FILED
May 7, 2014
INDIANA UTILITY
REGULATORY COMMISSION

STATE OF INDIANA

INDIANA UTILITY REGULATORY COMMISSION

IN THE MATTER OF THE VERIFIED PETITION OF INDIANA MICHIGAN POWER COMPANY FOR APPROVAL OF ALTERNATIVE REGULATORY PLAN FOR DEMAND SIDE MANAGEMENT (DSM) AND ENERGY EFFICIENCY (EE) PROGRAMS FOR 2015 AND ASSOCIATED ACCOUNTING AND RATEMAKING MECHANISMS, INCLUDING TIMELY RECOVERY THROUGH I&M'S DSM/EE PROGRAM COST RIDER OF ASSOCIATED COSTS, INCLUDING ALL PROGRAM COSTS, NET LOST REVENUE, SHAREHOLDER INCENTIVES AND CARRYING CHARGES, DEPRECIATION AND OPERATIONS AND MAINTENANCE EXPENSE ON CAPITAL EXPENDITURES.	**)**	**CAUSE NO. 44486**

EXHIBITS
OF
INDIANA MICHIGAN POWER COMPANY

VOLUME 3 OF 3

EXHIBIT JCW-18

Evaluation of Residential Incentive Program Portfolio

January 2013 through December 2013

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M&V Report: April 2014

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Executive Summary

This report provides the results of the impact and process evaluation of the residential programs portfolio of programs that were offered by Indiana Michigan Power (I&M). This report presents results for activity during the period January 1, 2013 and December 31, 2013.

Activity over this period took place in program year four (PY4) in which the I&M Residential Portfolio achieved program activity in each of the six programs currently offered:

- Residential Appliance Recycling (ARP);
- Residential Home Energy Reporting (HERP);
- Residential Online Energy Check-Up (OECUP);
- Residential Peak Reduction (PRP);
- Residential Renewables and Demonstrations (R&DP);
- Residential Home Weatherization (HWP).

For the 2013 evaluated programs, ADM's evaluation efforts consisted of estimating gross and net energy impacts resulting from program implementation, evaluating the cost-effectiveness of each program, and providing process related feedback and recommendations.

Evaluation Objectives

The objectives of this evaluation include:

- Development of program-specific evaluation plans;
- Design samples allowing for estimation of energy and demand impacts at the 90% confidence level with +/- 10% relative precision for each program;
- Conduct on-site verification inspections and telephone surveying as needed;
- Estimate gross annual energy savings and peak demand reductions by program;
- Estimate net energy and peak demand impacts through evaluation of program free-ridership;
- Evaluate the cost-effectiveness of each program using the Total Resource Cost test, Utility Cost Test, Societal Cost Test, Participant Cost Test, Ratepayer Impact Test; and
- Evaluate program processes and provide feedback and recommendations for amendments and/or improvements.

Summary of Findings

Gross energy and peak demand impacts were estimated through engineering and billing analysis, statistical and simulation modeling, participant surveying, and telephone verification activities depending on the particular program and measure types. Estimates of program free-ridership derived via participant surveying were used to develop net-to-gross ratios (NTGR's) for the Appliance Recycling, Renewables and Demonstrations, and Home Weatherization programs. For the Online Energy Check-Up program this surveying process was unnecessary because the regression model specification included a control group. By analyzing regression models with and without the control group, ADM was able to determine free-ridership. The Home Energy Reporting and Peak Reduction programs assumed no free-ridership; therefore, the participant survey contained no questions pertaining to NTGR. These NTGR's for all six programs where impact evaluation was calculated were multiplied by the estimated gross impacts to provide net impact estimates. Table ES-1 and Table ES-2 below present the verified ex post gross and net impacts by program.

Table ES-1 Annual kWh Savings Impact Summary [1]

Program	*PY4 Annual kWh Program Goals*	*Ex Ante Gross kWh Savings*	*Gross Audited kWh Savings*	*Gross Verified kWh Savings*	*Ex Post Gross kWh Savings*	*Ex Post Net kWh Savings*
Appliance Recycling	6,248,000	3,987,730	3,987,730	3,963,874	3,703,364	2,507,800
Home Energy Reporting	18,400,000	16,698,313	16,698,313	16,698,313	14,583,147[2]	14,583,147
Online Energy Check-Up	11,481,000	12,257,878	12,257,878	12,279,596	10,341,216	8,789,969
Peak Reduction	207,000	213,356	213,356	213,356	91,946	91,946
Renewables and Demonstrations	31,000	58,978	58,978	58,978	58,838	51,184
Home Weatherization	2,245,000	50,919[3]	50,919	50,919	42,134	38,342

[1] Totals in the report tables may not correspond exactly to the summation of individual values due to rounding.

[2] Savings calculated by ADM are based on 2012 participants and 2013 participants who were added to the program in October 2013. Participants added on December 31, 2013 received no savings.

[3] The number of participants listed in I&M's December 2013 scorecard differs from what ADM verified. It was agreed upon by the program implementer, I&M, and ADM that the correct number of participants is 33. Ex ante savings and ex post savings were calculated for the 33 participants.

Table ES-2 Peak Demand Savings Impact Summary

Program	*Ex Post Gross Peak kW Savings*	*Ex Post Net Peak kW Savings*
Appliance Recycling	438	297
Home Energy Reporting	1,819	1,819
Online Energy Check-Up	986	839
Peak Reduction	2,993	2,993
Renewables and Demonstrations	9.75	8.87
Home Weatherization	10.62	9.66

ADM estimated the cost-effectiveness of the PY4 programs and overall portfolio using the Utility Cost Test (UTC), Total Resource Cost Test (TRC), Ratepayer Impact Measure Test (RIM), Societal Cost Test (SCT), and the Participant Cost Test (PCT). The results are provided in Table ES-3 below.

Table ES-3 Cost Effectiveness Testing by Program

Program	*UCT*	*TRC*	*RIM*	*SCT*	*PCT*
Appliance Recycling	1.14	1.44	0.33	1.60	-
Home Energy Savings	0.86	0.86	0.24	0.95	-
Online Energy Check-Up	4.87	4.87	0.41	5.58	-
Peak Reduction	0.39	0.59	0.38	0.55	-
Renewables and Demonstrations	0.64	0.67	0.31	0.81	-
Home Weatherization	0.13	0.13	0.11	0.15	-

The process evaluation examined program operations and results for each program throughout the program operating year. This portion of the evaluation is designed to identify potential program improvements that may prospectively increase program efficiencies or effectiveness in terms of customer participation and satisfaction levels.

The following presents a selection of key portfolio-level findings from the most recent program year and full program cycle:

- **High Program Satisfaction:** Participants who completed projects in PY4 under the Online Energy Check-Up program, Peak Reduction program, Renewables and Demonstrations program, Home Weatherization program, and Appliance Recycling program expressed a high degree of satisfaction with the programs overall. A majority of customers who received reports through the HERP reported that they were satisfied with the usefulness of the information provided in the report about their energy consumption and indicated that they may implement some of the recommendations in the future.

- **Program Activity:** The biggest challenge facing the OECUP, HWP and ARP has been the low level of activity relative to the program goals. The discrepancy between actual program activity and the program goals raises the question as to whether or not the goals were set appropriately given the design of the programs, or if there are necessary changes that should be made with regard to how the programs are designed or operated. The Home Energy Reporting program achieved its goal for the number of participants who were sent bimonthly reports during the first year of operation. The PRP and R&DP were close to meeting their Year 4 program goals.

Recommendations have been developed based on interview findings and overall analysis of program processes. These recommendations may provide strategic advantage during future program cycles.

1. Introduction

This report presents the results of the impact and process evaluations of the Residential Appliance Recycling, Residential Home Energy Reporting, Residential Online Energy Check-Up, Residential Peak Reduction, Residential Renewables and Demonstrations, and Residential Home Weatherization programs that Indiana Michigan (I&M) Power offered its residential customers during the period of January 2013 through December 2013. Descriptions of each program are detailed in the subsections below.

1.1 Residential Appliance Recycling

The Residential Appliance Recycling program (ARP) is designed to help customers reduce their energy consumption by removing old, working refrigerators, and freezers from their homes for recycling. There is a limit of two refrigerators or freezers per household per calendar year. I&M generates energy savings because the old appliances, which are generally inefficient, are permanently removed from the system. The environment also benefits from the recycling process through safe disposal of environmentally harmful material.

The goal of the program is to reduce the number of old, inefficient refrigerators and freezers that customers have moved to their garages or other locations such as basements and patios. Many areas in which spare units are placed are not space conditioned and most refrigerators used in that environment operate under a heavy thermal load during the summer. This is exacerbated by the fact that the appliances are usually quite old and inefficient. Previous studies by the Environmental Protection Agency (EPA), the Department of Energy (DOE) and other utilities have determined that removing these appliances, and properly recycling them, performs an energy saving service.

I&M contracts with JACO, Inc. (JACO) to implement the program. The program is designed as a turnkey, stand-alone energy efficiency initiative. The program targets existing multi- and single-family households, renters and homeowners who have old, inefficient refrigerators or freezers. Marketing for the program consists of newspaper, radio, direct mail, bill stuffers, a dedicated webpage, and TV ads. To be eligible for the program, appliances to be recycled must be in working condition, plugged in and cooling at the time of pick-up. The customer receives pick-up and removal service in addition to a $40[4] rebate per recycled refrigerator or freezer.

Removing old, inefficient refrigerators and freezers prevents them from being resold or transferred to another utility customer. The program provides annual electric energy savings for the remaining useful life (RUL) of the unit by permanently removing the appliance from service. As an added environmental benefit, 95% of the materials from these units are able to be recycled

[4] The program rebate was increased from $30 to $40 in May 2013.

(metals, plastic, glass, oil, etc.) and disposed of in an environmentally responsible manner, thus preventing the materials from reaching landfills and contaminating the environment.

The program had 3,600 participants during 2013.

1.2 Residential Home Energy Reporting

The I&M Residential Home Energy Reporting program (HERP) is offered to randomly selected utility customers. The goal of the program is to send bimonthly reports to the customer via mail describing their current energy usage, their energy usage compared to similar homes in the area, and recommendations on ways to save energy. The customer also has the ability to access a web based tool to find out additional information on ways to save energy within their home.

The program is run through a third-party implementer, OPower.

The program had approximately 106,450[5] participants as of Dec 31, 2013.

1.3 Residential Online Energy Check-Up

The Residential Online Energy Check-Up program (OECUP) identifies energy saving opportunities through a web-based self-service assessment tool where customers answer basic questions about their homes and how they use energy in it. Upon completion of the questions online, the OECUP generates a printable report that includes:

- Useful details about customer home’s energy consumption;
- Customized energy-saving recommendations;
- Potential savings from making the suggested improvement; and
- Environmental impact of implementing suggested improvements.

In addition, the customer is mailed a kit of energy efficient measures dependent on their water heating type:

Energy Efficient Kit for Gas Participants:

- 13 w CFL (1);
- 20 w CFL (2);
- 23 w (CFL) (1);
- LED bulb (1)*
- LED nightlight w/ photocell (2); and

[5] The programs ex ante savings were based off of 79,700 participants. 26,750 participants were added to the program on December 31, 2013 and though they are considered to be part of the 2013 program year, ex ante savings didn’t take them into account.

- Refrigerator/Freezer thermometer (1).

Energy Efficient Kit for Electric Participants:

- 13 w CFL (1);
- 20 w CFL (2);
- 23 w (CFL) (1);
- LED bulb (1)*
- Low Flow showerheads (2);
- Bathroom aerators (2);
- Kitchen aerator (1);
- Refrigerator/Freezer thermometer (1); and
- Hot water temperature card (1).

Participants who signed up for the program mid-October were sent kits that included 1 LED bulb. The program is administrated by I&M. The web based tool is administered by Apogee.

Participants received 22,169 kits (7,127 electric and 15,042 gas) during 2013.

1.4 Residential Peak Reduction

The Residential Peak Reduction program (RPRP) provides households in I&M's service territory the unique opportunity to save money and promote energy reliability. By participating in the program, participants help reduce stress on the electric grid when energy demand is at the highest. In return they receive:

- An $8.00 monthly bill credit for each central cooling unit controlled during the billing months of May through September for every year they participate;
- A program device installed near the outside central air conditioner. There is no cost for the device and installation; and
- A program welcome packet containing a quick reference guide to answer any additional questions and refrigerator magnet.

To qualify participants of the program must:

- Be an I&M customer living in Indiana;
- Have a home whose central air conditioning system is in good working condition. (Window and wall air conditioning units do not qualify for the program); and
- Own their home or have property owner's permission to participate.

The program is run through a third-party implementer, Honeywell, Inc.

The program had a total of 6,709 participants in 2013. (2,158 participants were from 2012 program year)

1.5 Renewables and Demonstrations

The Renewables and Demonstrations Pilot program is designed to allow customers to take advantage of renewable energy and emerging technologies. This program is intended to make it easier for customers to reduce their energy consumption and utilize technologies that have not been commonly installed in the region. The program is open to residential and business customers. The program is open to customers that install the following technologies:

- Ground Source Heat Pump
- Solar Photovoltaic
- Solar Hot Water
- LED parking lot or street lighting

During this first year of the program only residential Ground Source Heat Pumps and Solar Photovoltaic systems have been installed. The program goal was to provide 31,000 kWh in energy savings.

The program administrated by I&M. The program had a total of 7 participants in 2013.

1.6 Home Weatherization

The I&M Residential Home Weatherization program (HWP) is offered to customers who have completed a Home Energy Assessment[6] from Energizing Indiana and who would benefit from higher level standard home weatherization measures such as ceiling insulation, home infiltration, and duct sealing.

To participate in the Home Weatherization program, the customer must have:

- A high energy use home (>17,000 kWh);
- Have electric home heating;
- Occupy a residence built before 1990; and
- Have electric water heating, or a gas heated home and be a customer of NIPSCO.

The first step to participate in the Home Weatherization program is for customers to sign up and receive a Home Energy Assessment. During the assessment, the auditor identifies energy efficiency improvements and recommends measures to the participants.

[6] The Home Energy Assessment program is an Energizing Indiana Core program.

To receive the weatherization incentives, the customer must decide which weatherization measures recommended in the assessment they want implemented. By having an authorized contractor install recommended home weatherization improvements, I&M customers with electrically heated homes can earn incentives up to 50% of the cost of the work up to $3,000. I&M customers with gas heated homes who are customers of NIPSCO can earn incentives up to 40% of the cost of the work. Measures must also be cost effective in order to qualify for incentives.

The program is run through a third-party implementer, CLEAResult.

The program had a total of 33 participants during 2013.

1.7 Types of Savings Reported

This section describes the methodology for, and definitions of, the different types of energy savings reported for the residential programs during PY4.

- Ex Ante savings are the savings that were reported by the program implementer at the conclusion of the program year, prior to evaluation.
- Audited savings are determined by comparing the measures reported and confirmed through the program database in the I&M service territory.
- Verified savings are determined by applying an installation rate to the audited savings. The installation rate is defined as the ratio of units that were installed (verified) to the number of units reported (claimed).
- Ex Post gross savings reflect all adjustments made to the ex ante measure savings that were claimed by the program.
- Net savings reflects the portion of savings that are attributed to the effects of the program. The savings attributable to the program are the savings "net" of the total gross savings associated with the project.

1.8 Organization of Report

This report on the impact and process evaluation of the Residential program Portfolio for the period May 2012 through December 2012 is organized as follows:

- Chapter 2 presents and discusses the general methods used for sampling and data collection to obtain the results for estimating gross and net savings and the process evaluation for all the residential programs evaluated.
- Chapter 3 presents and discusses the methods used and results obtained from estimating gross and net savings and the process evaluation for the Appliance Recycling program.
- Chapter 4 presents and discusses the methods used and results obtained from estimating gross savings and the process evaluation for the Home Energy Reporting program.

- Chapter 5 presents and discusses the methods used and results obtained from estimating gross and net savings and the process evaluation for the Online Energy Check-Up program.
- Chapter 6 presents and discusses the methods used and results obtained from estimating gross and net savings and the process evaluation for the Peak Reduction program.
- Chapter 7 presents and discusses the methods used and results obtained from estimating gross and net savings and the process evaluation for the Renewables and Demonstrations program.
- Chapter 8 presents and discusses the methods used and results obtained from estimating gross and net savings and the process evaluation for the Home Weatherization program.
- Chapter 9 presents and discusses the methods used and results obtained from estimating cost effectiveness for the Appliance Recycling program, Home Energy Reporting program, and the Online Energy Check-Up program.
- Appendix A provides a copy of the questionnaires used for the survey of decision makes for the Appliance Recycling program.
- Appendix B provides a copy of the questionnaires used for the survey of decision makes for the Home Energy Reporting program.
- Appendix C provides a copy of the questionnaires used for the survey of decision makes for the Online Energy Check-Up program.
- Appendix D provides a copy of the questionnaires used for the survey of decision makes for the Peak Reduction program.
- Appendix E provides a copy of the questionnaires used for the survey of decision makes for the Renewables and Demonstrations program.
- Appendix F provides a copy of the questionnaires used for the survey of decision makes for the Home Weatherization program
- Appendix G provides a copy of the documentation for the Renewables and Demonstrations program.

2. General Methodologies

This chapter details general impact evaluation methodologies by program-type as well as data collection methods applied. This chapter will present full descriptions of:

- Gross Savings Estimation;
- Sampling Methodologies; and
- Data Collection Procedures.

2.1 Overview of Methodology

ADM's methodologies in the evaluation of the 2013 I&M Residential Portfolio are intended to provide:

- Gross and Net energy and peak demand impact results, by program, at the 90% confidence and +/-10% precision level;
- Program feedback and recommendations via process evaluation; and
- Cost effectiveness testing at the program level.

In doing so, ADM's evaluation will provide the IURC with verified savings results, recommendations for program improvement, and ensure cost-effective use of ratepayer funds.

2.2 Sampling

Sampling is necessary to evaluate savings for each program in the I&M Residential Portfolio insomuch as verification of a census of program participants is typically cost-prohibitive. As per I&M requirements, samples are drawn in order to ensure 90% confidence at the +/- 10% precision level. Programs are evaluated on one of three bases:

- Census Of Participants;
- Simple Random Sample; and
- Stratified Random Sample.

2.2.1 Census of Participants

A census of participant data is used for select programs where such review is feasible. No I&M residential programs incorporated a census approach in their entirety, but the OECUP had a census approach to a subset of the analysis. The Online Energy Check-Up program was evaluated by reviewing the deemed savings calculations for a census of line items in the provided tracking data, ensuring that energy and demand savings for each kit measure and participant were calculated appropriately.

2.2.2 Simple Random Sampling

For programs with relatively homogenous measures, ADM conducts a simple random sample of participants. The sample size for verification surveys is calculated to meet 90% confidence and 10% precision (90/10). The sample size to meet 90/10 requirements is calculated based on the coefficient of variation of savings for program participants. Coefficient of Variation (CV) is defined as:

$$CV(x) = \frac{Standard\ Deviation\ (x)}{Mean(x)}$$

Where x is the average kWh savings per participant. Without data to use as a basis for a higher value, it is typical to apply a CV of .5 in residential program evaluations. The resulting sample size is estimated at:

$$n_0 = \left(\frac{1.645 * CV}{RP}\right)^2$$

Where,

1.645 = Z score for 90% confidence interval in a normal distribution

CV = Coefficient of variation

RP = Required precision: 10% in this evaluation

With 10% required precision (RP), this calls for a sample of 68 for programs with a sufficiently large population.

2.2.3 Stratified Random Sampling

No I&M residential programs incorporated a stratified random sampling approach in their entirety. For the I&M Appliance Recycling program a random sample - stratified by appliance type recycled - was selected to ensure that 90 percent confidence with ±10 percent relative precision would be achieved for each appliance type. On this assumption, a minimum sample size consisting of 68 participants who recycled refrigerators and 68 participants who recycled freezers was required.

2.3 Data Collection

This subsection provides descriptions of ADM's data collection procedures, including:

- Telephone Surveying; and
- On-Site Verification.

2.3.1 Telephone Surveying

ADM conducted a large volume of telephone surveys during the evaluation of the four residential programs within the 2013 I&M Residential Portfolio. These surveys were designed to collect a variety of data needed for the evaluation effort, including:

- Verification of appliances recycled, recommendations implemented, and kits received by participants;
- Parameters used in gross savings calculations;
- Data on decision-making to be used in determining program free-ridership; and
- Feedback from participants from their experiences with the program.

Table 2-1 below presents the total surveys conducted by program.

Table 2-1 Telephone Surveys by Program

Program	*Surveys Completed*
Appliance Recycling	365
Home Energy Reporting	462
Online-Energy Check-Up	424
Peak Reduction	446
Renewables and Demonstrations	5
Home Weatherization	14
Total Surveys:	1,716

Surveys with business program participants, I&M staff, and contractors were conducted by ADM staff. Surveys with residential program participants were conducted by Research America, an experienced survey firm, with ADM performing quality control checking on the survey programming and monitoring a sample of phone calls. This ensured that interviewers were adhering to the survey script and that all questions were read correctly.

2.3.2 On-site Surveys

In the interest of providing a cost-effective evaluation ADM completed no on-site verification efforts.

3. Residential Appliance Recycling Program

This chapter addresses the methodologies and impact findings of gross and net kWh savings and peak kW reductions resulting from the Residential Appliance Recycling Program during the period January 2013 through December 2013.

3.1 Program Specific M&V Methodologies

The M&V approach for the Appliance Recycling program (ARP) is aimed at measuring the following:

- Numbers of refrigerators and freezers collected and recycled;
- Average annual kWh savings per collected appliance;
- Average kW reduction per collected appliance;
- Providing estimates of net-to-gross savings and free-ridership; and
- Estimating cost effectiveness of the ARP in 2013.

Table 3-1 below summarizes the inputs needed for gross savings calculations and the source of each input.

Table 3-1 Data Sources for Gross Impact Parameters – Appliance Recycling Program

Parameter	*Source*
Number of Units Recycled	Program Tracking Data, Participant Surveying
Unit Energy Consumption	Regression model developed in prior studies, various appliance and household characteristics
Appliance and Household Characteristics	Participant Surveying, US Census data
Net –to-Gross-Ratio	Participant Surveying

3.1.1 Verification of Units Recycled

A first aspect of conducting measurements of program activity is to verify the number of refrigerators and freezers collected and recycled. ADM takes several steps in verifying the number of refrigerators and freezers collected and recycled which consists of the following:

- Validating program tracking data provided by JACO by checking for duplicate or erroneous entries;
- Verifying that refrigerators and freezers are recycled according to the agreed-upon process between JACO and I&M; and

- Conducting verification surveys with a statistically valid sample of program participants. The focus of these verification surveys are to verify that customers listed in the program tracking database did indeed participate and that the number of appliances claimed to be recycled was accurate. Additionally, survey respondents are asked a series of questions to verify the working condition of their recycled appliances; it is a program requirement that collected units be in working condition at the time of pick-up.

