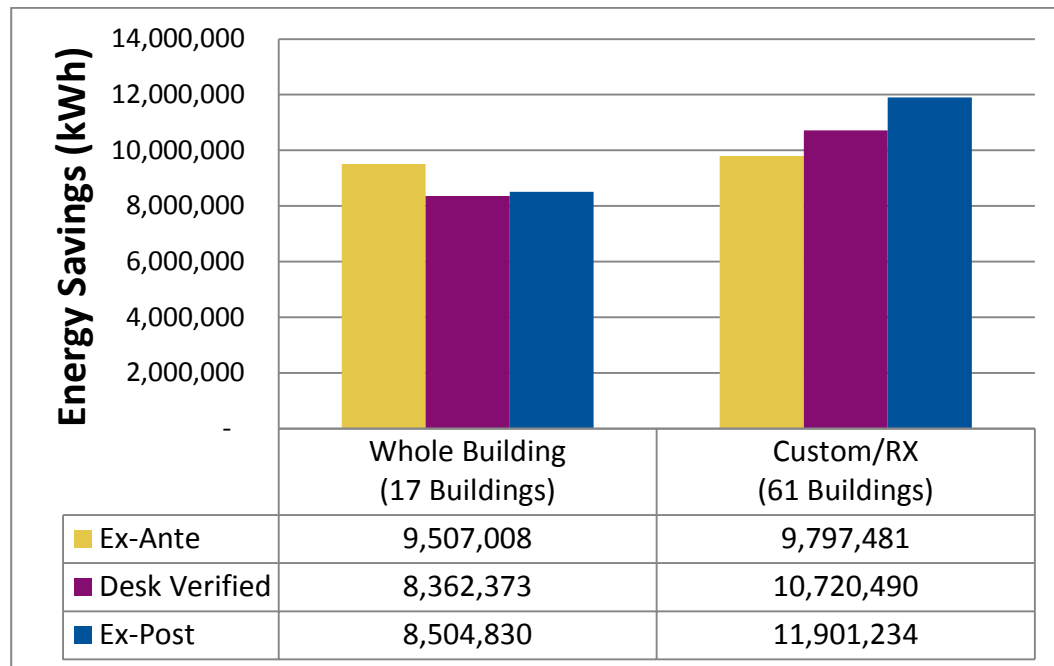
All but one of the whole building demand reduction claims had an extremely low realization rates. The reported demand reduction does not appear to take into consideration the demand reduction that is coincident with the summer peak time. Where executable models were available, Navigant reran the model for the summer peak hours to determine coincidence savings. If the executable model was not available Navigant used regional publically available coincidence factors.

### 3.2.3 Project Approach Savings Analysis

By inspecting the impact results by program approach, certain characteristics were different between the projects that were energy modeled, i.e., projects in the Whole Building Approach, versus projects whose savings were determined by engineering calculations. Not surprisingly, the buildings that were energy modeled tended to be larger buildings with greater energy savings. Average *ex-ante* savings claim for buildings in the Whole Building Approach were roughly 3.5 times larger than the average *ex-ante* savings claim for Prescriptive or Custom Approaches.



**Figure 3-6. Energy Savings by Program Approach**



There were differences in the realization rates of different project types due to the differing methods of calculating savings between the different process approaches. Figure 3-6 compares the savings from the *ex-ante* claim, the preliminary file review and the final site *ex-post* result. While the buildings in the Whole Building Approach had a relatively significant savings reduction from the file review, this was almost entirely due to the one Large Project with a modeling input error. The realization rate between the file review savings and *ex-post* savings was 1.02, indicating that projects with this level of design scrutiny did not have differences between the information on file and the actual building.

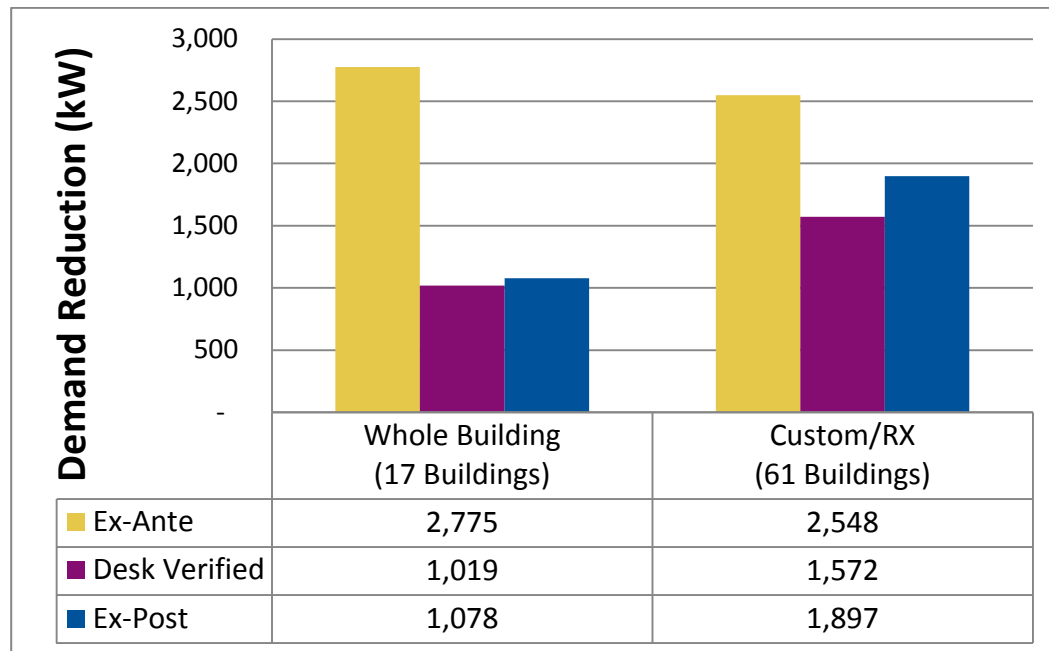
Buildings completing the Prescriptive or Custom Approaches also required adjustments in energy savings as the files were verified and the buildings were inspected. In general savings reported for custom and prescriptive projects did not thoroughly capture all available lighting savings resulting in a realization rate greater than one for Custom and Prescriptive NRNC projects.

Figure 3-7 presents the results of the impact study by program approach for coincident demand reduction. All of the Whole Building projects sampled reported building demand reduction rather than the summer coincident peak reduction. This may indicate a disconnection between the Non-residential New Construction Program and building modelers as to which demand reduction should be reported.





**Figure 3-7. Summer Coincident Demand Reduction by Program Approach**



Custom and prescriptive projects realization rates were primarily reduced due to the one Medical/Hospital building with large chillers contributing a negative savings.

### 3.2.4 Discussion of Errors in Ex-ante Savings

As mentioned in sections 3.2.2 and 3.2.3, a one-time baseline model input error was discovered in a large modeled project which had a significant effect on program savings. An additional one-time error was discovered in a large chiller project regarding peak demand savings. There was a project where the applied-for daylight harvesting controls were not included in the savings, and another project where the implementation contractor's standard approach was not accurate for the fixtures installed and operation hours. All modeled projects sampled reported site peak demand reduction rather than the coincident peak demand reduction.

Beyond these errors, Navigant took exception to the 2010 Ohio draft TRM that states manual light reduction control accounts for a 30 percent energy reduction. A more modest reduction is usually taken and Navigant applied a 10 percent reduction referencing the Efficiency Vermont TRM User's Manual number 2010-67a. Per the energy code, most spaces require either a method of uniformly reducing light levels by at least 50 percent or having occupancy control. However since occupancy control typically results in a 30 percent energy reduction, the program may claim savings on the difference between the minimal requirement of manual light reduction and automatic systems, such as occupancy control or daylight harvesting control. Navigant increased savings to account for this difference where applicable.

The implementation contractor should insure that efficiency measures required by code are not given energy savings. Most commonly this occurred when energy savings was claimed on variable speed





drives on HVAC fans over 10 HP. Additionally in lighting there were a few cases of the baseline allowed watts per square foot being incorrectly applied. Navigant adjusted savings in these cases.

### **3.3 Process Findings**

The process evaluation found that the program processes appear to be effective and that progress is being made towards program goals as the program becomes more established. Feedback from program participants and Solution Providers indicates a relatively high level of satisfaction both with program design and program processes. The program has also been successful in achieving earlier involvement in building projects as market awareness increases. Several recommendations for continued program improvement are found in each of the subsections below.

The remainder of this section presents these findings in more detail. The section begins by discussing participant satisfaction with various aspects of the program. This is followed by a discussion of the effectiveness of various aspects of the program processes, beginning with marketing, and continuing through the incentive payments:

- » Participant Motivations
- » Marketing Efforts and Program Awareness
- » Customer Enrollment Process
- » Incentive Payment Process

Following this, the following aspects of the program processes are examined in further detail:

- » Customer Behavior in the Absence of the Program
- » Customer Experience and Barriers
- » Review of Program Tracking Data
- » Verification and Due Diligence

#### **3.3.1 Participant Satisfaction**

Participants were quite satisfied with the program. On a scale of 0-10 they gave the program an average overall score of 8.4. Twenty-four percent of surveyed participants were very satisfied, rating the program at 10 out of 10; 87 percent of respondents rated the program at 8.0 or higher. Table 3-7 Shows satisfaction overall and by category. The pattern of high ratings continued into the sub-categories of ease of finding information, the level of documentation required and the application process. The only observed difference in the pattern regarded the application process. The application process had a reasonably high average rating but 24 percent rated the application process at 5 or below. Comments in response to questions about program improvements suggest that some participants found the application language too technical or otherwise confusing. One commenter noted that the stated lighting incentive calculation procedure led them to dramatically over-estimate the incentive.

**Table 3-7. Respondent Satisfaction with the Program**

Category	Rating (33 respondents)
Ease of Finding Information	7.8
Application Process	6.8
Level of Documentation	7.4
Overall Satisfaction	8.4

Despite the high ratings, responding participants offered several suggestions for improving the program. These suggestions included:

- » Streamline and shorten the application process;
- » Be more proactive about communicating with applicants when documentation is insufficient or is missing;
- » Use more accessible language in the online application requirements.

Some of the responses suggest Solution Providers were not involved in those respondents' projects until some point past the initial application stage.

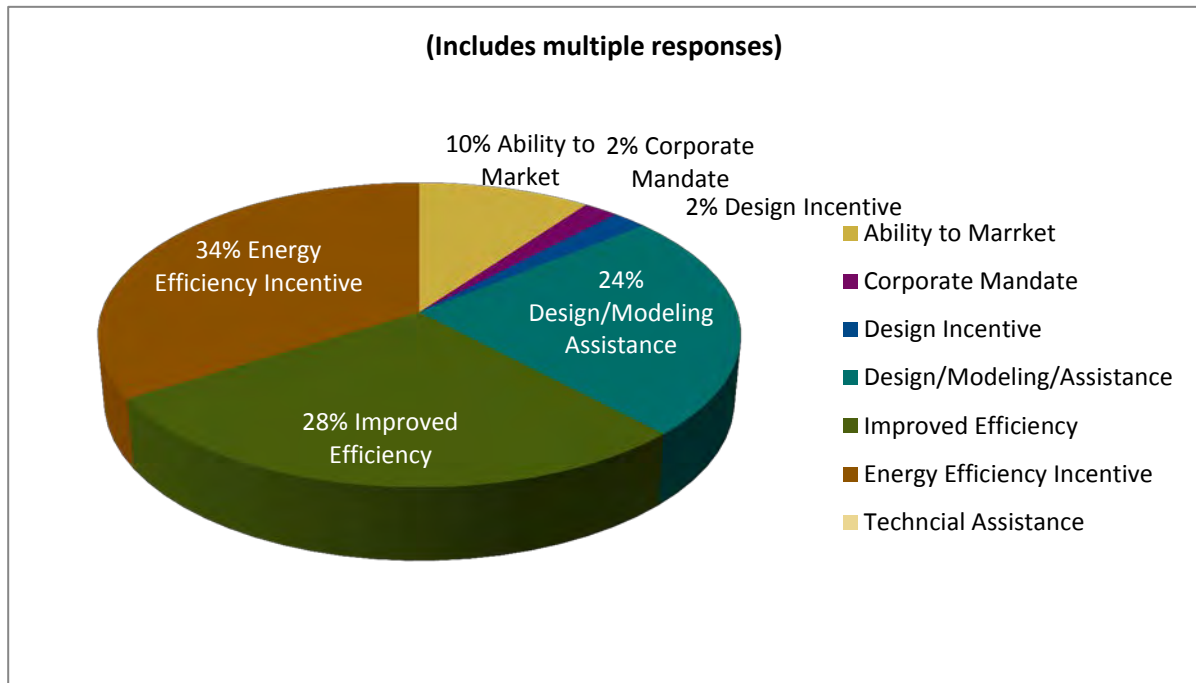
Most of responses received from Solution Providers who had been involved in the program indicated a reasonably high level of satisfaction with the program, both from the perspective of the Solution Providers and indirectly from their clients.

### **3.3.2 Participant Motivations**

Energy Efficiency incentives, improved efficiency and design and modeling assistance were identified by respondents as the strongest reasons for participating in the New Construction program, as shown in Figure 3-8. As a motivator, energy efficiency incentives were closely followed by improved efficiency and the design and modeling assistance. The motivations point to a participant population with a strong energy efficiency orientation and motivation. Individual participants cited motivating factors, including Ohio state tax credits, recommendations from other school districts to participate and the need to replace equipment in the next several years.



**Figure 3-8. Reasons for Participating in the AEP Ohio New Construction Program**



In terms of overall participant motivations – their influences for pursuing energy efficiency in the first place, as seen in Table 3-8 -- survey respondents in all program approaches pointed to the desire to be energy efficient or green, followed by payback on their investment, industry standard practices and the availability of incentives. Direct program influences such as marketing materials or actions by AEP Ohio and DNV KEMA account managers and staff were relatively weak but still exerted some influence on those decisions. The responses from each program approach were quite consistent, with the exception of payback on investment, where prescriptive participants had a strong but noticeable difference from the whole building/custom participants. There is also a difference in the influence of the AEP Ohio Account Executive between the groups, but this may be attributable to the relatively large size of the whole building/custom participants; those customers would be more likely to interact with Account Executives. Table 3-8 shows the influences by program approach and combined responses.

**Table 3-8. Influences on Respondent Energy Efficiency Actions**

Influence	Prescriptive	Whole Building/Custom	Combined
Desire to be energy efficient/"Green"	8.9	8.9	8.9
Payback on Investment	7.4	8.7	7.9
Industry Standard Practices	7.3	7.7	7.4
Availability of Incentive	7.2	7.6	7.3
Architect/Engineer	7.3	7.4	7.3
Corporate Policy	6.7	6.8	6.7
Vendor/Contractor	6.4	6.1	6.3
Previous Experience with the Program	6.0	6.4	6.2
AEP Ohio Program/Marketing Materials	5.2	5.8	5.4
AEP Ohio Account Representative	4.8	6.2	5.3
AEP Ohio staff or DNV KEMA Recommendation	5.1	5.2	5.1

According to Solution Providers, such as Architecture and Engineering firms interviewed as part of the review, many of the projects which participated in the Whole Building approach had already made a commitment to pursuing the LEED process. Solution Providers reported that the application process for the AEP Ohio program aligned reasonably well with the LEED process and that they didn't see the AEP Ohio program requiring significant additional work beyond completing the application.

Given the motivation of obtaining a certain level of LEED certification, there is an opportunity for the New Construction program to increase the emphasis placed on energy efficiency within the overall objective of LEED certification. There is a number of ways that a project can obtain a given level of LEED certification. While some Solution Providers reported that the level of energy efficiency included in their building project was essentially unchanged by the availability of the program, others indicated that the availability of the program incentives increased the level of energy efficiency included in the building by between 25 and 40 percent. One of those Solution Providers indicated that *"the incentives do change the level of efficiency"* and indicated that while the project *"was going through the LEED process, it was not as focused on the energy elements"*. The availability of the program can help steer these projects to a greater emphasis on energy efficiency.

Solution Provider interview responses indicated the orientation to LEED certifications are supported by participant survey responses. Of 15 respondents answering that question, 13 percent said they built to code, while 67 percent were building to LEED Silver or Platinum standards prior to their participation in the program.

### 3.3.3 Marketing Efforts and Program Awareness

In 2012 AEP Ohio and DNV KEMA continued to be proactive in identifying and reaching out to key market segments and market actors to build awareness of the Non Residential New Construction Program and recruit projects. Navigant reviewed the application forms, web site and other



communications materials used in the program as well as communications and outreach efforts carried out by DNV KEMA to build awareness of the New Construction program during the second year of the program.

We understand that DNV KEMA staff has met with a number of Solution Providers, including Architectural and Engineering (A&E) firms involved in supporting program applicants. Several of the A&E firms interviewed as part of the review mentioned meeting with DNV KEMA staff or attending sessions offered by DNV KEMA to provide an overview of the program. DNV KEMA also provided information on several events held during the year, including:

- » *"Getting it Right: Choices in Lighting Efficiency"* seminar, held in June, 2012.
- » *"Compressed Air Seminar and Expo"* held in Columbus.
- » *"Gazing into the Energy Cost Crystal Ball: How the past and present shape tomorrow's choices"*, held in Columbus in November, 2012.

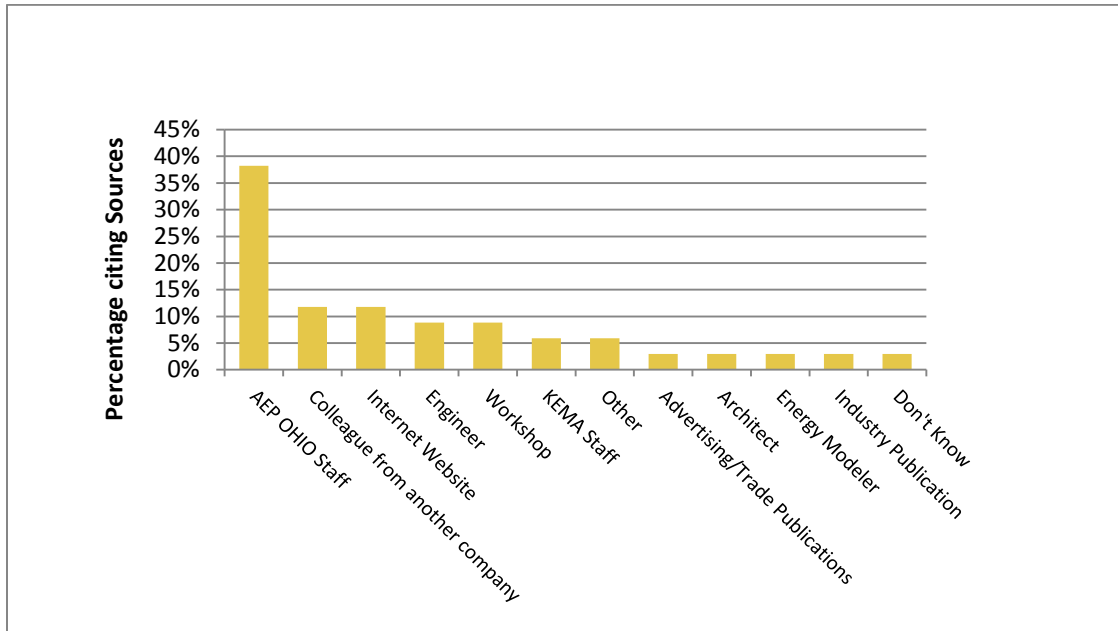
Solution Providers reported that they had found these sessions informative and helpful in better understanding how to access the program to assist their clients. At least one firm mentioned that they saw business potential in more actively leveraging assistance available from the program but indicated that they hadn't pursued that opportunity as of yet.

Most of the Solution Providers interviewed dealt primarily with public sector organizations and generally indicated that there was a fairly high level of awareness of the program among their public sector clients.

Surveyed participants most frequently described AEP Ohio staff as their source for learning about the program, particularly for prescriptive projects. Fifteen percent (combined) cited DNV KEMA or a workshop as their information source. Other information sources cited by respondents included colleagues in other organizations and the internet. One respondent noted using a database of utility incentives as their source. Figure 3-9, below shows the information sources as cited by participants.



**Figure 3-9. Participant Information Sources**



In reviewing information available regarding the program on the web, it was noted that the AEP Ohio web page for Builders and Contractors, which provides application forms for new service connections (<https://www.aepohio.com/builders/Default.aspx>) doesn't include any information or links to the New Construction Program.

Participants appeared to be well aware of the program prior to enrollment, with only the occasional exception. Institutional participants are oriented to taking advantage of the incentive opportunities. The relatively low participation of large and small offices suggests some focus on marketing to those market segments would be appropriate. Government/municipal participants were relatively few but that may reflect budgetary realities in that segment.

### 3.3.4 Barriers to Participation

Feedback from Solution Providers and participants indicated no significant barriers to program participation beyond the increased capital costs required to achieve higher efficiency standards. While not meaningful enough to be considered barriers, there were some participant comments that merit consideration and further monitoring. Some participants commented about the complexity of the application process. One comment concerned the response time for applications to be reviewed and another participant requested additional feedback about overall project approval status.

### 3.3.5 Customer Enrollment Process

Navigant reviewed the customer enrollment process, including the application forms, processes followed by DNV KEMA in reviewing and approving applications, time required for review and



approval of applications and approval review processes. We found no significant issues with respect to the enrollment and approval process.

Participants were moderately favorable about the application process, rating the documentation requirements slightly higher than the application itself. Prescriptive participants were more favorable about the application process than whole building/custom participants. One participant suggested posting (status of) submitted documentation so participants would know where their projects stand in the approval process. Participant suggestions largely mirror Solution Providers suggestions reported below.

It is apparent that the program has been successful in getting projects enrolled in the program at a much earlier stage in the second year of program operation. This is not surprising in a relatively new program such as this, particularly given that many of these projects take two years to complete. Feedback from Solution Providers indicates that the Solution Providers often drive the application process, but that increasingly public sector clients are already aware of the program before a Solution Provider raises it in discussion. Solution Providers generally indicate that they apply relatively early in the development process, generally just after completing any energy modeling in the case of the whole building approach.

While Solution Providers generally indicated a relatively high level of satisfaction with the program, they did offer several suggestions that would make interactions with the program easier and more effective. Among these they suggested:

1. That DNV KEMA assigns a single individual as the point of contact for each Solution Provider. While understanding that different staff from DNV KEMA may be involved in reviewing particular projects, it was felt that if each Solution Provider had a consistent single point-of-contact that they could reach out to that this would help smooth out issues that arose during interactions regarding different projects.
2. More clearly defining the information that is required for a whole building project review. There was some concern among Solution Providers that additional information was required during the design review and that the need to go back to obtain this additional information added to the cost of the process.
3. That a project name be assigned to each project that the Solution Providers could more readily relate to. The project numbers now assigned to projects don't relate to other information regarding the project and require additional work to track.
4. Increasing the extent to which information required regarding the project can be automatically uploaded, as it now is on the USGBC (US Green Building Council) site.

### **3.3.6 Incentive Payment Process**

DNV KEMA has six engineers available in their Ohio office to assist in reviewing New Construction projects. In addition they call upon sustainability consultants from their Sustainable Buildings group in California who assist in reviewing in Whole Building projects. Local staff is also involved in supporting other programs administered by DNV KEMA.





DNV KEMA commented that as the program has evolved they have trained contractors and Solution Providers in how to complete application forms and as a result most of the forms received are now complete. Incentives available under the program are reserved for 90 days when applications are received, subject to successful review and approval. If project information received is complete and the project qualifies, then payments can be processed. In most instances, payment is made after the project has been fully reviewed and on receipt of a certificate of occupancy. DNV KEMA follows up on projects as they evolve. Depending on the nature of the project and how it has changed over time, the final determination of available incentives may be recalculated based on the final “as-built” design.

Navigant discussed the review and approval process with both AEP Ohio and DNV KEMA staff and identified the following issue:

- » DNV KEMA reported that some Engineering firms are not willing to provide executable files to DNV KEMA in order to verify building energy simulation results.

Given that modeling results can be subject to assumptions made in the modeling process and even to the version of model used, these executable files are important parts of the review process.

A number of Solution Providers indicated that they saw the DNV KEMA review as a process of verification. We understand that DNV KEMA staff has made recommendations in some projects on opportunities to increase energy efficiency in the design.

### **3.3.7 Actions Absent the Program**

Participant data suggests mixed attitudes about performance standards prior to participating. A majority of prescriptive participants (57%) had a prior policy toward energy efficiency, while few whole building/custom participants (25%) had such a policy in place.

Interviews with program staff indicate that in some instances, DNV KEMA staff has been able to recommend improvements for projects under the Whole Building Approach. In most instances, however, it appears that an initial or revised ‘as-built’ modeling of the project is accepted from the applicant and that DNV KEMA’s role is to verify the level of savings attained. Feedback from Solution Providers reinforced that this is perceived to be the “normal” course; that while DNV KEMA sometimes offers suggestions for improvement, in most instances the discussion centers around verification rather than opportunities for further improvements.

Building energy modeling remains an important component of new construction, as 45 percent completed models as part of their projects. Although there is no direct evidence the program caused modeling to happen, those who did models found it beneficial for their projects.

The New Construction program had some impacts on energy efficiency practices but respondents had largely determined their energy efficiency construction practices prior to participating in the program. Seventy-eight percent of the participants did not change their energy efficiency building practices as a result of the program. The program seemed to have only a small effect on other participant projects as a result of participation. Whether the subject building is pursuing LEED certification or not, DNV KEMA’s apparent focus on verification has not had the influence on emphasizing energy efficiency it could have.





### 3.3.8 Customer Experience/Barriers

As noted above, participants provided high satisfaction ratings for the program. The most important barrier cited, (74%), was the additional capital cost of energy efficiency measures. Two participants were not aware of energy efficiency opportunities and one expressed concern about performance of efficient equipment. Several common barriers were not cited at all, including payback (although payback was cited as an important factor in deciding to use energy efficient measures), split incentives, lack of market demand from building users or additional time that may be required to incorporate efficiency. These results likely stem in part from the composition of the respondent group, with its emphasis on institutional or public facilities. A more office- or retail-oriented sample might have found more typical concerns. There were additional comments noting that the program was oriented towards engineers or certain building types.

Solution Providers reported no significant perceived barriers to participation in the program. The discussion guide was structured to differentiate between the decision to include higher levels of energy efficiency in building projects and the decision to participate in AEP Ohio's New Construction program. While Solution Providers indicated that there are a number of barriers that may limit the extent to which energy efficiency measures may be incorporated in the design of new buildings, none indicated that they felt there were any significant barriers to participating in the program.

### 3.3.9 Program Tracking Data Review

The coding of program approaches is awkward; there is not a single clear code for the program approach. AEP Ohio combines the "measure type" and "program approach" into a single column in the "Measures" version of the tracking database.

Other issues that Navigant identified during tracking system review include confusion where the same term is used in different contexts. For example, the same term Custom is used as a business program name and as a specific approach within the New Construction Program. There is no information provided to explain column headings or acronyms. For example:

- » Columns are labeled "LTKWHSavings", "KWHsavings" with no explanation that LTKWHSavings refers to lifetime savings, while KWHsavings refers to annual measure savings. Similarly within the list of measures, a key term, Lighting Power Density is listed as "LPD" with no explanation.
- » Some contact information was recorded in the database, but it was unclear which contact information was recorded.

A number of fields collected as part of the application process were also not found in the tracking database.

### 3.3.10 Verification and Due Diligence

The level of verification carried out differs depending on the type and size of the project. All projects are reviewed by a technical reviewer and most projects also go through a peer review process. Projects that involve incentives over \$25,000 are also reviewed by AEP Ohio staff.



- » Reviews for the Prescriptive and Custom Approach program are relatively simple. Staff reviews the application and supporting documentation to determine compliance with program rules and determines the level of incentives. For the Custom Approach, engineering calculations are also reviewed.
- » In the Whole Building approach, applicants submit model inputs and outputs. Program staff reviews the model, project documentation and drawings to determine whether the energy simulation model properly represents the building design. DNV KEMA reviewers work with the modelers representing the applicant to ensure that the model is accurate and gives the applicant the best possible idea of what incentives will be available under the program. In rare instances, the reviewers have adjusted the model for the applicant, but in an estimated 98 percent of cases, the reviewers provide comments to the modelers who then adjust the model.

Some models allow the modeler to change model logic in order to accommodate unusual systems or approaches. While valuable to the modeler, these changes can significantly alter model outputs (affecting incentive levels), but can be very difficult for an evaluator/reviewer to identify. Navigant also notes that AEP Ohio and DNV KEMA do not have a formal Dispute Resolution process in place for the program.

### 3.4 Cost Effectiveness Review

**Table 3-9. Inputs to Cost-Effectiveness Model for AEP Ohio NRNC Program**

Item	
Measure Life	14
Projects	94
<i>Ex-post</i> Annual Energy Savings (MWh)	20,406
<i>Ex-post</i> Coincident Peak Savings (MW)	2.98
Third Party Implementation Costs	417,877
Utility Administration Costs	71,047
Utility Incentive Costs	\$1,699,646
Participant Contribution to Incremental Measure Cost (Cost of efficiency measures – incentive payment)	4,941,169

Based on these inputs, the TRC ratio is 1.7. Therefore, the program passes 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 3-10. Cost Effectiveness Results for the Non Residential New Construction Program**

Test Results for NRNC	Benefit/Cost Ratio
Total Resource Cost	1.7
Participant Cost Test	2.4
Ratepayer Impact Measure	0.7
Utility Cost Test	5.6

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



## 4 Key Findings and Recommendations

This section presents the key findings and recommendations from the 2012 Non-Residential New Construction program impact and process evaluations.

### 4.1 Key Tracking System Findings and Recommendations

With respect to the Project Tracking Database, Navigant offers the following observations and recommendations for improved clarity and tracking:

1. It is not apparently clear which projects are enrolling in the Prescriptive approach or the Custom approach.
  - a. **Recommendation:** Consider designating a column specifically identifying program approach. The column “ApplicationType” distinguishes projects as Whole Building approach or “New Construction”. Suggest modifying the New Construction designation to either state Custom or Prescriptive.
2. New Construction projects use a baseline of the applicable energy code. The code used can have certain vintages depending on when permitting was pulled and there is an option between ASHRAE 90.1 and IECC. Clearly identifying the correct baseline energy code is vital to accurately quantifying savings.
  - a. **Recommendation:** Consider adding the capability of tracking what baseline is applicable (IECC 2006, ASHRAE 90.1-2004, IECC 2009, or ASHRAE 90.1-2007) for a particular project.
  - b. **Recommendation:** Collect permit data to verify which vintage of code is applicable
3. Several acronyms and abbreviations are used in the tracking database that may be unclear to someone unfamiliar with the system.
  - a. **Recommendation:** Consider adding a folder documenting the database; with an explanation of column headers, any acronyms used as field values, and any protocols with respect to how the data is reported. If different spreadsheets are used for different program approaches, explanations of how these spreadsheets differ and where to locate other tracking data should be included.
4. Data entries in the project database were not always entered consistently.



- a. **Recommendation:** Use pull down menus where possible in entering data to ensure that fields are entered consistently (i.e. ensuring the same spelling of an organization's name if the organization undertakes multiple projects).
5. Some information appears to be tracking the same information, for example: business type and business segment or District and Region.
  - a. **Recommendation:** Review the need for multiple, similar fields.
6. In some cases, not all of the contact information collected in the application was transferred to the tracking database.
  - a. **Recommendation:** Attempt to ensure that all contact information is listed in the spreadsheet or can be easily linked to the spreadsheet in order to facilitate follow up and evaluation. Navigant also recommends that the application form and tracking database be revised to include the positions of key contacts, such as architect, mechanical designer, electrical designer and building modeler. Experience with similar programs indicates that this can be very helpful for tracking active Solution Providers as well as verifying savings.
7. Some information currently gathered as part of the application is not in the tracking database. For example, it would be useful to know what proportion of the projects was also seeking LEED certification.
  - a. **Recommendation:** Review the information gathered as part of the application to determine whether it should be added to the tracking database.
8. On closer examination of the project files it appears that some of the completed projects classified as "Miscellaneous" could have been classified within specific business type categories already utilized.
  - a. **Recommendation:** Examine projects classified as Miscellaneous and where applicable, assign the appropriate business type category. For buildings with multiple business types, assign the predominate business type for the measures.

## **4.2 Key Process Findings and Recommendations**

Consideration of these process recommendations may improve savings achieved and simplify the verification process.



1. In reviewing information available regarding the program on the web, it was noted that the AEP Ohio web page for Builders and Contractors, which provides application forms for new service connections (<https://www.aepohio.com/builders/Default.aspx>) doesn't include any information or links to the New Construction Program. While it is hoped that Builders will become involved in the New Construction Program well before this point, it is suggested that a link be added to help build awareness of the program with those approaching AEP Ohio for new services.
  - a. **Recommendation:** Add an NRNC link to the AEP Ohio Builders and Contractors webpage, pointing builders to build efficiently with AEP Ohio assistance.
2. Solution providers have made progress enrolling projects early in the design phase. Early involvement provides an opportunity to encourage high levels of energy efficiency in the project design and is important for the NRNC Program to be effective. Navigant encourages this trend.
3. Despite overall satisfaction among participants and Solution Providers, these groups expressed some concerns regarding the application and approval process.
  - a. **Recommendation:** Continue streamlining the application process seeking participants and Solution Providers input about their critical needs. Continue to clarify requirements in the application and on the website. Provide examples of 'ideal' applications with explanations.
  - b. **Recommendation:** Assign a relatable project name to each project so that the Solution Providers can reference the project easily. The project numbers now assigned to projects don't relate to other information regarding the project and require additional work to track.
4. Some Solution Providers were concerned that additional information was required during the design review and that the need to go back to obtain this additional information added to the cost of the process.
  - a. **Recommendation:** Add clarity by clearly defining the information required for a whole building project review.
  - b. **Recommendation:** Facilitate the ability to automatically upload project information, as it now is on the USGBC (US Green Building Council) site.
5. Some Solution Providers found the process confusing and lacking consistency depending on who they engaged at DNV KEMA for a particular project.



- a. **Recommendation:** That DNV KEMA assigns a single individual as the point of contact for each Solution Provider. While understanding that different staff from DNV KEMA may be involved in reviewing particular projects, it was felt that if each Solution Provider had a consistent single point-of-contact it would help mitigate issues that arose during interactions regarding different projects.
6. The program has established a strong presence, particularly in the institutional and medical areas. Navigant believes one of the key challenges for the program lies in building awareness and understanding of the program among other types of buildings.
  - a. **Recommendation:** Increase outreach and education targeted at Solution Providers in the private building sector.
  - b. **Recommendation:** Investigate if there are particular barriers among non-participants such as flexibility or time required to participate in AEP Ohio NRNC Program. These can be a particular concern for design/build projects.
7. Prescriptive projects tend towards interior lighting power density only savings and are not reaching the potential of the prescriptive approach. Exterior lighting, lighting controls, HVAC and refrigeration are common measure categories that should have better representation in the prescriptive approach.
  - a. **Recommendation:** Navigant recommends improving the comprehensiveness of each project through a combination of project reviews during design, education of Solution Providers, incentive adjustments and Solution Providers SPIFFs.
8. A number of Solution Providers indicated that they saw the DNV KEMA review as a process of verification. We understand that DNV KEMA staff has made recommendations in some projects to increase energy efficiency in the design and we suggest that DNV KEMA continue and expand such efforts in future.
  - a. **Recommendation:** Encourage project applicants to use the design process and modeling to test the value of alternative building system improvements. This encouragement can take the form of DNV KEMA recommending specific improvements during the design stage (best practice), and general education on the benefits of energy efficiency relative to the small incremental cost.
  - b. **Recommendation:** Obtain executable building energy models on all Whole Building projects. Review model with building improvement recommendations as a regular part of DNV KEMA's process.



- c. **Recommendation:** AEP Ohio should work with Solution Providers and participants to promote increasing energy efficiency components in LEED-oriented projects and develop strategies and initiatives to further the energy efficiency emphasis of LEED projects. There may be limited incentive improvements possible since the Whole Building approach currently provides tiered incentives as savings increase compared to the ASHRAE standard. Therefore improvement should be focused on direct engagement and education.
9. Some models used in the Whole Building approach allow the ability to alter model logic in order to accommodate unusual systems or approaches. While valuable to the modeler, these changes can significantly alter model outputs (affecting incentive levels) and can be very difficult for an evaluator/reviewer to identify.
  - a. **Recommendation:** Navigant suggests that Whole Building applicants be required to document any changes made to the algorithms/logic of the model and identify these changes in model summaries/reports.
10. Continue to educate and advocate with Solution Providers and participants for comprehensive designs that leverages lighting controls, HVAC, thermal shell, commercial kitchen, and other equipment efficiency opportunities.
11. AEP Ohio and DNV KEMA do not have a formal Dispute Resolution process in place for the program.
  - a. **Recommendation:** While disputes to date have been resolved between the applicant and program staff conducting the reviews, we recommend that a formal dispute resolution process be established.

### ***4.3 Key Project File Findings and Recommendations***

These recommendations are referring to the files and documents collected and retained for a particular project. They form the basis of the energy savings claim and are used as part of the verification process. In the following discussion there will be references to files unavailable from DNV KEMA, such as lighting layout drawings. Navigant had contacted DNV KEMA multiple times to retrieve the requested files. In some cases DNV KEMA was able to provide further documents, but others were missing from the project files entirely.

1. New Construction project files can be considerable and complex with several design modifications over time. Without intimate knowledge of the project the details can be confusing and there exists uncertainty as to which document is the current revision.





- a. **Recommendation:** It is suggested that all project files include an overview or summary sheet that briefly states what happened over the course of the design and construction of the building, which may span multiple years.
  - b. **Recommendation:** All project files should include a general drawing that lets the reviewer know the size, configuration and use of the buildings.
2. Most projects involved energy savings due to lighting power density savings. To calculate lighting power density, building area as well as the power of lighting systems needs to be verified. Additionally light reduction controls are required as part of building code in certain areas. Details of the spaces need to be understood in order to determine the effect of this requirement on the baseline energy. Of the 32 projects requiring lighting layout drawings, seven were not available for the evaluation team to review.
  - a. **Recommendation:** When there are lighting measures claimed, a lighting layout drawing and a lighting schedule should be a requirement of the program so that Lighting Power Density and light reduction controls can be accurately calculated and verified.
3. Projects involving energy savings due to HVAC or motor measures need details on the equipment in order to verify savings. Of the 30 projects sampled involving HVAC savings, seven projects did not include these drawings.
  - a. **Recommendation:** For projects with HVAC or motor measures, a mechanical equipment drawing, schedule and specifications should be a requirement of the program.
4. Whole Building projects include savings due to insulation above code minimums, yet wall details are rarely included in the project files.
  - a. **Recommendation:** All whole building projects should submit the lighting and HVAC materials noted above as well as wall details indicating insulation materials and thickness
5. Whole Building projects use energy modeling to determine savings beyond energy code compliance. DNV KEMA reported that some Engineering firms are not willing to provide executable files to DNV KEMA in order to verify building energy simulation results. Of the 11 modeled projects Navigant sampled, eight either did not have a complete set of executable files or the executable files were not provided at all. Navigant asserts that without executable files, a comprehensive review is not possible and when errors are found it is difficult to adjust savings with accuracy. Comparing evaluations of projects with executable files available, Navigant



typically finds more errors when the executable models are provided than if only input and output files are available.

- a. **Recommendation:** Require fully executable building energy models as a requirement to obtain an incentive from AEP Ohio. Both the baseline and the as-built model need to be provided.
  - b. **Recommendation:** Provide a small modeling incentive that pays for interfacing time between modeler and DNV KEMA. This will improve the efficiency of reviewing the models and help built trust between the modeling community and the NRNC Program.
  - c. **Recommendation:** Develop a confidentiality MOU letter that explains the model will only be shared among AEP Ohio, DNV KEMA, and evaluators if sampled for impact evaluation.
  - d. **Recommendation:** That Navigant be advised to deduct energy savings off of any 2013 Whole Building projects where both the baseline and as-built executable models are not provided
6. Cost information was lacking on all projects and was very difficult to verify.
- a. **Recommendation:** Cost information of both as-built and baseline equipment should be documented. A clear statement as to how cost was determined needs to be provided. Alternatively, incremental cost difference may be provided if sources are referenced. Implementation contractor should screen for inaccurate project costs.
7. At times the project files included ComCheck™ documents used to demonstrate energy code compliance. This information was very helpful in the evaluation, and the implementation contractor should continue to include these in the project files when received.

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

These recommendations are specific to increasing realization rate and streamlining the impact verification.

1. Large modeled projects represent technical challenges in determining energy savings and significantly contribute to overall program results. Navigant found a baseline model input error on the program's largest project that was responsible for overstating energy savings.



- a. **Recommendation:** On the largest and most complex projects, provide a thorough engineering review by senior level engineers to challenge modeler assertions were applicable.
2. The basis for determining savings on Custom and Prescriptive projects is not clearly defined. Since there is no approved version of the Ohio TRM, other commonly referenced sources such as the DEER 2011 database may and likely are being used. However verification would be aided if the evaluation team understood the basis for savings claims.
  - a. **Recommendation:** Referenced documents should be provided for the DNV KEMA calculator where it does not agree with the 2010 draft Ohio TRM or where the draft Ohio TRM does not address a measure. Examples include a water-source heat pump project where annual cooling hours used were significantly higher than the Ohio TRM and a refrigerated case lighting project where the basis for the savings per linear foot was not provided.
3. On Whole Building projects, the reported demand reduction does not appear to take into consideration coincidence with the summer peaking period. This was the primary reason for the low demand realization rate.
  - a. **Recommendation:** Obtain energy models and run with the coincident peak period. Check that demand savings equals the reported coincident demand reduction.
4. In Custom and Prescriptive NRNC projects, coincidence factors to determine summer coincident peak were not provided. The factors would be helpful to determine how original demand reduction claims were calculated. Also, any interactive factors considered should be summarized.
  - a. **Recommendation:** Clearly document the source for summer coincidence factors and document interactive factors applied.
5. In some cases energy efficiency measures that were required by energy code were claimed by the projects. Most commonly this occurred when energy savings was claimed on variable speed drives on HVAC fans over 10 HP. Additionally in lighting there were a few cases of the baseline allowed watts per square foot being incorrectly applied.
  - a. **Recommendation:** The implementation contractor should insure that efficiency measures required by code are not given energy savings. Suggest DNV KEMA add baseline checks in their standard review.



6. In lighting systems the hours of operation and method to determine savings was not clarified, but it appears to be based on building type. Operation hours in the files were inconsistent and did not always follow the DNV KEMA lookup table for deemed hours. Navigant found hours of operation when visiting some sites significantly different than the calculation methods used by DNV KEMA.
  - a. **Recommendation:** Investigate expected hours of use for the lighting system and base savings calculation on the reported expectation. A summary sheet should clearly document how hours of operation were determined for lighting systems. The project file should contain an explanation if a custom approach to operation hours is taken.
7. Per energy code, most spaces require either a method of uniformly reducing light levels by at least 50 percent or the inclusion of occupancy control. This can be achieved cost effectively by allowing for manual bi-level switching. Occupancy control in lieu of manual light reduction represents energy savings beyond code minimum.
  - a. **Recommendation:** Specify that DNV KEMA calculate the difference in energy savings between minimally complying with energy code (bi-level switching) and the as-built lighting controls which many include occupancy sensors
8. In lighting systems, manual light reduction controls were not documented in the project files, nor were any savings associated with them. When combined with occupancy sensors, manual light reduction represents additional savings available to be claimed.
  - a. **Recommendation:** Clearly state whether manual light reduction controls are employed and whether or not a fixture has occupancy control. Also document whether or not energy code requires manual light reduction. Claim savings when lighting control system exceeds energy code requirements. Note: to count as manual light reduction the controls must reduce light in a reasonably uniform pattern. Switching by alternating rows of lights is considered reasonably uniform, however left half of room versus right half of room does not qualify as reasonably uniform.



## Appendix A Participant Survey Instruments

### 2012 AEP OHIO NON-RESIDENTIAL NEW CONSTRUCTION PROGRAM PARTICIPANT SURVEY (PRESCRIPTIVE)

#### a) Introduction:

ASK FOR NAMED CONTACT

Hello, my name is \_\_\_\_\_, from the Blackstone Group, calling on behalf of AEP Ohio. We are carrying out a review of the AEP Ohio's New Construction energy efficiency program. The reason for calling today is to ask you some questions regarding your experience with the program. Our objective is to better understand how effective the program has been and how it might be improved.

We understand your firm participated in the AEP Ohio program for a new building project at \_\_\_\_\_ [SITE\_ADDRESS]

[IF NEEDED: The survey will take about 15 minutes.]

Is now a good time to talk?

[THE TEXT IN TURQUOISE HIGHLIGHTING DOES NOT NEED TO BE PROGRAMMED. WE WILL PROVIDE INTERVIEWERS WITH A ONE PAGE HANDOUT OF THIS TEXT]

***IF NEEDED: IF THEY EXPRESS HESITATION, USE AN APPROPRIATE COMBINATION OF THE FOLLOWING.  
OVERCOMING OBJECTIONS:***

- Confidentiality. We are an independent research firm and your response only will be presented in aggregate along with responses from other survey participants.
- Not the right person – that's fine, do you know who would be more appropriate to talk to? Do you have their contact details? RECORD NEW CONTACT
- Security. Your responses will not affect any financial incentives or rebates you have received, nor will it affect your ability to participate in the program in the future.



- Sales concern. I am not selling anything. On behalf of AEP Ohio I simply want to understand what factors were important to your company's decision to apply to this program and subsequent decision to proceed.
- Contact. If you would like to talk with someone about this survey from our client or the Program Managers, the contacts are:
  - **AEP Ohio** – the contact person is **Linda Ecker** – available by phone at (614) 883-7881 or by e-mail at: [lecker@aep.com](mailto:lecker@aep.com)

**b) Awareness & Motivation**

Q1. How did you learn of the AEP Ohio New Construction program? (DO NOT READ LIST) (ACCEPT MULTIPLE RESPONSES) (IF NEEDED: IF RESPONDENT HEARD FROM SOMEONE WITHIN THEIR COMPANY ASK IF THEY KNOW WHERE THAT PERSON MIGHT HAVE HEARD OF THE PROGRAM) [MULTIPUNCH]

1. ADVERTISING/TRADE PUBLICATIONS
2. AEP OHIO STAFF
3. ARCHITECT (SPECIFY ARCHITECT) [OPEN END]
4. COLLEAGUE FROM ANOTHER COMPANY
5. ENERGY MODELER (SPECIFY ENERGY MODELER) [OPEN END]
6. ENGINEER (SPECIFY ENGINEER) [OPEN END]
7. INDUSTRY/TRADE ASSOCIATION (SPECIFY ASSOCIATION) [OPEN END]
8. INTERNET/WEB SITE (SPECIFY WEBSITE) [OPEN END]
9. DNV KEMA STAFF
10. WORKSHOP
97. OTHER (SPECIFY) [OPEN END]
98. DON'T KNOW [EXCLUSIVE]
99. REFUSED [EXCLUSIVE]



Q2. What were the main reasons your company decided to participate in the program? (DO NOT READ LIST. SELECT ALL THAT APPLY.) [MULTIPUNCH]

1. ABILITY TO MARKET BUILDING/ATTRACT TENANTS
2. CORPORATE MANDATE TO PARTICIPATE IN EFFICIENCY PROGRAMS
3. DESIGN INCENTIVE
4. DESIGN/MODELING ASSISTANCE
5. IMPROVED ENERGY EFFICIENCY/LOWER OPERATING COSTS
6. INCENTIVE TO PAY FOR ENERGY EFFICIENCY IMPROVEMENTS
7. TECHNICAL ASSISTANCE
97. OTHER (SPECIFY) [OPEN END]
98. DON'T KNOW [EXCLUSIVE]
99. REFUSED [EXCLUSIVE]

**c) Experience with Program**

DISP1. I am now going to ask a few questions about your experience with the program.

Q3a. Using a scale of 0 to 10 where 0 means "very difficult" and 10 means "very easy", how would you rate the ease of finding information about the program?

[INSERT DROP DOWN LIST WITH 0: VERY DIFFICULT TO 10: VERY EASY, INCLUDE 98: DON'T KNOW AND 99: REFUSED.]

Q3b. Using that same 0 to 10 scale, how easy or difficult did you find the application process? (IF NEEDED, REPEAT: a scale of 0 to 10 where 0 means very difficult and 10 means very easy)

[INSERT DROP DOWN LIST WITH 0: VERY DIFFICULT TO 10: VERY EASY, INCLUDE 96: NOT APPLICABLE, 98: DON'T KNOW AND 99: REFUSED.]



Q4. Using a scale of 0 to 10 where 0 means “very dissatisfied” and 10 means “very satisfied”, how would you rate your level of satisfaction with the following:

[FORMAT AS GRID, 0: VERY DISSATISFIED TO 10: VERY SATISFIED, INCLUDE 98: DON'T KNOW AND 99: REFUSED ACROSS THE TOP AND A AND B AS STUBS ON THE LEFT SIDE. ROTATE A AND B.]

- a) The level of documentation required
- b) The program overall

Q5. Are there specific things that your company does differently in other new construction projects now because of your participation in the program?

[MULTIPUNCH] (DO NOT READ LIST. SELECT ALL THAT APPLY)

- 1. CHANGED PURCHASING POLICY TO SPECIFY A LEVEL OF PAYBACK FOR ENERGY CONSUMING EQUIPMENT
- 2. ENROLL IN EFFICIENCY PROGRAM EARLIER IN THE DESIGN PROCESS
- 3. MODEL ENERGY CONSUMPTION AND EVALUATE ALTERNATIVES
- 4. REQUIRE NEW BUILDINGS MEET A SPECIFIED CODE OR STANDARD
- 5. SPECIFY PURCHASE OF CERTAIN TYPES OF EQUIPMENT OR LEVELS OF EFFICIENCY

97. OTHER (SPECIFY) [OPEN END]

96.NO, COMPANY DOESN'T DO ANYTHING DIFFERENTLY [EXCLUSIVE]

98. DON'T KNOW [EXCLUSIVE]

99. REFUSED [EXCLUSIVE]

Q6 What suggestions, if any, can you offer as to how the program application process could be improved?(PROBE)

97. [RECORD OPEN END]

96. NO SUGGESTIONS [SKIP TO Q7]

99. REFUSED [SKIP TO Q7]

Q6a. Do you have any other suggestions on how the overall program could be improved?

1. YES (SPECIFY) [OPEN END]

2. NO, NO OTHER SUGGESTIONS

99.REFUSED





Q7. What do you see as the main barriers to increasing the level of energy efficiency in the design of new building projects? (DO NOT READ LIST. SELECT ALL THAT APPLY.) [MULTIPUNCH]

1. ADDITIONAL CAPITAL COST OF ENERGY EFFICIENCY IMPROVEMENTS
2. PAYBACK/RETURN ON ADDITIONAL ENERGY EFFICIENCY IMPROVEMENTS
3. SPLIT INCENTIVES (DIFFERENT FIRM PAYING TO BUILD BUILDING THAN FIRM THAT PAYS FOR ENERGY COSTS)
4. UNCERTAINTY ABOUT PERFORMANCE OF EFFICIENCY IMPROVEMENTS
5. LACK OF DEMAND IN MARKET (FROM ULTIMATE USERS OF SPACE)
6. LACK OF UNDERSTANDING/INFORMATION ON OPPORTUNITIES
7. CODE LEVELS ALREADY EFFICIENT ENOUGH
8. ADDITIONAL TIME COMMITMENT REQUIRED TO INCORPORATE EFFICIENCY
97. OTHER[SPECIFY] [OPEN END]
96. NONE [EXCLUSIVE]
98. DON'T KNOW [EXCLUSIVE]
99. REFUSED [EXCLUSIVE]

**d) Modeling**

Q8. Did you complete a building energy simulation or modeling for the project?

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

**Q9 REMOVED**

[ASK Q10 IF Q8=1; ELSE SKIP TO DISP2]

Q10. Using a scale of 0 to 10 where 0 means "no value" and 10 means "a great deal of value", how much value do you feel energy modeling added to your project?

[INSERT DROP DOWN LIST WITH 0: NO VALUE TO 10: A GREAT DEAL OF VALUE, INCLUDE 98: DON'T KNOW AND 99: REFUSED.]



**e) CORPORATE POLICY BATTERY**

**[ASK ALL]**

Q11 Did your organization have a general policy about energy efficiency specifications for new construction projects, equipment purchases or energy modeling of new buildings before you participated in the AEP Ohio program?

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

**[ASK Q12 IF Q11=1. ELSE SKIP TO Q13.]**

Q12 Can you please describe your efficiency standard before you participated in the AEP Program? (DO NOT READ. SELECT ONE RESPONSE) [INTERVIEWER NOTE: ONLY CODE THE HIGHEST APPLICABLE STANDARD FOR THE RESPONDENT, 1 IS THE LOWEST, 5 IS THE HIGHEST. PROMPT IF NECESSARY] . **[SINGLE PUNCH.]**

- 1. BUILD TO BUILDING CODE
- 2. ABOVE BUILDING CODE
- 3. BUILD TO LEED SILVER
- 4. BUILD TO LEED GOLD
- 5. BUILD TO LEED PLATINUM
- 97. OTHER (SPECIFY) **[OPEN END]**
- 98. DON'T KNOW **[SKIP TO Q13]**
- 99. REFUSED **[SKIP TO Q13]**

**[ASK IF Q12=2. ELSE SKIP TO Q12B.]**

Q12a. Above building code by how much? (RECORD PERCENTAGE) [NUMERICAL OPEN END, RANGE 0-100]

- 998. DON'T KNOW
- 999. REFUSED

N13 Had that energy efficiency policy caused you to adopt energy efficient <SUBCATEGORYDESCRIPTION 1> before participating in the AEP Ohio program?



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

**[ASK IF N13=1] N14** Had that energy efficiency policy caused you to adopt energy efficient [<SUBCATEGORYDESCRIPTION 1>](#) for **other new construction projects** before participating in the AEP Ohio Program?

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

Q12b Did your energy efficiency standard change after you participated in the New Construction program?

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

[\[ASK IF Q12B=1. ELSE SKIP TO N13.\]](#)

Q12c. Can you please describe your new energy efficiency standard?

- 1 (DO NOT READ. SELECT ONE RESPONSE. PROMPT IF NECESSARY)  
LEED SILVER
- 2 LEED GOLD
- 3 LEED PLATINUM
- 4 ABOVE OHIO BUILDING CODE
- 5 97. OTHER (SPECIFY) [\[OPEN END\]](#)
- 98. DON'T KNOW
- 99. REFUSED

[\[ASK Q12D IF Q12C=4. ELSE SKIP TO N13.\]](#)

Q12d. Above Ohio Building Code by how much? (RECORD PERCENTAGE)  
[NUMERICAL OPEN END, RANGE 0-100]

- 998. DON'T KNOW
- 999. REFUSED



Q13 Has your firm been involved in multiple projects under AEP Ohio's New Construction program?

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

[ASK IF Q13=1. ELSE GO TO SKIP BEFORE N15.]

Q13a Was the same decision making process applied to all projects completed by your organization?

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

[ASK Q13AA IF Q13a=2 ELSE SKIP TO N15]

Q13aa Please describe how criteria differed between projects. [RECORD OPEN-END, 98=DON'T KNOW, 99=REFUSED]

[ASK N15 IF N13=1 OR N14=1]

N15 Did you receive an incentive for a previous installation of <SUBCATEGORYDESCRIPTION 1>?

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

## Firmographics

DISP3. Finally, I'd like to ask you few general questions about your company, specifically at [SITE\_ADDRESS].



**B1.** What is your job title or role? (DO NOT READ LIST) [SINGLE PUNCH]

- 1 BUILDING MANAGER
- 2 CHIEF FINANCIAL OFFICER
- 3 ENERGY MANAGER
- 4 FACILITIES MANAGER
- 5 OTHER FACILITIES MANAGEMENT/MAINTENANCE POSITION
- 6 OTHER FINANCIAL/ADMINISTRATIVE POSITION
- 7 PRESIDENT/CEO
- 8 PROPRIETOR/OWNER
  
- 97 (OTHER (SPECIFY) [OPEN END]
- 98 REFUSED
- 99 DON'T KNOW

**B2.** Approximately how many new building projects does your firm complete in Ohio, annually? [NUMERIC OPEN-END, RANGE 0-1000]

- 9998. DON'T KNOW
- 9999. REFUSED

**B3.** What is the principal business activity or type of business [COMPANY] conducts at the building for which the incentive was provided? 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) [SINGLE PUNCH.]

- 1 AGRICULTURAL
- 2 COLLEGE/UNIVERSITY
- 3 COMMUNITY SERVICE/ CHURCH/ TEMPLE/MUNICIPALITY
- 4 CONDO ASSOC/APARTMENT MGMT
- 5 CONVENIENCE STORE
- 6 GROCERY STORE
- 7 HEALTH CARE/HOSPITAL
- 8 HOTEL OR MOTEL



- 9 INDUSTRIAL ELECTRONIC & MACHINERY
- 10 INDUSTRIAL MINING, METALS, STONE, GLASS, CONCRETE
- 11 INDUSTRIAL PETROLEUM, PLASTIC, RUBBER AND CHEMICALS
- 12 OTHER INDUSTRIAL
- 13 OFFICE
- 14 PERSONAL SERVICE
- 15 RESTAURANT
- 16 RETAIL (NON-FOOD)
- 17 SCHOOL
- 18 WAREHOUSE
- 97 MISCELLANEOUS (SPECIFY)  
[OPEN END]
- 98 DON'T KNOW
- 99 REFUSED

**B4.** What is the total square footage of the portion of the facility that you occupy at this location? Your best estimate will be fine. [NUMERIC OPEN END, RANGE 100 – 999,997]

RECORD RESPONSE (In Square Feet)

98. DON'T KNOW

99. REFUSED

END. Thank you very much for taking the time to participate. We appreciate your assistance.



**2012 AEP OHIO NON-RESIDENTIAL NEW CONSTRUCTION PROGRAM  
PARTICIPANT SURVEY  
(CUSTOM or WHOLE BUILDING)**

**A. Introduction:**

**ASK FOR NAMED CONTACT**

Hello, my name is \_\_\_\_\_, from the Blackstone Group, calling on behalf of AEP Ohio's energy efficiency program. We are carrying out a review of the New Construction energy efficiency program, and the reason for calling today is to ask you some questions regarding your experience with the program. Our objective in conducting this survey is to better understand how effective the program has been and how it might be improved in future years.

We understand your firm participated in the AEP Ohio program for a new building project at \_\_\_\_\_ [SITE\_ADDRESS].

[IF NEEDED: The survey will take about 15 minutes.]

Is now a good time to talk?

[THE TEXT IN TURQUOISE HIGHLIGHTING DOES NOT NEED TO BE PROGRAMMED. WE WILL PROVIDE INTERVIEWERS WITH A ONE PAGE HANDOUT OF THIS TEXT]

Flysheet

*If they express hesitation, use an appropriate combination of the following.*  
Overcoming objections:

- Confidentiality. We are an independent research firm and your response only will be presented in aggregate along with responses from other survey participants.
- Not the right person – that's fine, do you know who would be more appropriate to talk to? Do you have their contact details? RECORD NEW CONTACT



- Security. Your responses will not affect your ability to participate in the program in the future.
- Sales concern. I am not selling anything. On behalf of AEP Ohio I simply want to understand what factors were important to your company's decision to apply to this program and subsequent decision not to proceed.
- Contact. If you would like to talk with someone about this survey from our client or the Program Managers, the contacts are:
  - **AEP Ohio** – the contact person is **Linda Ecker** – available by phone at (614) 883-7881 or by e-mail at: [lkeckerr@aep.com](mailto:lkeckerr@aep.com)

## B. Awareness & Motivation

Q1. How did you learn of the AEP Ohio New Construction program? (DO NOT READ LIST. SELECT ALL THAT APPLY.) [MULTIPUNCH]

1. ADVERTISING/TRADE PUBLICATIONS
2. AEP OHIO STAFF
3. ARCHITECT (SPECIFY ARCHITECT) [OPEN END]
4. COLLEAGUE FROM ANOTHER COMPANY
5. ENERGY MODELER (SPECIFY ENERGY MODELER) [OPEN END]
6. ENGINEER (SPECIFY ENGINEER) [OPEN END]
7. INDUSTRY/TRADE ASSOCIATION (SPECIFY ASSOCIATION) [OPEN END]
8. INTERNET/WEBSITE (SPECIFY WEBSITE) [OPEN END]
9. DNV KEMA STAFF
10. WORKSHOP
97. OTHER (SPECIFY) [OPEN END]
98. DON'T KNOW [EXCLUSIVE]
99. REFUSED [EXCLUSIVE]

Q2. What were the main reasons your company decided to participate in the program? (DO NOT READ LIST. SELECT ALL THAT APPLY.) [MULTIPUNCH]

1. IMPROVED ENERGY EFFICIENCY/LOWER OPERATING COSTS
2. DESIGN/MODELING ASSISTANCE





- 3. DESIGN INCENTIVE
- 4. INCENTIVE TO PAY FOR ENERGY EFFICIENCY IMPROVEMENTS
- 5. TECHNICAL ASSISTANCE
- 97. OTHER (SPECIFY) [OPEN END]
- 98. DON'T KNOW [EXCLUSIVE]
- 99. REFUSED [EXCLUSIVE]

### **C. Experience with Program**

DISP1. I am now going to ask a few questions about your experience with the program.