3.1.2 Calculating Gross Annual kWh Savings per Appliance

Ex ante savings for the Appliance Recycling program were assumed to be 1,136 kWh per refrigerator and 1,014 kWh per freezer recycled based on results for the PY3 evaluation. For the impact evaluation effort, these savings estimates were assessed by developing separate gross unit energy consumption (UEC) estimates for refrigerators and freezers recycled through the program using existing statistical models relating various appliance and household characteristics to estimated energy usage.

In evaluation research performed under contract for the California Public Utility Commission (CPUC), the Cadmus Group refined the use of linear multiple regression methodology for estimating energy savings resulting from refrigerator recycling.[7] This research consisted of a dual metering study to determine energy savings associated with refrigerators recycled throughout California between 2006 and 2008. For its study, Cadmus used data on refrigerator energy use obtained through two monitoring efforts:

- A monitoring study that ADM conducted in support of the evaluation of the California 2004-2005 Statewide Residential Appliance Recycling program (RARP)[8]; and
- Additional monitoring that Cadmus conducted as part of its study.

The product of these efforts was a database that contained energy use obtained through both Department of Energy (DOE) testing and in situ monitoring for a sample of 321 units, 184 of which were from the 2004-2005 evaluation and 137 from the 2006-2008 evaluation. Cadmus used the data from this dual monitoring sample to develop regression models that relate the annual unit energy consumption (UEC) of refrigerators - metered both in situ and according to DOE testing protocols – to various characteristics of the appliance and the household in which the appliance was used. The estimated coefficients from these models have been used in numerous subsequent studies to evaluate refrigerator degradation and to estimate appropriate UEC's for appliances recycled through similar programs. As examples, the results of the Cadmus study were used by ADM in its evaluation of the 2010 and 2011 Nevada Energy Second

[7] The Cadmus Group, Inc. "Residential Retrofit High Impact Measure Evaluation Report", prepared for the California Public Utilities Commission. February 7, 2010.

[8] ADM Associates, Inc., Athens Research, Hiner & Partners, Innovologie LLC, "Evaluation Study of the 2004-05 Statewide Residential Appliance Recycling program" April 2008.

Refrigerator Recycling program[9],[10], and by NMR Group, Inc., in its recent evaluation of the 2009-2010 Massachusetts Appliance Turn-in program.[11]

ADM used the DOE-based multiple regression model developed by Cadmus to estimate the UEC for refrigerators recycled through I&M's program. Specifically, the average characteristics of refrigerators recycled through the program were multiplied by the associated coefficients from the Cadmus model and summed to produce an estimated average UEC for refrigerators recycled through the program. However, this UEC represents the annual energy consumption of the average refrigerator under conditions identical to the DOE testing procedure. To account for differences between the DOE testing environment and conditions in participants' homes, an adjustment for in situ conditions was necessary.

As part of its study, Cadmus compared the in situ and DOE based UEC's using an additional regression model which accounted for environmental factors that have the potential to affect refrigerator energy consumption. The results of this analysis indicated that there are three significant environmental factors affecting in situ refrigerator energy consumption that are not captured by DOE testing. Specifically, climate zone, household size, and whether the refrigerator is a primary or secondary unit. Cadmus used the dual monitoring data to develop a series of modification factors based on these three environmental variables. ADM used these modification factors, along with results from the participant survey, to determine appropriate adjustments to the DOE based refrigerator UEC estimate.

It is important to note that the Cadmus model only considers refrigerators. Accordingly, ADM used a refrigerator-to-freezer ratio factor to determine the average UEC for freezers. This refrigerator-to-freezer factor methodology is similar to that used by the NMR Group, Inc. in their recent evaluation of the Massachusetts Appliance Turn-in program.[12] Using relevant secondary sources, ADM concluded that freezers on average use 15% less energy annually than refrigerators. This implies a refrigerator-to-freezer factor of 0.85. The analysis supporting this refrigerator-to-freezer factor is detailed in the previously mentioned Massachusetts Appliance Turn-In program Evaluation performed by NMR Group, Inc.[13]

Finally, a partial use factor was developed for refrigerators and freezers to adjust UEC estimates to reflect the gross savings of appliances that were recycled through the program. The partial use factor is designed to account for the fact that not all refrigerators and freezers are plugged in year round. Secondary appliances are more likely to be unplugged for a portion of the year than

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[9] ADM Associates, Inc., "2010 Second Refrigerator Recycling Program, NV Energy—Southern Nevada, program year 2009, Measurement & Verification Report." June, 2011

[10] ADM Associates, Inc., "2011 Second Refrigerator Recycling Program, NV Energy—Southern Nevada, program year 2010, Measurement & Verification Report." March, 2012

[11] NMR Group, Inc., "Massachusetts Appliance Turn-in program Impact Evaluation" June 2011.

[12] Ibid.

[13] Ibid.

primary appliances, and since there was a large presence of secondary appliances in the program, the partial use factor is an important consideration when developing gross savings estimates.

Based on the proceeding discussion, the procedures[14] used by ADM to estimate gross energy savings (kWh) for the refrigerators and freezers recycled through the program can be summarized by the following steps:

(1) The Cadmus DOE based model was used to predict the average annual UEC for participating refrigerators in 2012 based on the average refrigerator characteristics established from JACO records and the participant survey.

(2) The average freezer annual UEC was obtained by multiplying the estimated average refrigerator UEC by the refrigerator-to-freezer factor of 0.85.

(3) The estimated UECs were adjusted to represent in situ operating conditions.

(4) Partial use factors were applied to the UEC estimates to account for the fact that some appliances are not used continuously throughout the entire year.

(5) The estimated average UECs for refrigerators and freezers were extrapolated to the population of program participating units to obtain a program level estimate of gross kWh savings resulting from refrigerator and freezer recycling.

3.1.3 Calculating Gross Peak Demand (kW) Savings

Gross peak demand savings were calculated based on the critical peak demand definition provided by I&M. Specifically, I&M established an on-peak period of 7:00 a.m. - 9:00 p.m. during weekdays (a 14 hour period each weekday). Measure specific normalized 8,760 hour load shapes were used to identify the average demand during this on-peak period. These load shapes assign a portion of estimated gross kWh savings to each hour of the year. After identifying the total kWh saving's that fall into the defined on-peak hours, dividing by the total number of hours in the peak period results in the average gross peak demand reduction. There are a total of 3,640 hours per year that meet the criteria of I&M'S on-peak period definition. Appliance load shapes developed as part of the End-Use Load and Consumer Assessment program (ELCAP)[15] were used to estimate the percentage of kWh savings occurring during those 3,640 on-peak hours.

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[14] Same procedures used as in the 2011 evaluation (PY2).

[15] Pratt RG, CC Conner, EE Richman, KG Ritland, WF Sandusky, and ME Taylor. 1989. Description of Electric Energy Use in Single-Family Residences in the Pacific Northwest. (End-Use Load and Consumer Assessment program [ELCAP]). DOE/BP-13795-21, prepared for Bonneville Power Administration by Pacific Northwest Laboratory, Richland, Washington.

3.1.4 Calculating Net Energy (kWh) and Peak Demand (kW) impacts

The purpose of the Appliance Recycling program is to remove working but inefficient refrigerators and freezers from utility distribution systems. However, even without the program some refrigerators or freezers that were removed by the program might have been disposed of in a way that would have resulted in their removal from the electric grid. These units would represent free-ridership. Thus the question to be addressed in the net savings analysis was what proportion of gross savings resulting from the removal of refrigerators and freezers was directly attributable to the ARP.

Independent of program intervention, participating appliances would have been subject to one of four potential alternative outcomes:

- Unit would have been kept by the household but not used;
- Unit would have been kept by the household and still used;
- Unit would have been discarded by the household through a method in which the unit would be destroyed; and
- Unit would have been discarded by the household through a method in which the unit would be transferred and kept in use.

Of the four categories in this taxonomy, two are indicative of free-ridership:

- Unit would have been kept by the household but not used; or
- Unit would have been discarded by the household through a method in which the unit would be destroyed.

These categories are indicative of free-ridership because the units would have been removed from the grid and not used / destroyed even if they had not been recycled through the program. To use this taxonomy to estimate the free-ridership percentages for refrigerators and freezers recycled through ARP, estimates are needed for (1) the percentage of recycled refrigerators or freezers that would have been kept by a household but not used and (2) the percentage of refrigerators or freezers that would have been discarded by a household through a method in which the refrigerator would have been destroyed. For this evaluation, data with which to develop these estimates were obtained by asking questions about the discarding of units in the participant telephone survey. Specifically, the following two questions were asked:

- Had you already considered disposing of the refrigerator/freezer before you heard about I&M's Appliance Recycling program? (By dispose of, I mean getting the appliance out of your home by any means including selling it, giving it away, having someone pick it up, or taking it to the dump or a recycling center)
- What would you have most likely done with the refrigerator/freezer had you not disposed of it through I&M's program?

Based on the answers to these survey questions, separate free-ridership rates were developed for refrigerators and freezers recycled through the program. Net-to-gross ratios (NTGR's) for refrigerators and freezers were calculated as one minus the free-ridership rate. The NTGR's were then multiplied by the ex post verified gross savings estimates to determine net impacts. Spillover effects were not considered as part of the net savings analysis for this evaluation.

3.2 Impact Results

ADM estimated ex post gross electric savings and peak demand reductions through detailed analysis of program tracking data and participant survey data. The estimated gross impacts resulting from the PY4 Appliance Recycling program are summarized in Table 3-2. Table 3-3 and Table 3-4 show the audited and verified savings.

Table 3-2 Gross Impact Summary[16]

Appliance Type	*PY4 Program Goals (kWh)*	*Verified Appliances Recycled*	*Per-Unit Annual Savings (kWh)*	*Annual Savings (kWh)*	*Peak Demand Savings (kW)*
Refrigerators	6,248,000	2,744	1,079[17]	2,959,643	351.55
Freezers		835	891	743,721	86.40
Total		3,579	-	3,703,364	437.95

Table 3-3 Gross Impact kWh

Ex Ante Gross kWh Savings	*Gross Audited kWh Savings*	*Gross Verified kWh Savings*	*Ex Post Gross kWh Savings*	*Realization Rate*
3,987,730	3,987,730	3,963,874	3,703,364	93%

Table 3-4 Gross Impact kW

Ex Ante Peak kW Savings	*Audited Peak kW Savings*	*Verified Peak kW Savings*	*Ex Post Peak kW Savings*
-	-	-	438

In addition to gross savings, ADM estimated associated net-to-gross ratios (NTGRs) for both refrigerators and freezers based on results from the participant survey. Applying the estimated

[16] Note – The totals in the various tables throughout the Appliance Recycling program section may not correspond exactly to the summation of individual values listed due to rounding.

[17] Per-unit energy savings decreased because the average age of recycled units decreased from 2012 to 2013 (27 to 26 years). Another contributing factor for freezers was the lower per-unit savings is a higher part-usage percentage, which increased from 5% to 11% from 2012 to 2013

NTGRs of 68% for both measures to the gross savings reported in Table 3-2 results in the net savings detailed in Table 3-5 below. The net realization rate is 91%.

Table 3-5 Net Impact Summary

Appliance Type	*PY4 Program Goals (kWh)*	*Net-to-Gross Ratio*	*Per Unit Net Annual Savings (kWh)*	*Net Annual Savings (kWh)*	*Net Peak Demand Savings (kW)*
Refrigerators		0.68	729	2,000,718	237.65
Freezers	4,311,120	0.68	607	507,082	58.91
Total		-	-	2,507,800	296.56

The calculations leading to these results are detailed in the sub-sections to follow.

3.2.1 Verification of Units Recycled

As a first step toward estimating program level kWh and kW impacts, ADM reviewed program tracking data provided by JACO for accuracy. No duplicate entries were discovered. To verify that the number of units claimed in the program tracking database was accurate, ADM administered a telephone survey with a sample of program participants.

All 365 respondents who completed the participant survey verified that they had in fact participated in the program during 2013. All but one survey respondent also indicated that the number of appliances recycled was identical to the claims in the JACO tracking database (one respondent claimed to have one refrigerator picked up while the tracking database listed one freezer was picked up). However, in order for participating appliances to accrue energy savings by being taken out of service, the units must be in working condition at the time of pick-up. Two survey respondents who recycled refrigerators reported that their units were not in working condition at the time they were collected for recycle. All freezers recycled were in working condition. Based on these results, the verification rates shown in Table 3-6 for each appliance were determined:

Table 3-6 Verification Rates by Appliance Type

Utility	*Appliance Type*	
	Refrigerator	*Freezer*
Indiana Michigan Power	99.2%	100.0%

Based on these verification rates, Table 3-7 reports the numbers of refrigerators and freezers recycled through the program during PY4 that were verified as being in working condition when recycled and therefore program-eligible.

Table 3-7 Recycled Appliances Verified to be in Working Condition

Unit Type	*Quantity Reported as Recycled*	*Verification Rate*	*Quantity of Recycled Units Verified as program Eligible*
Refrigerator	2,765	99.2%	2,744
Freezer	835	100.0%	835

3.2.2 Gross Annual kWh Savings per Appliance

Gross annual kWh savings were calculated as described in chapter 3.1.2 of this report. The details and results of these calculations are reported in this section.

For refrigerators, Unit Energy Consumption (UEC) estimates were derived using the DOE monitoring procedure based regression model developed by Cadmus in the evaluation of the California Statewide Appliance Recycling program. The model specification and estimated coefficients of the Cadmus model are shown in Table 3-8.

Table 3-8 Cadmus DOE based UEC Regression Details[18]

(Dependent Variable – DOE Estimated UEC, R2=0.41)

Independent Variables	*Coefficient*	*t-Value*
Intercept	491.83	1.9
Dummy: Side-by-Side Configuration	98.96	0.5
Size (Cubic Feet)	35.3	2.9
Age (Years)	25.25	4.7
Interaction: Side-by-Side x Age	19.98	2.2
Dummy: 2006-2008 Metering Sample	-413.99	-6.3

The program tracking database included information regarding configuration, size, and age[19] for 2,723out of the 2,765 refrigerators collected during PY4. Of these 2,723 refrigerators, 17.4% were side-by-side models; the average size was 17.9 cubic feet and the average age was 25.9 years old. Table 3-9 shows all of the relevant refrigerator characteristics.

[18] Source: Cadmus et al. (2010). *Residential Retrofit High Impact Measure Evaluation Report.* February 8th, 2010.

[19] Model year is listed on refrigerator nameplates for many but not all units. As explained to ADM staff, when model year is not listed on the nameplate it is estimated based on appliance characteristics common to certain vintages.

Table 3-9 PY4 Refrigerator Characteristics

Appliance Characteristics	*Refrigerators*
Sample Size	2,723
Side-by-Side Percentage	17.44%
Average Size (Cubic Feet)	17.87
Average Age (Years)	25.96
Interaction: Side-by-Side x Age	2.83

The refrigerator characteristics shown above were used in conjunction with the model coefficients in Table 3-8 to calculate annual energy consumption estimates for program participating refrigerators. The refrigerator-to-freezer factor of 0.85 was applied to develop annual energy consumption estimates for freezers. These calculations are shown below:

- Refrigerator UEC (kWh)

$$491.83 + 98.96 * 0.1744\ (Side - by - Side) + 35.3 * 17.87(Size) + 25.25 * 25.96\ (Age) + 19.98 * 2.83\ (Interaction) - 413.99 = 1{,}438\ kWh$$

- Freezer UEC (kWh)

$$1{,}438\ * 0.85\ (refrigerator - to - freezer\ factor) =\ 1{,}221\ kWh$$

It is important to note that these UEC estimates are based on the DOE testing procedure, and therefore estimate the annual energy usage of appliances in the DOE testing environment. An adjustment is necessary to reflect in situ usage environments. ADM used the modification factors estimated by Cadmus as shown in Table 3-10 below.

Table 3-10 DOE to In Situ Adjustment Factors[20]

Primary	*Household Size*	*Climate Zone*	*% In Situ Delta21*
Yes	1-2	Cool	-30.8%
		Warm	-19.2%
	3+	Cool	-16.0%
		Warm	-6.4%
No	1-2	Cool	-21.3%
		Warm	-15.8%
	3+	Cool	-6.8%
		Warm	1.3%

For the purposes of this study, Indiana is treated as a Cool Climate. Estimates of primary vs. secondary appliances for refrigerators were derived from responses to the participant survey. These responses indicated that 49.2% of refrigerators collected in 2013 were primary appliances, while the other 50.8% were secondary appliances. All freezers were assumed to be secondary appliances. Estimates of household size were developed using data from the 2008-2010 American Community Survey for Indiana residents.[22] Based on this data, it was determined that 40.7% of Indiana households have one or two occupants, while 59.3% have three or more occupants. These values were used as proxies for program participating households. Using this information to weight the "% In Situ Delta" results in adjustment factors of:

- Refrigerators: *[(0.407 * -0.308 + 0.593* -0.16) * 0.492] + [(0. 407 * -0.213 + 0. 593 * -0.068) * 0.508] = -17.3%*
- Freezers: *(0.407 * -0.213 + 0.593 * -0.068) = -12.7%*

Applying these adjustment factors to the DOE based UEC estimates above results in the following in situ UEC estimates for refrigerators and freezers:

- Refrigerators: 1,189 kWh
- Freezers: 1,067 kWh

A final adjustment was made to account for not all refrigerators and freezers being plugged in year round. This partial use adjustment assigns different "use factors" based on three categories into which recycled appliances fall:

- Some units that were recycled were not being used at all before being sent for recycling. The use factor for such units therefore would be zero. That is, these units were not being used and therefore had no baseline energy usage.

[20] Source: Cadmus et al. (2010). ***Residential Retrofit High Impact Measure Evaluation Report.*** February 8th, 2010.

[21] A negative in situ delta represents an ***in situ*** UEC that is lower than the DOE UEC.

[22] The American Community Survey Data can be accessed for free via the Integrated Public Use Microdata Series (IPUMS) website at: http://www.ipums.org/

- Other units were being used, but for only part of the year. For these units, the use factor is calculated by dividing the number of months in the past year that the unit had been in use by the number of months in the year. Based on data collected through the survey of participants, the average number of months in use for a refrigerator that was being partly used was 3.4 months, implying a use factor of 0.285 (i.e., 3.4/12). For freezers in this category, the use factor was calculated to be 0.381, reflecting an average of 4.5 months in use for freezers being partly used.
- Units which are constantly in use have a use factor of one (1). The overall use factor and the corresponding overall Unit Energy Savings (UES) are calculated as a weighted average across the three categories, where the weights are determined by the percentages of units falling into the three categories. Table 3-11 shows the calculation of the overall UES for refrigerators and freezers when partial use is taken into account.

Table 3-11 Unit Energy Savings Adjusted for Partial Use

Operating Status of Unit	*Percentage of Recycled Units in Category*	*Use Factor*	*Calculation of UES to Adjust for Part Use*
Refrigerators			
Not running	4.17%	0	0
Running part time	7.20%	0.285	339
Running all time	88.64%	1	1,189
Weighted Average UES for Refrigerators			1,079
Freezers			
Not running	9.24%	0	0
Running part time	11.76%	0.381	407
Running all time	78.99%	1	1,067
Weighted Average UES for Freezers			891

Based on the findings detailed in this section, the ex post gross per-unit annual kWh savings for refrigerators recycled through the program is estimated to be 1,079 kWh; the ex post gross per-unit annual kWh savings for freezers recycled through the program is estimated to be 891 kWh.

3.2.3 Gross Peak Demand (kW) Savings per Appliance

Appliance load shapes for refrigerators and freezers were used to estimate the average kW reduction occurring during the I&M defined on-peak period. These load shapes were normalized versions of load shapes originally developed as part of the End-Use Load and Consumer

Assessment program (ELCAP).[23] The average daily load profile for each appliance type recycled through the program is shown in Figure 3-1.

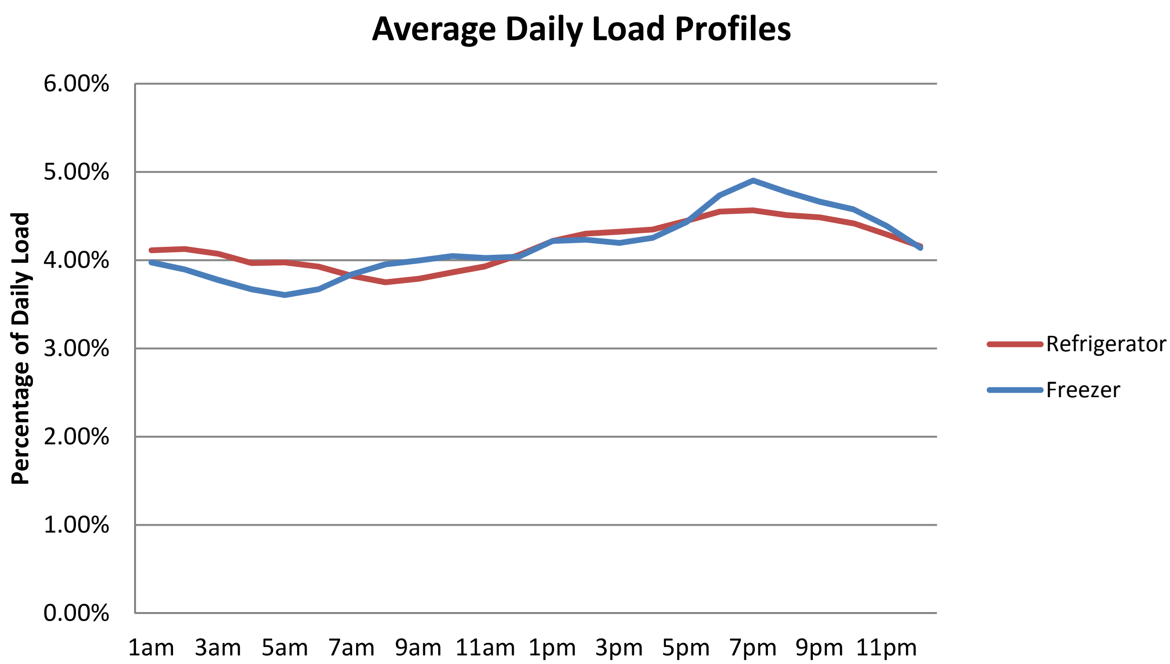


Figure 3-1: Average Daily Load Profiles

Using these normalized ELCAP load shapes, ADM determined that approximately 43.2% of the annual gross kWh savings attributable to a recycled refrigerator occurs during the on-peak period. This is equivalent to 489.4 kWh; dividing by the number of on-peak hours (3,640) results in an average on-peak demand reduction of 0.13 kW per recycled refrigerator.

Similarly, it was determined that approximately 42.3% of a freezer's energy consumption occurs during on-peak hours (376.6 kWh). Average on-peak demand reduction is thus 0.10 kW per recycled freezer.