Q3a. Using a scale of 0 to 10 where 0 means “very difficult” and 10 means “very easy”, how would you rate the ease of finding information about the program? [INSERT DROP DOWN LIST WITH 0: VERY DIFFICULT TO 10: VERY EASY, INCLUDE 98: DON'T KNOW AND 99: REFUSED.]

Q3b. Using that same 0 to 10 scale, how easy or difficult did you find the application process? [INSERT DROP DOWN LIST WITH 0: VERY DIFFICULT TO 10: VERY EASY, INCLUDE 96: NOT APPLICABLE, 98: DON'T KNOW AND 99: REFUSED.]

Q4. Using a scale of 0 to 10 where 0 means “very dissatisfied” and 10 means “very satisfied”, how would you rate your level of satisfaction with the following: [FORMAT AS GRID, 0: VERY DIFFICULT TO 10: VERY EASY, INCLUDE 98: DON'T KNOW AND 99: REFUSED ACROSS THE TOP AND A AND B AS STUBS ON THE LEFT SIDE. ROTATE A AND B.]

- c) The level of documentation required
- d) The program overall



Q5. Are there specific things that your company does differently in other new construction projects now because of your participation in the program? (DO NOT READ LIST. SELECT ALL THAT APPLY.) [\[MULTIPUNCH\]](#)

1. CHANGED PURCHASING POLICY TO SPECIFY A LEVEL OF PAYBACK FOR ENERGY CONSUMING EQUIPMENT
2. MODEL ENERGY CONSUMPTION AND EVALUATE ALTERNATIVES
3. REQUIRE NEW BUILDINGS MEET A SPECIFIED CODE OR STANDARD
4. SPECIFY PURCHASE OF CERTAIN TYPES OF EQUIPMENT OR LEVELS OF EFFICIENCY

97. OTHER (SPECIFY) [\[OPEN END\]](#)

96. NO, COMPANY DOESN'T DO ANYTHING DIFFERENTLY [\[EXCLUSIVE\]](#)

98. DON'T KNOW [\[EXCLUSIVE\]](#)

99. REFUSED [\[EXCLUSIVE\]](#)

Q6. What suggestions, if any, can you offer as to how the program application process could be improved? (PROBE)

97. [\[RECORD OPEN END\]](#)

96. NO SUGGESTIONS [\[SKIP TO Q7\]](#)

99. REFUSED [\[SKIP TO Q7\]](#)

Q6a. Do you have any other suggestions on how the overall program could be improved?

1. YES (SPECIFY) [\[OPEN END\]](#)

2. NO, NO OTHER SUGGESTIONS

99. REFUSED



Q7. What do you see as the main barriers to increasing the level of energy efficiency in the design of new building projects? (DO NOT READ LIST. SELECT ALL THAT APPLY.) [MULTIPUNCH]

1. ADDITIONAL CAPITAL COST OF ENERGY EFFICIENCY IMPROVEMENTS
2. PAYBACK/RETURN ON ADDITIONAL ENERGY EFFICIENCY IMPROVEMENTS
3. SPLIT INCENTIVES (i.e., DIFFERENT FIRM PAYING TO BUILD BUILDING THAN FIRM THAT PAYS FOR ENERGY COSTS)
4. UNCERTAINTY ABOUT PERFORMANCE OF EFFICIENCY IMPROVEMENTS
5. LACK OF DEMAND IN MARKET (FROM ULTIMATE USERS OF SPACE)
6. LACK OF UNDERSTANDING/INFORMATION ON OPPORTUNITIES
7. CODE LEVELS ALREADY EFFICIENT ENOUGH
8. ADDITIONAL TIME COMMITMENT REQUIRED TO INCORPORATE EFFICIENCY
97. OTHER (SPECIFY) [OPEN END]
96. NONE [EXCLUSIVE]
98. DON'T KNOW [EXCLUSIVE]
99. REFUSED [EXCLUSIVE]

#### D. Modeling

Q8. Did you complete a building energy simulation or modeling for the project? [SINGLE PUNCH]

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

#### Q9 REMOVED

[ASK Q10 IF Q8=1. ELSE SKIP TO DISP2.]

Q10. Using a scale of 0 to 10 where 0 means "no value" and 10 means "a great deal of value", how much value do you feel energy modeling added to your project?

[INSERT DROP DOWN LIST WITH 0: NO VALUE TO 10: A GREAT DEAL OF VALUE, INCLUDE 98: DON'T KNOW AND 99: REFUSED.]

#### E. CORPORATE POLICY BATTERY

ASK ALL



Q11. Did your organization have a general policy about energy efficiency specifications for new construction projects, equipment purchases or energy modeling of new buildings before you participated in the AEP Ohio program?

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

[ASK Q12 IF Q11=1. ELSE SKIP TO Q13.]

Q12. Can you please describe your efficiency standard before you participated in the AEP Program? (DO NOT READ. SELECT ONE RESPONSE. ONLY CODE THE HIGHEST APPLICABLE STANDARD FOR THE RESPONDENT, 1 IS THE LOWEST, 5 IS THE HIGHEST. PROMPT IF NECESSARY.) [SINGLE PUNCH.]

- 1. BUILD TO BUILDING CODE
- 2. ABOVE BUILDING CODE
- 3. BUILD TO LEED SILVER
- 4. BUILD TO LEED GOLD
- 5. BUILD TO LEED PLATINUM
- 100. OTHER (SPECIFY) [OPEN END]
- 101. DON'T KNOW [SKIP TO Q13]
- 102. REFUSED [SKIP TO Q13]

[ASK IF Q12=2. ELSE SKIP TO N13]

Q12a. Above building code by how much? (RECORD PERCENTAGE) [NUMERICAL OPEN END, RANGE 0-100]

- 998. DON'T KNOW
- 999. REFUSED

N13. Had that energy efficiency standard caused you to adopt energy efficiency improvements before participating in the AEP Ohio program? [SINGLE PUNCH.]

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



N14. **[ASK IF N13=1]** Had that energy efficiency standard caused you to adopt energy efficiency improvements for **other new construction projects** before participating in the AEP Ohio Program? **[SINGLE PUNCH.]**

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

Q12b Did your energy efficiency policy change after you participated in the New Construction program?

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

**[ASK IF Q12B=1. ELSE SKIP TO Q13.]**

Q12c. Can you please describe your new energy efficiency standard?

**(DO NOT READ. SELECT ONE RESPONSE. PROMPT IF NECESSARY) [SINGLE PUNCH.]**

- 1. LEED SILVER
- 2. LEED GOLD
- 3. LEED PLATINUM
- 4. % ABOVE OHIO BUILDING CODE
- 97.OTHER (SPECIFY) **[OPEN END]**
- 98.DON'T KNOW
- 99.REFUSED

**[ASK Q12D IF Q12C=4.]**

Q12d. Above Ohio Building Code by how much? (RECORD PERCENTAGE)

**[NUMERICAL OPEN END, RANGE 0-100]**

- 998. DON'T KNOW
- 999. REFUSED

Q13. Has your firm been involved in multiple projects under AEP Ohio's New Construction program? **[SINGLE PUNCH.]**

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



[ASK IF Q13=1. ELSE GO TO SKIP BEFORE N15.]

Q13a. Was the same decision making process applied to all projects completed by your organization? [SINGLE PUNCH.]

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

[IF Q13a=2] Q13aa Please describe how criteria differed between projects. [RECORD OPEN-END, 98=DON'T KNOW, 99=REFUSED]

[ASK N15 IF N13=1 OR N14=1]

N15. Did you receive an incentive for a previous installation of efficiency improvements included in your building project? [SINGLE PUNCH.]

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

### **Firmographics**

DISP3. Finally, I'd like to ask you few general questions about your company.

B1. What is your job title or role? (DO NOT READ LIST) [SINGLE PUNCH]

- 1. BUILDING MANAGER
- 2. CHIEF FINANCIAL OFFICER
- 3. ENERGY MANAGER
- 4. FACILITIES MANAGER
- 5. OTHER FACILITIES MANAGEMENT/MAINTENANCE POSITION
- 6. OTHER FINANCIAL/ADMINISTRATIVE POSITION
- 7. PRESIDENT/CEO
- 8. PROPRIETOR/OWNER

- 97.OTHER(SPECIFY) [OPEN END]
- 98.DON'T KNOW
- 99.REFUSED



B2. Approximately how many new building projects does your firm complete in Ohio, annually? (RECORD NUMBER) [NUMERICAL OPEN END RANGE 0-1000]

9998. DON'T KNOW

9999. REFUSED

B3. What is the principal business activity or type of business [COMPANY] conducts at the building for which the incentive was provided? 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) [SINGLE PUNCH.]

- 1 AGRICULTURAL
- 2 COLLEGE/UNIVERSITY
- 3 COMMUNITY SERVICE/ CHURCH/ TEMPLE/MUNICIPALITY
- 4 CONDO ASSOC/APARTMENT MGMT
- 5 CONVENIENCE STORE
- 6 GROCERY STORE
- 7 HEALTH CARE/HOSPITAL
- 8 HOTEL OR MOTEL
- 9 INDUSTRIAL ELECTRONIC & MACHINERY
- 10 INDUSTRIAL MINING, METALS, STONE, GLASS, CONCRETE
- 11 INDUSTRIAL PETROLEUM, PLASTIC, RUBBER AND CHEMICALS
- 12 OTHER INDUSTRIAL
- 13 OFFICE
- 14 PERSONAL SERVICE
- 15 RESTAURANT
- 16 RETAIL (NON-FOOD)
- 17 SCHOOL
- 18 WAREHOUSE

97

MISCELLANEOUS (SPECIFY) [OPEN

END]

98 REFUSED

99 DON'T KNOW

B4. What is the total square footage of the portion of the facility that you occupy at this location? Your best estimate will be fine. (RECORD SQUARE FEET.) [NUMERICAL OPEN END, RANGE 100-999,997]

999998. DON'T KNOW

999999. REFUSED

END. Thank you very much for taking the time to participate. We appreciate your assistance.

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## APPENDIX M

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## EXPRESS PROGRAM FOR SMALL BUSINESS

### Program Year 2012 Evaluation Report

Prepared for:  
AEP Ohio



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May 7, 2013



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## Executive Summary

This document presents a summary of the findings and results from the evaluation of the Express Program for Small Business (Express Program) implemented by AEP Ohio for the program year January 1, 2012 through December 31, 2012.<sup>1</sup>

The Express Program for Small Business provides a one-stop, turn-key service to small businesses (less than 200,000 kWh annual consumption) for lighting, HVAC and refrigeration measure upgrades. Savings estimates are based on prescriptive formulas for simplicity and auditability. Equipment installation contractors served as the contact point for the program to simplify the participation process for small business with limited resources and energy efficiency expertise.

The Express Program implementation contractor was replaced midway through the program year, suspending the program for the remainder of the year. Discussions with a new implementation contractor for the future shape of the program delayed new projects from being completed prior to the program year-end. Therefore, this report focuses on the impacts from projects implemented before the program was suspended.

### *Evaluation Objectives*

The two major objectives of the evaluation are to:

1. Quantify verified *ex post* energy savings and summer peak demand reduction<sup>2</sup> from the program during 2012
2. Provide data to determine program cost-effectiveness

### *Evaluation Methods*

The data collected for the evaluation of 2012 Express Program were gathered by 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.

---

<sup>1</sup> Program Year 2012 began January 1, 2012 and ended December 31, 2012.

<sup>2</sup> The summer on-peak period for claiming demand reduction is defined as non-holiday weekdays from 3 pm through 6 pm, June 1<sup>st</sup> through August 31<sup>st</sup>.



**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 Express projects	AEP Ohio Express Program Tracking Database	-	All	December 2012 through February 2012
In-depth Interviews	Program staff at AEP Ohio	Contacts from AEP Ohio	-	1 AEP Ohio Staff	January 2013
Billing Data	2012 Participants & Pipeline 2013 Participants	AEP Ohio Customer Information System	Census	730	February 2013-March 2013
Onsite Data Verification	Projects in the 2012 Program	Express Program Tracking Database	Sites around Columbus locations	20	March 2013

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

The impact results for the 2012 Express Program are shown in Table ES-2.

**Table ES-2. Savings Estimates for 2012 Express Program**

Program	Program Goals		<i>Ex-Ante</i> Reported Savings (a)		Verified <i>Ex-Post</i> Savings (b)		Realization Rates RR = (b) / (a)	
	MWh	MW	MWh	MW	MWh	MW	MWh	MW
Express Program	9.7	1.6	9,043	2.25	5,126	2.25	57%	100%

For AEP Ohio, the realization rate (defined as verified *ex post* savings/*ex ante* reported savings) is 57% for gross energy savings, and 100% demand reduction. The relative precision at a 90 percent confidence level for the 2012 Express projects in the sample is  $\pm 20$  percent for the energy realization rate and better than  $\pm 10$  percent for the demand realization rate. The precision reflects uncertainty in the regression model parameter estimates. Because the regression model includes all participants with viable data, the sampling error is virtually zero and so the savings estimates satisfy the 90% confidence and 10% precision targets.

### **Key Impact Recommendations**

1. AEP Ohio and the new implementation contractor should re-assess some of the baseline fixture wattages used for *ex-ante* savings estimates. Over-estimating existing fixture power will inflate *ex-ante* savings. Focus on the most common baseline systems, linear fluorescent lamps and incandescent lamps rated for >120V.



2. *Ex-ante* demand and energy savings estimates should include minimum burn-out estimates for sites that do not exceed the 10% threshold required to track lamp burn-out. Navigant suggests a minimum burnout estimate between 3% and 8%.
3. Operating hours should be more site-specific and precise. Operating hours could be based on:
  - » Actual business hours, plus one to two hours per day for pre-and post-occupancy usage
  - » A fifty-week year assuming holiday closures, or
  - » Deemed estimated hours by business type

### **Key Process Recommendations**

The report does not address program processes from the first half of the program year as these are not relevant to the new program model. Due to the late re-launch, there were no program processes for the new model to review for 2012.

1. The Express Program should complete a mid-year 2013 process and impact review. While not recommending a full-blown evaluation at mid-year, Navigant feels that the new program model should be reviewed to ensure AEP Ohio is getting the results it desires – impacts, coordination, customer satisfaction and installation sub-contractor feedback.

Several process improvement ideas from 2011 are independent of the implementation contractor and the program model. Navigant repeats key 2011 recommendations as areas to address in future process evaluations:

1. Lack of capital is one of the major issues with the program participants even though the sums involved are frequently small. Navigant suggests that AEP Ohio continues to explore financing options to fold into the program offer.
2. Lack of information about the program and the benefits of energy-efficient equipment are also major barriers to the program. AEP Ohio should explore how to get information to these less knowledgeable customers and should consider whether a general information/education campaign is needed.



## 1 Introduction and Purpose of the Study

This evaluation report covers the Express Program for Small Business element of the AEP Ohio's business energy efficiency and peak demand reduction (EE/PDR) portfolio. The goals of a program evaluation are to objectively 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.

This program delivery model was changed midway through 2012 when the implementation contractor was replaced. In June 2012 the program was suspended to affect this change. A number of projects started prior to program suspension were completed through the summer of 2012 and no projects were completed with the new program model under the new implementation contractor.

The effects of the implementation changes are reflected in this report. The evaluation report focuses primarily on the program impacts, as the processes in effect in early 2012 are not relevant to the redesigned program, and no new processes were firmly in place at the close of 2012 to evaluate for the redesigned program.

### 1.1 Evaluation Overview

The two major objectives of the evaluation are to:

1. Quantify energy savings and summer peak demand reduction from the program during 2012
2. Provide data to determine program cost-effectiveness

The evaluation will seek to answer the following key research questions.

#### 1.1.1 Impact Questions

1. Were the impacts reported by the program achieved?
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 and cost effectiveness of this program?

The 2012 evaluation provides AEP Ohio combined quantitative results for these impact questions.



## 2 Description of the Program

AEP Ohio supports a portfolio of programs which helps its customers find value through installing more efficient equipment. Programs are funded on an annual calendar year basis. Funding in any given program year is limited to that year's budgeted amount and, therefore, incentives are paid on a first-come, first-served basis until the program year's incentive funds are exhausted. Funds may be shifted between the multiple business program elements based on participant response and approval of the PUCO.

The program is implemented by a contractor. An AEP Ohio staff person supports outreach and marketing, and other AEP Ohio staff support planning, evaluation, and reporting. The contractor was replaced as program administrator in June 2012 and the program was suspended. The Express Program was not re-launched with the new program administrator until late in 2012 – too late to complete additional projects in 2012 or establish new program processes to evaluate.

### 2.1 Program Description

The Express Program provides one-stop turn-key services to small businesses (defined as customers with less than 200,000 kWh consumption per year) for lighting, HVAC and refrigeration measure upgrades. The program targets customers that typically do not participate in other program offerings due to various market barriers, including, lack of capital, inadequate energy expertise, or insufficient personnel to explore energy efficiency options. To address market barriers the Express Program has higher equipment incentives and in 2012 was delivered through Registered Express Contractors (Contractors) who were trained in energy efficiency and Express Program procedures and reporting. Contractors surveyed customers' sites, proposed retrofits, and installed customer-approved equipment within a prescribed period of time. AEP Ohio paid the equipment incentives to the contractor to reduce the administrative burden on the customer and simplify the participation process. Savings estimates are based on prescriptive formulas for simplicity and auditability.

#### 2.1.1 Eligibility

AEP Ohio business customers with annual consumption below 200,000 kWh can participate in the Express Program<sup>3</sup>. In addition to the annual consumption restriction, participants must be AEP Ohio customers and cannot be mercantile or managed national account customers. These other criteria presume that these other customer groups have adequate access to capital and energy efficiency expertise and support at the corporate level.

---

<sup>3</sup> By applying rules-of-thumb, the consumption restriction limits participants to about 10,000 square feet of office or retail space. Higher energy users, such as convenience stores or small manufacturing, generally will be smaller to comply with the consumption restriction. Unconditioned warehouses can be much larger.



### **2.1.2 Program Benefits**

Participating Express Program participants receive<sup>4</sup>:

- » A free facility assessment to identify potential energy-saving opportunities
- » A proposal that includes a list of recommendations and estimates of energy savings, project cost and payback period
- » Incentives paid directly to the contractor, up to 100% of the project cost
- » Installation of approved energy-savings equipment by a local, trained contractor
- » Pre- and post-installation inspections to assure quality and to verify energy savings

Eligible equipment includes indoor and outdoor lighting retrofits, occupancy sensors, refrigeration controls, HVAC equipment and other proven technologies. However, all of the 2012 participation consists of lighting measures. Incentives vary based on equipment type and the estimated energy saved.

## **2.2 Implementation Strategy**

The program implementer, AEP Ohio staff and local Registered Express Contractors (contractors) share responsibility for promoting the Express Program. The implementer and AEP Ohio staff partner to deliver informational presentations at trade shows and to community groups such as the Chambers of Commerce. The contractors, however, do most of the one-on-one marketing to customers. The program is designed to make their standard service offering more appealing, thus an assertive contractor could develop its business around the Express Program.

### **2.2.1 Program Delivery Mechanisms and Marketing Strategy**

The 2012 Express Program leveraged the relationship between local contractors and small businesses. These customers seldom have time to attend seminars or presentations, thus their contractors are their point of contact for ideas for reducing energy costs. By teaming with the contractors and training them on the Express Program procedures, AEP Ohio used contractors to market the Express Program to their customers in a one-on-one setting. In return, AEP Ohio conferred a “stamp of approval” on the contractor by certifying it with the program and conducting quality control steps during pre-installation and post-installation inspections.

Thirty-seven contractors submitted projects for incentives in 2012. Contractor approaches to the program vary, and successful contractors had a couple of approaches. Contractor tracking data show that contractors will target a specific street and/or strip mall and market to all eligible customers in that business neighborhood. When a contractor finds a receptive participant, they then target related facilities, for example, a restaurant or dry cleaner with multiple locations. Other contractors market the program only as part of their business-as-usual marketing, and thus, may have fewer projects among diverse sites and addresses.

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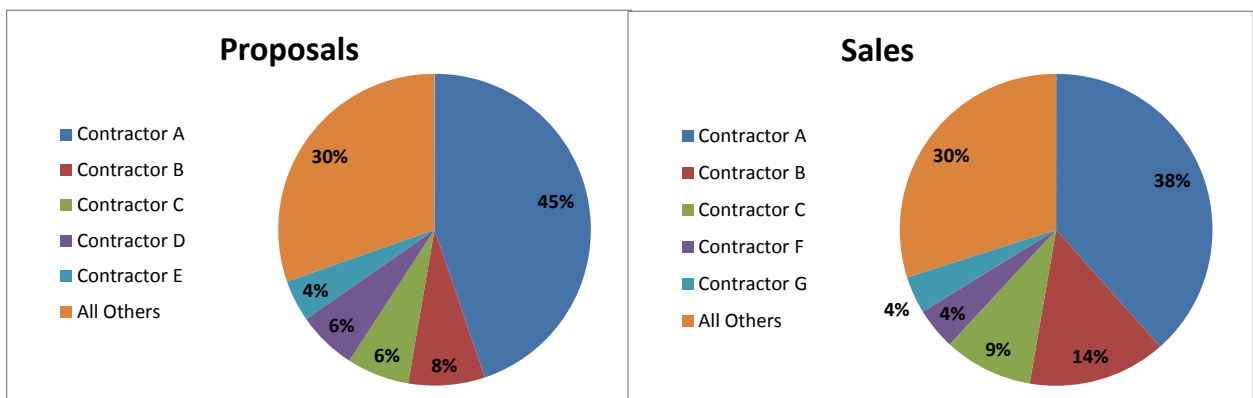
<sup>4</sup> Information obtained from the Express Program Fact Sheet 1210.



### 2.2.2 Solution Provider Participation

As of March 2012, 78 contractors were listed on the Express Program website. Among these contractors, 37 were active in 2012, and five accounted for 70% of completed proposals and 70% of sales through the program. Three contractors are among the top five on both metrics. The other thirty-two contractors had 30% of the proposals, and fifteen contractors completed only one or two projects in 2012. In the 2013 re-launched program, installation contractors will be sub-contracted to the program implementer to install measures identified during program implementer site surveys and proposals.

**Figure 2-1. 2012 Contractor Metrics – Express Program Proposals and \$ Sales**

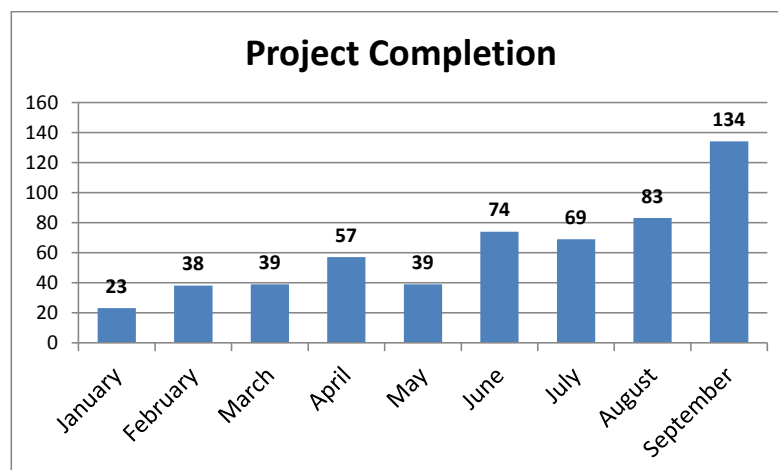


Source: AEP Ohio Express Program database exports from December 16, 2012.

### 2.3 2012 Express Program Participation

In general, the Express Program was reaching its intended market prior to being suspended, but participation prior to suspension was well below goals. Among the 556 projects completed in 2012, more than 51% were completed after the program was officially suspended. These later completions had been started prior to the program suspension.

**Figure 2-2. 2012 Contractor Metrics**





The evaluation team extracted key program participation data from AEP Ohio's Express Program database. The database includes two tables, project-level data and measure-level data. The project table consists of project total impacts, application submittal and status data, customer and contractor contact information and internal approval information. Project data is linked by a unique proposal number to measure-level information. The technical basis for AEP Ohio's *ex-ante* reported savings is described in Section 4.

Table 2-1 provides a profile of 2012 Express Program participation at the market segment level. Figure 2-2 through Figure 2-6 show other attributes of the 2012 participants. Table 2-2 and Figure 2-8 provides measure level breakouts.

The small retail and small office segments have a majority of the proposals and energy savings, an indication that the program is reaching these historically under-represented groups. In general, energy and demand savings are roughly proportional to the number of proposals generated for each market segment. Overall, the average *ex-ante* savings per proposal is 16,264 kWh.

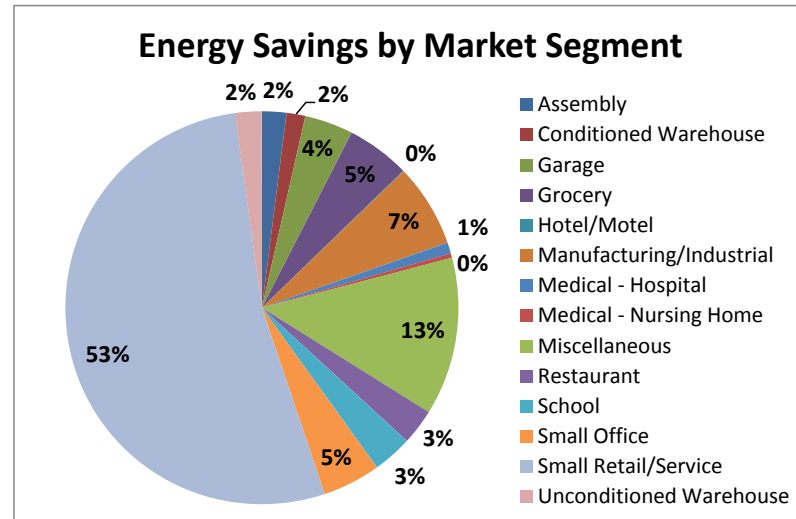
**Table 2-1. 2012 AEP Ohio Express Program Participation by Business Type**

Business Type	Project Count		Ex-ante Reported Savings,		Ex-ante Reported Savings,	
			MWh		MW	
Assembly	6	1%	182	2%	0.03	2%
Conditioned Warehouse	5	1%	140	2%	0.04	2%
Garage	24	4%	360	4%	0.10	4%
Grocery	43	8%	471	5%	0.07	3%
Hotel/Motel	2	0%	6	0%	0.00	0%
Manufacturing/Industrial	22	4%	618	7%	0.19	8%
Medical - Hospital	4	1%	81	1%	0.03	1%
Medical - Nursing Home	2	0%	35	0%	0.00	0%
Miscellaneous	54	10%	1,175	13%	0.25	11%
Restaurant	23	4%	264	3%	0.05	2%
School	12	2%	293	3%	0.06	3%
Small Office	51	9%	431	5%	0.11	5%
Small Retail/Service	298	54%	4,792	53%	1.29	57%
Unconditioned Warehouse	10	2%	197	2%	0.05	2%
<b>Total</b>	<b>556</b>	<b>100%</b>	<b>9,043</b>	<b>100%</b>	<b>2.27</b>	<b>100%</b>

Source: AEP Ohio Express Program database exports from December 16, 2012.

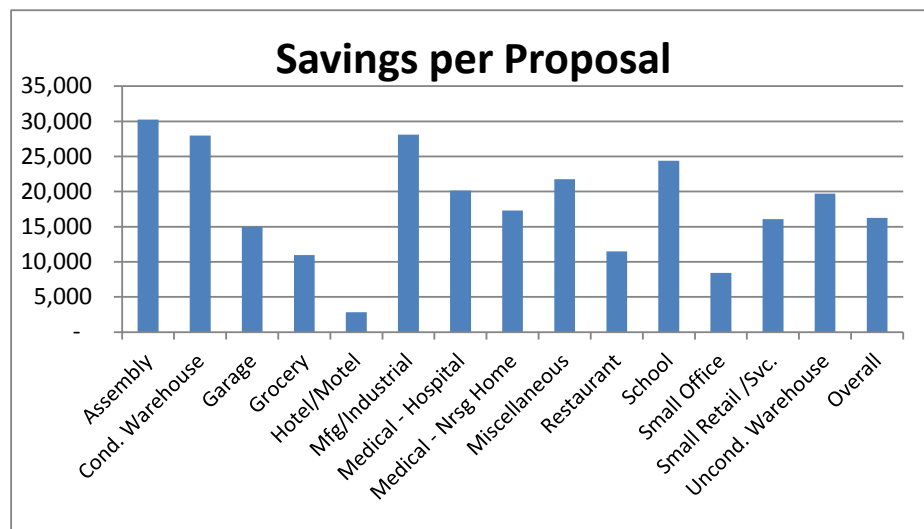


**Figure 2-3. 2012 AEP Ohio Express Program MWh Savings by Business Type**



Source: AEP Ohio Express Program database exports from December 16, 2012.

**Figure 2-4. 2012 AEP Ohio Express Program Average kWh Savings by Business Type**



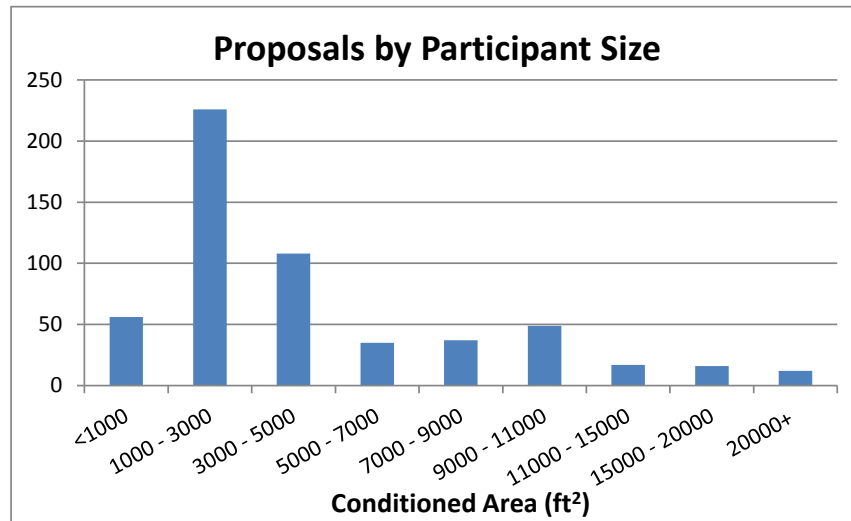
Source: AEP Ohio Express Program database exports from December 16, 2012.

Figure 2-5 and Figure 2-6 show the distribution of proposals and savings by reported participant floor area. The program appears to be successful enrolling typical small business. More than 70% of participants are between 1,000 sq. ft. and 5,000 sq. ft., and more than 50% of program *ex-ante* savings are attributed to these smaller customers. Figure 2-7 shows the average participant size by business type. As expected, the assembly, industrial and warehouse segments are the largest facilities in the program. Hotels, restaurants and small groceries (convenience stores) are the smallest participants by floor area.



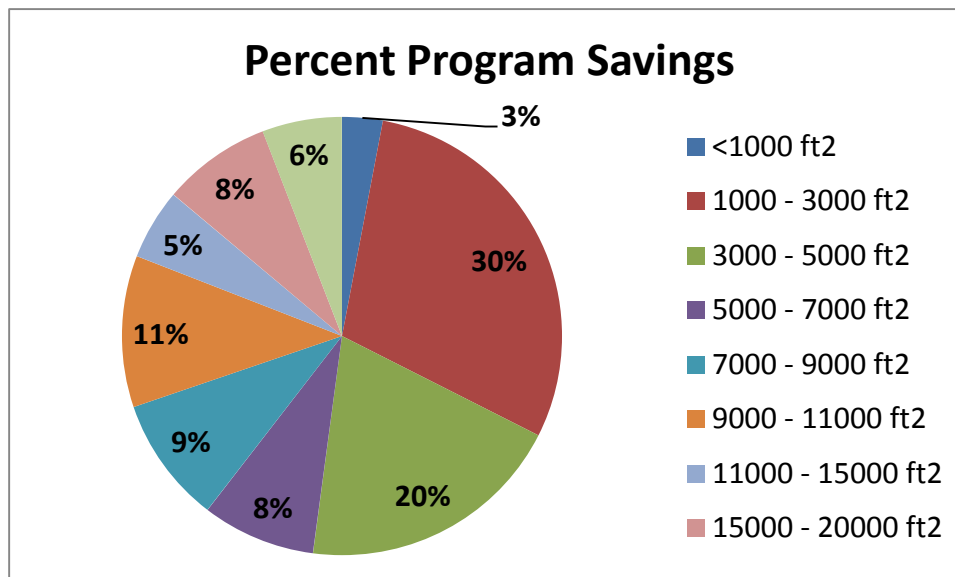


**Figure 2-5. 2012 AEP Ohio Express Program Proposals by Participant Size**



Source: AEP Ohio Express Program database exports from December 16, 2012.

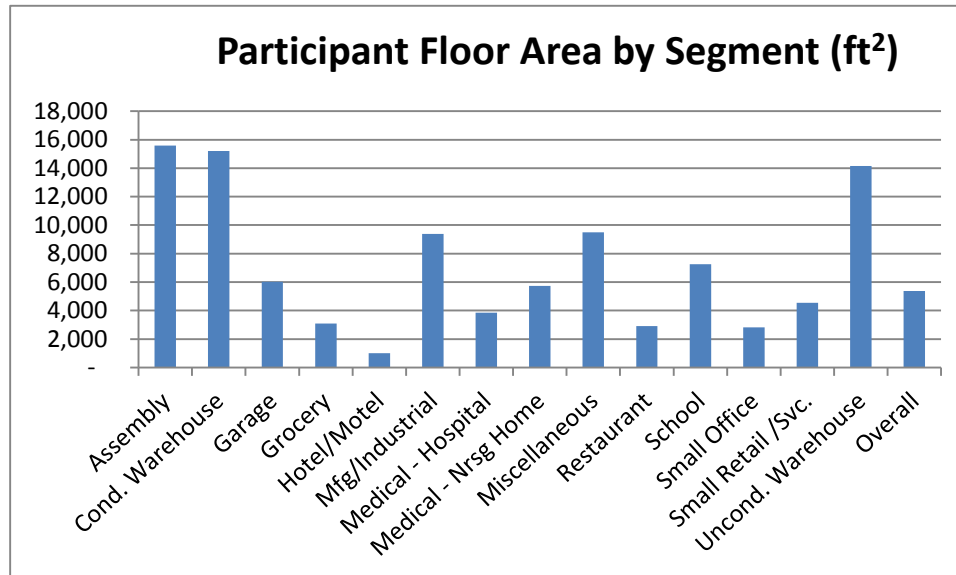
**Figure 2-6. 2012 AEP Ohio Express Program Proportion of Energy Savings by Conditioned Area (ft²)**



Source: AEP Ohio Express Program database exports from December 16, 2012.



**Figure 2-7. Participant Size (average) by Market Segment**



Source: AEP Ohio Express Program database exports from December 16, 2012.

**Table 2-2. 2012 AEP Ohio Express Program Savings by Retrofit Measure Type**

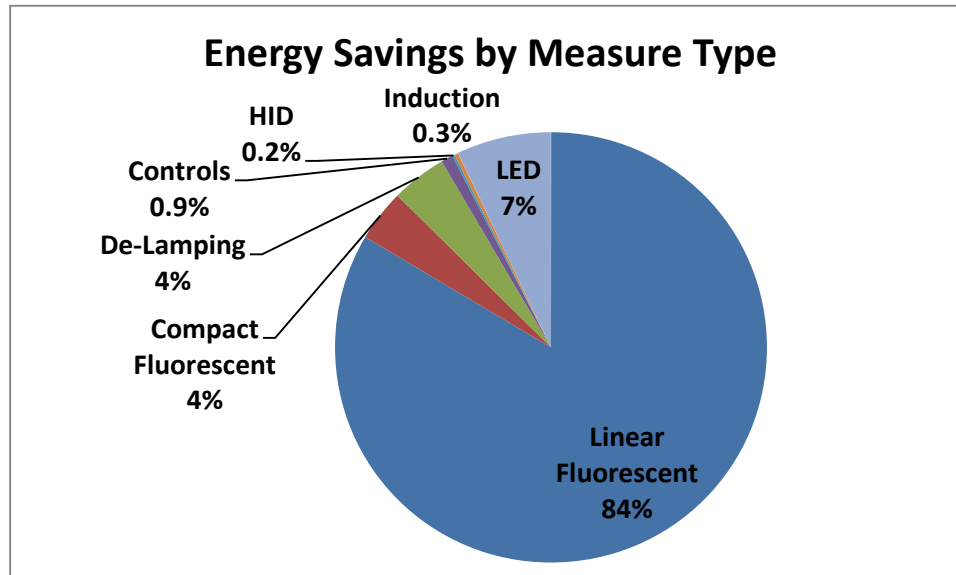
Measure Type	Example Systems	Ex-ante Savings, MWh	Ex-ante Savings, kW
Linear Fluorescent	All configurations of T5 and T8 system, excluding delamping	7,556	1,960.6
Compact Fluorescent	All configurations of screw-in and hard-wired CFLs	351	70.3
De-Lamping	Removal of lamps from linear fluorescent systems	373	115.8
Controls	Occupancy sensors (wall/switch/ceiling) and photocells	79	-
HID	Pulse-start metal halides	17	1.6
Induction	Induction Lamps and systems	25	7.9
LED	Exit Signs and other hard-wired or screw-in lamps	641	89.9
<b>Total</b>		<b>9,043</b>	<b>2,246.1</b>

Note: Totals may not sum due to rounding.

Source: AEP Ohio Express Program database exports from December 16, 2012.



**Figure 2-8. 2012 AEP Ohio Express Program Savings by Measure Type**



*Source: AEP Ohio Express Program database exports from December 16, 2012.*



### 3 Methodology

For Express Program participants, the evaluation team conducted impact evaluation activities following the methodologies outlined below.

#### 3.1 Analytical Methods

##### 3.1.1 Impact Evaluation Methods

The objective of the impact evaluation is to verify the *ex-ante* reported savings in the Express Program tracking system. Savings verification was conducted by multiple methods:

- » **Billing analysis** of 2012 participants and pipeline participants served as the basis for determining program savings. The fixed effects analysis method employed uses participants as their own controls for savings. Pre- and post-installation periods are determined on a project-by-project basis. Use of pipeline participants as a comparison group accounts for other exogenous effects such as macro-economic trends.
- » **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.
- » **Default Measure Savings Assessment:** to identify potential adjustments to *ex-ante* reported savings for measures where the evaluation team recommends an alternative default value for a specific measure.
- » **On-site Verification:** the Evaluation Team conducted onsite verification of measure installations and hours of operation for 20 projects in the greater Columbus area.

In 2012 the Express Program only installed lighting-related measures including linear fluorescent systems, high-bay retrofits, compact fluorescent lamps, controls, and de-lamping. The basis for AEP Ohio's *ex-ante* reported savings are driven by the first four main factors:

1. Estimated power used by existing fixtures
2. Prescriptive power estimates for new equipment
3. Burn-out ratios for existing lamps
4. Self-reported hours of use
5. Secondary effects from HVAC equipment

Reported savings for lighting measures are based on a technical reference spreadsheet (TRS) developed by the program implementer and customer-reported hours of operation in bins of hours. Custom measures rely upon contractor provided data and may be revised by the program implementer upon technical review.



### 3.2 Data Sources

The data for evaluation of the Express Program was gathered through a number of activities. The evaluation team conducted in-depth telephone interviews with the AEP Ohio Program Coordinator. The evaluation team reviewed tracking system data, performed onsite verification, and technical review of a sample of projects. Finally, the team performed a billing analysis of participants to determine *ex post* savings. See Appendix A. Table 3-1 provides a summary of these data collection activities, including the targeted population, the sample frame, and the timeframe in which the data collection occurred.

**Table 3-1. Data Collection Activities for 2012 Evaluation**

Data Collection Type	Targeted Population	Sample Frame	Sample Design	Sample Size	Timing
Tracking Data Analysis	2012 Express projects	AEP Ohio Express Program Tracking Database	-	All	December 2012 through March 2013
In-depth Interviews	AEP Ohio Program staff	Contacts from AEP Ohio	-	1 AEP Ohio Staff	January 2013
Billing Data	2012 Participants & Pipeline 2013 Participants	AEP Ohio Customer Information System	Census	730	February 2013-March 2013
Onsite Data Verification	Projects in the 2012 Program	Express Program Tracking Database	Random Sample Columbus locations	20	March 2013

#### 3.2.1.1 Tracking Data

The Express Program evaluation team was able to extract most key program participation data from the program tracking database, which was provided by AEP Ohio staff in MS Excel format. The tracking data used for this evaluation were extracted December 16, 2012.

Database tables included a project level dataset with project total impacts, application submittal and status data, and internal approval information. Project data is linked by a unique proposal number to measure level information. In general, the evaluation team found the data and tracking system adequate for program processes and evaluation purposes.

#### 3.2.1.2 Program Documentation

The evaluation team also reviewed program materials developed by the contractor and AEP Ohio, including: the contractor technical reference spreadsheets documenting prescriptive savings, the Express Program 2011 Policies and Procedures Manual, and program materials available from the program Web site (<https://www.aepohio.com/save/programs/Express/>).



### **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 participants, 2012 participants, and pipeline customers. Key data fields included the premise number (used to merge the billing and tracking data), bill account number, weather station, dates of bill period, read code, and usage amount.

### **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 twelve 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.

## **3.3 Sampling Plan**

### **3.3.1 Impact Sample**

The Impact Evaluation for savings was based on a billing analysis of an attempted census of 2012 participants and an attempted census of pipeline participants for 2013, to date, as a comparison group. Individual projects were dropped from the analysis due to insufficient data. Please see Appendix A for details. The attempted census achieves the impact evaluation goal of a relative precision of  $\pm 10$  percent at a 90 percent level of confidence.

Other impact questions were researched with less rigor since these data were only used to provide context for the billing analysis as well as the *ex-ante* savings and incentive calculations. The evaluation team reviewed measure inputs and savings to verify equations used to calculate savings and incentives and to verify the application of valid fixture power, hours of use and HVAC interaction factors. The evaluation team also performed site visits for 20 sites to verify equipment installation. These sites were selected from the tracking database based upon proximity to other on-site work performed for the AEP Ohio Business Program evaluations. On-site tasks only included verification of retrofit equipment and hours of operation based on facility hours. Since the program operations protocol called for pre-installation and post-installation inspections by the program implementer, the evaluation team did not sample sites for statistical validity.



## 4 Detailed Evaluation Findings

### 4.1 Impact Results

This section presents the results of the impact evaluation of the Express Program for Small Businesses. Evaluated impacts are based on a billing analysis of 2012 participants and 2013 pipeline participants.

#### 4.1.1 Findings from the Documentation Review Task

The evaluation team reviewed tracking data to verify methodologies and equations for estimating savings and incentives. Observations from the file review experience were that project tracking systems are generally well-organized and contain sufficient documentation. Contact information for both the customer and contractor is clearly presented, existing equipment and retrofits are adequately described to estimate savings and the incentive, and proposed equipment descriptions are adequately included.

#### 4.1.2 Program Impact Parameter Estimates

Energy and demand savings are calculated per measure with the following equations:

##### Equation 1. Demand Savings

$$\text{kW saved} = [(kW_{\text{ex}} \times (1 - \text{out}_{\text{ex}}) - kW_{\text{prop}} \times (1 - \text{out}_{\text{prop}}))] \times CF \times \text{HVAC}_d$$

##### Equation 2. Energy Savings

$$\text{kWh saved} = [(kW_{\text{ex}} \times (1 - \text{out}_{\text{ex}}) - kW_{\text{prop}} \times (1 - \text{out}_{\text{prop}}))] \times \text{HVAC}_e \times \text{hours}$$

Where:

$kW_{\text{ex}}$  = connected kW of the existing system fixture (fixture kW x quantity of fixtures)

$kW_{\text{prop}}$  = connected kW of the proposed system fixture (fixture kW x quantity of fixtures)

$\text{out}_{\text{ex}}$  = burn-out ratio of lamps in the existing system (assumed = 0% if less than 10%)

$\text{out}_{\text{prop}}$  = burn-out ratio of lamps in the proposed system (presumed = 0)

CF = coincidence factor of the probability that the lighting systems installed for the program are in use during the peak hours

$\text{HVAC}_d$  = HVAC interaction factor - demand

$\text{HVAC}_e$  = HVAC interaction factor - energy

Hours = operating hours are binned and equal 20, 40, 80, 120 or 160 hours per week for 52 weeks per year

The evaluation team reviewed the impact parameters to determine whether these were reasonable and acceptable or required revision.

The evaluation team reviewed inputs for fixture power, hours of operation and interactive effects. Individually, the team judged that most of these parameters are reasonable or acceptable, but when our



internal estimates did not agree with recorded project values, the team found that the discrepancy frequently resulted in over-estimated savings.

#### 4.1.2.1 Lighting Power

In general, the evaluation team agreed with estimated fixture power listed in the technical reference spreadsheet. However, most borderline fixture wattage tended to estimate existing equipment at a *higher* wattage than Navigant normally estimates, thus increasing estimated savings.

- » Existing 4-foot, T12, 2-lamp systems were listed at 77W. The evaluation team's estimate was 72-75W for the same system based on 2001 ballasts catalog from Advance Transformers (72W) and a mixture of older, less-efficient ballasts.
- » Incandescent lamps were listed at their rated wattage. The evaluation team estimates that many incandescent lamps in commercial settings are actually "long-life" bulbs which are rated at higher voltages and thus consume less power and produce less light when operating at 120V nominal. This practice is common because it increases bulb life by two to five times<sup>5</sup> and reduces bulb maintenance frequency and lamp and labor costs.

The evaluation team recommends more research in the estimates for fixture power for the most common existing and retrofit systems.

#### 4.1.2.2 Hours of Operation

The 2011 Express Program Evaluation Report<sup>6</sup> identified over-estimated hours of operation as a key component that over-estimated program savings. The methodology used in 2011 to determine hours of operation for savings and incentives calculations was imprecise, and the 2011 evaluation report found significant over-estimates of savings.

In response to the evaluation finding, the program implementer reviewed hours of operation for projects claimed for 2012, both retroactively and proactively. In general, the program implementer research revised hours of operation downward and *ex-ante* program savings were lower in revised reports. The methodology used to revise operating hours was not investigated as part of the evaluation, because AEP Ohio staff report the re-launched program will use actual business hours as the basis for hours of operation.

To prevent future over-estimates of savings, the evaluation team recommends a rigorous treatment of hours of operation for 2013 and beyond.

1. Hours of operation should be based on actual hours of operation, calibrated to site-specific business hours. Holiday hours should be considered since small businesses are more likely to shut down for holidays.
2. Hours for systems that are used less frequently, in private offices, storerooms or restrooms and overflow space should be accounted for as separate line items in the program database.

<sup>5</sup> GE Lighting Incandescent Lamp Characteristics 2/92.

<sup>6</sup> Program Year 2011 Evaluation Report: Express Program for Small Business, Navigant Consulting, May 10, 2012.





#### **4.1.2.3 Interactive Effects**

Direct savings from more efficient lighting in conditioned spaces includes interaction multipliers for total impacts in the Express Program, depending on the type of heating and/or air-conditioning equipment used. The interaction multiplier for electric demand also includes the coincidence factor. The evaluation team found interaction multipliers acceptable.

#### **4.1.2.4 As-Found Lamp Burn-Out**

Another finding in the 2011 Express Program evaluation report identified as-found lamp-burn-out as a potential source for savings over-estimates. Existing power and energy depends on the number of lamps burning at the time of the contractor's survey. Because lamps are most often replaced when a sufficient number have failed to affect illumination or aesthetics, some burned-out lamps are expected in the baseline case in most businesses. New equipment presumably does not burn out within the first year, with most replacements having a rated lamp life of 8,000 hours for CFLs, 18,000 hours for linear fluorescent lamps and 50,000+ hours for LED exit signs. The Express Program accounts for burn-outs when these amounts are excessive (greater than 10% of a facility or system) by proportionally reducing savings by the ratio of burned-out lamps. Lower degrees of lamp burn-out are ignored. From a practical stand-point, the evaluation team agrees with this treatment of lamp burn-out. However, the practice does introduce an inherent over-estimate of savings between 0 and 10% whenever burn-out is not factored in. Lamp burn-out correction was not addressed in the 2012 savings estimates, but it should be included in future program savings.

#### **4.1.3 Program Impact Billing Analysis *Ex-post* Energy Savings**

The evaluation team conducted a regression analysis using monthly billing data from 704 premises, including 519 2012 participating premises and 185 pipeline premises that are expected to participate in the program in 2013. The regression model takes advantage of the differential timing of program enrollment to identify program savings. The model essentially takes the perspective that the best comparison group for participants consists of those customers that enroll in the program in a later period. Pre- and post-installation periods are determined on a project-by-project basis. Use of fixed effects accounts for customer-specific characteristics that do not change over time, such as square footage of the premise. The regression accounts for seasonality of savings due to HVAC interaction effects via the inclusion of seasonal binary variables interacted with the program participation flag. For a detailed description of the regression model and results, see Appendix A.

The evaluation team estimates a realization rate of 57%. The *ex-post* savings average 9,423 kWh per premise<sup>7</sup>, representing a 14.3% reduction in site energy usage due to the Express Program. The 90% confidence interval around this estimate is 7,506 kWh to 11,341 kWh per premise, with a relative precision of 20%. Note that the precision reflects uncertainty in the regression model parameter estimates. Because the regression model includes all participants with viable data, the sampling error is virtually zero and so the savings estimates satisfy the 90% confidence and 10% precision targets. The

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<sup>7</sup> Twelve premises had two Express Program projects installed in 2012, thus there were 544 participant premises and 556 projects.



uncertainty in the regression model is driven by variability in the data and fewer post-installation period bills. At the time of this evaluation more than half of the 2012 participants had fewer than eight utility bills in the post-period.

Total 2012 program savings are calculated as the average program savings times 544, the number of participating premises in 2012. Total 2012 savings from the Express Program are 5,126 MWh.

#### 4.1.3.1 Demand Savings

Billing analysis does not estimate electric demand savings. Demand savings for lighting is calculated by Equation 1 in Section 4.1.

As noted earlier, the evaluation team identified a tendency to slightly over-estimate the existing fixture kW and under-estimate the burn-out ratio. Both of these items will over-estimate savings. The coincidence factor and HVAC interaction factors are documented in the draft Ohio Technical Resource Manual and are supported by simulations with Ohio weather and coincidence studies in other jurisdictions. The evaluation team confirmed these factors were accurately applied to Express Program projects.

At this point, the evaluation team does not have sufficient information to make adjustments to the *ex-ante* demand savings. Considering all of these factors, the evaluation team recommends adjusting future *ex-ante* demand savings by adding a nominal burn-out ratio to projects that are not already adjusted for burn-outs.

#### 4.1.4 Program Impact Results

Based on the Billing Analysis described in the previous section, the evaluation team estimated the verified program energy and demand impacts resulting from the 2012 Express Program, shown in Table 4-1. No further adjustments were made to verified kWh savings.

**Table 4-1. Savings Estimates for AEP Ohio 2012 Express Program**

Program	Ex-Ante Reported Savings (a)		Verified <i>Ex Post</i> Savings (b)		Realization Rates RR = (b) / (a)	
	MWh	MW	MWh	MW	MWh%	MW%
Express Program	9,043	2.25	5,126	2.25	57%	100%

Source: AEP Ohio Express Program database exports from December 16, 2012.

The low realization rate for energy is striking and deserves further consideration. While improved from the 2011 Express Program Evaluation report, the systematic potential to over-estimate *ex ante* savings persists. Navigant's preliminary analysis assumed that lighting comprises about 30-40% of electricity consumption (in a gas heated facility) and the predominant retrofits for linear fluorescent systems typically save 30-40% of lighting energy. Combined, *ex ante* expected savings will be between 9% and 16% versus the prior year's consumption, if *all* lighting is retrofit. Factoring in interactive effects would



increase this to between 10 to 18%. Billing analysis is most effective when savings is greater than 5 percent of the total to differentiate the savings from background noise in the data.

For the Express Program, the average annual consumption is about 65,900 kWh and the average *ex-ante* savings among the projects is 16,600 or 25%, roughly two times expectations. Furthermore, not all lighting systems were replaced<sup>8</sup>. Therefore, the full lighting savings *potential* was not installed.

The evaluation team concludes that the *ex-ante* estimates for the AEP Express Program continue to be high. Navigant's further research shows that the billing analysis is consistent with performance of similar programs.

Table 4-2 provides participation counts, *ex-ante* savings estimates, and *ex post* savings calculated at the measure end-use level.

**Table 4-2. 2012 AEP Ohio Express Program Participation and Savings by End-Use**

Measure End-Use	Participation Count (Projects)	<i>Ex-Ante</i> Reported Savings		Verified <i>Ex Post</i> Savings	
		MWh	MW	MWh	MW
Lighting	556	9,043	2,246	5,126	2.246
HVAC	0	0	0	0	0
Refrigeration	0	0	0	0	0
<b>Total</b>	<b>556</b>	<b>9,043</b>	<b>2.246</b>	<b>5,126</b>	<b>2.246</b>

*Source: AEP Ohio Express Program database exports from December 16, 2012. Navigant analysis.*

<sup>8</sup> Many Express Program proposals contain details on lighting systems that were already efficient, did not have proposed alternatives, or were declined by the customer.



## 5 Conclusions and Recommendations

### 5.1 Conclusions

#### 5.1.1 Program Impacts

The Express Program was suspended mid-year to change the program implementer. Participation was tracking below projections before the change was announced, continued below projections while the incumbent wound down started projects, and stopped altogether during the transition period which lasted until program year-end. As a result, annual participation and savings were well below projections for the program. Even with this important deficiency, the Express Program is an important component of business sector customer offerings.

1. The Express Program for Small Business has many positive attributes.
  - a. Hard-to-reach customers are the primary participants in the program. Most program participants are businesses with facilities smaller than 5,000 square feet.
  - b. All small business sectors are represented among participants.
  - c. The average participant used less than 70,000 kWh per year prior to participation.
  - d. Customers save about 14% of their electric bill with a projected simple payback of 1.8 years based on *ex-post* savings estimates and customer payments for upgrades.
2. Program tracking information is good. The evaluation team's review of savings calculations found no errors in algorithms. Data are mostly complete.
3. Only lighting measures were installed in 2012. No HVAC or refrigeration measures were installed.
4. The program did not meet goals mostly due to low participation. The number of active contractors was too small to reach goals, and almost half of all contractors completed fewer than three projects prior to the wrap-up after the program was suspended.
5. The realization rate (defined as verified *ex post* savings divided by *ex-ante* reported savings) is 57% for energy savings, and 100% for demand reduction. The relative precision at a 90% confidence level for the 2012 Express program is  $\pm 20\%$  for the energy realization rate and better than  $\pm 10\%$  for the demand realization rate. The reasons for low realization are several and compounding:
  - a. Assumed existing fixture wattage for common fixtures are slightly high with a tendency to over-estimate savings
  - b. Burned-out lamps in existing systems were underestimated
  - c. Hours of operation may still be over-estimated
6. A billing analysis is the most reliable method to determine savings in a program of this type.

### 5.2 Cost-Effectiveness Review

This section addresses the cost effectiveness of the Express Program for Small Business. Cost effectiveness is assessed through the use of the Total Resource Cost (TRC) test. Table 5-1 summarizes the unique inputs used in the TRC test.

**Table 5-1. Inputs to Cost-Effectiveness Model for Express Program**

Item	
Average Measure Life	11
Units	556
Annual Energy Savings (MWh)	5,126
Coincident Peak Savings (kW)	2,246
Third Party Implementation Costs	511,477
Utility Administration Costs	77,366
Utility Incentive Costs	1,412,605
Participant Contribution to Incremental Measure Costs	2,153,819

Based on these inputs, the TRC ratio is 0.7 Therefore; the program passes the TRC test. Table 5-2 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 5-2. Cost Effectiveness Results for the Express Program for Small Business**

Test Results	
Total Resource Cost	1.2
Participant Cost Test	2.6
Ratepayer Impact Measure	0.5
Utility Cost Test	1.6

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

### 5.2.1 Program Processes

Since no process significant evaluation was conducted, there are few process-related conclusions. A key conclusion from 2011 bears repeating since most other process conclusions stem from this one item.

1. Lack of information about the program and lack of information about the benefits of energy-efficient equipment should be assumed to be key barriers for the small business sector.

Customer outreach will be critical no matter the program model used.



### **5.3 Recommendations**

#### **5.3.1 Impact Recommendations**

1. Work with the implementation contractor to recruit participants who install measures other than lighting – refrigeration and/or HVAC – so that the full benefits of the program can be evaluated.
2. AEP Ohio should reassess some of the baseline fixture wattages used for *ex-ante* savings estimates. Over-estimating existing fixture power will inflate *ex-ante* savings. Focus on the most common baseline systems, linear fluorescent lamps and incandescent lamps rated for >120V.
3. *Ex-ante* demand and energy savings estimates should include minimum burn-out estimates for sites that do not exceed the 10% threshold required to track lamp burn-out. Navigant suggests a minimum burnout estimate between 3% and 8%.
4. Operating hours should be more site-specific and precise. Absent more specific data, operating hours could be based on:
  - » Actual business hours, plus one to two hours per day for pre-and post-occupancy usage
  - » A fifty-week year assuming holiday closures, or
  - » Deemed estimated hours by business type

#### **5.3.2 Process Recommendations**

1. Conduct a preliminary review of the program impacts and processes in mid-summer 2013 to identify any trouble points in the new program model and processes that can be corrected mid-stream and help ensure encouraging program results and evaluation at program year-end.



## Appendix A Fixed Effect Regression Model

### A.1 AEP Ohio Express Program Billing Analysis Detailed Description

#### Data Cleaning

The 2012 tracking database included 544 participating premises. Navigant received billing data for 735 pipeline premises. Navigant excluded premises from the analysis if any of the criteria listed in Table A-1 were met.

**Table A-1. Premise Exclusion Criteria**

Exclusion Criteria	Number of Customers
Original Dataset, less:	1625
Pipeline project was cancelled	599
Navigant received no billing data for the premise	14
Premise with usage greater than 300,000 kWh during the pre-program year	2
Premise in the PY2011 tracking database	306
<b>Customers included in the analysis</b>	<b>704</b>

Source: Navigant analysis

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

- » The account number differed from the account number at the time of participation, indicating the customer /tenant had changed
- » The observation occurred during the period that the work was being done (between the *workscheduleddate* and *workcompleteddate*)
- » The billing record was a duplicate

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

#### Regression Analysis

Navigant estimated a fixed effects regression model in which pipeline participants and participants that enter 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

<sup>9</sup> Multiple billing records for a given time period can result from presence of outdoor lights, amongst other reasons.



consists of those customers that enroll in the program in a later period. Use of fixed effects accounts for customer-specific characteristics that do not change over time, such as square footage of the premise.

The evaluation team expects slight seasonal variation of savings due to the interaction effects between lighting and the HVAC system. To account for the seasonality of savings, Navigant interacted seasonal binary variables with the post-installation variable. 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, such as extended business hours during a holiday season. The regression equation is given by:

#### Equation A-1. Regression Model

$$ADU_{it} = \alpha_i + \sum_{s=1}^{16} \beta_s * Season_{st} + \sum_{s=12}^{16} \gamma_s * Season_{st} * Post_{it} + \epsilon_{it}$$

Where:

$i$  = premise

$t$  = bill period

$s$  = season

$ADU_{it}$  = average daily usage (kWh) for premise  $i$  in period  $t$

$\alpha_i$  = constant term ("fixed effect") for premise  $i$

$Season_{st}$  = binary variable taking a value of 1 if period  $t$  is in season  $s$ . The sixteen seasons include winter 2009 and summer 2009 – winter 2013. Spring 2009 is the baseline season, because this is the first complete season of the analysis period.

$Post_{it}$  = binary variable taking a value of 1 if the measure has been installed at premise  $i$  prior to period  $t$

$\epsilon_{it}$  = model error for participant  $i$  in period  $t$ . Standard errors are clustered to account for heteroskedasticity and autocorrelation at the participant level.

$\beta_s, \gamma_s$  = 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 premises that have not yet entered 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 participants that have entered the program. Said differently, the parameters on the interaction terms capture the difference in energy consumption between premises that have entered the program and those that have not yet entered the program. This difference is the direct impact of the Express Program and is captured by the  $\gamma_s$  parameters.





Annual savings are calculated as the weighted sum of the seasonal savings, where the weights are the number of days in each season (91, 92, 92, and 91, respectively). The realization rate is calculated as the ratio of the annual savings estimate from the regression model to the average *ex-post* reported savings estimate for participants included in the regression model.<sup>10</sup> The realization rate is then multiplied by the average *ex-post* savings estimates for all 2012 participants to obtain the verified average savings estimate for the Express Program.

Parameter estimates are given in Table A-2. As expected, the parameters for variables involving post-installation are negative as usage decreases after program measures have been installed. T-statistics greater than 1.64 indicate that the parameter is statistically significantly different from zero at the 90% confidence level. Note that all parameters involving post-installation are statistically significant.

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<sup>10</sup> This step is necessary because the average ex-ante savings for premises included in the regression analysis differs from the average ex-ante savings for all 2012 participating premises. The difference results from premises and observations being excluded from the regression model due to missing or incorrect data.