3.2.4 Net Energy (kWh) and Peak Demand (kW) Impacts

To obtain net savings for the PY4 ARP, ADM surveyed program participants to develop estimates of free-ridership. As detailed in Section 3.1.4, the participant survey included two questions designed to elicit information on free-ridership, which in turn is used to estimate net-to-gross ratios for refrigerators and freezers separately. Spillover effects were not considered as part of the net savings analysis for this evaluation.

The specific questions used to assess free ridership were:

[23] Ibid.

- Question 14/35: Had you already considered disposing of the refrigerator/freezer before you heard about I&M's Appliance Recycling program? (By dispose of, I mean getting the appliance out of your home by any means including selling it, giving it away, having someone pick it up, or taking it to the dump or a recycling center)
- Question 15/36: What would you have most likely done with the refrigerator/freezer had you not disposed of it through I&M's program?

Individuals who indicated in the Question 14/35 that they had no previous plans to dispose of their appliance were assumed to be non–free-riders, unless they also indicated that they would have kept the unit continuously unplugged in the absence of the program. Individuals who indicated in Question 15/36 that they would have disposed of the appliance without the program and indicated that they would have done so in a manner that would have removed the appliance from the grid were assumed to be 100% free riders. Table 3-12 shows the survey response breakdown along with the associated free-ridership rates and NTGR's.

Table 3-12 Net-to-Gross Methodology and Results

Free-ridership Attribution	*Previous plans to get rid of fridge/freezer?*	*What would you have done with the fridge/freezer in the absence of the program?*	*Refrigerators*		*Freezers*	
			Count	*Frequency*	*Count*	*Frequency*
100%	Yes	Unit would have been discarded by the household through a method in which the unit would be destroyed	70	28%	29	26%
0%	Yes	Unit would have been discarded by the household through a method in which the unit would be transferred and kept in use	76	30%	41	37%
100%	No or Don't know	Unit would have been kept by the household but not used	11	4%	6	5%
0%	No or Don't know	Any other response	93	37%	34	31%
Total			250	100%	110	100%
Free-ridership				32%		32%
NTGR (1-Free-ridership)				68%		68%

Based on the survey responses for the 250 refrigerators and 110 freezers (eligible participants in calculating NTGR), ADM estimated NTGRs of 0.68 for refrigerators and freezers. These values were multiplied by gross per-unit kWh. These values were applied in discounting annual kWh and peak demand savings for the 2013 ARP.

3.3 Process Evaluation

This chapter presents the results of the process evaluation of I&M's Appliance Recycling program during program year four (PY4). The process evaluation focuses on the effectiveness of program policies and organization, as well as the program delivery framework. The purpose of the process evaluation is to assess the design and recent results of the program in order to determine how effectively it is achieving its intended outcomes. This evaluation is based upon analysis of program structure and interviews and surveys of participating I&M customers, I&M energy efficiency staff, program implementation contractor staff, and program tracking data. Additionally, the process evaluation allows for a year-to-year comparison of program performance, structure and design. The evaluators assess how the Appliance Recycling program has changed since the prior program year in terms of program effectiveness, processes, and other factors.

The chapter begins with a discussion of the overall progress of the program. This is followed by an examination of certain issues important for the future success of the program. This chapter also presents strategic planning and process recommendations, and highlights key findings from the surveys of customer participants and interviews with program operations staff.

3.3.1 Evaluation Objectives

The purpose of the process evaluation is to examine program operations and results throughout the program operating year, and to identify potential program improvements that may prospectively increase program efficiency or effectiveness in terms of customer participation and satisfaction levels. This process evaluation was designed to document the operations and delivery of the Appliance Recycling program during PY4.

Key research questions to be addressed by this evaluation of PY4 activity include:

- How effective is the program marketing? How do participants learn about the program and what are their reasons for participating?
- How effective is the working relationship between I&M and the program implementer?
- How satisfied are participants with the program? What was their level of satisfaction with the scheduling process, the pickup of the appliance, and the time it took receive the incentive?
- What strategies have been developed to increase program activity?

During the evaluation, data and information from numerous sources are analyzed to achieve the stated research objectives. Insight into the customer experience with the Appliance Recycling program is developed from a telephone survey of program participants. Additionally, the internal organization and operational efficiency of program delivery is examined through analysis of interviews conducted with I&M efficiency program staff and program implementation contractor staff.

3.3.2 Summary of Primary Data Collection

- **Review of program documentation and relevant literature:** ADM reviewed relevant program documents, reports, and other materials to gain an understanding of program operation and structure. Documents reviewed included the program website, an evaluation of the program from the prior year, copies of press releases, and program tracking data. Reports from evaluations of other programs were also reviewed as were other materials related to appliance recycling programs.
- **Participant surveys:** Participant surveys were the primary data source for understanding the customer perspective on the program and evaluating participant satisfaction. The participant surveys provided customer feedback and insight regarding customer experiences with the Appliance Recycling program. Respondents reported on their satisfaction with the program, characteristics of the appliance they recycled, characteristics of the replacement unit (if applicable), and the ease of signing up and having the unit recycled.
- **Interview with I&M staff members:** Interviews with I&M staff members, including program managers, provided insight into various aspects of the program and its organization. I&M staff members also provided information regarding recent organizational and procedural improvements that have been implemented in order to enhance program efficiency and effectiveness.
- **Interview with JACO staff:** JACO program implementation staff was interviewed to provide information regarding program progress and observations regarding customers. JACO staff reported on recent program changes and future plans to improve program operational efficiency.

3.3.3 Summary of Conclusions and Recommendations

During the fourth program year, 3,600 refrigerator and freezer units were recycled through the Appliance Recycling program. However, the number of units and the associated savings fell short of meeting the program's PY4goals. Utility and program implementation staff members are developing strategies to increase program activity that includes increasing program marketing. Should these efforts fail to generate the activity to meet the programs more ambitious future goals, other approaches should be tested or considered, such as increasing the incentive level.

Overall, findings from program staff interviews and participant surveys were fairly consistent with those identified during PY3. The following presents a selection of key conclusions from PY4:

- **Program has been particularly effective in recycling older appliances:** As is typical with appliance recycling initiatives, approximately 84% of the appliances recycled through the program during PY4 were 16 years of age or older. High activity in older appliances leads to greater savings because older units are on average less efficient.
- **Participants report high levels of overall satisfaction:** As with the prior program year, results from the participant survey indicate that customers are pleased with the I&M

Appliance Recycling Program, both in relation to specific program elements and in their overall program experience. Participants reported very few operational or design issues, and indicated that they valued the opportunity to participate in the program. This consistent result across program years suggests that program operation and structure are sufficient to meet customer needs and address participant issues as they arise.

- **Effective program operation and delivery:** program operations staff reported that the program has been running smoothly and as intended. From the customer perspective, participants provided information confirming that their eligibility had been properly verified, that they had experienced a straightforward program enrollment and appliance pick-up process, and that program staff had been able to accommodate their needs. Additionally, I&M staff reported that the JACO team has been very efficient and professional throughout the program year. These factors contribute to customer satisfaction, pickup crew efficiency, and overall program performance.
- **High value placed on convenience of program services:** As with the prior program year, the majority of program participants stated that they highly valued the ease, convenience, and reliability of the appliance pick-up service, and placed less emphasis on the financial incentive offered by the program. Survey results suggest that customers are primarily looking for a straightforward and convenient way to remove their old appliances from their homes. This likely reflects the fact that the current structure of the I&M Appliance Recycling program appeals to customers who are less concerned with financial incentives. In order to recruit customers who are primarily motivated by the financial benefits of the program, it may be beneficial to increase the incentive level from $40 to $50. This is a typical incremental increase used in appliance recycling programs when increased marketing levels and operational improvements do not provide sufficient participation levels.

The evaluation team currently has the following recommendations for program improvement consideration.

- **Keep program incentive levels at its current amount.** JACO staff reported that the new $40 incentive has increased program activity and this is consistent with program activity during the year, which shows greater program activity after the new incentive went into effect. Although more marketing activity occurred during this period, the increased activity was generally higher than during other periods during which marketing activities occurred, suggesting that the higher level of program activity was at least in part attributable to the higher incentive. Given the decreased goals and reduced budget for 2014, it does not make sense to increase the incentive at this time.
- **Consider adjusting ex ante savings estimations based on the results of this evaluation.** Specifically, ADM recommends the per unit savings estimates shown in Table 3-2 for recycled refrigerators and freezers in future program years. Per-unit savings for a particular program year will depend on appliance characteristics of the particular batch of recycled units in a given year. However, for planning purposes these values are reasonable for at least the following program year where the program will already be active for 4 years.

- **Consider providing estimated cost savings associated with recycling second refrigerators and freezers.** The cost savings associated with recycling second units are often substantial and may be considerably larger than the rebate. Including these savings on promotional materials such as the program website may attract additional interest.
- **Consider a broader marketing message to appeal to more customers and other marketing tactics.** Currently, the program's marketing materials emphasize the financial benefits of the rebate and the energy cost savings. However, survey respondents indicated that the convenience of the pickup service is also valued. Additionally, customers may also be motivated by other non-financial benefits such as environmental benefits.

  Marketing strategies to consider that have been used by other utility refrigerator recycling programs include signs on recycling trucks and displays and brochures at community recycling events. However, the effectiveness of these techniques should be considered relative to their cost as generally bill inserts and direct mail are the most effective means of driving program participation. For example, half of the survey respondents reported of learning of the program from a bill insert compared to 10% who learned of the program through a television advertisement and 5% who learned of it through a newspaper advertisement.

3.3.4 Overview of the Program Process

I&M's Appliance Recycling program is designed to reduce energy consumption by removing appliances from customer's homes and recycling them in an environmentally responsible way. In particular, the goal of the program is to remove older appliances from use and reduce the number of secondary appliances in customers' homes.

AEP provides customers both convenience and financial incentives to encourage them to recycle refrigerators and freezers. The convenience the program offers is a service whereby the program will pick up the customer's appliances from their residence at no charge. Financial incentives are provided in the form of a $40[24] per unit rebate for disposing of a working appliance through the program. Furthermore, the program stresses the larger economic benefit from the energy savings resulting from disposing of an older model refrigerator or freezer. Although the program promotes the environmental benefits of recycling the units, the environmental benefits are not considered by staff to be a primary motivation for participants.

To participate in the Appliance Recycling program, potential participants must have an I&M account. Units are eligible for recycling if they are between 10 and 30 cubic feet in size and are in working condition at the time of pickup. Customers are allowed to recycle a maximum of two units per year and receive $40 per unit in incentives.

Customers can participate in the program either by signing up directly using a toll-free number, online, or through a kiosk at Sears when they purchase a new appliance. Customers are informed

[24] The increase in incentive happened in May 2013, midway through the program.

of the eligibility requirements when they sign up and are told that the unit will not be collected if it is found ineligible at the time of pickup. Customers are reminded 48 hours prior to pickup of their appointment.

Customers who participate through retailers such as Sears are given an orange, non-removable sticker to place on their unit. When the retailer delivers their new unit they also pick up the old unit and hold it until it can be picked up by JACO staff.

3.3.5 Verification and Appliance Collection Procedures

JACO's verification and appliance collection procedures were documented in the prior year's evaluation report and are similar to how the program is run on behalf of other utilities. These procedures are summarized below:

- When customers sign up, customer data provided by I&M is used to confirm that they are an I&M customer. I&M provides customer data on a regular basis to ensure that JACO has current information.
- Appliances are initially screened during the sign-up process for meeting the size and working condition requirements.
- Customers must either be home during the pickup appointment time or leave the appliances in an accessible location, plugged-in, and with a signed note on them. The signed note is photographed and entered into JACO's database.
- A safe removal path is verified at the time of pickup.
- The working condition of appliances is verified during the pickup, as are the unit size requirements.
- Appliances are rendered inoperable once the working condition of the appliance is verified. However, appliances picked up by retailers are left in working condition and JACO's subcontractor Appliance Distribution picks them up and verifies their working condition.
- Appliances are recycled at an appliance recycling facility in Indianapolis, Indiana.

3.3.6 Appliance Recycling Program Use

This section summarizes the program activity and is based on an analysis of the program tracking data provided to ADM by I&M. During the program year, 3,401 orders were completed and 3,600 units were collected for recycle. Additional details on the orders placed, units picked up, and characteristics of the units are presented below.

3.3.6.1 Orders Placed

During PY4, 3,401 orders for refrigerator and freezer were completed. The majority of these orders were placed by telephone (80.1%) as shown in Table 3-13. Although participating customers clearly prefer to sign up using the telephone, the share of participants who placed an order online is not negligible.

Table 3-13 How Orders were Placed During the Program Year

How Order was Placed	*Percent of Orders*	*Number of Orders (N=3,401)*
Telephone Orders	80.1	2,724
Online Orders	19.9	677

Table 3-14 shows the types of units picked up for each order. The majority of orders, 94%, resulted in a single unit being picked up, most frequently a refrigerator. Among orders that resulted in the pickup of two units, the picked up units were most frequently one refrigerator and one freezer followed by two refrigerators.

Table 3-14 Order Description

Units Picked Up	*Percent of Orders*	*Number of Orders (N=3,401)*
One Refrigerator	73.6%	2,502
One Freezer	20.6%	700
One Refrigerator and One Freezer	3.1%	107
Two Refrigerators	2.3%	78
Two Freezers	0.4%	14

Figure 3-2 shows the number of completed orders placed in each month of PY4 in total and by mode of placement. The trend for the number of orders completed appears to be stable and following expected seasonal fluctuations. Appliance Recycling programs are typically characterized by seasonal fluctuations in activity, where activity tends to decline during the winter months when homeowners are less likely to engage in remodeling activities and when secondary appliances are perceived to have greater utility during the holiday months. It is expected that activity will increase in the late spring and early summer. Additionally, the program was more actively marketed in the spring and summer months when customers are most inclined to participate in the program. Participation patterns for this program year compared to last year are different. In last year's program, there was a steady influx of participants as the program year progressed.

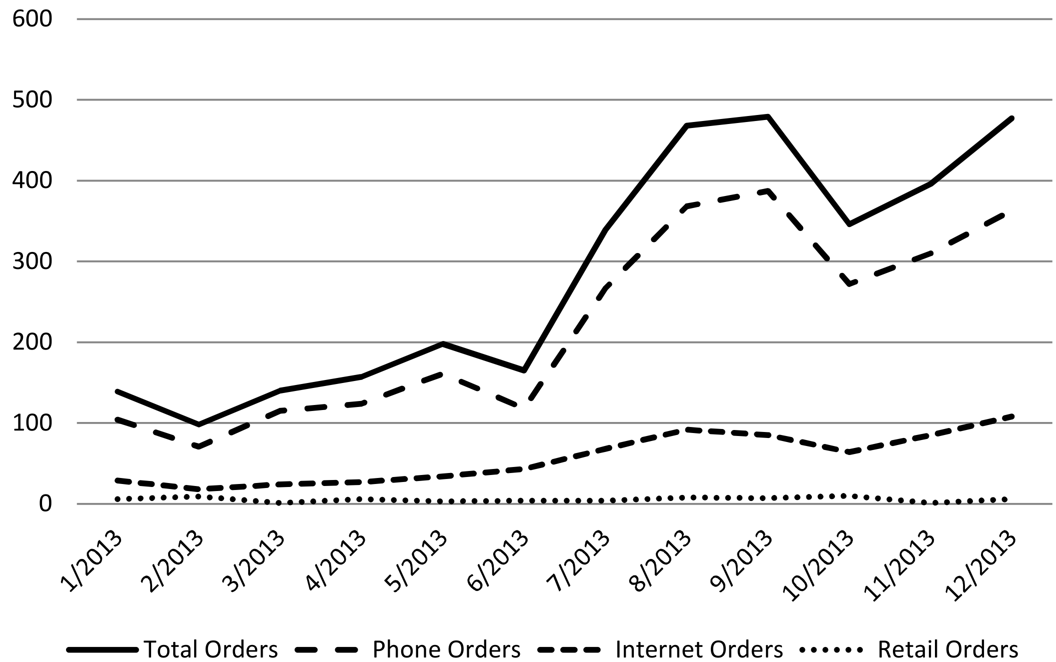


Figure 3-2 Number of Completed Orders by Month the Order was Placed

3.3.6.2 Units Collected

Table 3-15 shows that during the program year, 3,600 appliances were collected for recycle, 77% of which were refrigerators while the remaining balance was freezers.

Table 3-15 Type of Unit Recycled

Type of Unit	*Percent of Units*	*Number of Units (N=3,600)*
Refrigerator	76.8%	2,765
Freezer	23.2%	835

Another important finding regarding the potential energy savings from the recycling program is that 57.5% of the secondary units recycled were reportedly not replaced, as shown in Table 3-16. Furthermore, 83.1% of the primary units and 36.3% of the secondary units were replaced with new units, which on average tend to use less energy than older units. In comparison, less than 15% of the units were replaced with used units. Although savings potential is highest when participants do not replace their removed units, the replacement units are likely to operate at higher efficiency levels than the equipment recycled through the program. This is due to overall customer preference and the average age of recycled units.

Table 3-16 Unit Usage by Replacement Status

Unit Usage	*Replaced with a New Unit*	*Replaced with a Used Unit*	*Did Not Replace*
Primary (N=640)	83.1%	8.3%	8.6%
Secondary (N=2,902)	36.3%	6.0%	57.5%

Figure 3-3 displays the number of units recycled during PY4 by year of manufacture. The market potential study completed to inform the design of the recycling program noted that it was preferable that the units recycled were manufactured prior to 1997 because of the higher energy savings that could arise from removing older appliance from use. As shown below, the majority of recycled units met this criterion. Specifically, approximately 84% of the units recycled were manufactured before this date.

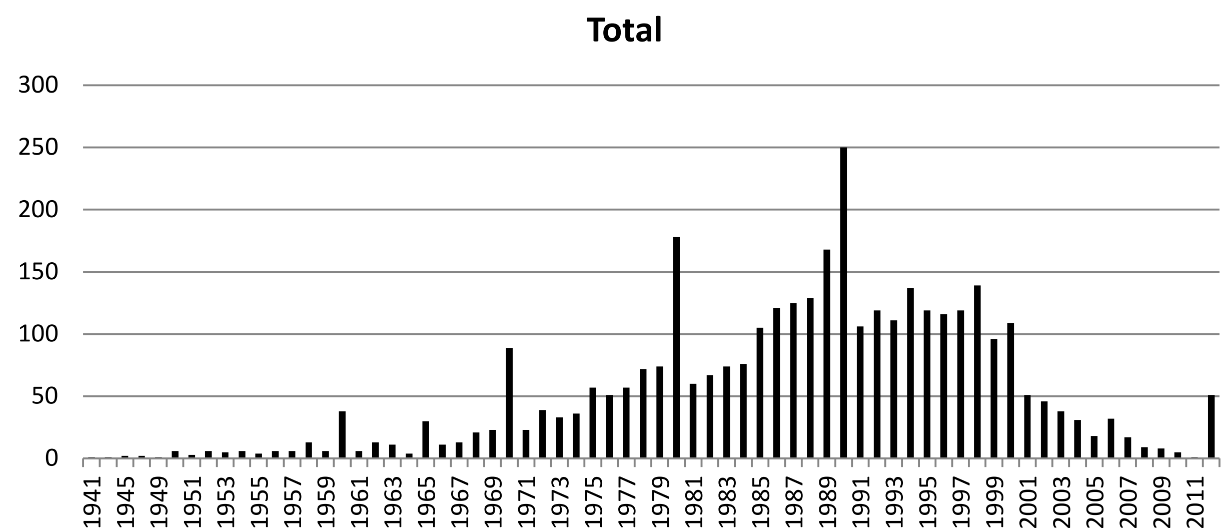


Figure 3-3 Recycled Units Year of Manufacture

The age of the recycled units varied somewhat by usage category. As shown in Table 3-17, recycled secondary units were older than recycled primary units.

Table 3-17 Age of Units Recycled by Usage Category

Unit Usage	*Age of Units Recycled*				*Number of Units*
	Less than 5 Years	*5-10 Years*	*11-20 Years*	*More than 20 Years*	
Primary	0.2%	4.4%	42.3%	52.8%	640
Secondary	0.2%	2.9%	23.1%	72.2%	2,902

****Total is less than 3,600 due to unknown usage for 58 units.***

3.3.7 Participant Survey Findings

A telephone survey was conducted with customers who had recycled at least one unit through the I&M Appliance Recycling program in 2013. The purpose of the participant survey is to evaluate customer perceptions of the program and gauge overall program satisfaction. The survey design focused on customer decision making and overall experience with the program, while gaining an understanding of how effectively the program is meeting customer needs. In total, 365 customers who participated in the 2013 program responded to the survey. Specific research topics covered within the survey instrument include:

- **Decision making process:** Respondents stated how they learned about the program, indicated which factors led them to participate in the program, and stated the actions they would have taken if the program had not been available.
- **Customer satisfaction:** Respondents conveyed their satisfaction levels with selected program elements including the program application process, the pickup process, and the program incentive. Respondents were also asked about their satisfaction with any interactions with I&M program staff.
- **Problem resolution:** Respondents were asked whether they experienced problems with any elements of the program and were asked to provide commentary describing any mentioned issues. These participants were also asked whether their problem had been resolved.

3.3.7.1 Customer Awareness of the Program

Participants were first asked how they first learned about the Appliance Recycling program. As shown in Figure 3-4, respondents most commonly reported that they heard about the program through a bill insert from I&M. This was followed by word-of-mouth, TV advertisements, and online. These results are consistent with the findings obtained by JACO when conducting participant questionnaires, where program participants typically cite bill inserts as their initial source of program information.

Thirteen percent of respondents reported learning of the program through word-of-mouth, compared to 16% in the prior program year. Additionally, 12% of respondents reported learning of the program through retailers in 2012, while four percent of respondents cited this source in 2013. The slight decrease of respondents who reported hearing about the Appliance Recycling program from friends or relatives suggests that the program is still largely benefiting from indirect marketing as a result of its continued operation over the course of several years. Past participants are likely satisfied with their experiences to the point where they are recommending the program to others, which is a positive reflection on program performance. Adding an additional retailer to the program may have contributed to increased program awareness as well.