**Table A-2. Regression Model Parameter Estimates, Equation A-1**

Variable	Coefficient	Standard Error	T-Statistic
Winter 2012 * Post	-31.357	7.857	-3.99
Spring 2012 * Post	-21.487	4.111	-5.23
Summer 2012 * Post	-30.719	4.574	-6.72
Fall 2012 * Post	-21.436	3.545	-6.05
Winter 2013 * Post	-17.537	4.968	-3.53
Winter 2009	9.989	2.255	4.43
Summer 2009	31.562	2.482	12.72
Fall 2009	0.330	1.561	0.21
Winter 2010	7.019	2.401	2.92
Spring 2010	1.636	1.354	1.21
Summer 2010	55.885	3.160	17.69
Fall 2010	5.280	1.785	2.96
Winter 2011	10.576	2.598	4.07
Spring 2011	1.715	1.711	1.00
Summer 2011	46.419	2.678	17.33
Fall 2011	-1.626	1.916	-0.85
Winter 2012	-0.655	2.266	-0.29
Spring 2012	0.376	1.952	0.19
Summer 2012	50.347	4.104	12.27
Fall 2012	-3.536	3.149	-1.12
Winter 2013	-1.647	4.397	-0.37

Source: Navigant analysis

Navigant estimated a second regression model incorporating heating and cooling degree days (HDD, CDD), in addition to seasonal binary variables. In this model, energy usage varies by season and also by degree days, while energy savings vary by degree days only. This alternative model is specified in Equation A-2.

**Equation A-2. Alternative Regression Model**

$$ADU_{it} = \alpha_i + \sum_{s=1}^{16} \beta_s * Season_{st} + \delta * HDD_{it} + \rho * CDD_{it} + \omega * Post_{it} + \gamma * HDD_{it} * Post_{it} + \tau * CDD_{it} * Post_{it} + \epsilon_{it}$$

Where:

all variables are defined as in Equation A-1, and



$HDD_{it}$  = average daily Heating Degree Days for premise  $i$  in period  $t$

$CDD_{it}$  = average daily Cooling Degree Days for premise  $i$  in period  $t$

Program impacts are captured by the three parameters corresponding to variables including *Post*:  $\omega, \gamma, \tau$ . *Ex-post* savings estimates are calculated via:

**Equation A-3. Ex-Post Savings**

$$Ex\ Post\ Savings = -(\omega + \gamma * \overline{HDD} + \tau * \overline{CDD})$$

Where:

$\overline{HDD}$  = the average daily Heating Degree Days from the data included in the regression model

$\overline{CDD}$  = the average daily Cooling Degree Days from the data included in the regression model

Parameter estimates from Equation A-2 are given in Table A-3. The parameter corresponding to the *Post* variable is negative, as are the parameters corresponding to the *Post* interaction terms. This indicates that usage decreases after program measures have been installed, and savings increase with degree days. Note that the parameter for  $HDD * Post$  is not statistically significant at the 90% confidence level. The model indicates that the relationship between energy usage or program savings and *CDD* is much stronger (parameter estimates are larger in absolute value) and more statistically significant (larger t-statistics) compared to *HDD*.

**Table A-3. Regression Model Parameter Estimates, Equation A-2**

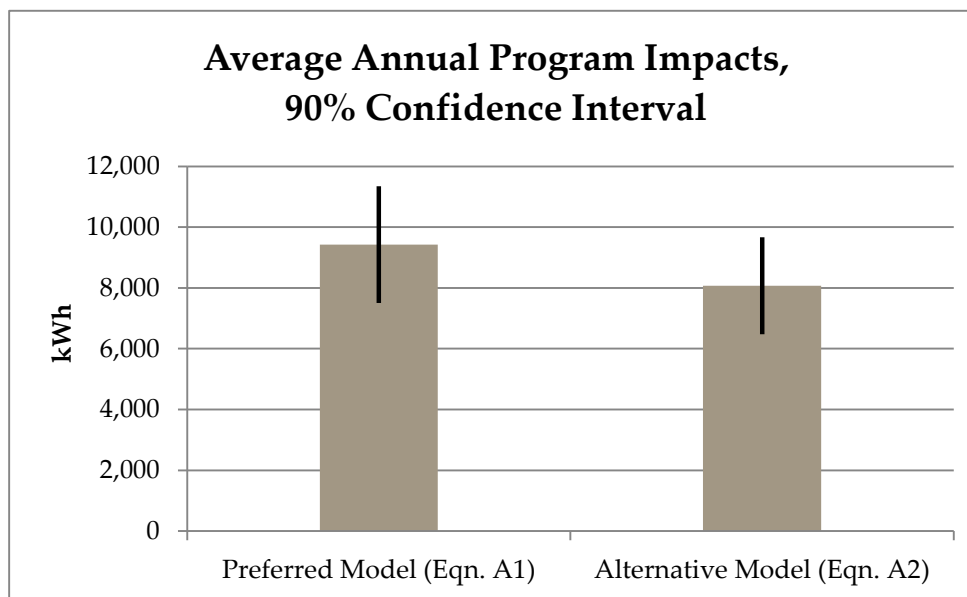
Variable	Coefficient	Standard Error	T-Statistic
Post	-17.175	4.029	-4.26
HDD * Post	-0.151	0.162	-0.93
CDD * Post	-0.997	0.502	-1.99
HDD	0.255	0.096	2.65
CDD	5.759	0.347	16.57
Winter 2009	10.165	1.962	5.18
Summer 2009	3.097	2.110	1.47
Fall 2009	2.071	1.557	1.33
Winter 2010	7.232	2.182	3.31
Spring 2010	-1.273	1.345	-0.95
Summer 2010	4.543	2.699	1.68
Fall 2010	2.680	1.745	1.54
Winter 2011	10.764	2.384	4.51
Spring 2011	-1.585	1.679	-0.94
Summer 2011	-3.509	2.510	-1.40
Fall 2011	-0.677	1.894	-0.36
Winter 2012	1.277	2.059	0.62
Spring 2012	-4.881	1.968	-2.48
Summer 2012	-5.012	3.271	-1.53
Fall 2012	-3.900	2.737	-1.43
Winter 2013	2.849	3.492	0.82

*Source: Navigant analysis*

Navigant prefers the model given in Equation A-1 because the seasonal binary variables interacted with the post-installation variable allow savings to vary by season. These variables capture weather impacts and other factors that influence program savings, such as extended business hours during a holiday season. Alternatively, the model given in Equation A-2 only captures variation in savings due to weather and does not account for other factors that vary with season and affect savings, potentially causing a biased estimate of savings. Note that the results of the two models are not statistically different, as shown in Figure A-1.



**Figure A-1. Average Annual Program Impacts and 90% Confidence Intervals, Eqns. A-1 and A-2**



Source: Navigant analysis

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## APPENDIX N

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## SOLUTION PROVIDER STUDY

### Program Year 2012 Evaluation Report

Presented to



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## Executive Summary

This document presents a summary of the findings and results from the evaluation of the Solution Providers who participated in AEP Ohio Business Programs January 1, 2012 through December 31, 2012 (PY 2012).<sup>1</sup> Solution Providers serve all Business Programs, excluding the Express Program for Small Business. Solution Providers, who have signed up with AEP Ohio, and are listed on the AEP Ohio website, and trade allies who are not listed, are included in this report. The top three types of Solution Providers in our sample include 1) lighting contractors or lighting suppliers, 2) energy solution providers and 3) engineering companies. The top three customer types mentioned by the Solution Providers are industry/manufacturing, retail (non-food) and schools.

Solution Providers in our sample tend to have positions with authority within their organization. They typically hold the title of Manager or Coordinator, President, CEO, owner or Engineer. Most of them installed lighting projects, but a few installed HVAC equipment or variable speed drives (VSDs) or controls.

### *The Sample*

Navigant chose to stratify the Solution Provider sample to reduce costs while providing a quality study. One goal of stratification is to design a sampling approach that allows for the efficient determination of program impacts. By grouping together projects that are similar in some defining characteristic, it is often possible to reduce the variability within each stratum, thereby reducing the overall sample needed to achieve desired levels of confidence and precision.

The evaluation team grouped Solution Providers into three strata: Large, Medium, and Small Solution Providers. Once Solution Providers were assigned to their appropriate stratum, sample sizes for surveying were determined using an assumed CV of 0.5 for each stratum with the goal of achieving 90% confidence and 10% precision across the entire sample. Table ES-1 presents the sample by Strata.

**Table ES-1. Solution Provider Sample**

[Strata]	Population Size ([units])	Coefficient of Variation ( $\sigma/\mu$ )	Sample Size	COMPLETES
Large (>1,500 MWh)	17	0.5	17	7
Medium (< 1,500 MWh, > 500 MWh)	78	0.5	54	30
Small (< 500 MWh, > 30 MWh) <sup>d</sup>	355	0.5	51	53
Tiny (< 30 MWh)	146			
Total	596		122	90

<sup>1</sup> Program Year 2012 (PY 2012) participation is based on an implementation contractor payment request date to AEP Ohio between January 1, 2012 and December 31, 2012.



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

Ninety Solution Providers completed the Computer Assisted Telephone Interviewing (CATI) survey during April, 2013. The Solution Providers answered questions about topics relating to their program participation.

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

The primary objectives of this evaluation were to quantify Solution Provider attitudes towards the AEP Ohio Programs, to determine what impact the program had on job creation in 2012, and to determine what improvements would help them become more effective in delivering the program.

#### **Solution Provider Attitudes**

1. **Finding:** Solution Providers liked the AEP Ohio Business Programs. Solution Providers liked all the aspects of the programs and they do not see many drawbacks. They mentioned expanding their business and reducing customer costs as the driving force behind their program participation. They liked the trade ally bonus.
2. **Finding:** Solution Providers know to call the program implementer, DNV KEMA, or AEP Ohio for help. The most common reason to call was that help was needed with the application. DNV KEMA was 100% successful in resolving customer issues.

#### **Solution Providers on Job Creation**

1. **Finding:** Solution Providers in our sample used the AEP Business Programs to create 52 jobs or an average of 2.3 jobs per Solution Provider. Two-thirds of them said the program helped grow their business or opened up new markets. Most of them hired one or two new employees. However, only one in four Solution Providers in our study hired more employees because of the Business Programs.

**Recommendation:** The recurring theme from Solution Providers was the value of the Business Programs to help them grow/expand their business. AEP Ohio should look for changes in training or marketing support so that they can help Solution Providers increase their business. Navigant suggests that AEP Ohio, first identify the attributes of successful Solution Providers who expanded their businesses in 2012 and, then look for Solution Providers with similar attributes and provide them with a 'roadmap' for growth. A qualitative study should be considered for inclusion in the 2013 program evaluation research plan.

Lighting Solution Providers generally use a sales model; that is, they employ a sales staff and actively market their products and services to their customer base. Non-lighting Solution Providers, such as HVAC contractors, use a service business model, and generally respond to incoming calls to repair or replace equipment. As the Business Programs continue to attract non-lighting Solution Providers, AEP Ohio and its implementer should explore how the programs can be integrated into business models that have traditionally been organized around service rather than sales.



2. **Finding:** Most Solution Providers (76%) had ten or less Prescriptive, Custom or Self-Direct projects in 2012. They were asked a follow-up question about why they did not participate in more projects in 2012. Almost one-half said they did not know why. The other half said they were too busy, that demand had decreased, or that they generally did business in other utilities' service areas. AEP Ohio Solution Providers do not generally use any collateral materials and most marketing is via email and telephone.

**Recommendation:** Most Solution Providers are looking for more opportunities to implement the AEP Ohio Business Programs. AEP Ohio should consider working with Solution Providers to develop materials that would work with their business model or introduce them to more innovative marketing methods.

### **Solution Providers on Customer Needs**

1. **Finding:** Solution Providers reported that customers' decisions are based primarily on economic factors including rebates, energy savings and payback. Four of the top five reasons for customers' participating in the Business Programs were money-related. Two of the top three reasons for not participating in the programs were lack of cash or resources and low program incentives. Solution Providers said that customer drop outs were also caused by a lack of cash resources.

**Recommendation:** AEP Ohio takes many factors into account when setting energy efficiency measure rebates. These data suggest that AEP Ohio should continually look for that intersection between the amount of incentive that will move customers to act and the amount that will keep the programs cost-effective.

2. **Finding:** Solution Providers said customers liked the programs because they validate that energy efficient technology will save energy. The programs bring the expertise of the Solution Provider to those without engineering resources and help customers increase the visibility of the project in the larger community.

**Recommendation:** AEP Ohio should incorporate these ideas into collateral material if they are not already included in the messaging.

### **Solution Providers on Improving the Program**

Solution Providers had specific recommendations for improving the Business Programs.

1. **Finding:** Most applications (about two-thirds) are reviewed within two to four weeks. However, Solution Providers reported that two customers had dropped out because of lengthy application reviews. Long application review times were more likely with more complicated custom projects.

**Recommendation:** DNV KEMA should analyze delayed projects and identify what aspects of the projects are most likely to lead to a long delay. Solution Providers could be notified regarding actions to take to prevent a delayed application and the resultant reduction in customer satisfaction.



2. **Finding:** Solution Providers found the rebate levels to be deficient, for different reasons, for lighting products, for HVAC equipment and for variable speed drives (VSD). Reduction in the Prescriptive Program lighting rebate levels meant that rebates now cover about 20 percent to 30 percent of the project cost, rather than the 50 percent of project cost found in earlier program years.

**Recommendation:** Navigant would not recommend an increase in incentives for the Business Programs based on process results, but Solution Providers could be better trained on how to position energy efficient products and the incentive levels with customers. One way would be to concentrate on ensuring ongoing savings are realized once the equipment is installed rather than on the rebate. AEP Ohio and DNV KEMA could develop long-term customer case studies documenting annual achieved savings.

### **Increase the Response Rate**

1. **Finding:** Navigant conducted in-depth interviews in previous years, but moved to a CATI survey of Solution Providers in 2012. While the evaluation team achieved an overall completion rate of 74% of our planned number of surveys, we were only able to reach 41% of our completion goal for the larger Solution Providers, and 55% of our completion goal for the medium Solution Providers, with customer size measured by kWh saved.

**Recommendation:** AEP Ohio should consider a system for 2014 where at least a partial evaluation survey must be completed online before Solution Providers receive their final bonus payment. Other methods for increasing participation should also be considered.





## 1. Introduction

The goal of this report is to present a summary of the 2012 findings and results from the evaluation of Solution Providers attitudes toward the AEP Ohio Prescriptive, Custom and Self-Direct Programs. Prior to 2012, a limited number of Solution Providers were interviewed using an in-depth interviewing guide. Solution Provider participation levels reached almost 600 firms in 2012, presenting the opportunity for converting to quantitative data collection methods. The survey is attached in Appendix A.

The primary objectives of this evaluation are to quantify Solution Provider attitudes towards the AEP Ohio Business Programs, to determine what impact the program had on job creation in 2012, and to determine what improvements would help them become more effective in delivering the programs.

### 1.1 The Sample

Navigant chose to stratify the Solution Provider sample to reduce costs while providing a quality study. One goal of stratification is to design a sampling approach that allows for the efficient determination of program impacts. By grouping together projects that are similar in some defining characteristic, it is often possible to reduce the variability within each stratum, thereby reducing the overall sample needed to achieve desired levels of confidence and precision.

For the Solution Provider telephone survey, Navigant determined that the most appropriate characteristic to stratify the trade allies by was the total amount of *ex-ante* kWh and kW savings generated by the projects administered by each firm. The evaluation team binned Solution Providers firms into three strata: Large, Medium, and Small firms. The initial kWh cutoffs were designed so that one-third of overall energy savings fell into each stratum, excluding savings generated from self-performed projects. This implies that the Large Stratum contained relatively few Solution Providers, while the Small stratum contained the majority of firms. From here, the kWh cutoffs were adjusted slightly to account for natural breakpoints in the project sizes. This process lead to natural strata breakpoints at 500 MWh and 1,500 MWh. Additionally, the sample selection excluded 146 firms that fell into the bottom 1 percent of overall savings due to the low value of information surveys that these projects can provide to the program as a whole. In total, this criterion excluded 146 Solution Providers. Once firms were assigned to their appropriate stratum, sample sizes for surveying were determined using an assumed CV of 0.5 for each stratum with the goal of achieving 90% confidence and 10% precision across the entire sample.



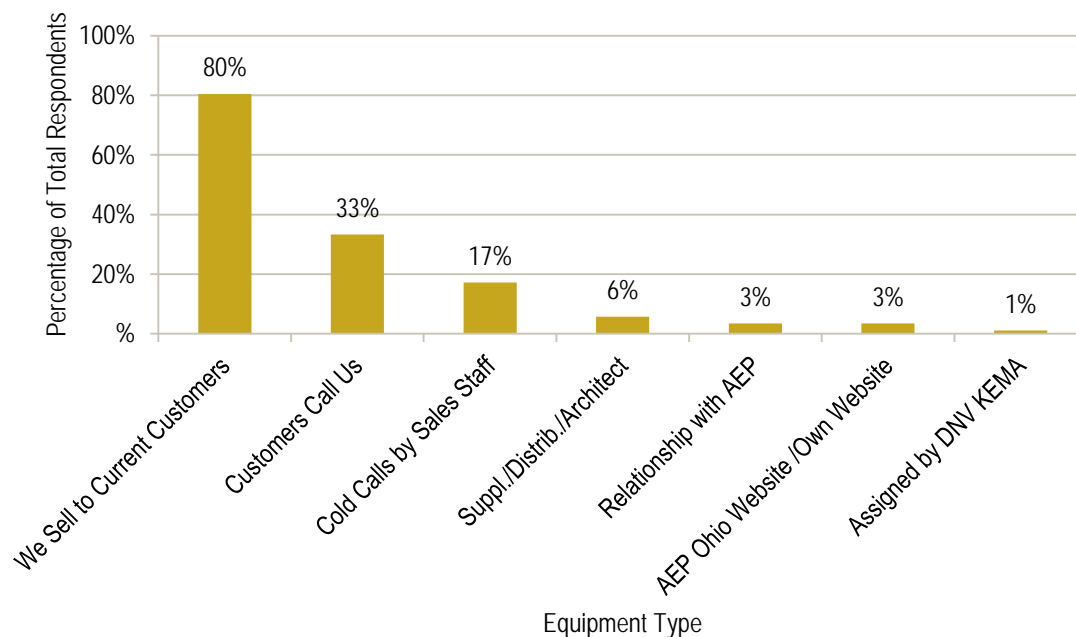
## 2. Solution Providers Perspective

Much of the survey concerned what Solution Providers thought about the program, including topics such as, how they were introduced to the program, how firms use marketing materials in their sales efforts, what they like about the program, why they continue to participate, and what customer service issues they encounter. In addition, the study also looked at the benefits and drawbacks of the Business Programs from the viewpoint of the Solution Provider.

### 2.1 How Solution Providers Become Involved In the Programs

Most of the Solution Providers marketed the AEP Ohio programs to their own customers (80%). One-third said current customers called them requesting help with the program (33%). About half that proportion (17%) have sales staff to conduct cold calls. The full distribution of how Solution Providers marketed the Business Programs is presented in Figure 1.

**Figure 1. How Solution Providers Become Involved in the AEP Ohio Business Programs**



### 2.2 Use of Marketing Materials

Solution Providers differed on their use of marketing materials. Over half (52%) of them said they did not use any marketing materials, either their own or AEP Ohio's, in their promotion of the program. Eight percent (N=7) of Solution Providers distributed collateral material from both their own firm and from AEP Ohio. Almost three out of ten used their own marketing materials exclusively; 6 percent used AEP Ohio's materials exclusively.

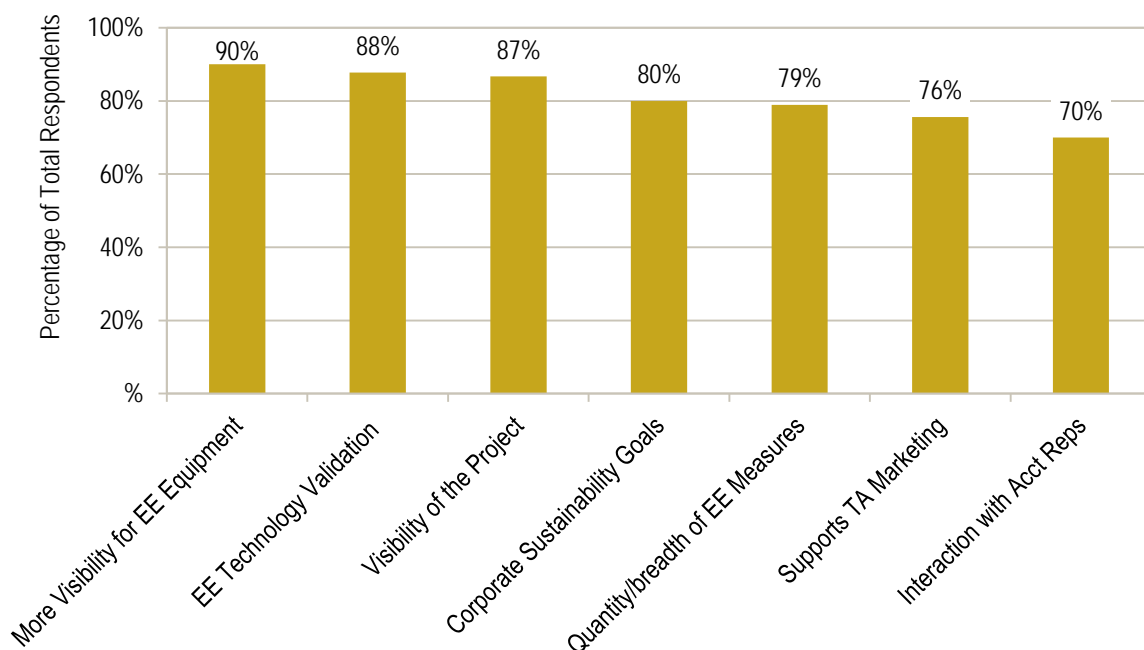


Most Solution Providers think AEP Ohio's marketing and promotion of the energy efficiency programs have been successful (86%). Seventy percent said the training they received when they signed up for the program was useful.

### 2.3 What Features Trade Allies Like Most

Between 70 percent and 90 percent of the trade allies reported that they 'liked' certain the program features. Three of the features were rated highest, more visibility of the energy efficiency equipment (90%), validation of the energy efficient equipment (88%) and the visibility of the project (87%). Features cited by 80 percent or less of Solution Providers included support for corporate sustainability goals (80%), the quality and breadth of the energy efficiency measures (79%), support for Solution Provider marketing (76%) and increased interaction with AEP Ohio account representatives (70%). Data on what feature Solution Providers like most about the Business Programs is presented in Figure 2.

**Figure 2. What Features Trade Allies Liked Most about AEP Ohio's Business Programs**

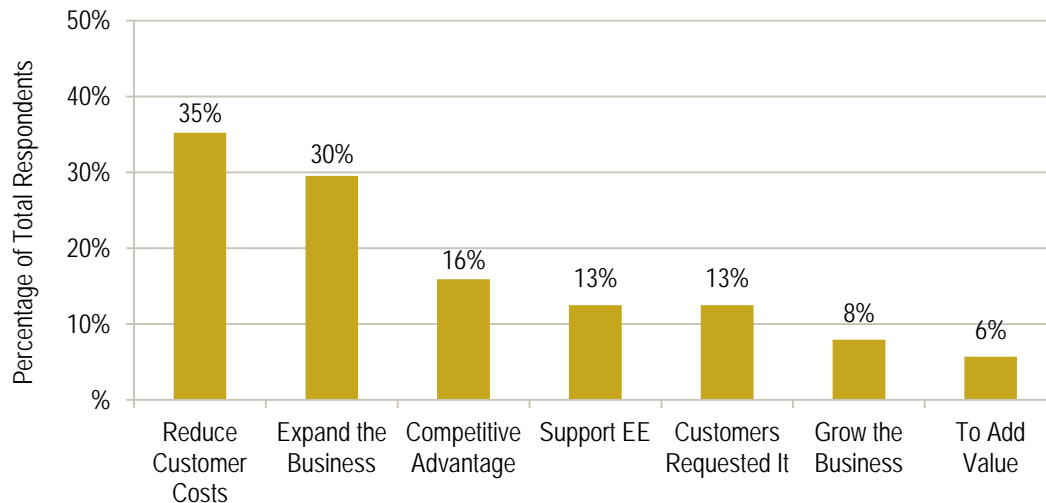


### 2.4 Reasons Solution Providers Participate in the Business Programs

Solution Providers participated in the AEP Ohio business programs to reduce customers' costs (35%), to expand their business (30%), for the competitive advantage (16%) and to support energy efficiency (13%). Few Solution Providers said they were responding to customer requests (13%), to grow the customer's business (8%), or to add value for the customer (6%). The distribution of why Solution Providers participate in the Business Programs is presented in Figure 3.



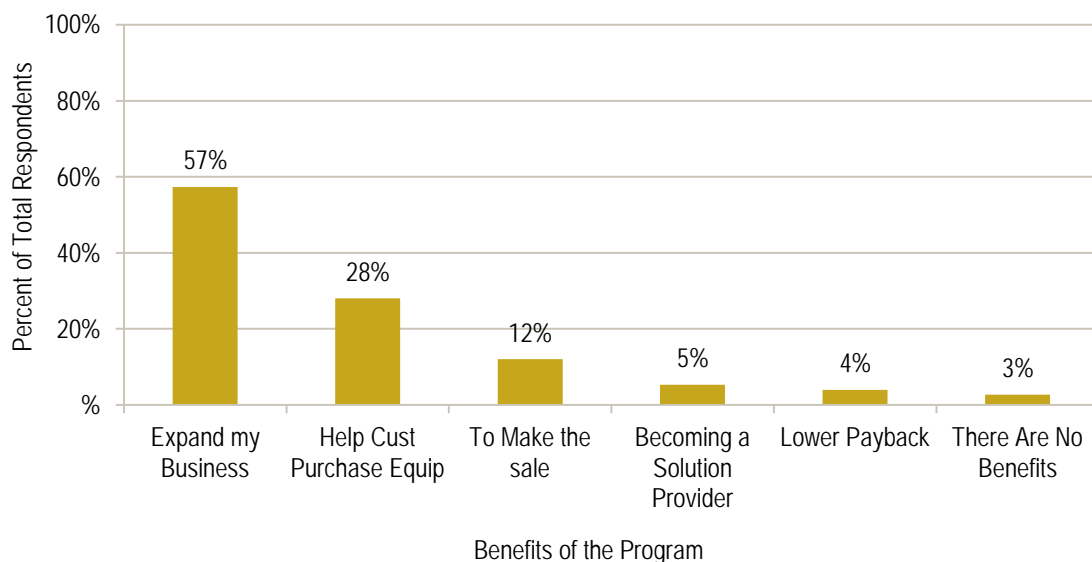
**Figure 3. Reasons Solution Providers Participate in the Business Programs**



## **2.5 Benefits of the Programs**

Solution Providers said the most important benefit of the AEP Ohio Business Programs was to expand their business (57%). Fewer Solution Providers said helping their customers purchase energy efficient equipment was a benefit to the programs (28%). Over 10 percent of the Solution Providers cited the increased probability of making a sale as a program benefit (12%). The distribution of perceived program benefits is shown in Figure 4.

**Figure 4. Perceived Benefits of the Business Programs**

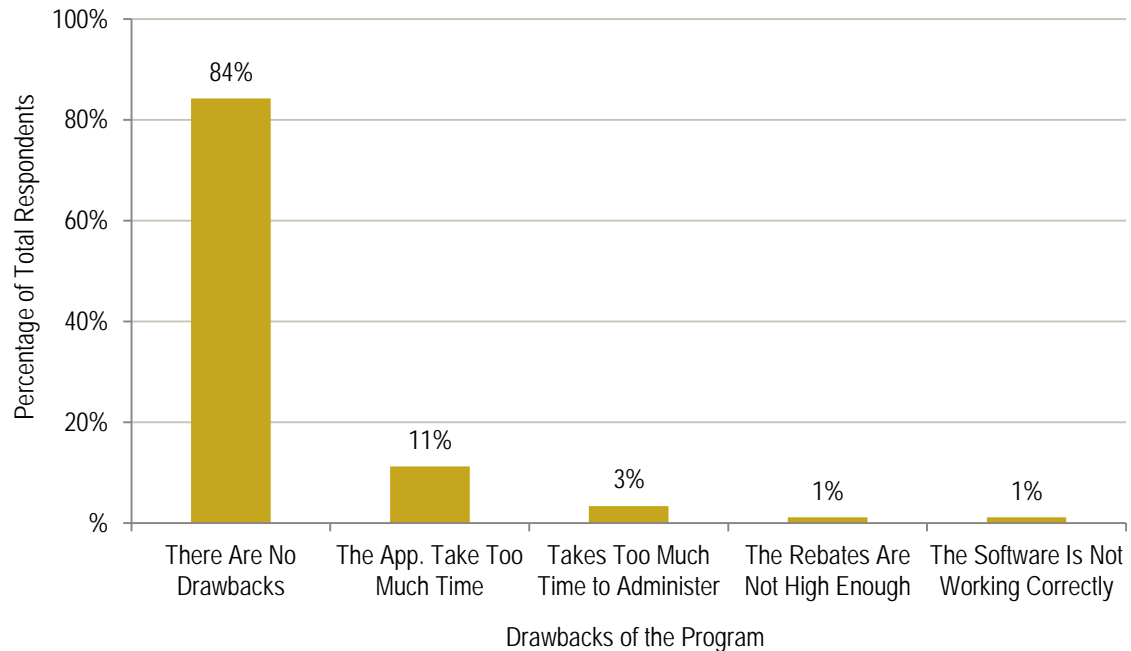




## 2.6 Drawbacks of the Programs

Most Solution Providers could not think of any drawbacks to the AEP Ohio Programs (84%). Of those that could, the drawbacks mentioned most frequently were that applications take too much time (11%) or that the program takes too long to administer (3%). The distribution of the drawbacks of the programs is presented in Figure 5.

**Figure 5. Drawbacks of the Business Programs**



## 2.7 Customer Service Issues

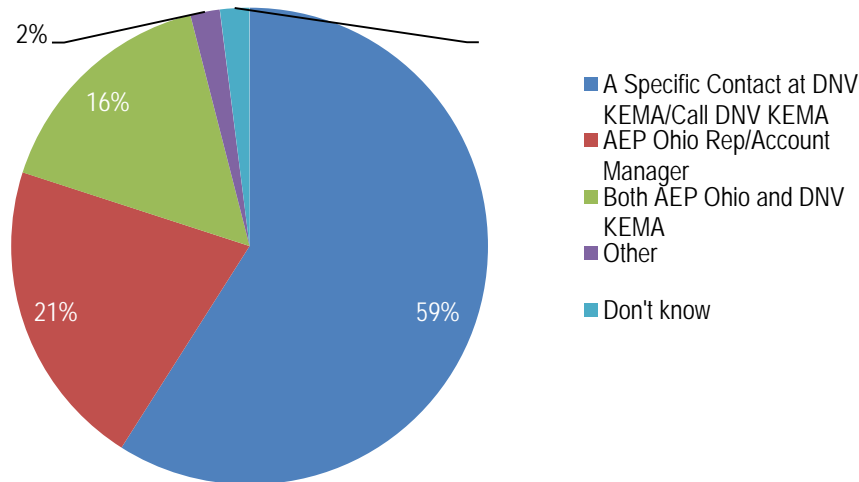
All but four Solution Providers (96%) said they completed the applications for their customers during 2012. Survey respondents were asked to rate the ease or difficulty of completing the application on a zero to ten-point scale, where zero is difficult and ten is easy. They rated the application 7.6 on the scale, indicating the application was easy for many Solution Providers.