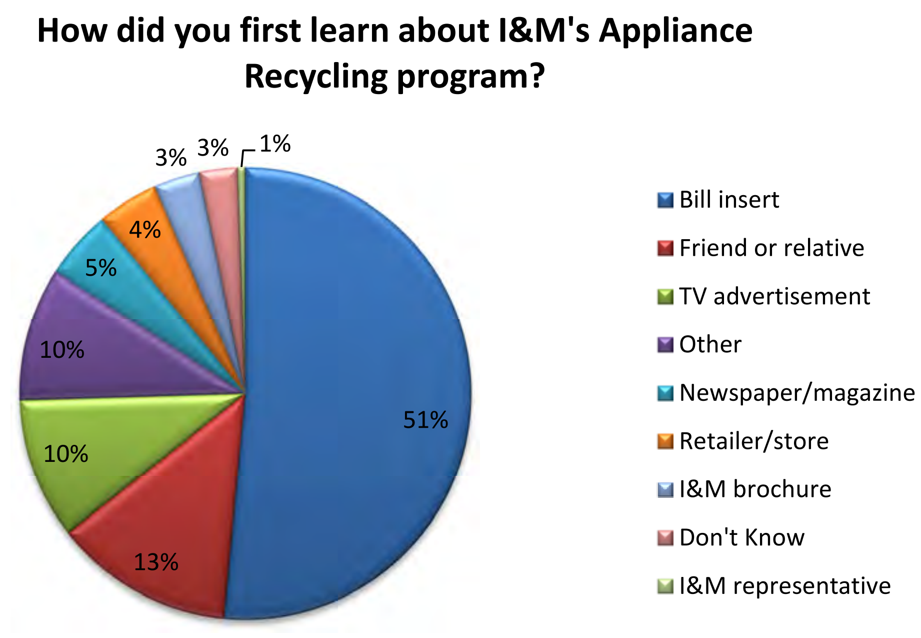


Figure 3-4 How Customers Initially Learned about the Program

When asked if they learned about the program from any other sources, an additional 25 respondents stated they learned about the program through an on-line channel.

3.3.7.2 Customer Decision Making Characteristics

In order to understand customer values and potential motivations for participating in the program, survey respondents were asked to identify the main reason they decided to dispose of their appliance through I&M's Appliance Recycling program. As shown in Figure 3-5, participants most commonly reported that they chose the I&M program because of the available financial incentive. However, the majority of respondents cited reasons related to non-financial benefits offered by the program, such as the ease and convenience and free pick-up service. While customers likely had several potential options for disposing of their old appliances, the I&M program differentiates itself by offering a financial incentive rather than charging a fee or solely providing a free pick-up. Additionally, some customers may value the safe, effective, and well-documented recycling methods employed by JACO.

As supported by Figure 3-5, the convenience of haul away and the program incentive are typically the two most common motivations for customers to participate in appliance recycling programs such as the Appliance Recycling program.

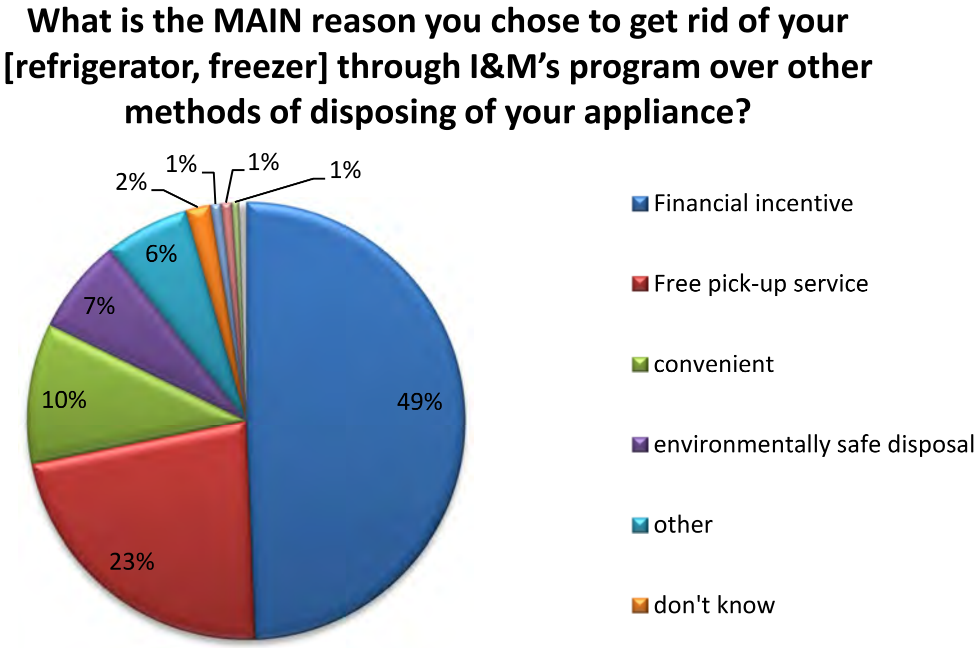


Figure 3-5 Main Reasons for program Participation

Respondents were then asked whether they would have participated in the program with reduced rebate amounts; results are displayed in Table 3-18. Sixty percent of respondents reported that they would still participate in the program if the rebate check amount had been less than $30/40. Additionally, 56% of respondents stated that they would have participated in the program if a financial incentive had not been available. While this question alone does not directly address the full set of customer motivations. It further emphasizes customer focus on the overall convenience of having their appliances picked up free of charge, and suggests that the financial incentive may be less important than the actual services offered by the program.

It should be noted that, of the 189 respondents who previously reported that the financial incentive was their main reason for participating in the program, 98 stated that they still would have participated in the program if there had been no available rebate. These findings suggest that participants likely value multiple benefits offered by the program and that the financial incentive may not be the primary driver of program participation. This is in agreement with commentary provided by JACO staff, who stated that customers typically value the conveniences offered by the program at least as highly as they value the associated program rebates.

Table 3-18 Customer Reported Participation with Reduced Rebate Amount

	Response	*Percentage of Respondents Saying Yes (N = 230)*
Would you have participated in the program if…	The rebate check had been less?	60%
	There had been no rebate check altogether?	56%

Respondents were asked a series of questions related to their plans and potential actions they may have taken in the absence of the Appliance Recycling program. As shown in Table 3-19, about three-fifths of respondents who had recycled a refrigerator reported that they had already considered disposing of the unit before learning of the program as compared to two-thirds of respondents who had recycled a freezer. It is unclear whether these customers had made specific plans to recycle their appliances, and whether they would have proceeded to dispose of the units if the program had not been available. While customers typically have varying degrees of prior planning, the Appliance Recycling program likely motivated many participants to take immediate action rather than waiting to have their appliances hauled away or sold.

Table 3-19 Prior Plans to Dispose of Refrigerators or Freezers

	Response	*Refrigerators (N = 264)*	*Freezers (N = 119)*
Had you already considered disposing of your [refrigerator, freezer] before you heard about I&M's Appliance Recycling program?	Yes	62%	66%
	No	37%	32%
	Don't know	1%	2%

Respondents were then asked what they likely would have done with their refrigerator or freezer if they had not disposed of it through the I&M Appliance Recycling Program. Table 3-20 presents these reported alternative actions. The alternative actions that would likely result in the appliance being removed from the electrical grid include:

- Taking the appliance to the dump or recycling center;
- Having the appliance removed by a retailer;
- Hiring someone to take the appliance away; and
- Keeping the appliance stored and unplugged (although this may not permanently remove the appliance from the grid, as it could be plugged in at a later date).

Approximately one-fifth of respondents indicated that they would have taken the appliance to a dump or recycling center. Three of the 11 respondents who provided a response of “other” described actions that would also result in the removal of the appliance from the grid, such as leaving the refrigerator on the curb for trash pick-up or independently dismantling the appliance.

Table 3-20 Customer Reported Actions in Absence of Program Participation

	Response	*% of Units (N = 383)*
What would you have most likely done with the [refrigerator, freezer] had you not disposed of it through I&M's program?	Sold it to a private party	8%
	Sold it to a used appliance dealer	4%
	Kept it and continued to use it	11%
	Kept it and stored it unplugged	6%
	Given it away to a private party	10%
	Given it away to charity	7%
	Put it on curb with free sign	3%
	Had it removed by retailer	6%
	Taken it to a dump/recycle center	19%
	Fired someone to take it away	11%
	Other	3%
	Don’t Know	11%

3.3.7.3 Program Sign-up Process

Participants were asked about their experiences during the process of applying for an appliance pick-up through either the online or telephone system. As previously mentioned in the program description, the majority of participants sign up for the program via telephone; about 80% of respondents to the customer survey reported that they had used this method.

All but one of the 64 respondents who stated that they had signed up for the program online indicated that it was easy to find the sign-up screen on the I&M website. Additionally, these 64 participants reported that the website answered all of their questions about the Appliance Recycling program; all but one of the participants stated they had received a confirmation when their sign-up process was completed. This indicates that the I&M Appliance Recycling web portal is functioning effectively, and that customers are experiencing few if any issues when using the online sign-up method.

Two hundred thirty one of the 233 respondents who had signed up for the program over the telephone reported that the program representative they spoke to was polite and courteous; two participants answered “Don’t Know”. Two hundred twenty nine respondents stated that the representative was able to answer all questions related to the Appliance Recycling program. Additionally, 27 of these respondents stated that they had needed to call more than one time when attempting to sign up for the program.

Overall, 93% percent of respondents stated that they were able to schedule a convenient appliance pick-up date and time. Five respondents who indicated that they were not able to schedule a convenient appointment stated that the scheduling did not meet their expectations. These five participants did state that they were at least somewhat satisfied with the overall scheduling process.

These findings suggest that the structure and operation of both the telephone and online sign-up methods is well-designed and straightforward. Participants did not identify any issues with these processes, and indicated that they were pleased with the ease and convenience associated with enrolling in the Appliance Recycling program.

3.3.7.4 Customer Satisfaction

The participant survey also asked customers about their satisfaction with several elements of the program. These elements included:

- Satisfaction with the scheduling of pick-up appointments;
- Satisfaction with the actual pick-up of the appliance;
- Satisfaction with the time it took to receive the rebate after participating;
- Satisfaction with the rebate amount; and
- Satisfaction with the overall process of participating in the program.

Respondents were asked about their levels of satisfaction with these program elements; with the response options of “very satisfied”, “somewhat satisfied”, “somewhat dissatisfied”, and “very dissatisfied”. Table 3-21 displays the reported satisfaction ratings for each selected program element. Overall, satisfaction ratings were very high, with few low ratings reported by respondents; these results are very similar to satisfaction ratings for PY3.

- **Customer satisfaction with pickup appointment scheduling:** Ninety-five percent of respondents indicated that they were at least somewhat satisfied with the scheduling of their pick-up appointment, and only three respondents indicated that they were dissatisfied with this aspect of the program. These respondents stated that they had some difficulty with their experience scheduling the appliance pick up, usually related to the length of time to pick-up, or some other problem in coordinating the pick-up. Overall, these findings represent relatively high satisfaction scores for the appointment scheduling aspect of the program, as nearly all participants were able to schedule a convenient appointment during their first interaction with program staff.
- **Customer satisfaction with actual appliance pick-up:** When asked how satisfied they were with the actual appliance pick-up process, 90% of respondents reported that they were “very satisfied”. Four of the respondents reported being dissatisfied with this portion of their program experience. Although some customers typically view the process of entering the home for equipment auditing or removal as burdensome or uncomfortable, these responses suggest that the JACO team was professional and efficient during visits to participant

residences. Additionally, the open-ended commentary provided by participants strongly suggests a high level of satisfaction with the JACO pickup team.

- **Customer satisfaction with time to receive program rebate:** Seventy one percent of respondents reported being "very satisfied" with the time it took to receive their rebate, while 20% of respondents indicated that they were "somewhat satisfied" with this aspect. While this program element received the fewest ratings of "very satisfied", these ratings reflect high satisfaction levels for customers. Less than two percent of respondents rated the time to receive the rebate with either a 'somewhat dissatisfied' or 'very dissatisfied' response. Of these respondents, one of these respondents reported that it had taken 2 weeks to receive the program rebate, while the other reported that he never received it. It should be noted that program documentation states that the expected time to receive a rebate is four to six weeks, and that 96% of respondents indicated that they had received their check within this time frame.
- **Customer satisfaction with overall process of program experience:** Eighty-seven percent of respondents reported being very satisfied with the overall process of having their appliance recycled, from the time they called for a pickup to the time they received their rebate. Four of the respondents indicated any dissatisfaction with their overall experience, and the open-ended commentary reflected a high amount of praise for program design and delivery.

Table 3-21 Participant Satisfaction with Selected Elements of Program Experience

Element of program Experience	*Very satisfied*	*Somewhat satisfied*	*Neither satisfied nor dissatisfied*	*Somewhat dissatisfied*	*Very dissatisfied*	*N*
Scheduling of the appliance pick-up	82%	13%	1%	2%	1%	365
Actual appliance pick-up	90%	5%	2%	0%	1%	365
Time until rebate was received	71%	20%	7%	1%	1%	288
Rebate amount	76%	18%	4%	1%	1%	365
Overall program experience	87%	11%	1%	1%	1%	365

In addition to satisfaction levels for specific program elements, respondents were asked about their experiences interacting with I&M program staff. As shown in Table 3-22, 84% of respondents reported that they were very satisfied with these communications, and two of the respondents indicated dissatisfaction with program staff. These instances of customer dissatisfaction did not reveal any trends with issues relating to program staff communication. Rather, these were individual complaints specific from particular customers. These findings are a positive reflection upon staff members and overall program accommodation of customer needs, and suggest that I&M is effectively minimizing customer issues and addressing problems as they arise.

Table 3-22 Satisfaction with Communications with I&M staff

	Response	*Percentage of Respondents (N = 365)*
How satisfied are you with your communications with I&M and program staff?	Very satisfied	84%
	Somewhat satisfied	7%
	Neither satisfied nor dissatisfied	1%
	Somewhat dissatisfied	0%
	Very dissatisfied	0%

Some respondents provided open-ended commentary related to their overall satisfaction with the I&M Appliance Recycling program. A small number of participants explained that they thought the rebate amount should be increased, or that they had experienced difficulties in the appointment scheduling process. However, nearly all of the open-ended commentary was positive in nature, which further suggests that participants highly value their experiences with the program. Specific commentary included:

> *"I was very pleased with the service."*
>
> *"A great program; quick and easy."*
>
> *"The program is very efficient."*

Respondents were also given the opportunity to provide suggestions for improving the I&M Appliance Recycling Program. These suggestions ranged from asking for larger rebate amounts to recommending that new equipment types such as washers and dryers be added to the program. Several respondents stated that they thought the program could benefit from increased advertisement, or mentioned that more people should be aware of the benefits offered by the program. Specific recommendations included:

> *"[I&M] should advertise the program more."*
>
> *"Make more options for scheduling."*
>
> *"The rebate should be sent quicker."*
>
> *"I think they should have evening pickups."*

3.3.7.5 Customer Savings on Electric Bills

In order to gauge whether participants have recognized the long-term benefits of removing an old appliance from their home, respondents were asked whether they had noticed savings on their electric bills since the pick-up was performed. As shown in Table 3-23, nearly one-fourth stated that they had seen savings on their bills. There are several reasons why participants may not see immediate electric savings, including seasonal usage patterns and the use of new appliances in the home. Additionally, participants who recycled secondary units that were only plugged in and running during certain months or for special occasions would be less likely to notice savings on their electric bills, as the recycled appliances likely accounted for a relatively small percentage of their overall electric usage.

Table 3-23 Recognition of Savings on Electric Bills

	Response	*Percentage of Respondents (N = 365)*
Have you noticed any savings on your electric bill since removing your old appliance(s)?	Yes	22%
	No	33%
	Not sure	41%
	Don't Know	4%

Although some participants may have only noticed a minimal amount of savings on monthly electric bills, 85% of respondents who indicated that they had seen electric savings stated that they were very satisfied with the level of savings that had been realized. None of the participants who reported seeing monthly savings stated that they were dissatisfied with the savings amount. As the findings from the customer survey suggest that participants were primarily focused on the convenience and actual process of removing the appliance from their home, it is likely that long-term monthly savings was not a primary goal or concern.

3.3.7.6 Customer Appliance Profiles

In order to collect data relevant to both the impact and process aspects of the evaluation, respondents were asked about the units that they had recycled through the Appliance Recycling program. Respondents provided information related to whether their appliances were functional upon being picked up by the JACO recycling team. As shown in Table 3-24, 91% of respondents who had recycled a refrigerator through the program reported that it was in working condition. The respondents who reported that their refrigerator was non-functional or had problems mainly explained that the unit would not keep food cold enough. Similarly, ninety-three percent of respondents who had recycled a freezer through the program stated that it had been in working condition, while the three respondents who reported problems with the unit indicated that it would not produce cold air or that it would not keep food cold enough. One eligibility requirement for the I&M Appliance Recycling program is that the units must be in working condition at the time of pick-up. Although some respondents indicated that their appliances were not working, these units may have been technically functional but did not meet the standards of the customer. These results suggest that the JACO team is actively and accurately verifying that participating appliances are at least technically operational at the time of removal.

Table 3-24 Reported Condition of Recycled Appliances

Was the [refrigerator, freezer] in working condition when it was picked up?	*Response*	*Refrigerators (N =264)*	*Freezers (N = 119)*
	Yes	91%	93%
	Worked but had problems	8%	6%
	No	2%	-

3.3.7.7 Customer Residence Profiles

Respondents were asked a series of questions related to the characteristics of their home. Table 3-25 displays the age of participant homes as reported by respondents, and shows that nearly one-third of respondent homes were constructed prior to 1960. Only eight percent of homes were built after the year 1999.

Table 3-25 Reported Age of Participant Residences

Approximately when was your home constructed?	*Response*	*Percentage of Respondents (N = 365)*
	Before 1960	33%
	1960 to 1969	13%
	1970 to 1979	15%
	1980 to 1989	9%
	1990 to 1999	13%
	2000 to 2005	5%
	2006 or later	3%
	Don't know	6%

As shown in Table 3-26, the majority of respondents stated that they own their residence, with only three percent of respondents indicating that they are tenants.

Table 3-26 Rental and Ownership Status of Participant Residences

Do you own or rent this residence?	*Response*	*Percentage of Respondents (N = 365)*
	Own	94%
	Rent	3%

Finally, Table 3-27 indicates that 90% of respondents reported living in single family, detached construction homes. Very few respondents reported living in condominiums, multi-family residences, or mobile homes.

Table 3-27 Participant Residence Type

	Response	*Percentage of Respondents (N = 365)*
Which of the following best describes your home or residence?	Single family, detached construction	90%
	Single family, manufactured/modular	2%
	Single family, mobile home	2%
	Condominium	1%
	Other	1%

3.3.8 Program Operations Perspective

This section summarizes the core findings from interviews conducted with I&M and JACO program staff for the purposes of developing market environment and internal program management perspectives.

Interviews were conducted with program staff to gain insight into program operation and overall market trends. The interviews were designed to center on topics related to experiences with the programs and with other groups involved in managing or promoting the programs. Interview topics included program operations, the overall effectiveness of the program process, and the identification of areas for future program improvement.

These interviews were performed with the following two groups:

- **JACO staff:** Interviews were conducted with program management staff of the Appliance Recycling program implementation contractor, JACO.
- **I&M staff members:** Interviews were conducted with members of I&M Appliance Recycling program management.

Findings from the operations staff interviews are summarized below.

3.3.8.1 Program Goals

Program staff explained that the PY4 savings goal for the Appliance Recycling program was informed by a market potential study performed in 2008 and updated in 2010. The goals for PY4 were higher than in PY3 and despite additional program activity, the program fell short of its planning goals.

Because of the lower than expected program activity in prior years, the 2014 savings goals for the program were decreased, along with a corresponding decrease in the program’s budget.

3.3.8.2 Incentive Increased

The incentive for recycling appliances increased from $30 a unit to $40 a unit. This change became effective in May but was not promoted until June. The program implementer believes that the incentive increase has been effective in generating additional program activity.

3.3.8.3 Increased Marketing Effort

The program marketing effort was increased in 2013. The program implemented bill messaging promoting the program in January and June and sent bill inserts in March, July, August, and November. Additionally, the program received news coverage during a home pick up event in August. Other efforts include a direct mail campaign to 130,000 customers in November and television advertising in South Bend and Fort Wayne. Additionally, a contest was held to promote the program that offered four $250 gift cards to customers that recycled appliances. Utility staff also reported that they are interested in “out of the box” suggestions for how to generate additional program activity.

3.3.8.4 No Change in Retailer Partnerships

During last year’s interviews with program implementation staff, it was mentioned that the program was working on developing a partnership with Best Buy to enable customers purchasing new appliances through the chain to recycle their units through the program. However, this partnership has not been established. The implementation contractor indicated that the Best Buy has committed to establishing the partnership in 2015. Additionally, the program continues to partner with Sears and ABC Warehouse.

3.3.8.5 Working Relationships and Program Communication

The working relationship between I&M and JACO appears to be effective. JACO provides an online dashboard that I&M staff can check at anytime to monitor the program. Additionally, reports are provided with a full list of orders and invoice information. I&M maintains customer lists to ensure program eligibility. JACO is provided regular updates of this list and reports that the data meet their needs for administering the program.

4. Residential Home Energy Reporting Program

This chapter addresses the methodologies and impact findings of gross and net kWh savings and peak kW reductions resulting from the Residential Home Energy Reporting Program during the period January 2013 through December 2013.

4.1 Program Specific M&V Methodologies

The M&V approach for the Home Energy Reporting program (HERP) is aimed at determining the following:

- Numbers of homes that received reports in the mail;
- Number of homes that opted out of the program;
- Number of homes that accessed the web based tool to receive more information regarding their homes energy usage and receive more recommendations;
- Average annual kWh savings per home;
- Average kW reduction per home; and
- Estimating cost effectiveness of the HERP in 2013.

Table 4-1 below summarizes the inputs needed for gross savings calculations and the source of each input.

Table 4-1 Data Sources for Gross Impact Parameters – Home Energy Reporting Program

Parameter	*Source*
Number of Participants	Program Tracking Data/ Participant Surveying
Number of Opt Outs/ Account closures	Program Tracking Data
Recommended Measures Completed	Survey data/ I&M Residential Billing Database
Monthly kWh Consumption	I&M Residential Billing Database
Daily Weather Data (HDD and CDD)	Direct Pull From KFWA (Fort Wayne Airport) Weather Station

4.1.1 Verification of Participation In program and Recommendation Measures Completed

A first aspect of conducting measurements of program activity is to verify if participants of the program did participate in the program. Second aspect is to verify if any of the lifestyle, appliance, or structural recommendations mentioned in the report were adapted or implemented. ADM takes several steps in verifying participation and if recommendation measures were completed, which consists of the following:

- Validating program tracking data provided by OPower by checking for duplicate or erroneous entries;
- Verifying that participants were part of the program according to the agreed-upon process between OPower and I&M; and
- Conducting verification surveys with a statistically valid sample of program participants. The focus of these verification surveys are to verify that customers listed in the program tracking database did indeed participate. Participants are also asked about what recommendations, if any, were implemented within the household.

4.1.2 Calculating Gross Annual kWh/kW Savings

The scope of the HERP reports includes recommendations for lifestyle, structural, and appliance changes. In order to determine the kWh and kW savings attributable to these recommendations, ADM conducted a regression analysis with propensity matching using a census of program participant data and control group from the 2012 participant group. October 2013 participants were given a proportion of the 2012 participant group savings to account for the few months they participated in the program. Participants added to the program on Dec 31, 2013 were not included in this group due to not enough post data being collected to warrant calculations of savings. The billing data for the 2012 participants includes two years of monthly observations for each customer. Data screening procedures include:

- Removing duplicate records
- Removing customers with incomplete (less than two years of data) billing records
- Screening for outliers (>7000 kWh per month)

4.1.3 Calculating Net Energy (kWh) and Peak Demand (kW) impacts

The program assumed no free-ridership; therefore net savings are equal to gross savings. (NTG=1)

4.2 Impact Results

ADM estimated ex post gross electric savings and peak demand reductions through detailed analysis of participant billing data and participant survey data. The estimated gross impacts resulting from the PY4 Home Energy Reporting program are summarized in Table 4-2. Savings calculated by ADM are based on 2012 participants as well as participants who were added to the program in October 2013. Participants added to the program on December 31, 2013 received no savings, as not enough post data has been collected to properly calculate savings. Table 4-3 and Table 4-4 show the audited and verified savings.

Table 4-2 Gross Impact Summary

Program	*PY3 Program Goals (kWh)*	*Peak Demand Savings (kW)*		*Annual Energy Savings, (kWh)*		*Realization Rate*
		Ex Ante	*Ex Post*	*Ex Ante*	*Ex Post*	
Home Energy Reporting	18,400,000	-	1,819	16,698,313	14,583,147	88%

Table 4-3 Gross Impact kWh

Ex Ante Gross kWh Savings	*Gross Audited kWh Savings*	*Gross Verified kWh Savings*	*Ex Post Gross kWh Savings*	*Realization Rate*
16,698,313	16,698,313	16,698,313	14,583,147	88%

Table 4-4 Gross Impact kW

Ex Ante Peak kW Savings	*Audited Peak kW Savings*	*Verified Peak kW Savings*	*Ex Post Peak kW Savings*
-	-	-	1,819

The program assumed no free-ridership; therefore net savings are equal to gross savings. (NTGR=1)

4.2.1 Verification of Participation in program

As a first step toward estimating program level kWh and kW impacts, ADM reviewed program tracking data provided by OPower for accuracy. No duplicate entries were discovered. Table 4-5 lists total participation for the 2013 program year.

Table 4-5 Total Program Participants

Variable	*# of Participants*
May 2012 Beginning program Participation	50,500[25]
Opt Outs (Customer contacted I&M to be taken off list)	-381
Other Reasons (accounts closed)	-7,969
Participants added on October 2013	37,550
Participants added on Dec 31, 2013	26,750
Total 2013 participants	106,450

**Participants added on Dec 31, 2013 did not start receiving reports till 2014. Because they were added on the last day of 2013, they are counted as 2013 participants but weren't active (hadn't started receiving reports) in the program till 2014. Ex ante savings were based off of 79,700 participants.*

To verify that the number of homes in the program tracking database claiming to have received reports in the mail was accurate, ADM administered a telephone survey with 462 program participants. All respondents who completed the participant survey verified that they had received reports in the mail through the program during 2013. ADM applied a verification rate of 100% to the program.

4.2.2 Gross Annual kWh Savings and Peak kW Reduction

Savings calculated by ADM are based on only 2012 participants (i.e. Wave 1) and October 2013 participants (i.e. Waves 2). December 31, 2013 participants (i.e. Wave 3) did not have their savings calculated as not enough post data was collected to warrant savings to be calculated for 2013 participants, as well as properly calculate savings.

In the interim, until Waves 2 and 3 accumulate enough post-treatment data, first-year savings from Wave 1 will be deemed towards the later waves.

[25] 5,000 of these May 2012 participants were taken out of the program in October 2013 to serve as the persistence group for the 2014 evaluation.

Regression Methodology

ADM conducted a regression analysis to determine the savings attributable to the HERP. ADM received 40,600 program participant's monthly billing data from February 2012 through February 2014. These program participants were first screened by the procedures below.

(1) Cross Referencing with program Participants in the ARP, OECUP, R&DP, PRP, and HWP programs;

(2) Removal of Customers who opted out of the program;

(3) Removal of the 5,000 Customers that are part of the persistence group; and

(4) The dataset was also screened for duplicate entries (identical kWh and date for the same account), but this did not result in the loss of any customers.

This resulted in a Preliminary analysis group of 36,000 program participants.

To serve as a baseline, account numbers for a control group of 17,000 (chosen via randomization) were provided by OPower. This group was first screened according to criterion 1 above. It was confirmed by visual inspection and a t-test for the equivalence of two means that their average monthly usage prior to July 2012 (when Wave 1 first began receiving home energy reports) are statistically identical with respect to bills.[26]

The mixed effects panel regression model[27] was then specified as follows:

$$\begin{aligned}\mathrm{kWh}_{i,t} = {} & \beta_1 \mathrm{HDD65}_{i,t} + \beta_2 \mathrm{CDD75}_{i,t} + \beta_3 \mathrm{Post}_{i,t} + \beta_4\left(\mathrm{Post}_{i,t} * \mathrm{HDD65}_t\right) + \beta_5\left(\mathrm{Post}_{i,t} * \mathrm{CDD75}_t\right) \\ & + \beta_6\left(\mathrm{Post}_{i,t} * \mathrm{Treatment}_i\right) + \alpha_i \mathrm{Customer}_i + \varepsilon_{i,t}\end{aligned}$$

Where the subscript i denotes individual customers and $t = 1, \dots, T(i)$ serves as a time index, where $T(i)$ is the number of bills available for i. The model is defined as "mixed effects" because the model decomposes its parameters into fixed-effects (i.e. HDD65, CDD75, Post, Treat, and its various interactions) and random effects (i.e. the individual customer's base usage). Put simply, a fixed effect is assumed to be constant and independent of the sample, while random effects are assumed to be sources of variation (other than natural measurement error) that are uncorrelated with the fixed effects. The approach is similar to others that treat the individual customer as a fixed-effect, but is more computationally efficient as the number of individuals in the sample becomes very large.

[26] Average pre daily usage for treatment group: 53.399 kWh; for control group: 53.440 kWh. From two sample t-test, t = 0.4091 with 163617 degrees of freedom, p = 0.6825.

[27] Implemented in R using the lme4 package (citation). The syntax used for model specification is `lmer(avg.kw ~ 1 + treat*post + post * (cdd + hdd) + (1 | ACCOUNT_NUMBER), data=dataset)`

While the results of this model are expected to be consistent with a pooled regression (which ignores the individual customer effect), controlling for the individual effect achieves some improvement in the model's fit to the data. The variables included in the both regression models are specified in Table 4-6 below.

Table 4-6 Description of Variables Used in the Regression Model

Variable	*Description*
Customer random intercept	Unique identifier for each customer to control for any customer specific differences.
Heating Degree Days (HDD)	Average Heating Degree Days per day within each billing period. This was calculated by summing up the number of heating degree hours per day, and then averaging over the number of days in the billing period. The setpoint of 65 was used for the model.
Cooling Degree Days (CDD)	Average Cooling Degree Days per day within each billing period. This was calculated by summing up the number of cooling degree hours per day, and then averaging over the number of days in the billing period. The setpoint of 75 was used for the model.
Post	Indicator if an observation is post audit (=1 if post, =0 otherwise). Billing Periods beginning after 7/15 are considered "Post" for both the Treatment and control groups.
kWh	The average daily kWh usage for account i during billing period t.

The HDD and CDD have been calculated on a daily basis so they can be applied to each customer's billing period, however long that may be. It is rare that a customer's billing dates are on the first of each month, so this ensures that no estimation of usage must occur to match weather data with the billing data.

A free-rider in the HER program would be a customer who would have reduced energy usage regardless of the program's influence. The experimental design for this study excludes customers who are known to be enrolled in other energy-efficiency programs, and controls for attributes that may correlate with energy conservation via the randomization. A free-rider then would have been equally likely to have been in the treatment or control groups, and hence Net-to-Gross is 1. There are no assumed free-riders.

An analysis of early Wave 1 billing data was used to provide a proxy estimate for Wave 2 (customers receiving HERs after October 2013), but restricted to the first 6 months after implementation (August 2012 to January 2013). This is due to findings that suggest in the year following implementation, the savings in Wave 1 relative to its control group has exhibited a maturation effect wherein savings have increased over time. Thus, early Wave 1 savings are deemed towards Wave 2 in its early stages.

Wave 1 persistence group participants received 12 months of savings[28] while Wave 2 participants had 2 months (60 days) of savings calculated.

The results of the regression analysis are listed in Table 4-7.

Table 4-7 Output from the Net Savings Regression Model

Regression Model Output		
	Wave 1[29]	Wave 2[30]
Daily kWh Savings(β_6) with standard error in parentheses	0.907 (0.101)	0.437 (0.110)
Number of Customers (Combined Treatment and Control)	53,500	53,500
R-Squared	0.144	0.125
Monthly kWh Mean during Post Period	1,763	1,795

4.2.3 Calculating Net Annual kWh/kW Savings

The coefficient estimate on β_6 from the regression model output in **Error! Reference source not found.** was used to determine the annual Net kWh and kW savings for the HER program. The calculation steps are detailed in Table 4-8 and are as follows:

(1) Scale the daily savings from the regression model up to the annual level, by multiplying by a factor of 365.

(2) kW savings were calculated by applying a flat load shape (i.e. 1/8760) to the kWh savings.

(3) Multiply by the number of program participants (including dual enrolled customers) to arrive at a program level kWh savings number. Dual enrolled customers are assumed to have the same energy savings as mono-enrolled customers for the purposes of the HERP program. The Dual enrolled customers were only removed from the regression model because they would likely have higher savings attributable to the other program.

[28] Billing data showed savings for these participants continued for November and December even though reports were not received in November 2013.

[29] Using Wave 1 billing data with post period restricted to January 2013 to December 2013.

[30] Using Wave 1 billing data with post period restricted to August 2012 to January 2013.

Table 4-8 Calculation of Net Per-Participant and Program Level kWh and kW Savings

Wave	*Daily kWh Savings*	*Per Participant PY4 kWh Savings*	*Per Participant PY4 kW Savings*	*Number of Participants*	*Program Level PY4 kWh Savings*	*Program Level PY4 kW Savings*
1	0.9074	331.20[31]	0.0378	37,150	12,304,117	1,405
1	0.9074	331.20[32]	0.0378	5,000	1,656,000	189
2	0.272	16.592[33]	0.006	37,550	623,030	225
3	-	-	-	26,750	-	-
Totals				106,450	14,583,147	1,819

4.3 Process Evaluation

This chapter presents the results of the process evaluation for I&M’s Home Energy Reporting program during PY4. The process evaluation focuses on the effectiveness of program policies and organization, as well as the program delivery framework. The purpose of the process evaluation is to assess the design of the program in order to determine how effectively it is achieving its intended outcomes. This evaluation is based upon analysis of program structure and interviews and surveys of participating I&M customers, I&M energy efficiency staff, program implementation contractor staff, and program tracking data.

The chapter begins with a discussion of the overall progress of the program. This is followed by an examination of certain issues important for the future success of the program. This chapter also presents strategic planning and process recommendations, and highlights key findings from the surveys of customer participants and customers who opted out of the program opt outs and interviews with program operations staff.

4.3.1 Evaluation Objectives

The purpose of the process evaluation is to examine program operations and results throughout the operating year, and to identify potential improvements that may prospectively increase program efficiency or effectiveness in terms of customer participation and satisfaction levels. This process evaluation was designed to document the operations and delivery of the Home Energy Reporting program during PY4.

Key research questions to be addressed by this evaluation of PY4 activity include:

[31] 365 days of savings

[32] 365 days of savings

[33] 60 days of savings

- How useful are the program reports sent in the mail? Have participants implemented any of the report recommendations on ways to save energy that are included in the reports?
- Why did customers not participate in the web based tool? What web based recommendations did participants receive and how useful were they?
- How satisfied are participants with the program? What was their level of satisfaction with information provided in the report, the web based tool, and savings on monthly bills from recommendations implemented?
- Have there been any notable changes or trends in program operation or participant activity since the prior program year, and how have these affected overall program performance?

During the evaluation, data and information from multiple sources were analyzed to achieve the stated research objectives. Insight into the customer experience with the Home Energy Reporting program is developed from a telephone survey of program participants and individuals who opted out of the program. The internal organization and operational efficiency of program delivery is examined through analysis of interviews conducted with I&M efficiency program staff.

4.3.2 Summary of Primary Data Collection

- **Review of program documentation and relevant literature:** ADM reviewed relevant practices for audit programs were also reviewed.
- **Participant and opt-out surveys:** Surveys were the primary data source for many components of this process evaluation, and served as the foundation for understanding the customer perspective. The participant surveys provided customer feedback and insight regarding customer experiences with the Home Energy Reporting program. Respondents reported on their satisfaction with the program and the usefulness of the report and web tool recommendations provided. Individuals who opted out of the program were also surveyed in an attempt to understand why they chose to not continue to receive the energy use reporting.
- **Interview with I&M staff members:** Interviews with I&M staff members, including program managers, provided insight into various aspects of the program and its organization. I&M staff members also provided information regarding future plans for the program and its interaction with other I&M programs.

4.3.3 Summary of Conclusions and Recommendations

By the end of PY4 there were 79,700[34] participants in the Home Energy Reporting program. The program generated 16,698,313 kWh in ex ante gross savings.

The following presents a selection of key conclusions from the second year of program operations:

[34] This number does not include the participants added to the program on December 2013. Ex ante savings were calculated off of 79,700 participants.

- **Opt-Out Rate remains low:** As was the case in 2012, the number of opt-outs in the program remained low during 2013. In comparison to participants who did not opt-out of the program, opt-outs were more likely to report that the report was less useful for understanding home energy use, ways to reduce energy consumption, and that the web tool was useful. The Reasons given by opt-outs for discontinuing their participation included that the reports were not helping them save energy, that the energy comparisons were inaccurate, and that they did not have time to receive the reports.
- **Participants generally satisfied with the program:** Fifty-five percent of participants in the program noted that they were very satisfied or somewhat satisfied with the program. A relatively large share of participants (35%) reported not being satisfied or dissatisfied with the program. The share of satisfied customers is lower than typically seen in energy efficiency programs. Although they may opt-out of participation, customers do not voluntarily sign up for the program. This non-voluntary aspect may account for relatively large customers reporting a neutral opinion of the program overall. It is important to note that few participants reported dissatisfaction. Not surprisingly, satisfaction was lower among program opt-outs.
- **Participants found the information to be useful:** The majority of participants found the information on home energy use and ways to reduce it to be useful. Additionally, most participants who accessed the web tool found it useful for identifying ways to reduce energy use.
- **Template change issue:** On three occasions, reporting was distributed based on templates that were not consistent with the templates approved by I&M. OPower reported that they have implemented changes to their processes to ensure that this does not occur in the future.

The evaluation team currently has the following recommendations for program improvement consideration.

- **Consider adjusting ex ante savings estimations based on the results of this evaluation.** Specifically, ADM recommends the per participant savings estimates shown in Table 4-8 for future program years. For planning purposes these values are reasonable for at least the following program year.

4.3.4 Program Theory and Activities

The Home Energy Reporting program is designed to reduce energy consumption by providing information and recommendations to customers, thereby encouraging them to implement energy saving equipment and adopt energy saving behaviors. Customers who receive the reports in the mail are informed of their current energy use and how it compares to similar households in the area. Additionally, the participants have the option of accessing a web based tool that provides additional information on their energy consumption and additional recommendation to lower energy usage. Participating customers are also referred to I&M’s other residential incentive programs by links provided on the web based tool and mailed reports.

The key program activities for the Home Energy Savings program are:

- Developing program infrastructure;
- Selecting customers to send reports to;
- Customers receiving the reports; and
- Customers implementing recommendation provided in the reports and/or web based tool.

The Home Energy Savings program is administered by OPower which assigns a program coordinator to administer the program. The audit program uses software published by OPower, a firm that develops reports specific to a participants home energy consumption.

To date, the program has not been marketed. Program enrollments are summarized in Table 4-9. At the end of 2013, 79,700 randomly selected customers were enrolled in the program. These enrollments were the result of the addition of two cohorts of participants, one in July 2012 and one in October 2013, and customers opting out of the program or address changes in 2012 and 2013. Program participants receive reports in the mail bi-monthly. However, 5,000 customers from the July 2012 cohort were selected as a persistence group. This group no longer receives the reporting and will be evaluated to determine if the savings persist. The primary program activity is the customer's completion of the recommendations provided to them via the mailed reports or the web based tool.

Table 4-9 Home Energy Reporting Enrollments

Customers Entering Program	*Number of Customers*
July 2012 Cohort	50,500
October 2013 Cohort	37,550
Customers Leaving Program	
2012 Opt Outs	90
2012 Address Change	2,423
2013 Opt Outs	291
2013 Address Change	5,546
Total Remaining Participants at End of 2013	79,700

4.3.5 Participant Survey Findings

The following section presents key findings from surveys conducted with customers who participated in I&M's 2013 Home Energy Reporting program and those who opted out of the program.

ADM conducted telephone surveys with program participants and opt-outs as part of the evaluation effort for the 2013 Home Energy Reporting program. This survey was designed to gather information regarding the participant and opt-out perspective on program operations and delivery, as well as to characterize specific energy efficiency measures and behaviors resulting from customer participation in the recommendation process. Data collected via participant and opt-out surveying are used in evaluating:

- Awareness of the program;
- Implementation of energy efficient measures and behaviors;

- Decision making behaviors after taking part in the program; and
- Satisfaction with the program.

In total, 401 customer participants who had received reports in the mail through the program and 61 individuals who opted out of the program responded to the survey.

4.3.5.1 Customer Feedback on Usefulness of Reports Received Through Program

In order to characterize the potential energy savings impacts of the program, participant and opt-out survey respondents were asked how useful the reports received in the mail were for helping them understand the amount of energy used. As shown in Figure 4-1, the majority of the participant respondents reported that they found the reports sent “very useful” to “slightly useful”. However, when considering the opt-outs, over half of the respondents noted that they found the reports “not useful”.

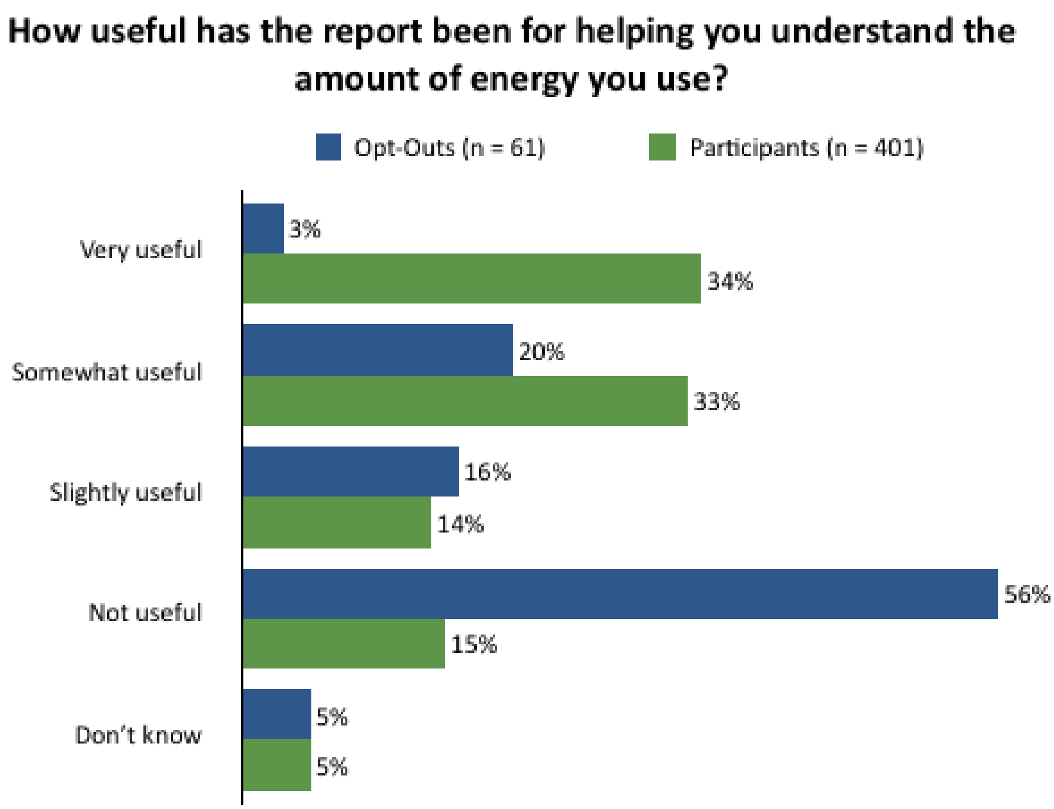


Figure 4-1 Usefulness of Report for Understanding Energy Use

Those who reported that the report was “not useful” stated several reasons for their response. Examples of commentary provided by survey respondents included:

> *“It was generally common sense…what we could do on our own.”*

"The information is not useful because my home is fully insulated and energy efficient."

"The base numbers do not make sense."

Participants were also asked how useful the report was in helping them understand how to reduce their energy consumption. As shown in Figure 4-2, the majority of participant respondents reported that they found the reports sent "very useful" to "slightly useful". Once again, approximately half of the opt-outs stated that the report was "not useful".