### 2.7.1 Solution Providers' Contacts for the Program

Solution Providers were asked whom they contacted to ask questions about the programs. Almost 60 percent of them call DNV KEMA directly. One of five Solution Providers called their contact at AEP Ohio and 16 percent have contacts and call both firms as needed. The distribution of who to contact for help with the program is presented in the pie chart in Figure 6.



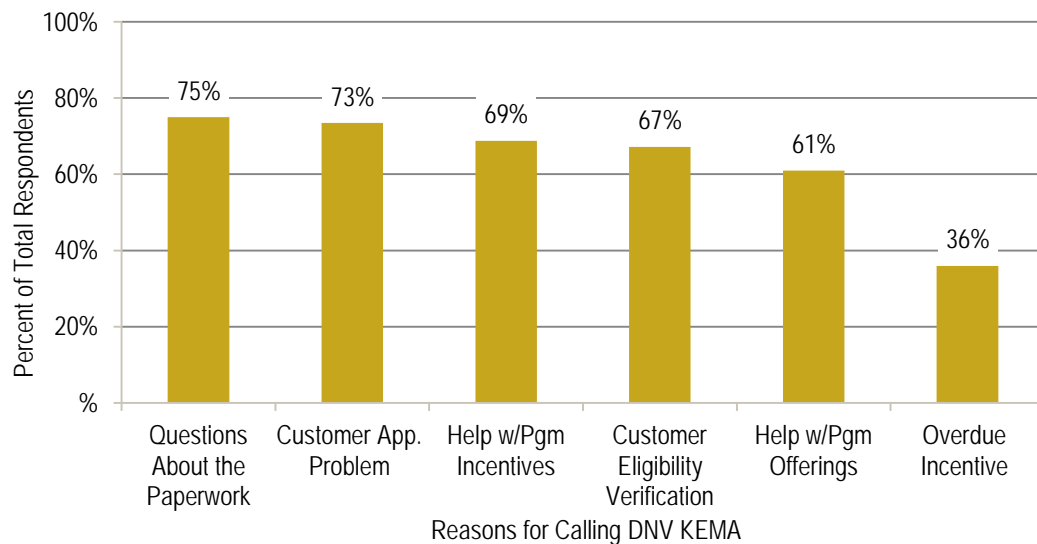
**Figure 6. Contacts for the Programs**



### 2.7.2 Calling DNV KEMA Staff

Most (71%) of the Solution Providers had occasion to call DNV KEMA during their relationship with the AEP Ohio Programs. They cited the top two reasons for calling DNV KEMA staff as having questions about the paperwork (75%) and trying to solve customer application problems (73%). They also called DNV KEMA for other reasons, such as help with program incentives (69%), confirmation of customer eligibility (67%) and help with program offerings (61%). Slightly over one-third called to check on overdue incentives (36%). The distribution of reasons for calling DNV KEMA is presented in Figure 7.

**Figure 7. Reasons for Calling DNV KEMA**

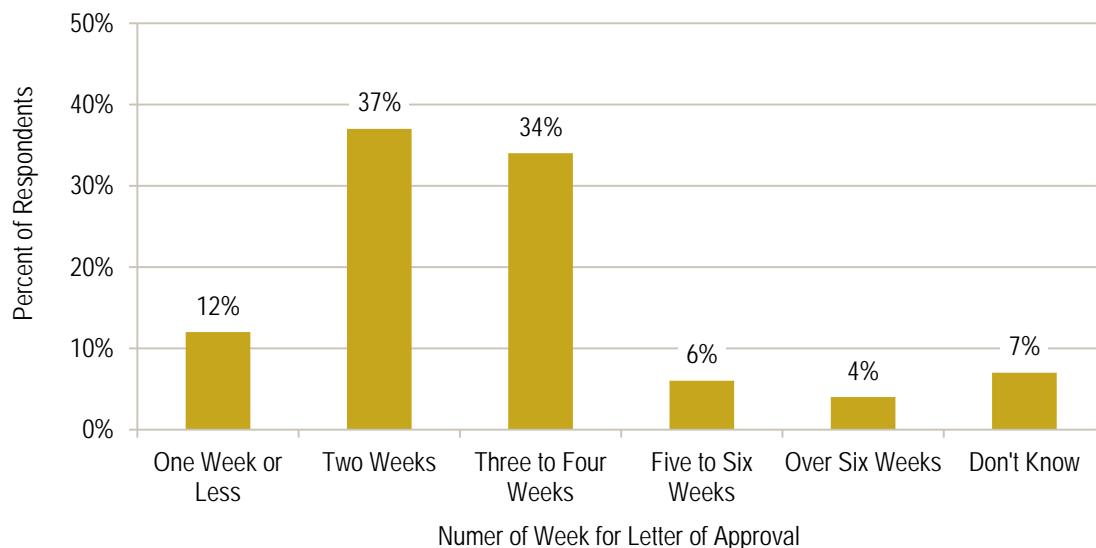




All of the Solution Providers who called DNV KEMA reported that the issue was resolved to their satisfaction. Almost all (90%) of Solution Providers reported that customers did not usually need any help after the equipment was installed. A few Solution Providers continued to help customers with data issues and late rebate checks after the equipment was installed.

**2.7.3 Application Review Time** Solution Providers reported that the review time for applications was usually between two to four weeks (71%). Few applications were reviewed in less than a week (12%) or in over five weeks (10%). The number of weeks DNV KEMA generally takes to review an application and send the letter of approval is presented in Figure 8.

**Figure 8. Number of Weeks Taken for Review**



Solution Providers were then asked if the project review time delayed any of their projects. Eighteen percent reported that the review process delayed some of their projects and further revealed that two customers dropped out of the program because of the length of the review time.

Another program requirement for the Custom Program – that all documentation be submitted within 60 (really 90 days) days of project completion – also affected the ability of two Solution Providers to complete their projects. One Solution Provider explained the relationship between this requirement and the Self-Direct Program like this:

“Many custom projects cannot be finished in the 60-day timeframe, so it adds an extra challenge. Sometimes a custom project (sic) isn't even applied for because it won't get done in the 60-day time frame, and so it will be submitted as Self-Direct later.”

Solution Providers are confused on the terms of the program requirements. They may be confusing the requirements for two different program policies.



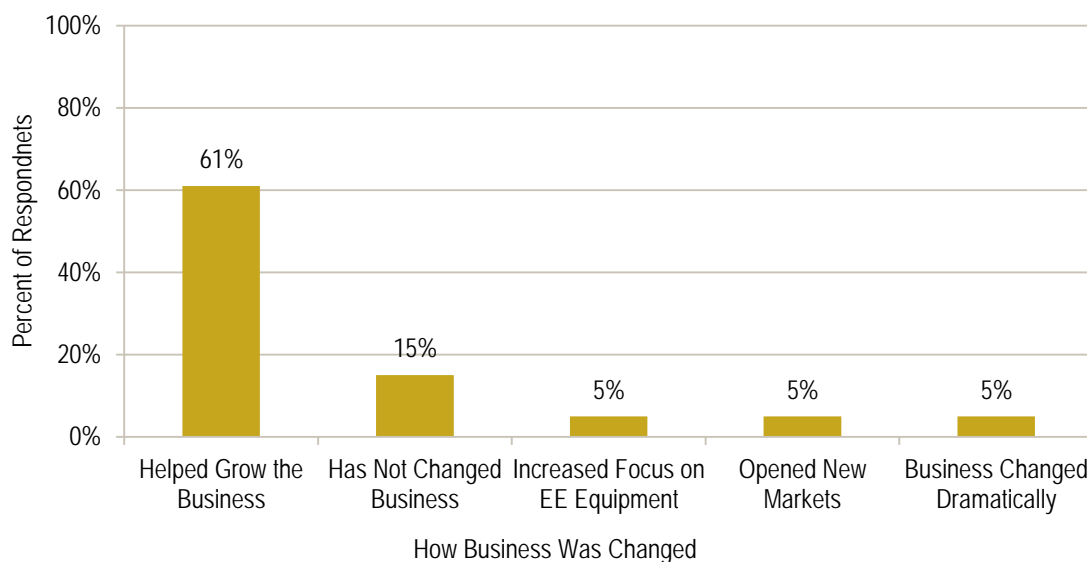
### 3. Effect of AEP Ohio Programs on Solution Providers' Business

The qualitative data from previous studies suggested the Business Programs were not only a reflection of a slightly improved economic climate in Ohio, but that the programs were also having an impact on the Solution Providers' economic health. In this study, one of the goals was to quantify how the programs were affecting the Solution Providers. A number of issues related to this topic were included in the survey of Solution Providers, including what business changes Solution Providers attribute to the programs, how many employees they added due to increased work, yearly sales, and how to increase program participation.

#### 3.1 Changes in Solution Provider Businesses

Over 60 percent of Solution Providers (61%) reported that the AEP Ohio Business Programs have helped them grow their businesses. While 14 percent of Solution Providers have not seen a change in their business, other Solution Providers said the programs have opened up new markets (5%), increased their focus on energy efficient equipment (5%) or changed their business in dramatic, but unspecified ways (5%). Data on how the AEP Ohio Business Programs changed the Solution Providers' business is presented in Figure 9.

**Figure 9. How Solution Providers said the AEP Programs Changed their Business**



#### 3.2 Number of Employees Added

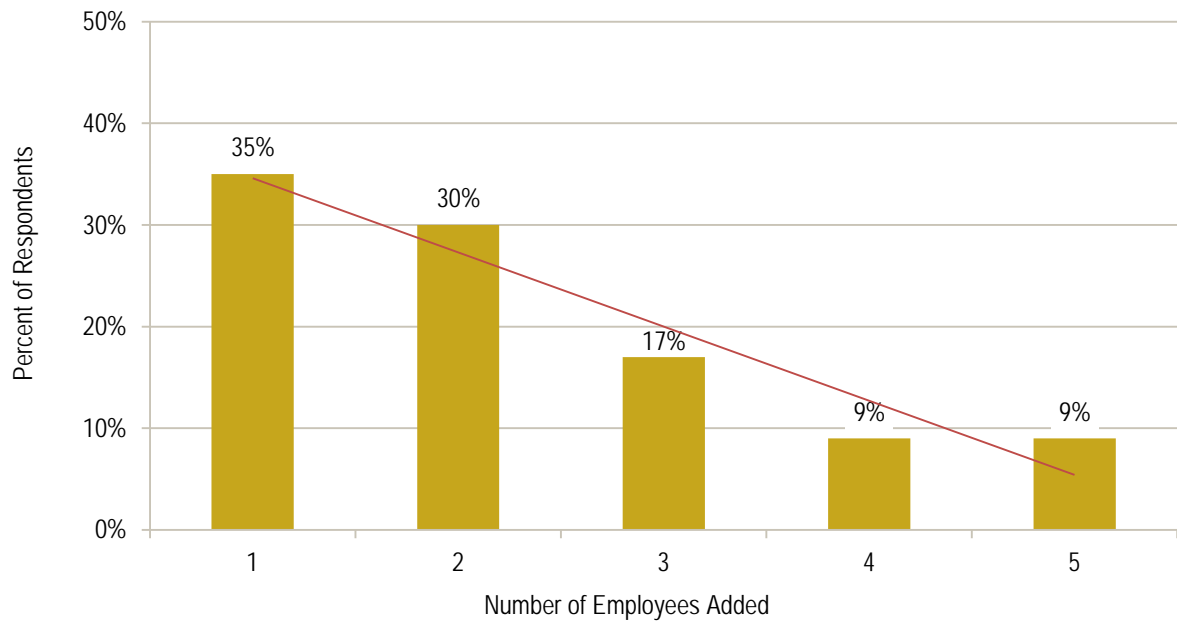
Solution Providers were also asked if their firm hired more employees because of the AEP Ohio Business Programs. Over one-fourth of them, or 22 Solution Provider firms, said they did hire more employees. They hired an average of 2.3 employees for a total of 52 employees.





Figure 10 presents the distribution of the number of employees hired by Solution Providers and indicates that most of the Solution Providers hired one or two employees because of the AEP Ohio Business Programs, although a few hired four or five new employees.

**Figure 10. Number of Employees Added by Solution Providers because of the Business Programs**

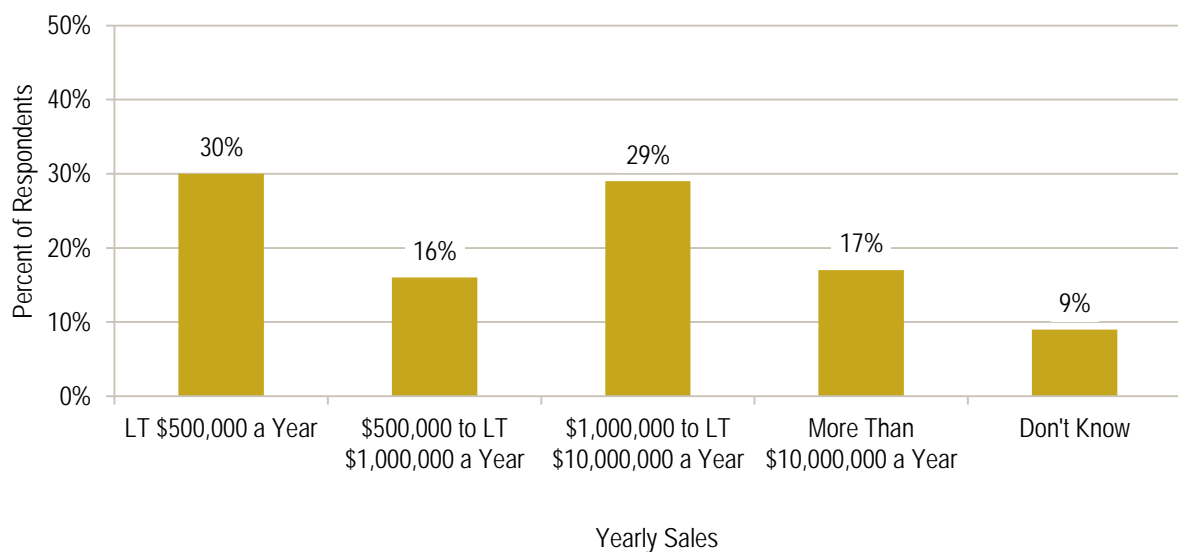




### 3.3 Solution Providers Estimated Yearly Sales

Solution Providers ranged in size from the one-third who said their business sales were less than \$500,000 a year, to the 17 percent who reported more than \$10 million in sales a year. The second largest Solution Provider segment (29%) had \$1 million to \$10 million in sales a year. A brief review of the mean number of employees added showed that Solution Providers with less than \$500,000 a year added an average of 1.67 employees because of the Business Programs, while Solution Providers with larger sales added an average of 2.5 employees.

**Figure 11. Solution Providers' Estimated Yearly Sales**



### 3.4 How to Increase Participation

Most (76%) Solution Providers had ten or less Prescriptive, Custom or Self Direct projects in 2012<sup>2</sup>. They were asked a follow-up question about why they did not participate in more projects in 2012. Almost one-half said they did not know why. The other half said they were too busy, that demand had decreased or that they generally did business in other utilities' service areas. Fewer survey respondents (three or less) said that the smaller jobs were not worth the hassle, that they lacked knowledge of the program, that they were new to the program and were just ramping up, or that the incentives were not large enough.

When these Solution Providers were asked what would encourage them to be involved in more energy efficiency projects in the future, the most common answer was 'more customer demand'. It was mentioned by 20 of the low participant (i.e.; less than ten projects in 2012) group. The next most mentioned idea for more involvement was higher incentives, mentioned by nine Solution Providers, and

<sup>2</sup> 2012 DNV KEMA tracking database.



less paperwork, mentioned by five Solution Providers. Other ideas mentioned by a few survey respondents included a larger Solution Provider bonus and more training.



## 4. Solution Providers' Perspectives on Customers' Experiences

### 4.1 Introduction

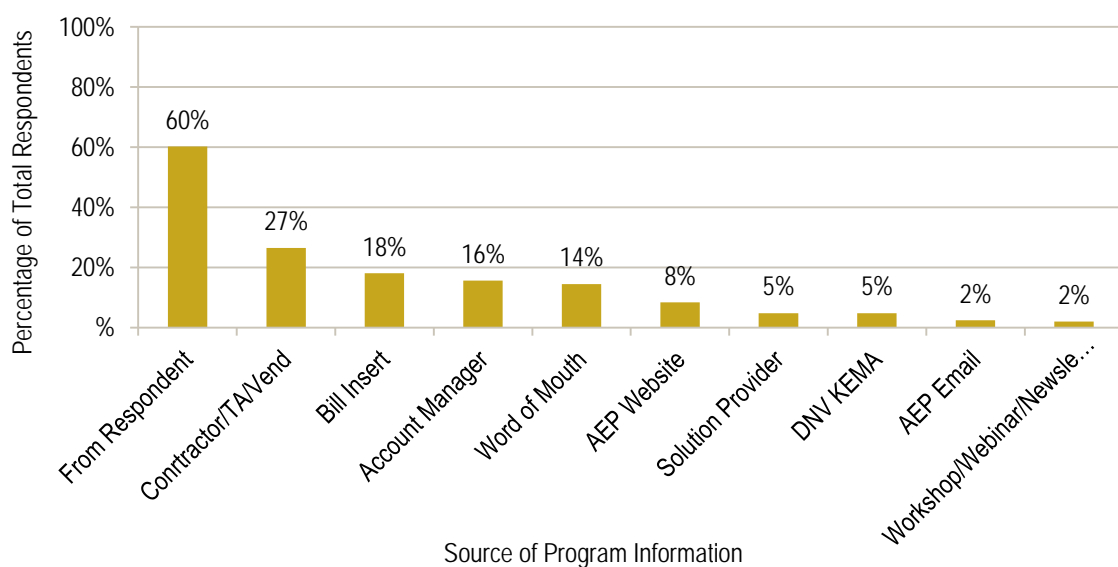
Solution Providers were asked to share their knowledge of the customer experience. As the first line of contact with customers, Solution Providers should serve as a rich source of information about the customer experience. In the survey, we asked Solution Providers about customer attitudes:

- How customers learn about the program
- Why customers participate in the program
- What program features customers like most
- Reasons customers choose to not participate in the program
- Why customers drop out of the program

### 4.2 How Customers Learned About the Programs

Solution Providers reported that they or other trade allies are the most significant players in informing customers about the Business Programs. They said that customers also learned about the program from bill inserts (18%), their account manager (16%), through word of mouth (14%) or from the AEP Ohio website (8%). The other sources of knowledge about the program received 5 percent or less of the mentions. The data on the role of Solution Providers in customer involvement in the programs is presented in Figure 12.

**Figure 12. How Customers Become Involved in the Programs**

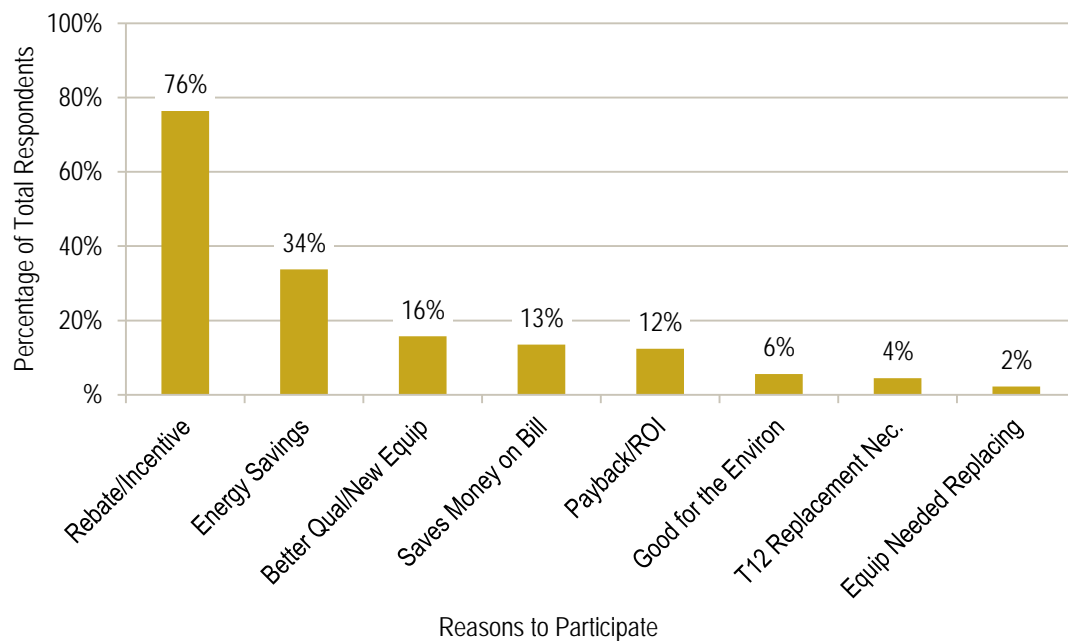




### 4.3 Reasons Customers Participate in the Program

As Navigant has found with other groups, Solution Providers primary reasons for participating in the programs were financial. Solution Providers thought that most customers (76%) participated for the rebate or incentive as well. One-third of the Solution Providers thought energy savings motivates customers. Fewer Solution Providers cited other reasons customers would participate in the energy efficiency programs, such as better or newer equipment (16%), or bill savings (13%). The data on why Solution Providers think customers participate in the programs is presented in Figure 13.

**Figure 13. Reasons Customers Participate in the Programs**

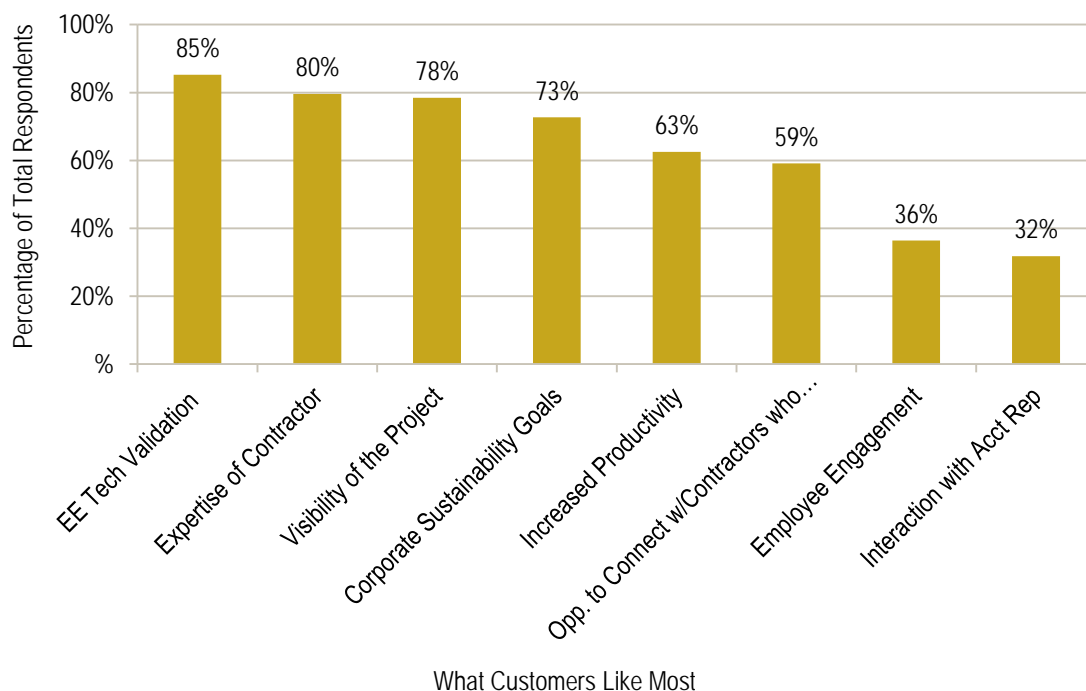




#### 4.4 Which Features Customers Like Most

Solution Providers said most customers (85%) liked how the program increased the acceptance of the energy efficiency equipment in the market. They also thought customers valued the expertise of the contractor (80%) and the visibility of the project (78%) in the community. Almost three-fourths of the survey respondents (73%) said the programs helped customers meet corporate sustainability goals. Solution Providers said that customers also appreciated the benefits of increased productivity (63%) and the opportunity to meet contractors or Solution Providers who were interested in energy efficient issues (59%). Fewer customers, according to Solution Providers, liked the employee engagement feature of the programs (36%) and the interaction with account manager or representative (32%). One Solution Provider said that customers only like the rebate (not shown). The distribution of which features Solution Providers think customers like most is presented in Figure 14.

**Figure 14. Which Program Features Customers Like Most According to Solution Providers**

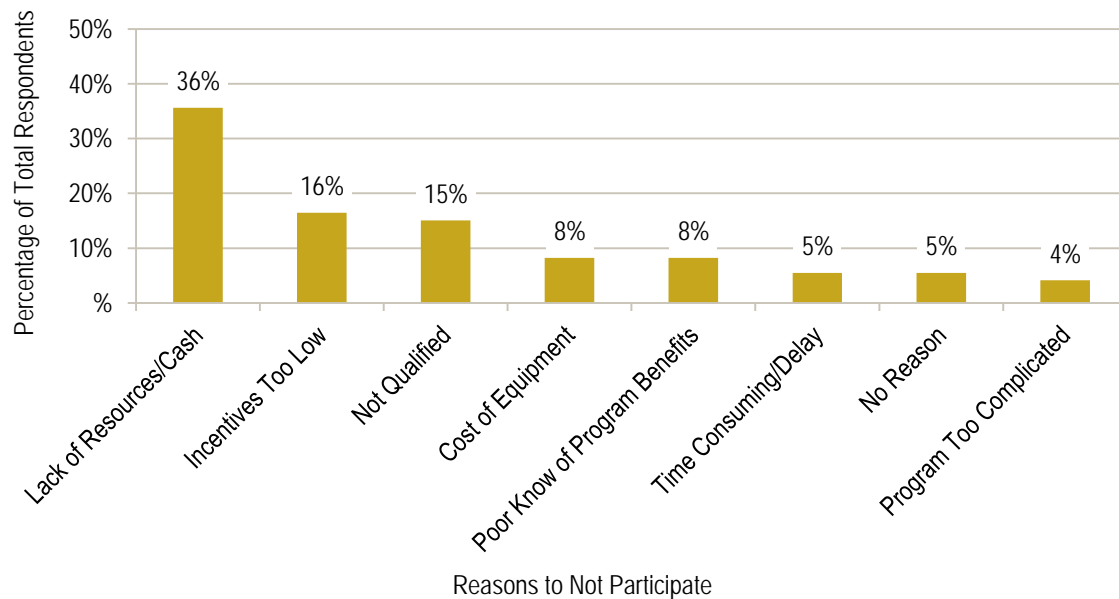




#### ***4.5 Reasons that Customers Do Not Participate in the Program***

Solution Providers thought that lack of resources (36%) and not enough incentives (16%) were two reasons customers did not participate in the Business Programs. Some of their customers did not qualify for the program (15%). Other reasons were mentioned by fewer Solution Providers. The data shown in Figure 15 presents Solution Providers' perspective of why customers do not participate in the Business Programs.

**Figure 15. Reasons Customers Do Not Participate in the Programs According to Solution Providers**



Three of the ninety Solution Providers reported that customers had dropped out of the Business Programs. All of the Solution Providers said customers dropped out because they no longer had the resources for the project.



## 5. Description of Solution Providers

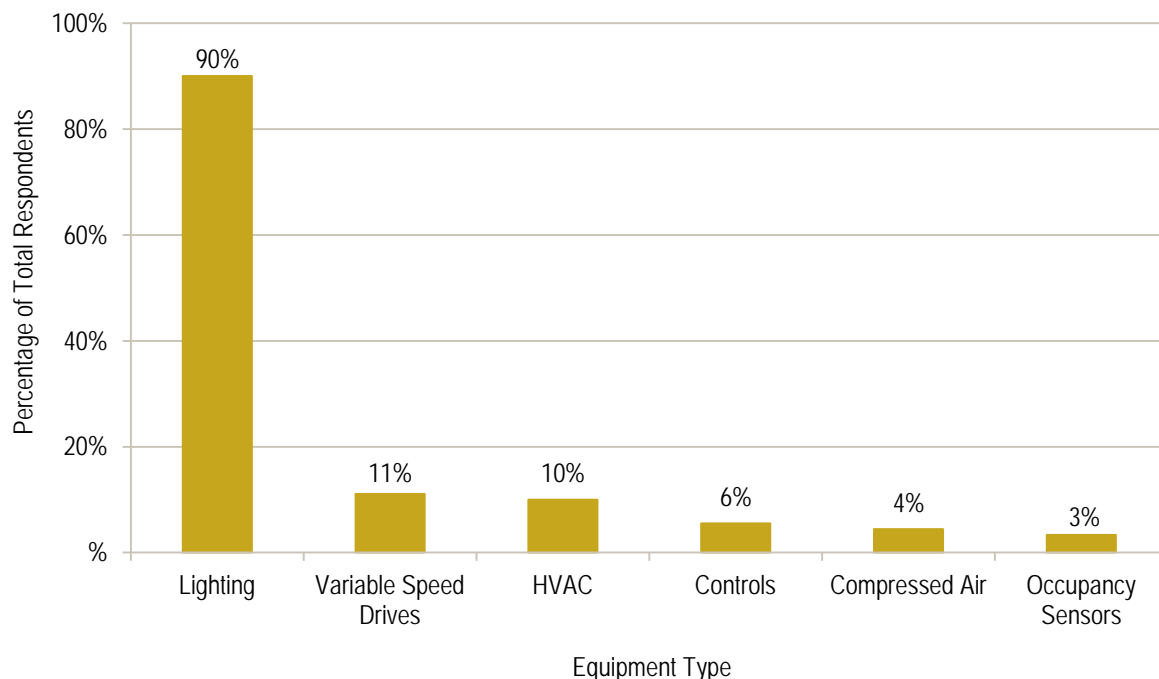
Solution Providers were told how many Prescriptive, Custom and Self-Direct projects they had sold to customers during 2012. They were then asked to identify which program they were most familiar with. Greater than 80 percent of the respondents said they were most familiar with the Prescriptive Program, 10 percent were most familiar with the Custom Program, and 7 percent were most familiar with the Self-Direct Program. One Solution Provider mentioned he was most familiar with the New Construction Program.

In Section 5, the evaluation team explores the type of equipment the Solution Providers installed, the technologies with inadequate rebates, the types of firms in the sample, the types of customers in the Solution Provider's customer base, and the respondent's title.

### 5.1 Type of Equipment Installed

Almost all of the Solution Providers installed lighting equipment. About 10 percent installed HVAC equipment and/or variable speed drives. Fewer Solution Providers installed controls (6%), compressed air (4%) or occupancy sensors (3%). The distribution of the type of equipment installed by Solution Providers is shown in Figure 16.

**Figure 16. Type of Equipment Installed**



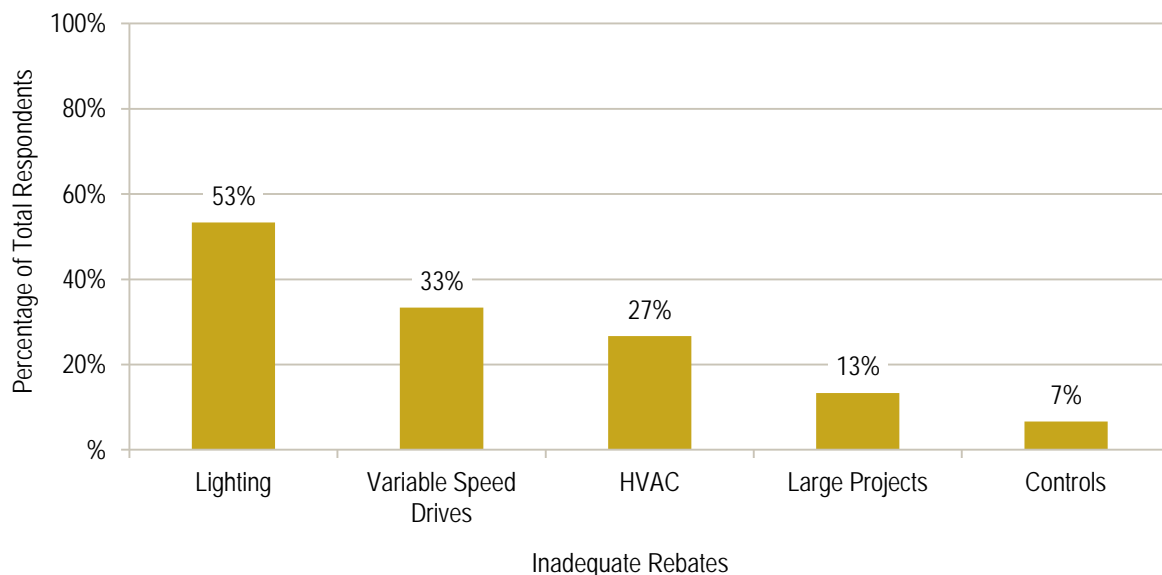




## 5.2 Technologies with Inadequate Rebates

Solution Providers were asked later in the survey to indicate which technologies had inadequate rebates. The percentage of Solution Providers who rated the program rebates inadequate were in approximately the same rank order as the installed equipment shown in Figure 16, lighting (53%), variable speed drives (33%), HVAC (27%) and controls (7%). Twenty-two Solution Providers answered this question. The distribution of which technologies Solution Providers thought had inadequate rebates is shown in Figure 17.

**Figure 17. Which Technologies Have Inadequate Rebates**



One Solution Providers said the reduction in lighting incentives means that about 20 to 30 percent of the project cost was covered, down from 50 percent in previous program years. Energy-efficient HVAC equipment is significantly more costly than standard equipment. The HVAC equipment rebate does not cover enough of this difference to influence a customer to choose the energy efficient option. One Solution Provider said: "It's disproportionate for HVAC. The incentive you get is 20 dollars per ton. That's a very small incentive for a large capital investment."

The few Solution Providers who sold variable speed drives said the incentives were too low for VFDs. One Solution Provider said the incentive calculation does not account for how the drive will be used. He said: "A VFD is a motor control like a gas pedal, when it runs fast that is not a good use, if it runs slowly there should be a better incentive..."

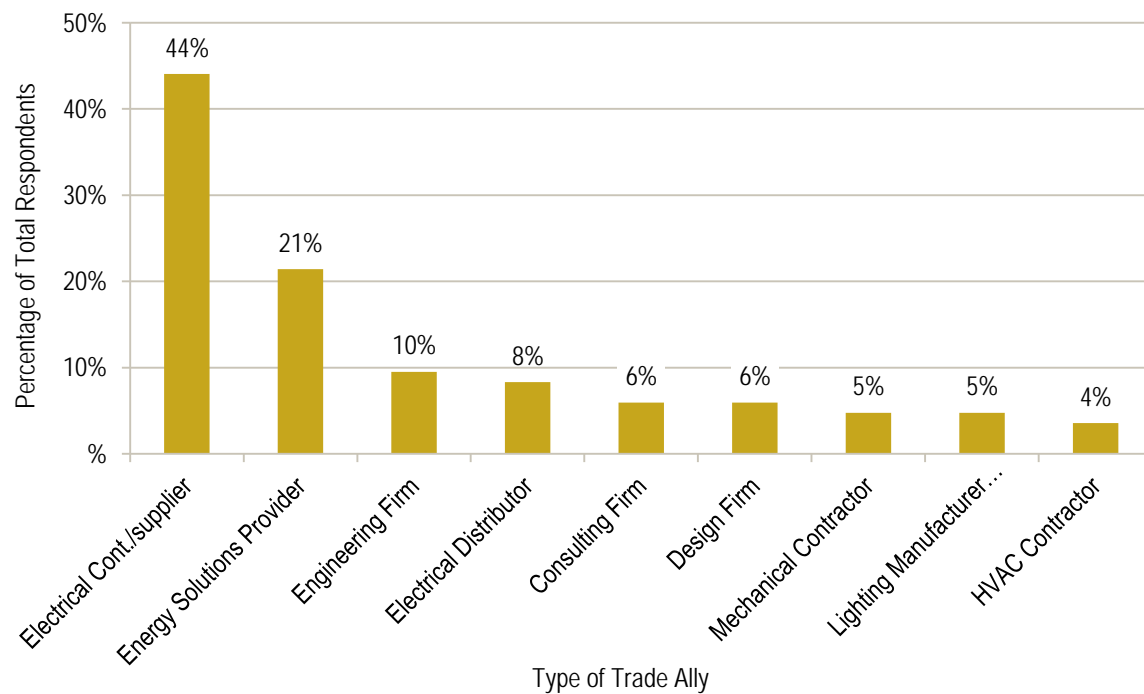
On the other hand, when asked if the incentives are effective at encouraging customers to pursue projects they would not have considered without the programs, 80 percent of the survey respondents said "Yes."



### 5.3 Type of Firm

Over 40 percent of the survey respondents were electrical contractors or suppliers (44%). Twenty-one percent identified themselves only as energy solution providers. Ten percent or less said they were from an engineering company (10%), an electrical distributor (8%), a consulting company (6%) or a design firm (6%). Even fewer were from a mechanical service company (5%), a lighting manufacturer or other manufacturer (5%) or an HVAC contractor (4%). Type of trade ally in the study is presented in Figure 18.

**Figure 18. Type of Solution Provider in the Study**

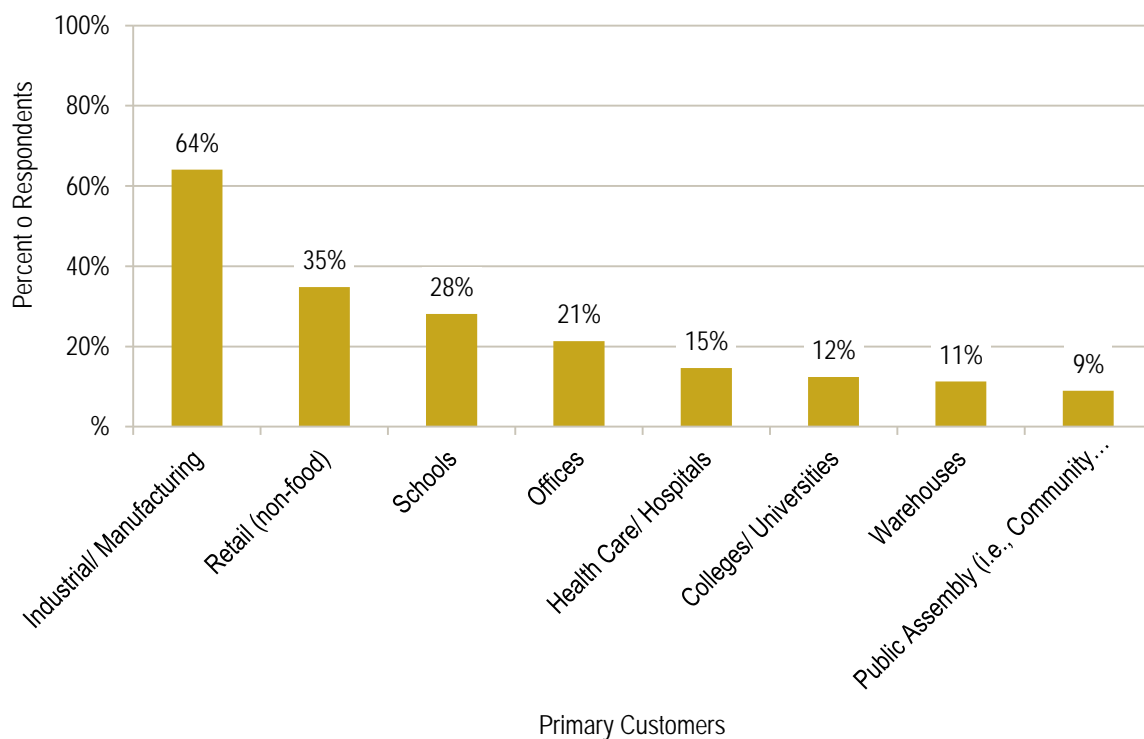




#### 5.4 Type of Business Served

Solution Providers were most likely to mention that industry and manufacturing comprised their customer base (64%). Over one-third of Solution Providers said their primary customers were retail establishments (35%), followed by schools (28%) and offices (21%). Other business types mentioned were health care/hospitals, colleges/universities, warehouses and public assembly groups such as community centers, churches and other not-for-profit groups. The distribution of the primary business customers by the Solution Providers in our sample is presented in Figure 19.

**Figure 19. Type of Business in the Solution Provider Customer Base**

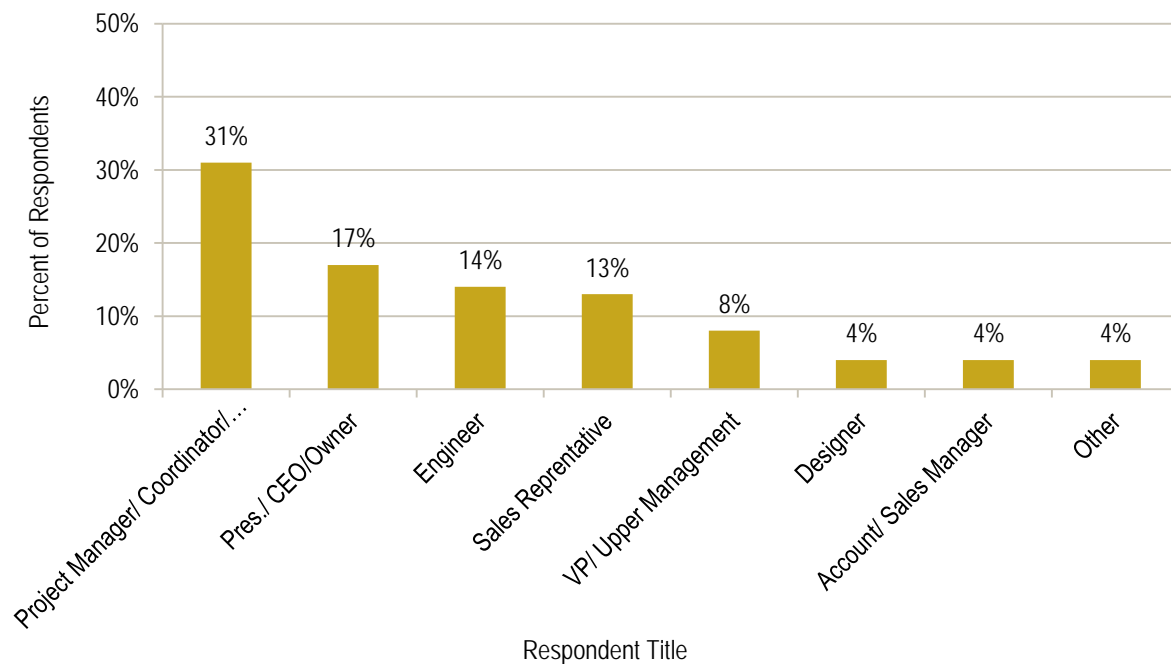




### 5.5 Respondent's Title

Sampled survey respondents had various titles within their company. The most common position title was Manager or Coordinator, mentioned by 31 percent of the Solution Providers. The next most common position was the President, CEO or owner of the firm (17%), followed closely by Engineer and Sales Representative. The distribution of the title of the respondent is shown in Figure 20.

**Figure 20. Title of Respondent**





## 6. Evaluation Findings and Recommendations

A total of 90 Solution Providers completed the CATI survey during April, 2013. The Solution Providers were asked about many topics relating to their program participation.

### 6.1 Key Impact Findings and Recommendations

The primary objectives of this evaluation were to quantify Solution Provider attitudes towards the AEP Ohio Programs, to determine what impact the program had on job creation in 2012, and to determine what improvements would help them become more effective in delivering the program.

#### 6.1.1 Solution Provider Attitudes

1. Finding: Solution Providers liked the AEP Ohio Business Programs. Solution Providers liked all the aspects of the programs and they do not see many drawbacks to the program. They mentioned expanding their business and reducing customer costs as the driving force behind their program participation. They liked the trade ally bonus.
2. Finding: Solution Providers know to call DNV KEMA or AEP Ohio for help. The most common reason to call was that help was needed with the application. DNV KEMA was 100% successful in resolving customer issues.

#### 6.1.2 Solution Providers on Job Creation

1. Finding: Solution Providers in our sample used the AEP Business Programs to create 52 jobs or an average of 2.3 jobs per Solution Provider. Two-thirds of them said the program helped grow their business or opened up new markets. Most of them hired one or two new employees. However, only one in four Solution Providers in our study hired more employees because of the Business Programs.

**Recommendation:** The recurring theme from Solution Providers was the value of the Business Programs to help them grow/expand their business. AEP Ohio should look for changes in training or marketing support that they can make to help Solution Providers increase their business. Navigant suggests that AEP Ohio, first, identify the attributes of successful Solution Providers who expanded their businesses in 2012 and, second, look for Solution Providers with similar attributes and provide them with a 'roadmap' for growth. A qualitative study should be considered for inclusion in the 2013 research plan.

Lighting Solution Providers generally use a sales model; that is, they employ a sales staff and actively market their products and services to their customer base. Non-lighting Solution Providers, such as HVAC contractors, use a service business model, and they generally respond to incoming calls to repair or replace equipment. As the Business Programs continue to attract non-lighting Solution Providers, AEP Ohio and the implementer should explore how the programs can be integrated into business models that have traditionally been organized around service rather than sales.



2. Finding: Most solution providers (76%) had ten or less Prescriptive, Custom or Self Direct projects in 2012. They were asked a follow-up question about why they did not participate in more projects in 2012. Almost one-half said they did not know why. The other half said they were too busy, that demand had decreased, or that they generally did business in other utilities' service areas. Solution Providers do not generally use any collateral materials and most marketing is via email and telephone.

**Recommendation:** Most Solution Providers are looking for more opportunity to implement the AEP Business Programs. AEP Ohio should consider working with Solution Providers to develop materials that would work with their business model or introduce them to more innovative marketing methods.

#### 6.1.3 Solution Providers on Customer Needs

1. Finding: Solution Providers reported that, for customers, decisions are based primarily on economic factors including rebates, energy savings and payback. Four of the top five reasons for customers participating in the Programs were money-related. Two of the top three reasons for not participating in the Programs were lack of cash or resources and low program incentives. Solution Providers said that customer dropouts were also caused by a lack of cash resources.

**Recommendation:** AEP Ohio considers many factors when setting the rebates. These data suggest that AEP Ohio should continue to look for that intersection between the amount of incentive that will move customers to act and the amount that will keep the programs cost-effective.

2. Finding: Solution Providers said customers liked the programs because they validate that energy efficient technology will save energy. The programs bring the expertise of the Solution Provider to those without engineering resources and help customers increase the visibility of the project in the larger community.

**Recommendation:** AEP Ohio should incorporate these ideas into collateral material if they are not already included in the messaging.

#### 6.1.4 Solution Providers on Improving the Program

Solution Providers had specific recommendations for improving the Business Programs.

1. Finding: Most applications (about two-thirds) are reviewed within two to four weeks. Solution Providers reported that two customers had dropped out because of lengthy application reviews. Complicated custom projects generally require longer application review times.

**Recommendation:** DNV KEMA should analyze delayed projects and identify what aspects of the projects are most likely to lead to a long delay. Solution Providers could be notified regarding actions to take to prevent a delayed application and the resultant reduction in customer satisfaction.

2. Finding: Solution Providers found the rebate levels to be deficient for lighting products, for HVAC equipment and for variable speed drives (VSD) for different reasons. Reduction in the



lighting rebate levels meant that rebates now cover about 20 percent to 30 percent of the project cost rather than the 50 percent of project cost found in earlier program years.

**Recommendation:** Navigant would not recommend an increase in incentives for the Business Programs based on process results, but Solution Providers could be better trained on how to position energy efficient products and the incentive levels with customers. One way would be to concentrate on ensuring ongoing savings are realized once the equipment is installed rather than on the rebate. AEP Ohio and NKV KEMA could develop long-term customer case studies documenting annual achieved savings.

#### 6.1.5 Increase the Response Rate

1. **Finding:** Navigant conducted in-depth interviews in previous years, but moved to a CATI survey of Solution Providers in 2012. While we achieved an overall completion rate of 74% of our planned number of surveys, we were only able to reach 41% of our completion goal for the larger Solution Providers and 55% of our completion goal for the medium Solution Providers as measured by kWh saved.

**Recommendation:** AEP Ohio should consider a system for 2014 where at least a partial evaluation survey must be completed online before Solution Providers receive their final bonus payment. Other methods for increasing participation should also be considered.



## Appendix A. Solution Provider Survey

### **AEP-Ohio Evaluation for the Business Custom/Prescriptive/ Self Direct Program Solution Provider CATI Survey February 8, 2013**

#### Introduction

Hi, may I please speak with [INSERT NAME FROM SAMPLE]?

My name is \_\_\_ and I'm calling from the Blackstone Group, an independent market research firm. We are part of the team hired to conduct an evaluation of AEP-Ohio's Business Programs. We're currently in the process of conducting interviews with lighting contractors and equipment suppliers to improve our understanding of AEP-Ohio's Business Programs.

Our records show that you have been named as a lighting contractor or equipment or service provider for one or more of AEP-Ohio's Business Programs, such as the Custom, Prescriptive, or Self Direct Programs. We are interested in talking to the person most experienced with the one of these AEP-Ohio Business Programs. (CONFIRM THAT THIS IS THE PERSON MOST KNOWLEDGEABLE AT THEIR BUSINESS OR GET ALTERNATE NAME).

My questions will only take about 15-20 minutes, and the information you provide will be kept anonymous in our reports. General observations and findings will appear in our final report, but they will be kept completely confidential and will not be identified with any named person or company. **Is this a good time to talk?** (IF NOT, SCHEDULE A CALL BACK.)

B1. Are you a Registered Solution Provider with AEP Ohio?

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

B2. Our records show that, in 2012, you delivered [INSERT NUMBER OF PRESCRIPTIVE FROM SAMPLE] Prescriptive, [INSERT NUMBER OF CUSTOM FROM SAMPLE] Custom, and [INSERT NUMBER OF SELF-DIRECT FROM SAMPLE] Self-Direct Projects. We would like to ask you to answer the following questions in light of your experience with the [INSERT HIGHEST PROGRAM TYPE] Program.





B3. Which business program are you most familiar with? [USE THIS ANSWER TO REPLACE "INSERT PROGRAM"] (SINGLE PUNCH)

1. Prescriptive
2. Custom
3. Self Direct
4. New Construction
5. Other\_(Specify\_\_\_\_\_)
6. Don't Know
7. Refused

B4. What type of equipment did you install for the [INSERT PROGRAM TYPE] Program? (DO NOT READ LIST. SELECT ALL THAT APPLY.) [ALLOW MULTIPLE RESPONSES]

1. BUILDING ENVELOPE
2. LIGHTING
3. HVAC
4. REFRIGERATION
5. MOTORS
6. COMPRESSED AIR
7. VARIABLE SPEED DRIVES
97. OTHER (SPECIFY) \_\_\_\_\_
8. NO EQUIPMENT WAS INSTALLED [EXCLUSIVE] [TERMINATE]
98. DON'T KNOW [EXCLUSIVE]
99. REFUSED [EXCLUSIVE]

#### Training

Now we would like to ask you some questions about training needs for program registration.

T1. Was the training provided as part of the registration process useful to your organization?

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



T2. What type of additional training would be useful? [OPEN END]

RECORD RESPONSE \_\_\_\_\_

98. DON'T KNOW

99. REFUSED

*Customer Service*

Now we would like to turn to some customer service questions.

CS1. Did you complete the program paper application for your customers during 2012?

1. YES

2. NO

98. DON'T KNOW

99. REFUSED

CS2. On a 0 to 10 point scale, where 0 means the standard application is very difficult to use and 10 means the standard application is very easy to use, how would you rate the standard application? (REPEAT SCALE AS NEEDED.)

0. Very difficult to use

1.

2.

3.

4.

5.

6.

7.

8.

9.

10. Very easy to use

98. DON'T KNOW

99. REFUSED

CS3. Did customers frequently need your help with program issues after the equipment was installed?

1. YES

2. NO

98. DON'T KNOW

99. REFUSED



CS4. [ASK IF CS3=1] What type of help did they need? [OPEN END]

98. DON'T KNOW

99. REFUSED

#### Marketing and Promotion to Customers

Now we would like to move on to some questions about marketing and promotion to customers.

MP1. How does your company become involved with projects associated with the [INSERT PROGRAM TYPE] program? (ACCEPT MULTIPLE RESPONSES) (DO NOT READ LIST)

1. Existing customer relationship – we market to them
2. Existing customer relationship – they call us because they heard about the program
3. Cold calls by sales staff
4. Assigned by KEMA
5. Relationship with AEP Ohio representative
97. OTHER (SPECIFY) \_\_\_\_\_
98. DON'T KNOW
99. REFUSED

MP2. Generally, how do customers find out about the [INSERT PROGRAM TYPE] program? (ACCEPT MULTIPLE RESPONSES) (DO NOT READ LIST)

1. SOLUTION PROVIDER MARKETING THE PROGRAM
2. KEMA MARKETING THE PROGRAM
3. AN AEP OHIO ACCOUNT MANAGER
4. THE AEP OHIO WEBSITE
5. AN AEP OHIO WORKSHOP/WEBINAR
6. AN AEP OHIO EMAIL
7. A CONTRACTOR/TRADE ALLY/CONSULTANT
8. AN AEP OHIO BILL INSERT
9. A FRIEND/COLLEAGUE/WORD OF MOUTH
10. AN AEP OHIO NEWSLETTER
11. A VENDOR/SUPPLIER
12. A NON-AEP OHIO WEBSITE
13. A NON-AEP OHIO WORKSHOP/WEBINAR
97. OTHER (SPECIFY) \_\_\_\_\_
98. DON'T KNOW
99. REFUSED



MP3. Has your company promoted the program through its own marketing collateral?

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

MP4. Do you distribute utility-produced marketing materials?

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

MP5. Do you think AEP Ohio's level of marketing and promotion of the [INSERT PROGRAM TYPE] Program has been successful so far?

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

MP6. Do you have suggested changes to AEP Ohio's marketing efforts for next year?

- 1. YES (READ: Please describe these changes.)  
\_\_\_\_\_
- 2. NO
- 98. DON'T KNOW
- 99. REFUSED



#### Customer Participation

Now we would like to move into the topic of customer participation.

CP1. What reasons do customers give for participating in the [INSERT PROGRAM TYPE] program? (SELECT ALL THAT APPLY.) [ALLOW MULTIPLE RESPONSES] (DO NOT READ)

1. ENERGY SAVINGS
2. GOOD FOR THE ENVIRONMENT
3. LOWER MAINTENANCE COSTS
4. BETTER QUALITY/NEW EQUIPMENT
5. REBATE/INCENTIVE
6. IMPROVED SAFETY/MORALE
7. SET EXAMPLE/INDUSTRY LEADER
8. ABLE TO MAKE IMPROVEMENTS SOONER
9. SAVES MONEY ON UTILITY BILL
10. EQUIPMENT NEEDED REPLACING
97. OTHER (SPECIFY) \_\_\_\_\_
98. DON'T KNOW [EXCLUSIVE]
99. REFUSED [EXCLUSIVE]

CP2. What is the review time between completing the pre-approval application and letter of approval from AEP Ohio? Is it...

1. One week or less
2. Two weeks
3. Three to four weeks
4. Five to six weeks
5. Over six weeks
98. DON'T KNOW
99. REFUSED

CP3. Has the project review delayed any of your projects?

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



CP4. Have any of your customers dropped out of the program because of the review time required?

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

[ASK CP5 IF NUMBER OF CUSTOM FROM SAMPLE IS > 0]

CP5. For Custom projects, does the requirement that all documentation be submitted within 60 days of project completion affect your ability to complete projects for incentives?

- 1. YES (SPECIFY) \_\_\_\_\_
- 2. NO
- 98. DON'T KNOW
- 99. REFUSED

CP6. What are the reasons that customers might not participate in the [INSERT PROGRAM TYPE] program? (SELECT ALL THAT APPLY.) [ALLOW MULTIPLE RESPONSES] (DO NOT READ)

- 1. LACK OF RESOURCES/CASH
- 2. PAPERWORK TOO BURDENSOME
- 3. INCENTIVES NOT HIGH ENOUGH/NOT WORTH THE EFFORT
- 4. PROGRAM IS TOO COMPLICATED
- 5. COST OF EQUIPMENT
- 6. POOR UNDERSTANDING OF PROGRAM BENEFITS
- 7. TIME CONSUMING
- 8. UNDERFUNDED/RAN OUT OF MONEY
- 9. NOT AWARE OF PROGRAM
- 97. OTHER (SPECIFY) \_\_\_\_\_
- 98. DON'T KNOW [EXCLUSIVE]
- 99. REFUSED [EXCLUSIVE]

CP9. Do customers regularly drop out of this program?

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



IF CP9 = YES ASK CP10

CP10. What reasons do these customers give you for dropping out of the program? (SELECT ALL THAT APPLY.) [ALLOW MULTIPLE RESPONSES] (DO NOT READ)

1. EQUIPMENT DOES NOT QUALIFY
2. PROGRAM DELAYED PROJECT TOO LONG
3. NO LONGER HAS RESOURCES FOR PROJECT
4. HAVE NOT HAD ANY PROGRAM DROPOUTS
97. OTHER (SPECIFY) \_\_\_\_\_
98. DON'T KNOW [EXCLUSIVE]
99. REFUSED [EXCLUSIVE]

CP11. Other than incentives, what do customers like most about the [INSERT PROGRAM TYPE] Program? (READ LIST. SELECT ALL THAT APPLY.) [ALLOW MULTIPLE RESPONSES]

1. Interaction with AEP Account Representatives
2. Energy Efficiency technology validation (approval/legitimization) by Program
3. Connecting with contractors who value energy efficiency in their field
4. Expertise of Contractor / Program team on the project
5. The visibility of the project to enhance reputation
6. Supports corporate sustainability goals
7. Employee engagement
8. Increased productivity
97. OTHER (SPECIFY) \_\_\_\_\_
9. CUSTOMERS DON'T LIKE ANYTHING OTHER THAN INCENTIVES [EXCLUSIVE]
98. DON'T KNOW [EXCLUSIVE]
99. REFUSED [EXCLUSIVE]



CP12. Other than incentives, what do you (Service Providers) like most about the [INSERT PROGRAM TYPE] Program? (READ LIST. SELECT ALL THAT APPLY.) [ALLOW MULTIPLE RESPONSES]

1. Interaction with AEP Account Representatives
2. The quantity and breadth of approved EE technology
3. EE technology validation (approval/legitimization) by Program and AEP
4. The visibility of projects to enhance reputation
5. Supports corporate sustainability goals
6. Program complements Service Provider marketing
7. Increased visibility for EE equipment
97. OTHER (SPECIFY) \_\_\_\_\_
98. I DON'T LIKE ANYTHING OTHER THAN INCENTIVES. [EXCLUSIVE]
98. DON'T KNOW [EXCLUSIVE]
99. REFUSED [EXCLUSIVE]

#### Rebates/Incentives

Now we would like to move on to rebates and incentives.

R1. How has your business changed from your participation in AEP Ohio's business programs? [OPEN END]

98. DON'T KNOW
99. REFUSED

R2. If you install lighting equipment through the program, are program participants satisfied with the incentive levels for lighting equipment?

1. YES
2. NO
3. DON'T INSTALL LIGHTING / NA
98. DON'T KNOW
99. REFUSED

R2A. [ASK IF R2=2] Why not? [OPEN END]





R3. If you install HVAC equipment through the program, are program participants satisfied with the incentive levels for HVAC equipment?

- 1. YES
- 2. NO
- 3. DON'T INSTALL HVAC / NA
- 98. DON'T KNOW
- 99. REFUSED

R3A. [ASK IF R3=2] Why not? [OPEN END]

R4. If you install variable speed drives through the program, are program participants satisfied with the incentive levels for the variable speed drives?

- 1. YES
- 2. NO
- 3. DON'T INSTALL VARIABLE SPEED DRIVES / NA
- 98. DON'T KNOW
- 99. REFUSED

R4A. [ASK IF R4=2] Why not? [OPEN END]

R5. Are the incentives effective at encouraging customers to pursue projects they would not have considered without the [INSERT PROGRAM TYPE] program?

- 1. YES
- 2. NO
- 3. MIXED – SOME YES AND SOME NO
- 98. DON'T KNOW
- 99. REFUSED

R6. [ASK IF R5=3] For which type of projects are the incentives ineffective? (READ LIST. SELECT ALL THAT APPLY.) [ALLOW MULTIPLE RESPONSES]

- 1. Lighting
- 2. HVAC
- 3. Variable speed drives
- 97. OTHER (SPECIFY) \_\_\_\_\_
- 98. DON'T KNOW [EXCLUSIVE]
- 99. REFUSED [EXCLUSIVE]



Call Center

Our next questions will focus on where you find help with the programs.

CC1. Do you know whom to contact for help with the [INSERT PROGRAM TYPE] program?