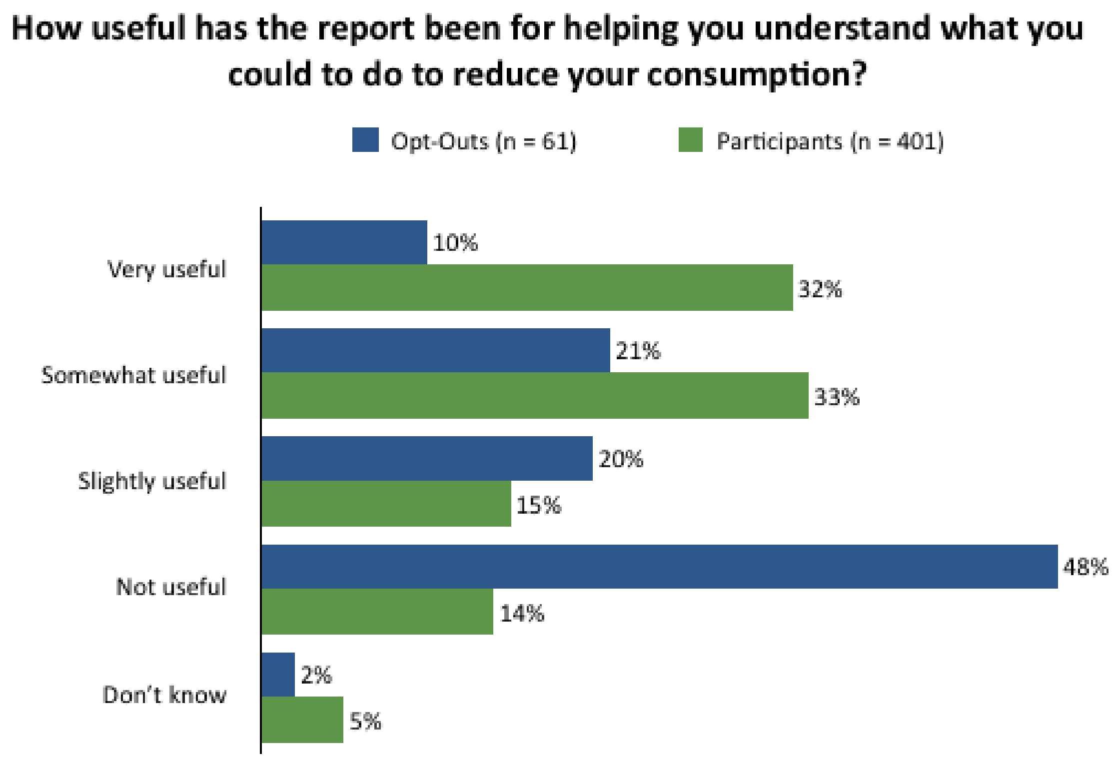


Figure 4-2 Usefulness of Report for Understanding Energy Consumption

4.3.5.2 Customer Feedback on Usefulness of Web Based Tool Accessible Through Program

A total of 1175 participants accessed the web-based tool during the 2013 program year. In order to characterize the energy savings impacts of the web based tool portion of the program, participant survey respondents were asked whether they had implemented any of the recommendations provided within the web-based tool. When considering the participant respondents, out of the 401 respondents, only 7% (30) had accessed the web-based tool. When considering the opt-outs, out of 61 respondents, approximately 18% (11) percent had accessed the web-based tool. These participants indicated how useful they found the information on the web tool for identifying ways to reduce their home energy use. As shown in Figure 4-3, half of the participants that used the web tool found it to be "very useful". Approximately half of the opt-outs who used the web tool found it to be "slightly useful".

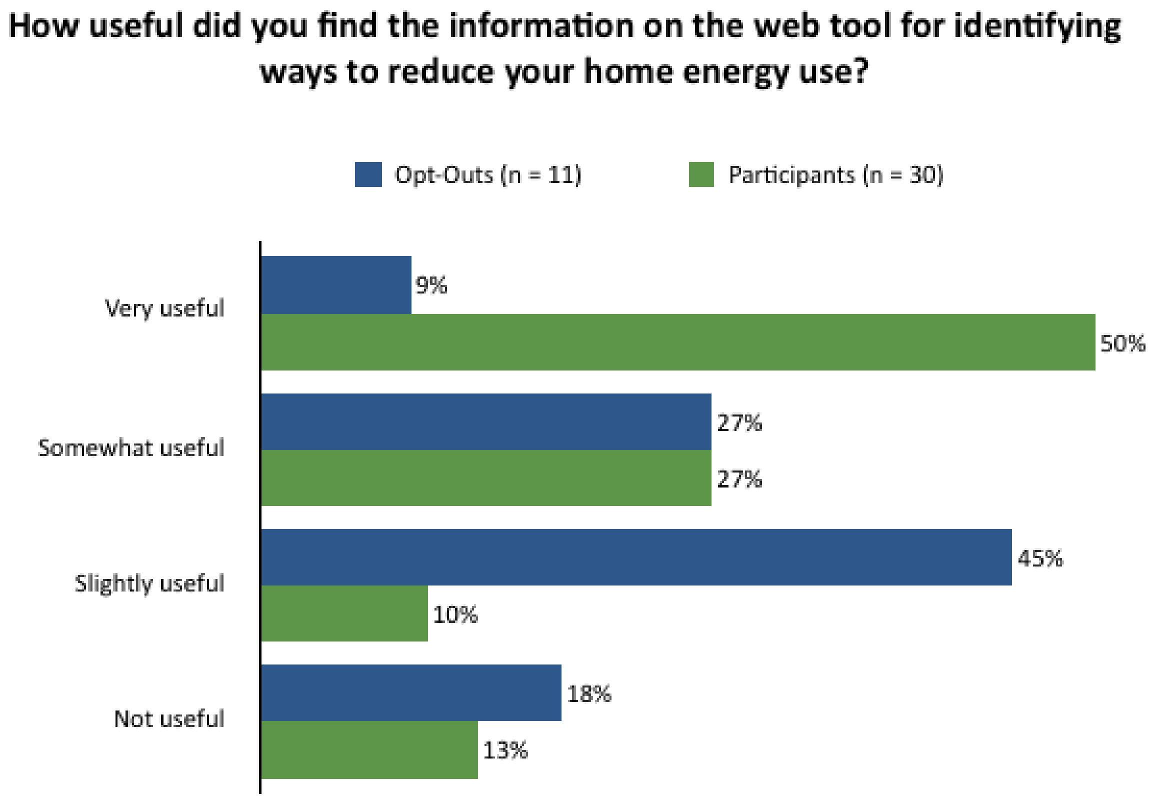


Figure 4-3 Usefulness of Web Tool

Respondents who reported that they did not find the tool useful were asked to elaborate on why they provided this response. The following commentary highlights examples of their responses:

> *"We already have an energy efficient home."*
>
> *"I tried to explain and got nowhere!"*
>
> *"I did not have anything I wanted to do at the time."*

Participants and opt-out respondents who did not utilize the web-based tool were asked why they did not use the tool. Table 4-10 categorizes the responses given by these survey respondents.

Table 4-10 Reasons for Not Accessing Web Based Tool

Reasons for not accessing web based tool	*Opt-Outs (n=50)*	*Participants (n=369)*
Was not aware of the tool	18%	33%
Not interested in saving energy right now	6%	3%
Did not know how to access the tool	2%	3%
Did not know how to use the tool	0%	1%
Did not think the tool would provide useful information	16%	6%
Did not have the time to use the tool	18%	25%
Other	38%	26%
Don't know	2%	3%

Of the 7% (30) of participant respondents who accessed the web based tool, 27% had implemented some type of measures that were included in the structural, appliance, or lifestyle recommendations listed on the web based tool. Of the 18% (11) of opt-out respondents who accessed the web based tool, 18% had implemented some of the recommendations. Examples of measures implemented by web based survey respondents are listed below.

- Windows;
- Insulation;
- Appliances;
- Doors; and
- Water heaters.

4.3.5.3 Participant Energy Efficiency Decision Making Prior To Participating In the Program

The survey instrument included multiple questions designed to gather information related to customer behavior prior to participating in the program. Participants were asked whether they had installed any energy efficient equipment prior to participating in the Home Energy Reporting program. Of the participant respondents, 59% reported having previously installed energy efficient equipment. Of the opt-outs, 75% reported having previously installed such equipment. These participants were asked to provide details regarding the specific equipment they had previously purchased. The types of energy efficient equipment that the respondents had previously installed included: CFL/LED lighting, windows, large appliances, insulation, water heaters, furnaces, and air conditioning units.

Respondents were then asked whether they had applied for financial incentives for the energy efficient equipment they had purchased prior to participating in the Home Energy Reporting program. Of the participants who installed energy efficient measures, 18% (236) applied for and received financial incentives for those previous measures. Of the opt-outs who installed energy efficient measures, 20% (46) applied for and received financial incentives.

Participants and opt-outs who had not applied for financial incentives for previously installed energy efficient measures were asked why they had not applied. Figure 4-4 displays their responses. The majority of both the participants and the opt-outs did not know about financial incentives. Approximately 42% of the opt-outs were unaware of financial incentives while 49% of participants were unaware. A larger portion of opt outs (17%) noted that they did not know whether their measures qualified for financial incentives whereas only 8% of participants cited this reason.

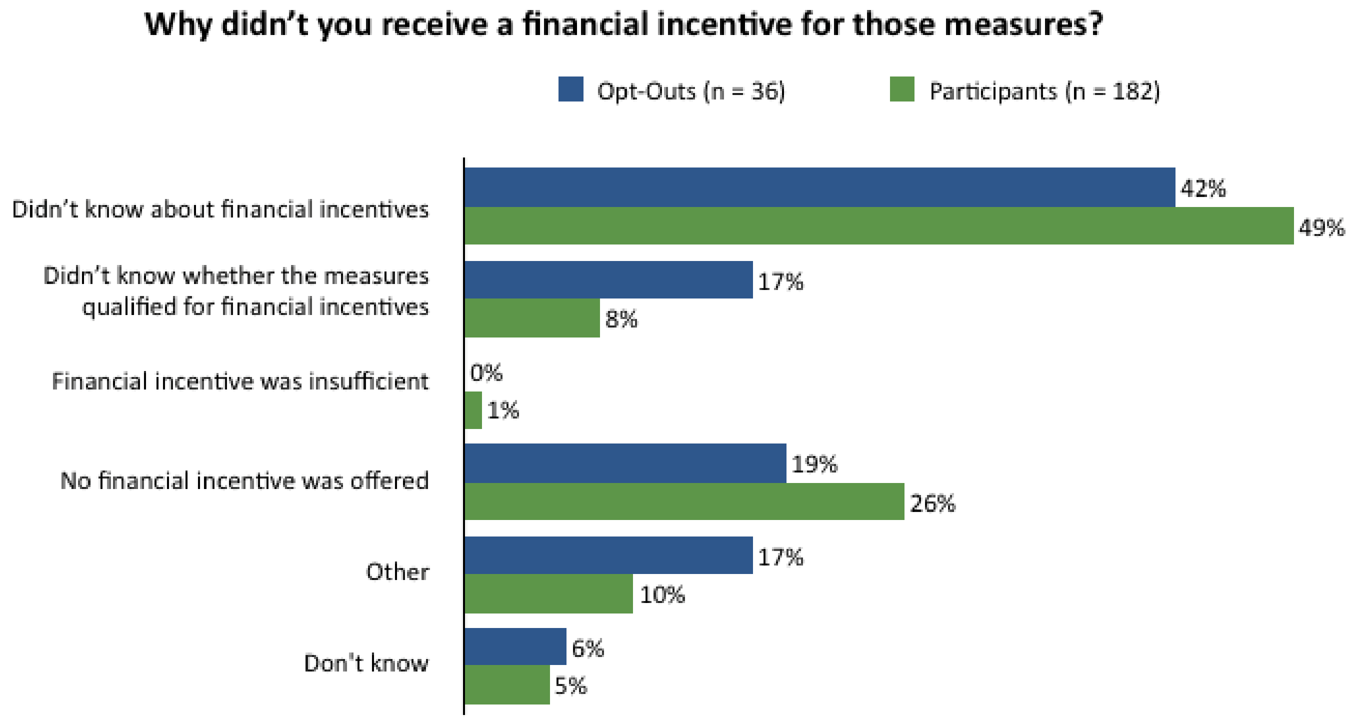


Figure 4-4 Reasons for Not Applying for Financial Incentives

4.3.5.4 Customer Satisfaction

Participants and opt-outs were asked about their levels of satisfaction with selected elements of the Home Energy Reporting program experience. Results were provided on a scale of 1 to 5, with 1 representing "very dissatisfied" and 5 representing "very satisfied". As displayed in Table 4-11 participants generally reported moderate to high satisfaction levels with all of the program elements.

Table 4-11 Customer Satisfaction with Selected Program Elements

	Satisfaction Rating					
Element of program Experience	*Very satisfied*	*Somewhat satisfied*	*Neutral*	*Somewhat dissatisfied*	*Very dissatisfied*	*n*
Savings on your monthly bill (if recommendations implemented)						
Participants	19%	21%	44%	2%	7%	197
Opt Outs	8%	4%	68%	4%	12%	25
Performance of installed equipment (if any recommendations implemented)						
Participants	41%	25%	21%	1%	2%	197
Opt Outs	44%	32%	16%	0%	0%	25
Information provided by I&M through the web based tool (web tool registered participants only)						
Participants	40%	43%	10%	0%	7%	30
Opt Outs	9%	27%	45%	9%	9%	11
Information provided by I&M through the reports sent in the mail						
Participants	36%	24%	33%	2%	2%	401
Opt Outs	7%	16%	38%	10%	28%	61
Overall program satisfaction						
Participants	29%	26%	35%	3%	3%	401
Opt Outs	7%	15%	36%	18%	21%	61

Satisfaction with the performance of installed equipment was consistent across both participants and opt outs. Many respondents, both participants and opt outs, were at least somewhat satisfied with this aspect of the program.

Opt outs were more likely to be somewhat dissatisfied or very dissatisfied with elements such as savings on monthly bills, information provided by I&M through the web based tool, information provided through the reports in the mail, and the overall program. Participants, however, found the information provided much more useful. Participants were more satisfied with information provided by I&M through the web based tool and information provided through the reports in the mail. Participants had higher levels of overall program satisfaction than opt outs.

Some survey respondents provided strong praise for the Home Energy Reporting program, mentioning that they were very happy to have the opportunity to participate. Such commentary included:

> *"I appreciate the program and hope it continues."*

“I think it is very good education. Thank you!”

“I think that the home energy reports program is informative about saving energy.”

These results suggest that participants have continued to be moderately to highly satisfied with their program experiences. There were few instances of negative issues expressed by survey respondents, which indicates that the majority of participants valued their program experience.

Opt-outs were also asked why they chose to no longer participate in the program. These findings shed light on why individuals choose to opt out of the program. Some opt-outs felt that the reports were inaccurate and did not accurately reflect the amount of energy they had used. Others felt that the reports were useless because they were already engaging in energy-saving behaviors and purchasing energy efficient equipment. Some noted more generally that the reports were not helping them to save money. Other reasons for opting out of the program included: no time to read the report and implement the measures, the intrusiveness of the reports, not understanding the report, and getting too much mail.

4.3.6 Program Operations Perspective

This section summarizes the core findings from interviews conducted with I&M program staff for the purposes of developing market environment and internal program management perspectives.

Interviews were conducted with program staff to gain insight into program operation and overall market trends. The interviews were designed to center on topics related to experiences with the programs and with other groups involved in managing or promoting the program. Most of the interview questions focused on any changes that may have been made to the program in the prior year. The interview focused on program management activities, the overall effectiveness of the program process, and the identification of areas for future program improvement.

Respondents shared their perspectives on the program launch and how it has taken shape during its first year of implementation. Interview questions related to the respondents’ individual roles in administering the programs and their perceptions of overall program strengths, weaknesses, and opportunities.

4.3.6.1 Summary of Interview Findings

Key program features and trends addressed by respondents include:

- **Program underwent two major expansions:** There were two expansions of the program during 2013. These expansions added to the initial group of 44,596 remaining participants who began receiving reports in July 2012. The first expansion, which occurred in October 2013, added an additional 37,550 participants with 35,104 remaining at year end. A second expansion occurred in December 2013 and January 2014. However, these participants were not included in the counts of program participants for the program year because they were added at the very end of 2013 and beginning of 2014. By the end of 2013, not including those from the second expansion, there were 79,700 program participants.

- **Communication between I&M and OPower sufficient:** I&M and OPower discuss the program operations by telephone on a weekly basis. Additionally, I&M's OPower contact meets with utility staff in person once a quarter. These formal meetings are supplemented with regular email exchanges to discuss issues and address any potential questions. Both staff from I&M and OPower felt that was ample communication between the two organizations. In addition, they felt that the interactions were adequately meeting their needed objectives.
- **Templates changed to qualify for lower postage rate:** The United States Postal Service informed OPower the postage cost of the reports would increase because the contents of the report were largely informational and consequently the reporting did not qualify for the discount advertising rate. To re-qualify for the advertising rate, changes to the language in the report template were made. These changes included reducing the extensive of the writing in them and increasing the emphasis on energy saving products. With these changes the, reports re-qualified for the lower advertising postage rate.
- **Errors made in reporting template:** On three occasions OPower made an error on the templates used for the reports sent to the customers. The errors included using incorrect language in the template and referring to an incorrect URL address. These errors occurred when the final templates that I&M staff signed up on did not get utilized to print the reports sent to customers. To prevent these errors from occurring again, OPower reported adding process and technical changes to their procedures for implementing approved report templates. These changes include the implementation of additional quality assurance reviews and impact all of their operations for the home energy reports that they send to customers of their utility clients.
- **Low opt-out rate and few customer problems:** As in previous years, the opt-out rate from the participants added to the program was less than OPower typically sees in its delivery of the program in other service territory. In previous years, the opt-out rate for the program has been approximately 1%. By the end of 2012, there were only 90 opt-outs. Through the end of 2013 there were only 291 opt-outs. The overall opt-out rate for the program at the end of 2013 was less than 1%.

  Program staff reported that a few customers do call the customer service center about the reporting noting concerns such as their belief that the report is inaccurate in the comparisons it is making of their energy use to other customers. However, most of these customers also state that they would like to continue with the program rather than choosing to opt-out. Customers also contact the call center because they are glad to receive the reporting.
- **Group of initial participants selected for persistence study:** During the 2013 program year, a persistence group was added to the program. The goal of the inclusion of the persistence group is to determine if savings persist in this subsample once participants stopped receiving reports.

5. Residential Online Energy Check-Up Program

This chapter addresses the methodologies and impact findings of gross and net kWh savings and peak kW reductions resulting from the Residential Online Energy Check-Up Program during the period January 2013 through December 2013.

5.1 Program Specific M&V Methodologies

The M&V approach for the Online Energy Check-Up program (OECUP) is aimed at determining the following:

- Numbers of kits distributed;
- Percent of kit components installed;
- Average annual kWh savings and kW reduction per kit measure;
- % of participants who completed recommended measures;
- Average annual kWh savings and kW reduction for recommended measures;
- % of homes with electric water heating;
- Providing estimates of net-to-gross savings and free-ridership; and
- Estimating cost effectiveness of the OECUP in 2013.

Table 5-1 below summarizes the inputs needed for gross savings calculations and the source of each input.

Table 5-1 Sources for Gross Impact Parameters – Online Energy Check-Up Program Data

Parameter	*Source*
Number of Participants	Program Tracking Data
Installation Rates of Kit Measures	Survey data
Recommended Measures Completed	Survey data/ Billing Analysis
% of Homes with Electric Water Heating	Program Tracking Data/Survey Data
Hours of Use	Data from the Indiana TRM[35]

5.1.1 Verification of Kit Measures Installed

A first aspect of conducting measurements of program activity is to verify the number of kit measures received and installed. ADM takes several steps in verification effort, which is consisted of the following:

- Validating program tracking data provided by Apogee by checking for duplicate or erroneous entries;
- Verifying that gas and electric kits were sent to the appropriate participants and according to the agreed-upon process by I&M; and
- Conducting verification surveys with a statistically valid sample of program participants. The focus of these verification surveys was to verify that customers listed in the program tracking database did indeed participate and the total number of measures in the kit were received. Additionally, survey respondents were asked a series of questions to verify that the kit measures were installed and if they are still in use.

5.1.2 Calculating Gross Annual kWh/kW Savings per Kit Measure

The Online Energy Check-Up program identifies energy saving opportunities through a web-based self-service assessment tool where customers answer basic questions about their homes and how they use energy within it. Upon completion of the questions online, the OECUP generates a printable report that includes:

- Useful details about customer home’s energy consumption;
- Customized energy-saving recommendations;
- Potential savings from making the suggested improvement; and
- Environmental impact of implementing suggested improvements.

[35] http://www.in.gov/iurc/files/42693_1order_081512.pdf

In addition, the customer is mailed a kit of energy efficient measures dependent on their water heating type.

5.1.2.1 Analysis of Kit Measures Savings

ADM reviewed the 2012 Indiana TRM to calculate kit measures distributed through the OECUP in 2013. ADM's deemed review is broken down between the following seven measure categories:

- 13W/20W/23W CFLs;
- LED night lights;
- Low Flow Showerhead;
- Refrigerator/Freezer Thermometer;
- Water heater Thermometer;
- Bath aerator;
- Kitchen faucet aerator; and
- 10W LED bulb[36].

A. Deemed Savings Review - CFLs

The program distributes both Gas and Electric kits containing a mix of CFLs. The available sets include:

- Electric: (1) 13W, (2) 20W, and (1) 23W CFLs;
- Gas: (1) 13W, (2) 20W, and (1) 23W CFLs

Annual savings for an individual CFL are calculated as:

Annual kWh Savings (CFLs) = (CFL Watts × Hours of use per day × Hrs per Yr/1000) × WHF_d × % Installed × #Kits

Where,

CFL Watts = Wattage of CFLs provided in the kit

Hours of use per day = Delta Watts Multiplier from Ohio TRM for 13W, 20W, and 23W light bulbs

Hours per Year = A function of room-type and whether the resident lives in single or multi-family housing

[36] LED bulbs were added to kits in mid November. Participants who signed up for the program starting in mid October received kits with LED bulbs.

WHF_d = Waste Heat Factor for Energy to account for cooling savings from efficient lighting

Peak kW Reductions (CFLs) = {(CFL Watts × Hours of use per day ×

× CF)/ 1000} × WHF_d × % Installed × #Kits

Where;

CFL Watts = Wattage of CFLs provided in the kit

Hours of use per day = Delta Watts Multiplier from Indiana TRM for 13W, 20W, and 23W light bulbs

WHF_d = Waste Heat Factor for Demand to account for cooling savings from lighting

CF = Peak Coincidence Factor for measure

B. Deemed Savings Review – Low Flow Showerheads

The program's Electric kit contains two low flow showerheads. Annual savings for low flow showerheads are calculated as:

Annual kWh Savings (Low Flow Showerheads) = (2.80-GPMlow) × min/day × #people × shower/per × 8.3 × (Tshower-Tmains) × days in year/DHW Recovery Efficiency/3412 × % Installed × # Electric Kits × 2

Where,

2.80 = The baseline is a standard showerhead using 2.80 GPM

GPMlow = GPM of the showerhead provided in the kit

people = Average number of people per household

Shower/per = Average showers/ per day

Days in year = Days shower used per year

Min/day = Average minutes per shower

8.3 = Constant to convert gallons to lbs

Tshower = Assumed temperature of water used for shower (105)

Tmains = Assumed temperature of water entering house

2 = Two low flow showerheads are included in the kit

Peak kW Reductions (Low Flow Showerheads) =
(2.80-GPMlow) × 60 × 8.3 × (Tshower-Tmains)/ DHW Recovery Efficiency/3412 × CF × 2

Where,

2.80= The baseline is a standard showerhead using 2.80 GPM

GPMlow = GPM of the showerhead provided in the kit

8.3 = Constant to convert gallons to lbs

Tshower = Assumed temperature of water used for shower (105)

Tmains = Assumed temperature of water entering house

CF = Peak coincidence factor for measure

2 = Two low flow showerheads are included in the kit

C. Deemed Savings Review – LED night lights

The program's Gas kit contains two LED nightlights. Annual savings for an individual LED nightlight are calculated as:

Annual kWh Savings (LEDs) = (Incandescent Watts – LED Watts)/1000 × Hours/yr × % Installed × # Gas Kits × 2

Where,

Incandescent Watts = Wattage of an equivalent baseline LED

LED Watts = Wattage of LED provided in the kit

Hours/yr = A function of room-type and whether the resident lives in single or multi-family housing

2 = Two LED night lights are included in the kit

D. Deemed Savings Review – Refrigerator/Freezer Thermometer

The program's Online Energy Check-Up Gas and Electric kits contains one refrigerator/freezer thermometer. The thermometer is to be placed in the participant's refrigerator and freezer to check the temperature. The reference manual suggests an energy efficient temperature that the refrigerator/freezer should be set to which allows for energy savings. In the 2012 evaluation, the program implementer assigned 0 kWh savings for the measure.