- 1. YES (SPECIFY) \_\_\_\_\_
- 2. NO
- 98. DON'T KNOW
- 99. REFUSED

CC2. Have you contacted the KEMA call center regarding the [INSERT PROGRAM TYPE] program?

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

CC3. [ASK IF CC2=1] What are the main reasons for calling KEMA staff for help with the program? (READ LIST. SELECT ALL THAT APPLY.) [ALLOW MULTIPLE RESPONSES]

- 1. Questions about completing the paperwork
- 2. Help with the program offerings
- 3. Help understanding the program incentives
- 4. Verify customer eligibility
- 5. Solve an issue with a customer application
- 6. Follow up on overdue payment of incentive
- 97. OTHER (SPECIFY) \_\_\_\_\_
- 98. DON'T KNOW [EXCLUSIVE]
- 99. REFUSED [EXCLUSIVE]

CC4. [ASK IF CC2=1] Are your questions resolved by the KEMA staff to your satisfaction?

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



#### Solution Provider Participation

Our next questions will focus on your participation in AEP Ohio's business programs.

SPP1. What are the reasons your firm decided to participate in the AEP Ohio Business Programs? (DO NOT READ LIST. SELECT ALL THAT APPLY.) [ALLOW MULTIPLE RESPONSES]

1. EXPAND THE BUSINESS
2. HELPS REDUCE COSTS TO CUSTOMERS
3. INCREASE THE NUMBER OF CUSTOMERS
4. INCREASE OUR FIRM'S ABILITY TO COMPETE
97. OTHER (SPECIFY) \_\_\_\_\_
98. DON'T KNOW [EXCLUSIVE]
99. REFUSED [EXCLUSIVE]

SPP2. What are the main benefits to your firm associated with participating in the AEP Ohio Business Programs? (SELECT ALL THAT APPLY.) [ALLOW MULTIPLE RESPONSES] (DO NOT READ)

1. THE POTENTIAL FOR EXPANDING MY FIRM
2. THE ABILITY TO HELP CUSTOMERS PURCHASE NEEDED EQUIPMENT
97. OTHER (SPECIFY) \_\_\_\_\_
3. THERE ARE NO BENEFITS [EXCLUSIVE]
98. DON'T KNOW [EXCLUSIVE]
99. REFUSED [EXCLUSIVE]

SPP3. Are there any drawbacks to your firm associated with the AEP Ohio Business Programs? (SELECT ALL THAT APPLY.) [ALLOW MULTIPLE RESPONSES] (DO NOT READ)

1. THE WORK IS NOT STEADY
2. THE REBATES ARE NOT HIGH ENOUGH
3. THE APPLICATIONS TAKE TOO MUCH TIME
97. OTHER (SPECIFY) \_\_\_\_\_
4. THERE ARE NO DRAWBACKS [EXCLUSIVE]
98. DON'T KNOW [EXCLUSIVE]
99. REFUSED [EXCLUSIVE]



Program Adjustments and Enhancements

AE1. In your opinion, have the AEP Ohio Business Programs increased your company's business?

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

AE1a. Please estimate the size of your equipment installation business. Is it... (READ LIST. SELECT ONE RESPONSE.)

- 1. Less than \$500,000 a year
- 2. \$500,000 to less than \$1,000,000 a year
- 3. \$1,000,000 to less than \$10,000,000 a year
- 4. More than \$10,000,000 a year
- 98. DON'T KNOW
- 99. REFUSED

AE2. Has your firm hired new employees as result of your participation in the AEP Ohio Business Programs?

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

AE2a [ASK IF AE2=1] How many employees were hired in 2012 to respond to the demands of the AEP Ohio Business Programs?

- RECORD NUMBER OF EMPLOYEES [INSERT NUMERIC OPEN END]
- 98. DON'T KNOW
- 99. REFUSED

[CREATE PROJTOTAL VARIABLE. PROJTOTAL= SUM OF CUSTOM, PRESCRIPTIVE AND SELF-DIRECT PROJECTS.]



AE3. [ASK IF PROJTOTAL<10] Is there a reason you have not been involved with more energy efficient projects through AEP Ohio Business Programs? [OPEN END]

- 98. DON'T KNOW
- 99. REFUSED

AE4. [ASK IF PROJTOTAL<10] What would encourage you to become involved in more AEP Ohio Business Programs? [OPEN END]

- 98. DON'T KNOW
- 99. REFUSED

AE5. On a scale of 0 to 10 where 0 is "not at all satisfied" and 10 is "completely satisfied", how satisfied are you with your experiences with the AEP Ohio Business Programs?

(REPEAT SCALE AS NEEDED.)

- 0. Very Dissatisfied
  - 1.
  - 2.
  - 3.
  - 4.
  - 5.
  - 6.
  - 7.
  - 8.
  - 9.
  - 10. Completely Satisfied
- 98. DON'T KNOW
  - 99. REFUSED

AE6. [ASK IF AE5=0-6] Your rating suggests that you were not fully satisfied with the program. Why not? [OPEN END]

- RECORD RESPONSE \_\_\_\_\_
- 98. DON'T KNOW
  - 99. REFUSED



AE7. In your opinion, how can AEP Ohio increase participation in the [INSERT PROGRAM TYPE] Program? [OPEN END]

RECORD RESPONSE \_\_\_\_\_

98. DON'T KNOW

99. REFUSED



#### Success and the Future of These Efforts

We just have a couple more questions for you.

SF1. On a scale of 0 to 10, where 0 is not at all likely and 10 is very likely, how likely would your customers have been to install the same energy efficient equipment products without the program incentives? (REPEAT SCALE AS NEEDED.)

- 0. Not at all likely
- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10. Very likely
- 98. DON'T KNOW
- 99. REFUSED

#### Background

B5. How would you describe your company? Is your company a(n)... (READ LIST. SELECT ALL THAT APPLY.) [ALLOW MULTIPLE RESPONSES]

- 1. Electrical contractor
- 2. HVAC contractor
- 3. Mechanical service contractor
- 4. Energy solutions provider
- 5. Engineering company
- 6. Consulting company
- 7. Design firm
- 97. Other (Specify) \_\_\_\_\_
- 98. DON'T KNOW [EXCLUSIVE]
- 99. REFUSED [EXCLUSIVE]



B6. Who are your primary business customers? (SELECT ALL THAT APPLY – UP TO 3 RESPONSES) [ALLOW A MAXIMUM OF 3 RESPONSES] (DO NOT READ)

1. OFFICES
2. RETAIL (NON-FOOD)
3. FOOD STORES
4. COLLEGES/UNIVERSITIES
5. SCHOOLS
6. RESTAURANTS
7. HEALTH CARE/HOSPITALS
8. LODGING (HOTELS/MOTELS)
9. WAREHOUSES
10. SERVICES (E.G., AUTO REPAIRS, HAIR SALONS, ETC.)
11. PUBLIC ASSEMBLY (I.E., COMMUNITY SERVICE/CHURCHES/MUNICIPALITIES)
12. INDUSTRIAL/MANUFACTURING
13. MULTIFAMILY (E.G., APARTMENTS, ETC.)
97. OTHER (SPECIFY) \_\_\_\_\_
98. DON'T KNOW [EXCLUSIVE]
99. REFUSED [EXCLUSIVE]

B7. What is your position at [INSERT COMP FROM SAMPLE]? (DO NOT READ LIST. SELECT ONE RESPONSE)

1. PRESIDENT/CEO
2. VICE PRESIDENT/UPPER MANAGEMENT
3. ELECTRICIAN
4. MECHANICAL SERVICE CONTRACTOR
5. HVAC CONTRACTOR
6. ENGINEER
7. DESIGNER
8. SALES REPRESENTATIVE
9. ENERGY AUDITOR
97. OTHER (SPECIFY) \_\_\_\_\_
98. DON'T KNOW
99. REFUSED

That brings us to the end of our questions today. Thank you very much for taking the time to help with the evaluation. Your contribution is a very important part of the process.



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## APPENDIX O

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# TRANSMISSION AND DISTRIBUTION AND INTERNAL SYSTEM EFFICIENCY IMPROVEMENTS PROGRAM

## Program Year 2012 Evaluation Report

Prepared for:  
AEP Ohio



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May 10, 2013



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## 1 Program Description

AEP Ohio's Transmission and Distribution and Internal System Efficiency Improvements Program (load loss reduction program) is targeted to transmission and distribution (T&D) facilities that are candidates for efficiency improvements, typically in concert with other benefits, such as increased capacity or reliability performance. For most of these projects, T&D savings are achieved when lines and equipment are replaced with similar facilities with lower losses. For example, replacing smaller, high resistance wire with larger wire that has lower resistance is commonly referred to as reconductoring. Physical losses accrue in the form of heat losses. When heating losses are high due to loading equipment above normal ratings for extended periods of time, equipment can be damaged or experience premature loss of life. Loss reduction also is achieved when new lines are added and existing lines reconfigured, lines are converted to operate at a higher voltage (resulting in lower current needed to supply the same amount of load); feeder power factor is improved; and low loss devices are installed, such as highly efficient transformers. T&D efficiency benefits accrue via lower peak demand and reduced energy losses. Because losses are proportional to the square of the load served, the percent reduction in peak demand losses are higher than the percent reduction in energy losses.

AEP Ohio's T&D loss reduction program for projects placed in service during 2012 focuses on the measures listed below. The methodology AEP Ohio employed to derive demand and energy loss savings is presented in the sections that follow. Table 3 lists the TRM evaluation protocols that AEP applies to each of the categories.

- » Line reconductoring (distribution, subtransmission and transmission)
- » New substations and circuits (distribution, subtransmission and transmission)
- » Voltage conversion
- » Power factor improvement (via capacitor banks, regulators & load-tap changers)
- » Feeder reconfiguration
- » Load transfers and phase balancing

The items listed above commonly are referred to as load loss reduction programs. Electrical equipment, such as transformers, includes both load and no-load losses. Load losses are those that vary as the amount of current increases or decreases. No-load losses are those that are independent of load, and occur during all hours the device is in service. No-load losses typically occur only on equipment that requires inductive current (magnetizing current) to operate, such as transformers and motors. Loss reduction programs sometimes may include the replacement of equipment with high no-load losses with devices with lower no-load losses. The load reduction savings AEP Ohio has estimated for the above programs do not appear to include any projects focusing mostly on reduction of no-load losses, which is common among utilities.



## 2 Methodology

AEP Ohio estimated load loss reduction amounts using tools and methods that are commonly employed to accurately predict peak and energy savings. These include use of a comprehensive and detailed distribution feeder load flow simulation model (CYMDist) and network transmission load flow models (PSS/E) to estimate loss savings at the time of the feeder peak. The CYMDist and PSS/E models are commonly used by power industry professionals and each employs a level of rigor that is sufficient to accurately predict losses for transmission and distribution facilities.<sup>1</sup> The accuracy of the model results is highly dependent on model inputs and assumptions. AEP Ohio provided Navigant distribution model loss output tables and electrical diagrams that illustrate the upgrades and changes made for each feeder, with before and after loss summaries, thereby ensuring loss estimates are based on net loss savings. A typical line segment of a representative feeder (Crooksville Reconfiguration and Voltage Conversion project) targeted for loss savings is illustrated in Figure 1.

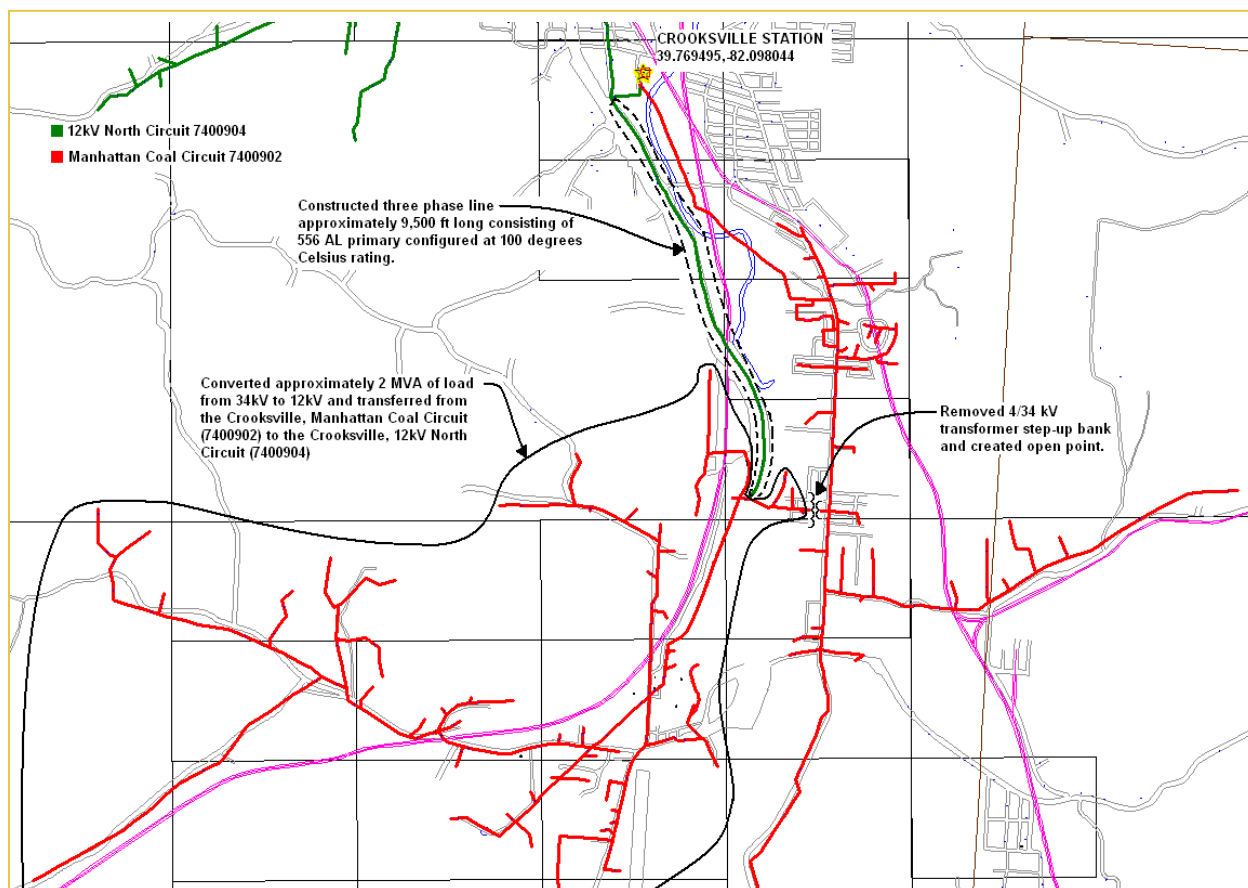
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<sup>1</sup> The loss reduction projects cited by AEP Ohio include distribution lines, typically 15kV class and below. They also include higher rated distribution and transmission lines rated 23kV, 34.5kV, 69kV, 138kV and 345kV. Lines rated 34.5kV, 69kV and 138kV often operate radially, but may be configured in a network arrangement, particularly 138kV. Lines rated 345kV are almost always operated in a network configuration.





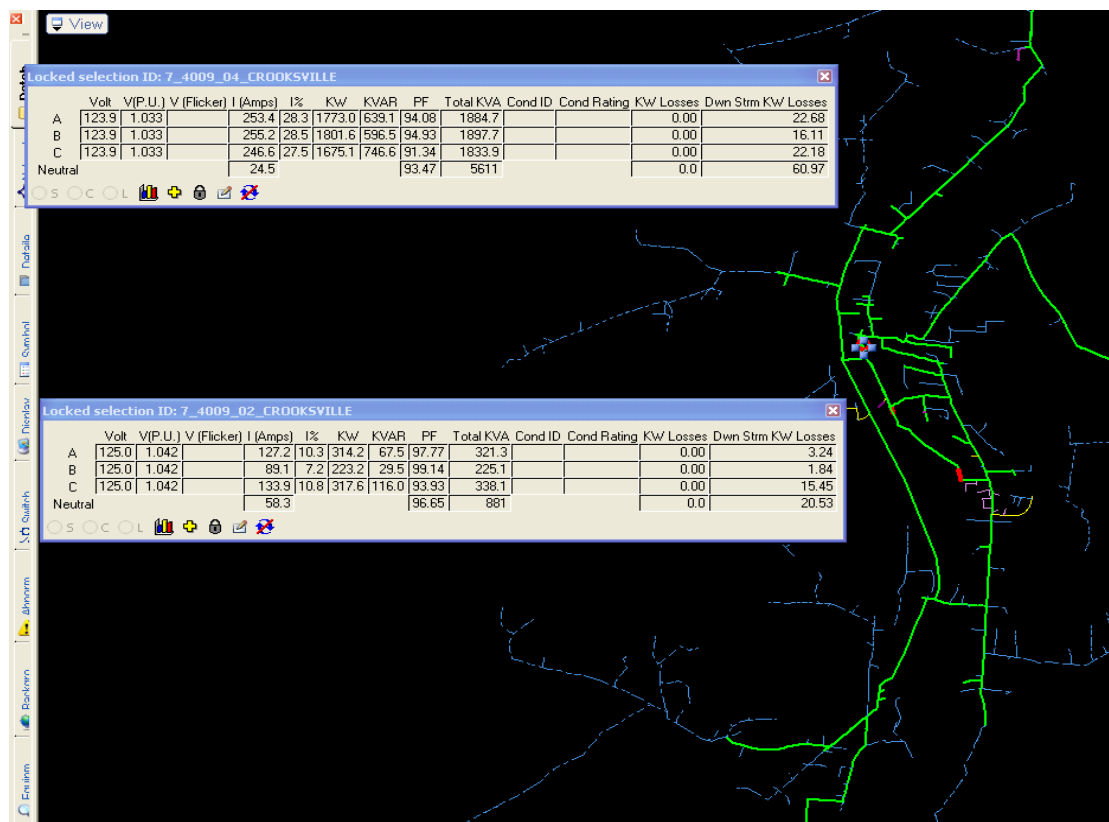
**Figure 1. Crooksville - Example Project Diagram**



In this example, several sections of the Crooksville circuit were reconfigured and converted to operate at a higher voltage, resulting in net peak loss savings of 309kW. Per Navigant's request, AEP Ohio provided CYMDist load flow electric one-line diagrams and loss savings results for representative feeders that Navigant selected. The reconfigured circuit and loss summary is illustrated below. (AEP Ohio also provided the feeder one-line diagram for the Crooksville circuit prior to reconfiguration and conversion, see Figure 2.



**Figure 2. Crooksville – Example Load Flow Diagram**



Peak demand losses are derived by conducting load flow studies with and without the upgrade, with the difference in losses between the two cases equal to the net loss savings. AEP Ohio provided copies of model output and feeder maps that confirm AEP Ohio's distribution planning personnel included a high level of detail in the CYMDist feeder model for each of the loss reduction programs listed above. The peak load loss savings AEP Ohio derived for each of the projects listed above are consistent with the percent savings Navigant has determined in its own studies of similar upgrades for utility distribution systems, as well as results we have reviewed from projects developed by other utilities. To derive energy loss savings, AEP Ohio employs the following formula, which Navigant supports as a reasonable and accurate approach. This equation has been vetted and accepted within the utility industry for decades.

$$\text{Energy Loss Savings} = \text{Peak Loss Savings} * (C_1 * LF + C_2 * LF^2) * 8760$$

Where LF is the feeder load factor, and C1 and C2 are coefficients derived using methods outlined in published industry literature. C1 and C2 for AEP Ohio are 0.1 and 0.9, respectively.<sup>2</sup>

<sup>2</sup> System Load Factor values used by AEP Ohio were obtained from internal reports titled "2006 Analysis of System Losses" for the Columbus Southern Power Company and Ohio Power Company, revised 09/30/2009. These reports compiled the results of system loss investigations conducted during 2006 and published in 2007



The loss factor for the above formula typically is between 0.40 and 0.50. The results of AEP Ohio's loss reduction program are presented in subsequent sections of this report.

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by Management Applications Consulting, Inc. for The Columbus Southern Power Company. These studies also included derivation of the C1 and C2 coefficients.



### 3 Detailed Findings

Table 1 summarizes the peak demand and energy reductions for AEP Ohio.<sup>3</sup> Results are presented separately for distribution and transmission assets. 2012 reported loss savings are higher for transmission facilities. Table 3 (Appendix) presents reported demand and energy loss savings for specific T&D projects that AEP Ohio placed in service during 2012.

**Table 1. Peak Demand and Energy Reductions**

	Number of Projects	Peak (kW)	Energy (MWh)
Distribution	28	1,778	5,885,299
Transmission	24	4,300	16,468,000
<b>TOTAL</b>	<b>52</b>	<b>6,078</b>	<b>22,353,299</b>

#### 3.1 Distribution Loss Savings

Navigant's review confirmed that AEP Ohio's composite peak demand savings of approximately 1.8 MW for distribution is reasonable and consistent with the level of savings associated with the 28 projects summarized above and listed individually in Table 3. This conclusion is supported by the type of projects included in the AEP Ohio loss reduction program and the methods AEP Ohio employed to derive these savings. For most AEP Ohio distribution projects, loss savings are less than one percent of peak feeder load. For many projects, peak loss reductions are between 0.1 and 0.3 percent. These modest reductions are reasonable given the scope of each upgrade, and confirm that AEP Ohio exercised care to not overstate savings. Further, similar to most electric utilities, most distribution projects are implemented to address capacity shortages or improve reliability or operating flexibility, with loss reduction as an ancillary benefit - major upgrades typically are not justified on loss reduction benefits alone. For example, several projects are line reconductoring; that is, replacing smaller wire with larger wire. However, the amount of wire replaced typically is a relatively small percent of the total miles of conductor on the feeder, which accounts for the relatively small amount of loss savings as a function of total feeder load. However, because distribution feeder losses typically are less than five percent of total feeder demand, the reduction that AEP Ohio cites represents significant savings.

#### 3.2 Transmission Loss Savings

The magnitude of total loss savings (4.3 MW at peak) associated with transmission level is based on the combined savings associated with 24 projects or line segments that resulted in loss savings. Table 3 lists specific transmission projects and upgrades placed into service in 2012. Similar to 2011, transmission losses are well above distribution level savings. This is not unusual, as major transmission upgrades often result in substantial line loss savings, as the amount of power delivered per line mile is much higher than distribution lines. Navigant views AEP Ohio's transmission peak loss savings as consistent

<sup>3</sup> In prior years' report, results were presented separately for Ohio Power Company and Columbus Southern Power. Following the merger of these two companies, results are reported on a consolidated basis.



with the level of loss reduction achieved by other utilities that have implemented upgrades comparable with those listed in Table 3. Similar to distribution, transmission upgrades usually are implemented to improve performance and increase capacity transfer capability, with loss reduction as an added benefit.

Navigant's conclusions are supported by our review of AEP Ohio's project details and the analysis AEP Ohio prepared for each project, each of which confirms that the level of rigor applied to transmission level projects also is consistent with methods employed by electric utilities and transmission system operators. Further, the analysis AEP Ohio used to derive transmission energy savings is consistent with methods used by many electric utilities. Most important, AEP transmission planning reports that it performed detailed network load flow studies to estimate transmission loss savings.<sup>4</sup> Based on the amount of transmission network load and types of upgrades outlined in Table 3, Navigant concludes that AEP Ohio's reported peak and energy loss savings is reasonable and accurate.

---

<sup>4</sup> The loss savings for transmission projects were derived on a composite basis for AEP Ohio, as it was necessary to conduct network load flow studies with all upgrades and modifications in service; that is, the transmission projects are not mutually exclusive in terms of their combined impact on the transmission network, as the resultant line loadings will vary as the network is changed. Thus, the loss savings associated with each project, if modeled individually, are not additive.



## Appendix A

Table 2 lists the T&D project types from the draft Ohio TRM.

**Table 2. T&D Project Types**

Ohio TRM T&D Project Types
1. Mass Plant Replacement and Expansion Analysis Protocol
2. Conductor Analysis Protocol
3. Large Customer Connection Analysis Protocol
4. Mass Plant Retrofit Analysis Protocol
5. Substation Transformer Analysis Protocol
6. System Reconfiguration Analysis Protocol
7. Voltage Conversion Analysis Protocol

Table 3 lists the project name, scope, whether the project was either Transmission (T) or Distribution (D), the type of project in terms of the draft Ohio TRM designations, and the peak demand reduction (kW) and the annualized loss reduction (kWh).

**Table 3. AEP Ohio T&D Projects**

Project	Scope	TRM Project Type	Peak Reduction (kW)	Annualized Loss Reduction (kWh)	Transmission or Distribution
Bascom Station, Bascom Circuit	Reconductoring	2	1	3,916	D
South Vanlue Station, North Circuit	Regulation	6	3	10,365	D
Willard Station, Commercial Circuit	Reconfiguration	6	26	102,303	D
East Sparta Station, East Sparta Circuit	Reconductoring	2	37	144,395	D
East Sparta Station, East Sparta Circuit	Regulation	6	8	33,587	D
Big Prairie Station, West Circuit	Reconductoring	2	6	22,391	D
Madisonburg, West Circuit	Reconfiguration	6	118	467,008	D



Project	Scope	TRM Project Type	Peak Reduction (kW)	Annualized Loss Reduction (kWh)	Transmission or Distribution
Berlin Station, Berlin Circuit	Reconductoring & Regulation	2,6	39	153,849	D
Bluffton Station, College Avenue Circuit	Capacitance	6	1	2,136	D
Billiar Station, Kidron Circuit	Reconductoring & Regulation	2,6	8	30,184	D
Broken Sword Station, National Lime & Stone Circuit	Capacitance & Reconfiguration	6	13	51,824	D
Maple Grove Station, West Circuit	Load Balancing	6	2	7,279	D
East Wooster Station, South Circuit	Reconductoring	2	20	79,793	D
Crooksville Station, North Circuit	Voltage Conversion & Reconfiguration	7,6	309	1,221,024	D
Cadiz Station, West Circuit	Reconductoring	2	18	69,745	D
East Sparta Station, Malvern Circuit	Reconductoring	2	175	692,619	D
Stadium Park Station, South Circuit	Reconductoring	2	19	74,967	D
Rozelle Station, Circuit F-0027802	Load & Phasing Balancing	6	29	80,355	D
Ross and Rozelle Stations - Circuits F-22604 and F-27801	Load Transfer	6	123	340,946	D
Rozelle Station -, Circuit F-27801	Reconductor of Distribution Circuit	2	40	110,255	D
Wild Cat Station, Circuit F-39201-02	New Substation and Circuits	5,6	419	1,165,829	D



Project	Scope	TRM Project Type	Peak Reduction (kW)	Annualized Loss Reduction (kWh)	Transmission or Distribution
Cornerstone, Circuit F-7440201-04	New Substation and Circuits	5,6	19	52,763	D
Elliot Station, Circuit F-11301	Reconductor Distribution Line	2	1	1,669	D
Elk Station, Circuit F-22801	Reconductor Distribution Primary	2	28	78,631	D
Bixby Station, Circuits F-7103 and F-7106	Reconductor Distribution Primary	2	106	293,634	D
Marion Station, Circuits F-705 and F-716	Reconductor Distribution Primary and Load Transfer	2,6	148	410,286	D
Huntley Station, Circuits F-1207 and F-1209	Reconductor Distribution Primary	2	14	38,940	D
Kimberly Station, Circuit F-11805	Reconductor Distribution Primary	2	52	144,606	D
Moreland Junction-Shreve 69 kV Line (Transco) - Rebuild/reconductor as necessary. Double-circuit the line between Moreland Junction and Moreland Switch.	Reconductoring	2	included below	included below	T
Replace the 138/69/12 kV transformer at West Moulton station.	Transformer Replacement	5	included below	included below	T
Rebuild 8.4 miles of 69 kV line between West Moulton and Wapakoneta.	Reconductoring	2	included below	included below	T
Millbrook-Offnere 69 kV Line: Reterminate at Cornerstone and Millbrook Park	Reconductoring	2	included below	included below	T





Project	Scope	TRM Project Type	Peak Reduction (kW)	Annualized Loss Reduction (kWh)	Transmission or Distribution
Ruhlman-Cornerstone Circuit: Reterminate	New Substation	5	included below	included below	T
Waller-Central Portsmouth Line: Reterminate	Transmission Line Work	2	included below	included below	T
Lima-Sterling 138 kV Line - Rebuild/reconductor with 795 kcm ACSR between Sterling and Rockhill.	Reconductoring	2	included below	included below	T
Wildcat Station - T-Line work to loop the 138 kV Hillsboro - Maysville line through the new Wildcat Station.	Reconfiguration	6	included below	included below	T
Paulding - Mark Center 69kV: Rebuild 11.85 Mi.	Reconductoring	2	included below	included below	T
DON MARQUIS (OP-CS) (OVEC): REPL 3 765KV TRANSFORMERS & PURCH/INSTALL SPARE	Transformer Replacement	5	included below	included below	T
NEWARK - THORNVILLE 69 KV : REBUILD 10.1 MI. KAISER JCT - NEWARK - NEWARK CENTER	Reconductoring	2	included below	included below	T
NEWCOMERSTOWN - RAY 34.5kV: REBUILD 15.4MI. NEWCOMERSTOWN - SUGARCREEK 34.5kV	Reconductoring	2	included below	included below	T
THORNVILLE - NEW LEXINGTON 69 KV: REBUILD 11.3 MI. NEW LEXINGTON - S FULTONHAM	Reconductoring	2	included below	included below	T
T-line - OH Transco: Construct a 138 kV double circuit transmission line from East Leipsic station to Yellow Creek station.	Reconductoring	2	included below	included below	T
Southeast Canton Station - Replace 345/138 kV Trf #1 with 675 MVA unit.	Transformer Replacement	5	included below	included below	T



Project	Scope	TRM Project Type	Peak Reduction (kW)	Annualized Loss Reduction (kWh)	Transmission or Distribution
Bakersville - Frontier Power 69kV: Rebuild/Relocate (Upgrades from 34kV)	Reconductoring	2	included below	included below	T
(TransCo - T-Line) Stone Plant - Freebyrd 138 kV Line (build at 69 kV if timing becomes an issue). Construct about 2.4 miles with 1033 ACSR	Reconductoring	2	included below	included below	T
Construct the Cole - Blair 69 kV Line (Transco)	Reconductoring	2	included below	included below	T
POSTON - ROSS 138kV: REBUILD POSTON - S BLOOMINGVIL SW	Reconductoring	2	included below	included below	T
POSTON - ROSS 138kV: REBUILD S BLOOMINGVIL SW - ROSS	Reconductoring	2	included below	included below	T
Transco Etna 69 kV Extension, West (operating at 40 kV).	Reconductoring	2	included below	included below	T
Transco Line #380:021 - Etna 40 kV Extension East - Construct new 69 kV line (operating at 40 kV)	Reconductoring	2	included below	included below	T
Turn 138 kV line into and out of station-CSP funded	Reconductoring	2	included below	included below	T
Poston-Harrison 138 kV Line (Transco)	Reconductoring	2	4,300	16,468,000	T

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