E. Deemed Savings Review – Water Heater Thermometer

The Electric kit contains one water heater thermometer. The thermometer is to be placed in sink water to determine its temperature. The reference manual suggests an energy efficient temperature that the water heater should be set to which allows for energy savings. In the 2012 evaluation, the program implementer assigned 0 kWh savings for the measure.

F. Deemed Savings Review – Faucet Aerators

The program's electric kit contains two faucet aerators. Annual savings for faucet aerators are calculated as:

Annual kWh Savings (Faucet Aerator) = (2.4-GPMlow) × min/day × DR × 8.3 × (Tft-Tmains) × 365/ DHW Recovery Efficiency/ 3412 × # Electric Kits × 2 × % Installed

Where,

2.4 = Gallons per minute of baseline faucet

GPMlow = Gallons per minute of low flow faucet

min/day = Average minutes per day used by each faucet in home

days/y = Days faucet used per year

DR = Percentage of water flowing down drain (if water is collected in a sink, a faucet aerator will not result in any saved water)

8.3 = Constant to convert gallons to lbs

Tft = Assumed temperature of water used by faucet

Tmains = Assumed temperature of water entering house

2 = Two faucet aerators are included in the kit

Peak kW Reduction (Faucet Aerator) = (2.4-GPMlow) × 60 × DR × 8.3 × (Tft-Tmains) / DHW Recovery Efficiency/ 3412 × CF × # Electric Kits × 2 × % Installed

Where,

2.4 = Gallons per minute of baseline faucet

GPMlow = Gallons per minute of low flow faucet

DR = Percentage of water flowing down drain (if water is collected in

8.3 = Constant to convert gallons to lbs

Tft = Assumed temperature of water used by faucet

Tmains = Assumed temperature of water entering house

CF = Peak Coincidence Factor for measure

2 = Two faucet aerators are included in the kit

G. Deemed Savings Review – Kitchen Aerator

The program's electric kit contains one kitchen aerator. Annual savings for a kitchen aerator are calculated as:

Annual kWh Savings (Kitchen Aerator) = (2.4-GPMlow) × min/day × DR × 8.3 × (Tft-Tmains) 365/ DHW Recovery Efficiency/ 3412 # Electric Kits % Installed

Where,

2.4 = Gallons per minute of baseline faucet

GPMlow = Gallons Per minute of low flow faucet

min/day = Average minutes per day used by each faucet in home

days/y = Days faucet used per year

DR = Percentage of water flowing down drain (if water is collected in a sink, a faucet aerator will not result in any saved water)

8.3 = Constant to convert gallons to lbs

Tft = Assumed temperature of water used by faucet

Tmains = Assumed temperature of water entering house

Peak kW Reduction (Faucet Aerator) = (2.4-GPMlow) × 60 × DR × 8.3 × (Tft-Tmains) / DHW Recovery Efficiency/ 3412 × CF × # Electric Kits × % Installed

Where,

2.4 = Gallons per minute of baseline faucet

GPMlow = Gallons per minute of low flow faucet

DR = Percentage of water flowing down drain (if water is collected in

8.3 = Constant to convert gallons to lbs

Tft = Assumed temperature of water used by faucet

Tmains = Assumed temperature of water entering house

CF = Peak Coincidence Factor for measure

H. **Deemed Savings Review – LED bulb**

The program began distributing both Gas and Electric kits containing one LED bulb. The available sets include:

- Electric: (1) 10 W LED bulb
- Gas: (1) 10 W LED bulb

Annual savings for an individual LED are calculated as:

Annual kWh Savings (LED) = ((Watt base - LED Watts)/1000) $\times$ Hours per year $\times$ (1+ WHF_d) % Installed #Kits

Where,

Watt base = Baseline lamp watts

LED Watts = Wattage of LED provided in the kit

Hours per Year = A function of room-type and whether the resident lives in single or multi-family housing

WHF_d = Waste Heat Factor for Energy to account for cooling savings from efficient lighting

Peak kW Reductions (LEDs) = ((Watt base - LED Watts)/1000) $\times$ (1+ WHF_d) $\times$ CF $\times$ % Installed $\times$ #Kits

Where;

Watt base = Baseline lamp watts

LED Watts = Wattage of LED provided in the kit

WHF_d = Waste Heat Factor for Demand to account for cooling savings from lighting

CF = Peak Coincidence Factor for measure

I. **Structural/Appliance and Lifestyle Recommendations**

The scope of the OECUP printable report includes recommendations for lifestyle, structural, and appliance changes. In order to determine the kWh and kW savings attributable to these recommendations, ADM conducted a regression analysis using a census of program participant data without non-participant data. The billing data includes two years of monthly observations for each customer. Data screening procedures include:

- Removing duplicate records;
- Removing customers with incomplete (less than two years of data) billing records; and
- Screening for outliers (customers who average monthly usage is below the 1st percentile and above the 99th percentile).

The regression model will be run with a log-linear specification, so that the output from the model can be applied as a percentage savings. This percentage will then be applied separately to electric water heated homes, and gas water heated homes to arrive at an annualized kWh savings number. This procedure is detailed further in the program's impact section.

5.1.3 Calculating Net Energy (kWh) and Peak Demand (kW) impacts

To calculate net kWh savings the non-participant data was included in the regression model. The inclusion of a control group to the regression analysis makes it such that a free rider would be equally likely to be in either group. Thus the resulting kWh savings from that model are net savings. ADM utilized all program participants who completed the audit before 6/1/2013, along with a ***propensity matched sample*** of residential non-participants. Data screening procedures include:

- Removing duplicate records;
- Removing customers with incomplete (less than two years of data) billing records; and
- Control group sub-sampling to ensure the kWh usage levels are equivalent for both groups.

The effect of the OECUP is assumed to be a constant and additive (e.g. “on average, program participation is associated a reduction in 20 kWh per monthly bill”) and appears in the regression model as a parameter that is interpreted as “daily change in kWh during the post-audit period”.

Peak demand savings were calculated for the kit components and recommendations portion separately. The behavioral and structural recommendations were assumed to have a flat (i.e. 1/8760) load shape.

5.2 Impact Results

ADM estimated ex post gross electric savings and peak demand reductions through detailed analysis of program tracking data and regression analysis. The estimated gross impacts resulting from the PY4 Online Energy Check-Up program are summarized in Table 5-2. Table 5-3 and Table 5-4 show the audited and verified savings.

Table 5-2 Gross Impact Summary[37]

Program	*PY4 Program Goals (kWh)*	*Peak Demand Savings (kW)*		*Annual Energy Savings, (kWh)*		*Realization Rate*
		Ex Ante	*Ex Post*	*Ex Ante*	*Ex Post*	
Online Energy Check-Up	11,481,000	-	986	12,257,878	10,341,216	84%

Table 5-3 Gross Impact kWh

Ex Ante Gross kWh Savings	*Gross Audited kWh Savings*	*Gross Verified kWh Savings*	*Ex Post Gross kWh Savings*	*Realization Rate*
12,257,878	12,257,878	12,279,596	10,341,216	84%

Table 5-4 Gross Impact kW

Ex Ante Peak kW Savings	*Audited Peak kW Savings*	*Verified Peak kW Savings*	*Ex Post Peak kW Savings*
-	-	-	986

In addition to gross savings, ADM estimated associated net-to-gross ratios (NTGRs) for the program from the participant survey. Applying the estimated NTGR of 85% to the gross savings reported in Table 5-2 results in the net savings detailed in Table 5-5 below.

Table 5-5 Net Impact Summary

Program	*PY4 Program Goals (kWh)*	*Net Peak Demand Savings (kW)*		*Net Annual Energy Savings, (kWh)*		*Realization Rate*
		Ex Ante	*Ex Post*	*Ex Ante*	*Ex Post*	
Online Energy Check-Up	9,758,850	-	780	10,419,196	8,789,969	84%

The calculations leading to these results are detailed in the sub-sections to follow.

5.2.1 Gross Annual kWh and Peak kW Reduction Savings

Net annual kWh savings were calculated as described in chapter three of this report. Net savings estimates for the Online Energy Check-Up program require the following parameters:

- The energy savings for the kit elements that were installed;
- The number and types of kits mailed to customers;

[37] Note – The totals in the various tables throughout the Online Energy Check-Up program section may not correspond exactly to the summation of individual values listed due to rounding.

- The energy savings for the lifestyle, structural and appliance recommendations suggested by the generated report;
- Number of homes that have electric water heating; and
- Installation rates for the various kit elements.

5.2.1.1 Number of Kits Mailed

The total number and type of kits mailed and installed at participant homes in the 2013 program year is determined by (1) reviewing the program tracking system and related documentation from I&M and (2) administering a telephone survey with program participants. Specifically, the tracking system is checked to assure that: (1) duplicate shipments to the same account number do not exist (2) the ex-ante kWh savings are reasonable and (3) that appropriate kits types are sent to customers. The energy efficiency kits are mailed to Indiana addresses on record for those ratepayers who complete the online energy audit questionnaire. ADM found no duplicates of shipments.

ADM administered a telephone survey to 424 program participants who received one of the four types of energy savings kits distributed through the program. Specifically, the number of respondents who received each of the types of kits is as follows:

- 100 who received an electric kit with an LED bulb;
- 105 who received a gas kit with an LED bulb;
- 99 who received an electric kit without an LED Bulb; and
- 120 who received a regular gas kit without an LED bulb.

All 424 survey respondents verified that they had participated in the program during 2013. Survey respondents also indicated that the measures received in their kits were identical to what was claimed in I&M's tracking database. Based on these results, the verification rate for kits sent is shown in Table 5-6.

Table 5-6: Sent Kits Verification Rates

Program	*Verification %*
	Kits Sent
Online Energy Check-Up	100%

Next ADM compared kits sent to participants' versus information in the tracking system regarding the participant's water heater type. All participants received the correct kit with the information provided as to their water heating type in the tracking system.

ADM confirmed that the program mailed 22,169 kits (15,042 gas kits and 7,127 electric kits). Table 5-7 reports the numbers of kits and types of kits that were verified as being sent to program eligible participants during PY4.

Table 5-7 Kits Verified Sent to Program Eligible Participants

Program	*Quantity of Kits Sent to Customers and Returned*	*Quantity of Kits Sent to Customers & Used*	*# of Electric Kits Sent & Used*	*# of Gas Kits Sent & Used*
Online Energy Check-Up	0	22,169	7,127 (3,483 with LEDs)	15,042 (6,780 with LEDs)

Measures included in electric and gas kits are provided once again below for reference.

Energy Efficient Kit for Gas Participants:

- 13W CFL (1);
- 20W CFL (2);
- 23W (CFL) (1);
- LED nightlight w/ photocell (2);
- Refrigerator/Freezer thermometer (1); and
- 10W LED bulb (1).

Energy Efficient Kit for Electric Participants:

- 13W CFL (1);
- 20W CFL (2);
- 23W (CFL) (1);
- Low Flow showerheads (2);
- Bathroom aerators (2);
- Kitchen aerator (1);
- Refrigerator/Freezer thermometer (1);
- Hot water temperature card (1); and
- 10 W LED bulb (1).

5.2.1.2 Installation Rate

Savings claims were further verified through the telephone survey effort by focusing on the installation rates of measures provided in the energy efficiency kit and if any recommendations listed in the audit had been implemented by the participant. Due to providing the most cost-effective evaluation, on-site inspections at participant homes were not performed. If the installation rates of kit measures had been determined by on-site data collection alone, it is reasonable to assume they may have been overstated, as customers may be inclined to install additional items upon scheduling the on-site visit. Though the program consists of direct install by the participant, the telephone survey recognizes that some of the items may have been uninstalled or perhaps never installed by participating home owners. The installation rates determined through the telephone survey were applied to each kit measure to determine verified savings.

5.2.1.3 Energy Savings

The items that were sent via mail to participant homes included a variable quantity of energy efficiency kit items to be determined or judged as appropriate by the participant. All of the energy efficiency measures distributed in the program have energy savings protocols that are part of the 2012 Indiana TRM. Energy savings for the program are determined by (1) counting the number of each item installed by each participant and (2) counting the number of participants who implemented lifestyle, structural, and appliance recommendations. The calculations for each kit measure and recommendations given are shown below.

A .Deemed Savings Calculations - CFLs

The program distributes both Gas and Electric kits containing a mix of CFLs. The available sets include:

- Electric: (1) 13W, (2) 20W, and (1) 23W CFLs;
- Gas: (1) 13W, (2) 20W, and (1) 23W CFLs

Annual savings for an individual CFL are calculated as:

- Annual kWh Savings (13W CFL) = (13 × 3.25 × 1,040/1000) × 0.941 × 80/76% × 22,169
- Annual kWh Savings (20W CFL) = (20 × 3.25 × 1,040/1000) × 0.941 × 72/70% × 22,169 × 2
- Annual kWh Savings (23W CFL) = (23 × 2.06 × 1,040/1000) × 0.941 × 70/66% × 22,169

Where,

(13/20/23) CFL Watts = Wattage of CFLs provided in the kit

3.25 = Delta Watts Multiplier from Ohio TRM for 13W and 20W light bulbs

2.06 = Delta Watts Multiplier from Ohio TRM for 23W light bulb

1,040 = Hours/yr; A function of room-type and whether the resident lives in single or multi-family housing (based on 2.85 hrs per day)

0.941 = Waste Heat Factor for Energy to account for cooling savings from efficient lighting

80%/72%/70%[38] = % of CFLs Installed from Electric kits according to survey (13/20/23W)

76%/70%/66%[39] = % of CFLs Installed from Gas kits according to survey (13/20/23W)

22,169= # of kits

Based on this analysis, kWh savings attributable to the CFLs measure in 2013 are 1,252,884 for Electric customers and 2,531,117 for Gas customers.

Peak demand reductions (kW) for the CFL measures are calculated as follows:

- Peak kW Reductions (13W CFLs) = [(13 × 3.25 × 1.057 × 0.11 × 80/76%)/ 1000]× WHF_d × 22,169
- Peak kW Reductions (20W CFLs) = [(20 × 3.25 × 1.057× 0.11 × 72/70%)/ 1000]× 2 × WHF_d × 22,169
- Peak kW Reductions (23W CFLs) = [(23 × 2.06 × 1.057× 0.11 × 70/66%)/ 1000] × WHF_d × 22,169

Where,

(13/20/23) CFL Watts = Wattage of CFLs provided in the kit

3.25 = Delta Watts Multiplier from Indiana TRM for 13W and 20W light bulbs

2.06 = Delta Watts Multiplier from Indiana TRM for 23W light bulb

1.057 = Waste Heat Factor for Demand to account for cooling savings from lighting

0.11 = Peak Coincidence Factor for measure

80%/72%/70% = % of CFLs Installed from Electric kits according to survey (13/20/23W)

76%/70%/66% = % of CFLs Installed from Gas kits according to survey (13/20/23W)

22,169 = # of kits

Based on this analysis, kW savings attributable to the CFLs measure in 2013 are 107 for Electric customers and 300.84 for Gas customers.

[38] ISR with Non-initial install adjustment

[39] ISR with Non-initial install adjustment

B. Deemed Savings Calculations – Low Flow Showerheads

Annual savings for showerheads are calculated as:

Annual kWh Savings (Low Flow Showerheads) = (2.80-1.5) × 8.36 × 2.46 × 0.58 × 8.3 × (105-57.9) × 365/0.98/3412 × 35% × 7,127 × 2

Where,

2.80 = The baseline is a standard showerhead using 2.80 GPM

1.5 = GPM of the showerhead provided in the kit

2.46 = Average number of people per household

0.58 = Average showers per day

365 = Days shower used per year

8.36 = Average minutes per shower

8.3 = Constant to convert gallons to lbs

105 = Assumed temperature of water used for shower (105)

57.9= Assumed temperature of water entering house

2 = Two low flow showerheads are included in the kit

35% = Installation rate

7,127 = # of electric kits

Based on this analysis, kWh savings attributable to the showerhead measure in 2013 are 3,301,219.

Peak kW Reductions (Low Flow Showerheads) =

(2.80-1.5) × 60 × 8.3 × (105-57.9) × 365/ 0.98/3412 × 0.00371 × 35% × 2 × 7,127

Where,

2.80 = The baseline is a standard showerhead using 2.80 GPM

1.5 = GPM of the showerhead provided in the kit

8.3 = Constant to convert gallons to lbs

105 = Assumed temperature of water used for shower (105)

57.9 = Assumed temperature of water entering house

0.00371 = Peak coincidence factor for measure

35% = Installation rate

2 = Two low flow showerheads are included in the kit

7,127 = # of electric kits

Based on this analysis, kW savings attributable to the showerhead measure in 2013 are 61,605.78 for Electric customers.

C. Deemed Savings Calculations – LED night lights

The program Gas kit contains two LED nightlights. Annual savings for an individual LED nightlight are calculated as:

Annual kWh Savings (LEDs) = (4 – 0.3)/1000 × 8 × 365 × 60% × 15,042

Where,

4 = Wattage of an equivalent baseline LED

0.3 = Wattage of LED provided in the kit

8 = Hours/Day; A function of room-type and whether the resident lives in single or multi-family housing

365 = days in year

60% = % of nightlights installed according to survey

15,042 = # of Gas kits

Peak kW Reduction = 0

Based on this analysis, kWh savings attributable to the LED nightlights measure in 2013 are 195,020 for Gas customers.

D. Deemed Savings Calculations– Refrigerator/Freezer Thermometer

The program's Electric and Gas kit contains one refrigerator/freezer thermometer. In the 2013 evaluation, the program implementer assigned 0 kWh savings for the measure.

E. Deemed Savings Calculations – Water Heater Thermometer

The Electric kit contains one water heater thermometer. In the 2013 evaluation, the program implementer assigned 0 kWh savings for the measure.

F. Deemed Savings Calculations – Faucet Aerators

The program's Electric kit contains two faucet aerators. Annual savings for the two faucet aerators are calculated as:

Annual kWh Savings (Faucet Aerator) = (2.4-1.5) × 2 × 63% × 8.3 × (80-57.9*) × 365/ 0.98/ 3412 7,127 2 36%

Where,

2.4 = Gallons per minute of baseline faucet

1.5= Gallons per minute of low flow faucet

2 = Average minutes per day used by each faucet in home

365 = Days faucet used per year

63% = Percentage of water flowing down drain (if water is collected in a sink, a faucet aerator will not result in any saved water)

8.3 = Constant to convert gallons to lbs

80 = Assumed temperature of water used by faucet

57.9 = Assumed temperature of water entering house

2 = Two faucet aerators are included in the kit

36% = Installation rate

7,127 = # of electric kits

Based on this analysis, kWh savings attributable to the faucet aerator measure in 2013 are 116,512 for Electric customers.

Peak kW Reduction (Faucet Aerator) = (2.4-1.5) × 60 × 63% × 8.3 × (80-57.9 / 0.98 / 3,412 × 0.00262 × 7,127 × 2 × 36%

Where,

2.4 = Gallons per minute of baseline faucet

1.5 = Gallons per minute of low flow faucet

63% = Percentage of water flowing down drain (if water is collected in a sink, a faucet aerator will not result in any saved water)

8.3 = Constant to convert gallons to lbs

80 = Assumed temperature of water used by faucet

57.9 = Assumed temperature of water entering house

0.00262 = Peak Coincidence Factor for measure

2 = Two faucet aerators are included in the kit

36% = Installation rate

7,127 = # of electric kits

Based on this analysis, kW savings attributable to the faucet aerator measure in 2013 are 28.51 for Electric customers.

G. Deemed Savings Calculations – Kitchen Aerator

The program's Electric kit contains one kitchen aerator. Annual savings for kitchen aerator are calculated as:

Annual kWh Savings (Kitchen Aerator) = (2.4-1.5) × 3 × 63% × 8.3 × (80-57.9*) × 365/ 0.98/ 3412 × 7,127× 45%

Where,

2.4 = Gallons per minute of baseline faucet

1.5= Gallons per minute of low flow faucet

3 = Average minutes per day used by each faucet in home

365 = Days faucet used per year

63% = Percentage of water flowing down drain (if water is collected in a sink, a faucet aerator will not result in any saved water)

8.3 = Constant to convert gallons to lbs

80 = Assumed temperature of water used by faucet

57.9 = Assumed temperature of water entering house

45% = Installation rate

7,127 = # of electric kits

Based on this analysis, kWh savings attributable to the faucet aerator measure in 2013 are 109,236 for Electric customers.

Peak kW Reduction (Faucet Aerator) = (2.4-1.5) × 60 × 635 × 8.3 × (80-57.9) / 0.98 / 3,412 × 0.00262 × 7,127× 45%

Where,

2.4 = Gallons per minute of baseline faucet

1.5 = Gallons per minute of low flow faucet

63% = Percentage of water flowing down drain (if water is collected in a sink, a faucet aerator will not result in any saved water)

8.3 = Constant to convert gallons to lbs

80 = Assumed temperature of water used by faucet

57.9= Assumed temperature of water entering house

0.00262 = Peak Coincidence Factor for measure

45% = Installation rate

7,127 = # of electric kits

Based on this analysis, kW savings attributable to the faucet aerator measure in 2013 are 28.51 for Electric customers.

H. Deemed Savings Calculations - LED

The program distributes both Gas and Electric kits containing LEDs. The available sets include:

- Electric: (1) 10W LED;
- Gas: (1) 10W LED.

Annual savings for an individual LED are calculated as:

- Annual kWh Savings (10W LED) = ((60-10)/1000) × 1,040 × 0.941 × 84/82% × 10,263

Where,

10 LED Watts = Wattage of LED provided in the kit

60 = Baseline lamp watts

1,040 = Hours/yr; A function of room-type and whether the resident lives in single or multi-family housing (based on 2.85 hrs per day)

0.941 = Waste Heat Factor for Energy to account for cooling savings from efficient lighting

84%[40] = % of LED's Installed from Electric kits according to survey

82%[41] = % of LED's Installed from Gas kits according to survey

3,483= # of electric kits

6,780= # of gas kits

Based on this analysis, annual kWh savings attributable to the LED measure are 143,705 for Electric customers and 272,176 for Gas customers.

Peak demand reduction (kW) for the LED measure are calculated as follows:

- Peak kW Reductions (10W LED) = ((60-10)/1000) × 0.11 × 1.057 × 74/70%) × 10,263

Where,

[40] ISR with Non-initial install adjustment

[41] ISR with Non-initial install adjustment

60 = Baseline lamp watts

10 Watts = Wattage of LED’s provided in the kit

1.057 = Waste Heat Factor for Demand to account for cooling savings from lighting

0.11 = Peak Coincidence Factor for measure

84% = % of LED’s Installed from Electric kits according to survey

82% = % of LED’s Installed from Gas kits according to survey

10,263 = # of kits

Based on this analysis, annual kW savings attributable to the LED measure are 20.898 for Electric customers and 40.68 for Gas customers.

I. Structural/Appliance and Lifestyle Recommendations

ADM conducted a regression analysis to determine the savings attributable to the non-kit components of the OECUP. ADM received 22,000 program participant’s monthly billing data from February 2012 through March 2014. These program participants were first screened by the procedures below.

(1) Removal of Customers without pre-audit monthly billing data.

(2) Removal of customers who completed the audit after 6/1/2013. This ensures that all customers in the regression have 9 months of post audit data. This is the minimum amount of data that can be used to analyze a program with monthly billing data and a savings level below 5% of monthly kWh.

(3) The dataset was also screened for duplicate entries (identical kWh and date for the same account).

This resulted in a final analysis group of 7,460 program participants.

Propensity Matching for Control Group Selection:

ADM received an extract of 486,000 residential customers billing data from which to select a control group. Initially, the participant group was split into two groups by water heating type (Electric vs. Natural Gas) as these groups have different usage levels. A random sample of 30,000 was then selected from residential population (486,000) to make the matching procedure more efficient. An initial comparison between the control group sample and participants shows a large differential in average monthly kWh usage in the pre-period (January 1st, 2012 – December 31st, 2012), detailed in Table 5-10 below.

Table 5-8 Comparison of Average Monthly kWh by Analysis Group

Analysis Group	*Pre-Propensity Match Average Monthly kWh*	*Post-Propensity Match Average Monthly kWh*
Electric	1,125	1,125
Electric Control	924	1,125
Gas	938	938
Gas Control	924	938

The large differential in average monthly kWh between the initial control group sample and the participants is the rational for conducting the propensity matching. Propensity matching is a method of selecting a suitable control group when a randomized experiment was not conducted. Each participant is matched 1-1 with a member of the control sample who has a similar usage level. For this analysis the matching will be done without replacement, meaning that each member of the control group can only match with a single member of the treatment group. Essentially, a matched sub-sample from the pool of 30,000 potential controls will be selected. Using the glm[42] command in R, each participant and potential control was given a "propensity score" (i.e. its estimated conditional mean from a logistic regression model), defined as the percentage likelihood of being in the participant group based on their usage level in the pre-period (February 1st, 2012 – December 31st, 2012).

The electric and gas datasets were propensity matched separately using the statistical package R[43]. The propensity matching procedure "Matching::Match" created two new datasets (Electric and Gas), each having nearly identical usage levels when comparing treatment and control groups in the pre-period.

Having a properly matched control group allows the fixed effects regression model to provide a less biased estimate of the energy savings attributable to the program. However, because the matching is based on limited information (aggregate usage from Feb-Dec 2012), it was found that the two groups differed somewhat in month-to-month usage, despite having similar usage overall for 2012. This suggests that there might be differences between the two groups' sensitivity to weather (the effect is most pronounced during the winter months). For this reason, a number of additional variables were added to the regression model to control for such differences that could not be eliminated via matching.

The mixed effects panel regression[44] model was then specified as follows:

---

[42] Syntax: `pscores <- glm(treat ~ pre.usg, data=dataset, family=binomial)`

[43] Sekhon, Jasjeet S. 2011. "Multivariate and Propensity Score Matching Software with Automated Balance Optimization: The Matching package for R." *Journal of Statistical Software.* 42(7): 1-52.

[44] R syntax (requires package lme4): `lmer(daily.kwh ~ post * treat + treat *(cdd + hdd)+ (1| acct_number), data=dataset)`

$$kWh_{i.t} = \alpha_i\,Customer_i + \beta_1 HDD65_t + \beta_2 CDD75_t + \beta_3 Post_{i,t} + \beta_4 Treat_i \cdot CDD75_t + \beta_5 Treat_i \cdot HDD65_t + \beta_6 Treat_i + \beta_7 Treat_i \cdot Post_{i,t} + C + \varepsilon_{i,t}$$

Where the subscript i denotes individual customers and $t = 1, \dots, T(i)$ serves as a time index, where $T(i)$ is the number of bills available for i. The model is defined as "mixed effects" because the model decomposes its parameters into fixed-effects (i.e. HDD65, CDD75, Post) and random effects (i.e. the individual customer's base usage). Put simply, a fixed effect is assumed to be constant and independent of the sample, while random effects are assumed to be sources of variation (other than natural measurement error) that are uncorrelated with the fixed effects. The approach is similar to others that treat the individual customer as a fixed-effect, but is more computationally efficient as the number of individuals in the sample becomes very large. The variables included in both regression models are specified in Table 5-11 below.

Table 5-9 Description of Variables Used in the Regression Model

Variable	*Description*
Individual customer random intercept (α_i)	Unique identifier for each customer to control for any customer specific differences.
Heating Degree Days (HDD)	Average Heating Degree Days per day within each billing period. This was calculated by summing up the number of heating degree hours per day, and then averaging over the number of days in the billing period. The setpoint of 65 was used for the model. HDD is interacted with the treatment group variable to control for systematic differences in weather sensitivity among the treatment and control groups.
Cooling Degree Days (CDD)	Average Cooling Degree Days per day within each billing period. This was calculated by summing up the number of cooling degree hours per day, and then averaging over the number of days in the billing period. The setpoint of 75 was used for the model. CDD is interacted with the treatment group variable to control for systematic differences in weather sensitivity among the treatment and control groups.
Post	Indicator if a participant's observation is post audit (=1 if post, =0 otherwise). For control group participants, all bills after 6/1/13 were labeled as post.
kWh	The average daily kWh, which is the read usage divided by the number of days since the last reading.

The results of the regression analysis are listed in Table 5-12.

Table 5-10 Output from the Net Savings Regression Model

Regression Model Output		
	Gas Kits	Electric Kits
Daily post savings (kWh) for treatment group (β_7). Standard errors are in parentheses.	0.94 (0.122)	1.11 (0.229)
Number of Customers (Combined Treatment and Control)	9,666	4,604
R-Squared	0.051	0.069
Average post-audit daily usage (kWh)	30.2	38.6

kWh and kW savings calculations for the OECUP non-kit and kit components:

The percentage saving value from the regression model output in Table 5-10 was used to determine the annual Net kWh and kW savings for the OECUP. The calculation steps are detailed in Table 5-11 and are as follows:

(1) Extrapolate the estimate of daily savings to annual savings by multiplying by 365.

(2) Subtract the kWh savings from the kit measures as they would be doubled counted by the regression analysis otherwise.

(3) kW savings were calculated by applying a flat load shape (i.e. 1/8760) to the kWh savings from the non-kit components.

(4) Multiply by the number of participants in each group to arrive at program level kWh/kW savings numbers.

(5) Gross savings were determined by using the NTGR factor from the 2011 evaluation and scaling up the net savings to account for that. Table 5-12 details the gross savings calculations.[45]

[45] Gross adjustment was applied to the overall program, not to the non-kit components separately.

Table 5-11 Calculation of Net Per-Participant kWh and kW Savings by Kit

Kit received for Water Heat Type	*Daily kWh Savings from Regression*	*Annual kWh Savings (Including Kit measures)*	*kWh Savings (Kit Measures)*	*Annual kW Savings (Excluding kit measures)*	*Annual kWh Savings (Excluding kit measures)*
Electric	0.942	601.70	570.07	0.004	31.63
Electric (w/ LEDs)	0.942	613.98	605.14	0.001	8.84
Gas	0.797	291.05	154.05	0.016	137.00
Gas (w/ LEDs)	0.797	302.98	188.16	0.013	114.82

Table 5-12 Calculation of Gross Per-Participant kWh and kW Savings by Kit

Water Heat Type	*Daily kWh Savings from Regression*	*Annual kWh Savings (Including Kit measures)*	*kWh Savings (Kit Measures)*	*Annual kW Savings (Excluding kit measures)*	*Annual kWh Savings (Excluding kit measures)*
Electric	1.108	707.89	670.67	0.004	37.22
Electric (w/ LEDs)	1.108	722.33	711.93	0.001	10.40
Gas	0.938	342.41	181.23	0.018	161.18
Gas (w/ LEDs)	0.938	356.46	221.38	0.015	135.09

Table 5-13 displays a breakdown of kit savings by measure.

Table 5-13 Calculation of Gross Per-Participant kWh and kW Savings by Measure

Kit Measure	*kWh Savings*	*kW Savings*
CFLs(4)	241.72	0.029
LED	48.93	0.060
Bath Aerators (2)	45.41	0.010
Kitchen Aerator	34.05	0.005
Showerheads (2)	1,323.42	24.698
LED nightlight	21.60	0

Table 5-14 converts the participant level Net kWh and kW savings to the program level. This is accomplished via multiplication between the participant level savings specific to the electric and gas customers, and the number of participants for each group. Table 5-15 details the same calculations using Gross savings.

Table 5-14 Calculation of Net Non-Kit Program Level kWh and kW Savings

Water Heat Type	*Annual kW Savings (Excluding kit measures)*	*Annual kWh Savings (Excluding kit measures)*	*Participants*	*Total Program kW (Excluding kit measures)*	*Total Program kWh (Excluding kit measures)*
Electric	0.004	31.63	3,644	13.16	416
Electric (w/ LEDs)	0.001	8.84	3,483	3.51	31
Gas	0.016	137.00	8,262	129.21	17,702
Gas (w/ LEDs)	0.013	114.82	6,780	88.87	10,204
Total	-	-	22,169	234.76	28,354

Table 5-15 Calculation of Gross Non-Kit Program Level kWh and kW Savings

Water Heat Type	*Annual kW Savings (Excluding kit measures)*	*Annual kWh Savings (Excluding kit measures)*	*Participants*	*Total Program kW (Excluding kit measures)*	*Total Program kWh (Excluding kit measures)*
Electric	0.004	37.22	3,644	15.48	576
Electric (w/ LEDs)	0.001	10.40	3,483	4.13	42
Gas	0.018	161.18	8,262	152.02	24,501
Gas (w/ LEDs)	0.015	135.09	6,780	104.55	14,123
Total	-	-	22,169	276.18	39,244

Table 5-16 below combines the Net kWh and kW savings for the kit measures with the savings determined from the regression analysis for the non-kit components to arrive at the program level savings. Table 5-17 details those calculations with Gross savings.

Table 5-16 Program Level Net kWh and kW Savings

Kit Type	*Per-Participant Annual kWh Savings from kit measures*	*Per-Participant Annual kWh Savings not from kit measures*	*Per Participant kWh Savings*	*Per Participant kW savings (=kWh savings/8760)*	*Program-Level Annual kWh Savings*	*Program-Level Annual kW Savings*
Electric	570.07	31.63	601.70	0.045	2,192,618	163.98
Electric (w/ LEDs)	605.14	8.84	613.98	0.047	2,138,492	163.70
Gas	154.05	137.00	291.05	0.033	2,404,655	274.51
Gas (w/ LEDs)	188.16	114.82	302.98	0.035	2,054,204	237.30
Total	-	-	-	-	8,789,969	839.49

Table 5-17 Program Level Gross kWh and kW Savings

Kit Type	*Per-Participant Annual kWh Savings from kit measures*	*Per-Participant Annual kWh Savings not from kit measures*	*Per Participant kWh Savings*	*Per Participant kW savings (=kWh savings/8760)*	*Program-Level Annual kWh Savings*	*Program-Level Annual kW Savings*
Electric	670.67	37.22	707.89	0.054	2,579,551	196.78
Electric (w/ LEDs)	711.93	10.40	722.33	0.056	2,515,875	195.05
Gas	181.23	161.18	342.41	0.039	2,828,991	322.95
Gas (w/ LEDs)	221.38	135.09	356.46	0.040	2,416,799	271.20
Total	-	-	-	-	10,341,216	985.98

5.3 Process Evaluation

This chapter presents the results of the process evaluation for I&M's Online Energy Check-Up program during PY4. The process evaluation focuses on the effectiveness of program policies and organization, as well as the program delivery framework. The purpose of the process evaluation is to assess the design and recent results of the program in order to determine how effectively it is achieving its intended outcomes. This evaluation is based upon analysis of program structure and interviews and surveys of participating I&M customers, I&M energy efficiency staff, program implementation contractor staff, and program tracking data. Additionally, prior year evaluation reports are reviewed for comparative and contextual purposes when developing findings for the current program year.

The chapter begins with a discussion of the overall format and operation of the program. This is followed by an examination of certain issues important for the future success of the program. This chapter also presents strategic planning and process recommendations, and highlights key findings from the surveys of customer participants and interviews with program operations staff.

5.3.1 Evaluation Objectives

The purpose of the process evaluation is to examine program operations and results throughout the program operating year, and to identify potential program improvements that may prospectively increase program efficiency or effectiveness in terms of customer participation and satisfaction levels. This process evaluation was designed to document the operations and delivery of the Online Energy Check-Up program during PY4. Additionally, the PY4 process evaluation provides an opportunity for comparison with PY3 program findings in order to identify consistencies, differences, and trends in program operations and performance over time.

Key research questions to be addressed by this evaluation of PY4 activity include:

- How effective is the program marketing? How do participants learn about the program and what are their reasons for participating?
- Why did customers participate in the program?
- What recommendations participants received and how useful were they?
- How satisfied are participants with the program? What was their level of satisfaction with completing the audit, the measure kit, and the recommendations?
- Are there any current plans for changes to program structure or design, and what opportunities may exist for future modifications to these factors?
- Have any significant trends, changes, or issues occurred since the PY3 program year that may provide insight into program development and performance over time?

During the evaluation, data and information from multiple sources were analyzed to achieve the stated research objectives. Insight into the customer experience with the Online Energy Check-Up program is developed from a telephone survey of program participants. The internal organization and operational perspective on the program is examined through analysis of interviews conducted with I&M program staff.

5.3.2 Summary of Primary Data Collection

- **Review of program documentation and relevant literature:** In the 2011 program year evaluation, ADM reviewed relevant program documents, reports, and other materials to gain an understanding of program operation and structure. For the current program year, ADM investigated whether there were notable changes to program documentation or reporting procedures in order to identify any relevant or significant changes to program delivery.
- **Participant surveys:** Participant surveys were the primary data source for providing insight into the customer perspective on the program. The participant surveys provided customer feedback and insight regarding customer experiences with the Online Energy Check-Up program. Respondents reported on their satisfaction with the program, the usefulness of the recommendations, and whether they installed the measures provided in the kit.

- **Interview with I&M staff members:** Interviews with I&M staff members, including program managers, provided insight into various aspects of the program and its organization. I&M staff members also provided information regarding future plans for the program and its interaction with other I&M programs.
- **Prior evaluation report review:** The evaluators reviewed the PY3 evaluation report for the I&M Online Energy Check-Up program in order to provide a basis for comparison with PY4 findings.

5.3.3 Summary of Conclusions and Recommendations

During PY4 there were 22,169 participants in the Online Energy Check-Up program as compared with 600 participants in PY3 and 591 participants in PY2. Although the number of participants increased dramatically, the program did not meet its planning goal of 31,581 participants. Despite not meeting the required goal, the large increase suggests that the awareness of, and interest in, the program has progressed to the point where participation is significant.

The following presents a selection of key conclusions from the current program year:

- **Program activity:** program activity was much greater than in the prior years that the program operated. The key factor likely driving the increased program activity was the promotion of the program through direct mailers. All customers who had not previously participated were sent direct mailers in two waves during the year. The number of customers participating in the program was higher in each month that the mailers were sent than in the months when the mailers were not sent.
- **Multiple benefits to inclusion of LED bulbs:** The LED bulbs distributed through the program have multiple energy and non-energy benefits. The LED bulbs distributed through the program were 10w bulbs, or 60w incandescent equivalents, compared to 18w CFL equivalents. Consequently, per installed unit savings are greater for the LED bulbs than for the CFLs. The inclusion of the LED may have also led to higher savings because through the generation of additional program activity. The number of participants was higher during the months the LED was offered and where higher than in other months when mailers were used to promote the program. During months when the LED was included (October, November, and December), the number of participants was on average approximately 30% higher than in other months when mailers were sent out (January, April, and July). In addition to the energy saving benefits, customers who received LED bulbs reported being more satisfied with the performance of the measures distributed in the kits. Additionally, the majority of participants who received the LEDs reported that they liked them better than the CFLs. The reasons given for this preference was that they were brighter, lasted longer, and used less energy than the CFLs.

  However, the LED bulbs added considerably to the cost of the kits and the installation rates for the LED were similar to the installation for the CFLs. It should be noted that the installation rates may increase overtime as the participants were surveyed shortly after the kits were distributed. A second survey of customers receiving the LED bulb is planned.

- **Participant satisfaction:** Participants reported relatively high satisfaction levels for the 2013 program year, most notably for the contents of the measure kits and the performance of the included measures. However, participants were comparatively less satisfied with the savings on their bills and the recommendations provided through the audit tool. This was likely due to some participants expecting the Online Energy Check-Up program measure kits to provide more significant savings, and some participants reported that they would have preferred recommendations that required less effort or produced greater energy savings. While some participants expressed these concerns, the majority of respondents were highly satisfied with their overall program experience. Additionally, 85% of the respondents indicated that the audit recommendations were somewhat or very useful.
- **Kit contents changed without notifying I&M:** The distributor of the kits changed the wattage of the 75w incandescent equivalent bulbs from 20w to 18w. The distributor did not realize the significance of this change for I&M because 20w and 18w bulbs are both considered to be 75w equivalents. However, the change has significance for I&M because it affects the total program savings. The distributor reported that such an oversight would not occur again but the firm has reportedly not instituted any procedural changes to ensure this.

The evaluation team currently has the following recommendations for program improvement consideration.

- **Continued marketing likely needed to sustain program activity:** The number of participants in the program was notably higher in months during which bill mailers were sent, and tended to decline in the following month. This suggests that continued promotion of the program may be needed to sustain activity in the coming program year.
- **Kit distributor should ensure utilities are notified of product changes:** Although the distributors of the kits recognizes that the I&M should be notified of any changes to the kit in the future, it was reported that the firm has not established any formal procedural or policy changes. The firms should establish a policy that utilities will be notified of any kit changes in advance of their occurrence and develop procedural changes to support this policy.
- **Consider offering LED in the future:** Given the positive reaction from customers to LED bulbs, it may be worth considering offering these in the future. However, the inclusion of the LED bulbs in the kits adds considerably to the cost and the current installation rate was comparable to the installation rate for the CFLs. As a result, even in consideration of the positive customer reaction and the greater savings associated with each LED bulb installed, continuation of the kits may not be worthwhile.
- **Use 2014 savings calculated for kits for PY5 ex ante savings:** The PY4 program had significantly more participants compared to PY3 which only had 600 participants. Having a larger participant group leads to more accurate savings regarding the program. ADM recommends using these kit and non-kit savings numbers for PY5 ex ante savings.

- **Use different baseline GPM to calculated showerhead savings:** The 2012 Indiana TRM states a baseline of 2.8 gallons per minute (GPM). However, the industry standard and LEED baseline for showerheads is 2.5 GPM. In order to accurately reflect expected incremental savings for energy efficient showerheads, ADM recommends revising Indiana's TRM showerhead equation to use the 2.5 GPM baseline value.

5.3.4 Program Theory and Activities

The program theory and primary activities have remained consistent since the Online Energy Check-Up program was initially implemented. This section provides a review of the program outline, noting any differences in program structure for the current year.

As with the prior program years, the 2013 Online Energy Check-Up program was operated with the objective of reducing energy consumption by providing energy usage information and access to financial incentives to customers. This in turn encourages participants to implement energy saving equipment and adopt energy saving behaviors. In each of the program years thus far, customers who complete the audit have been informed of their current energy use and how much of the use is accounted for by different end-uses. Additionally, the estimated monetary and carbon savings associated with the recommended measures are included in the audit report. Financial incentives are also provided to participants to further induce them to adopt energy efficiency measures. In addition to the information about energy use and ways to decrease it, participating customers receive a kit with energy savings measures at no charge.

The key program activities for the Online Energy Check-Up program are:

- Developing program infrastructure;
- Promoting the program;
- Customers completing the online audit tool and reading the report; and
- Mailing of energy efficiency kits to customers.

An I&M program administrator administers the Online Energy Check-Up program. The program uses software published by Apogee Interactive, a firm that develops internet based software for utilities. I&M has a website for the program that customers can access through the utilities residential energy efficiency programs website.

The primary program activity is the customer's completion of the online audit tool, which requires participants to provide a series of details regarding their energy use and home characteristics. The audit tool incorporates these data into a series of calculations that result in various recommendations for energy efficiency improvements for the customer.

Upon completion of the audit tool, customers are provided with a report of their home's energy use that integrates data from utility records of their energy use and a list of recommended measures that customers could implement to save energy. Additionally, links for I&M's

residential incentive programs are provided to customers to further encourage them to adopt the recommended measures. The intended outcomes of completing the audit report are that the customers will read and understand the report, that they will implement some of the recommended measures, and that they will participate in other I&M energy efficiency programs when appropriate.

Another key program activity is the mailing of the energy efficiency kit to customers who complete the online audit. Customers receive one of two different kits, depending on whether their water is heated with electricity or gas. The items in the kit for the 2013 program year were largely the same as those sent during PY3. However, a limited number of customers also received an LED light bulb. Additionally, the kit distributor switched from a 20w CFL to an 18w CFL at some point in the early part of the program year. The distributor was unable to provide the exact date the change was made. Specifically, customers with electric water heating received:

- 1-13w CFL;
- 1-18/20w CFL;
- 1-18/20w CFL (cool white);
- 1-23w CFL;
- 2 low flow shower heads;
- 2 bathroom aerators;
- 1 kitchen aerator;
- 1 refrigerator/freezer thermometer card; and
- 1 hot water temperature card.

Customers with gas water heating receive:

- 1-13w CFL;
- 1-18/20w CFL;
- 1-18/20w CFL (cool white);
- 1-23w CFL;
- 2 LED Nightlights w/photocell; and
- 1 refrigerator/freezer thermometer card.

The LED light bulb sent to a subset of customers was 10 watts.

Table 5-18 Cost of Energy Efficiency Kits Distributed

Kit Type	*Kit Cost (Excluding Delivery Charge)*
Electric Kit with LED	$30.15
Electric Kit without LED	$16.58
Gas Kit with LED	$27.17
Gas Kit without LED	$14.02

The intended outcomes for the energy efficiency kits are that customers will receive the kits and install the measures. Customers can request to not receive the kits by emailing the utility.

Figure 5-1 presents a logic model for the Online Energy Check-Up program process, including key program events and outcomes.

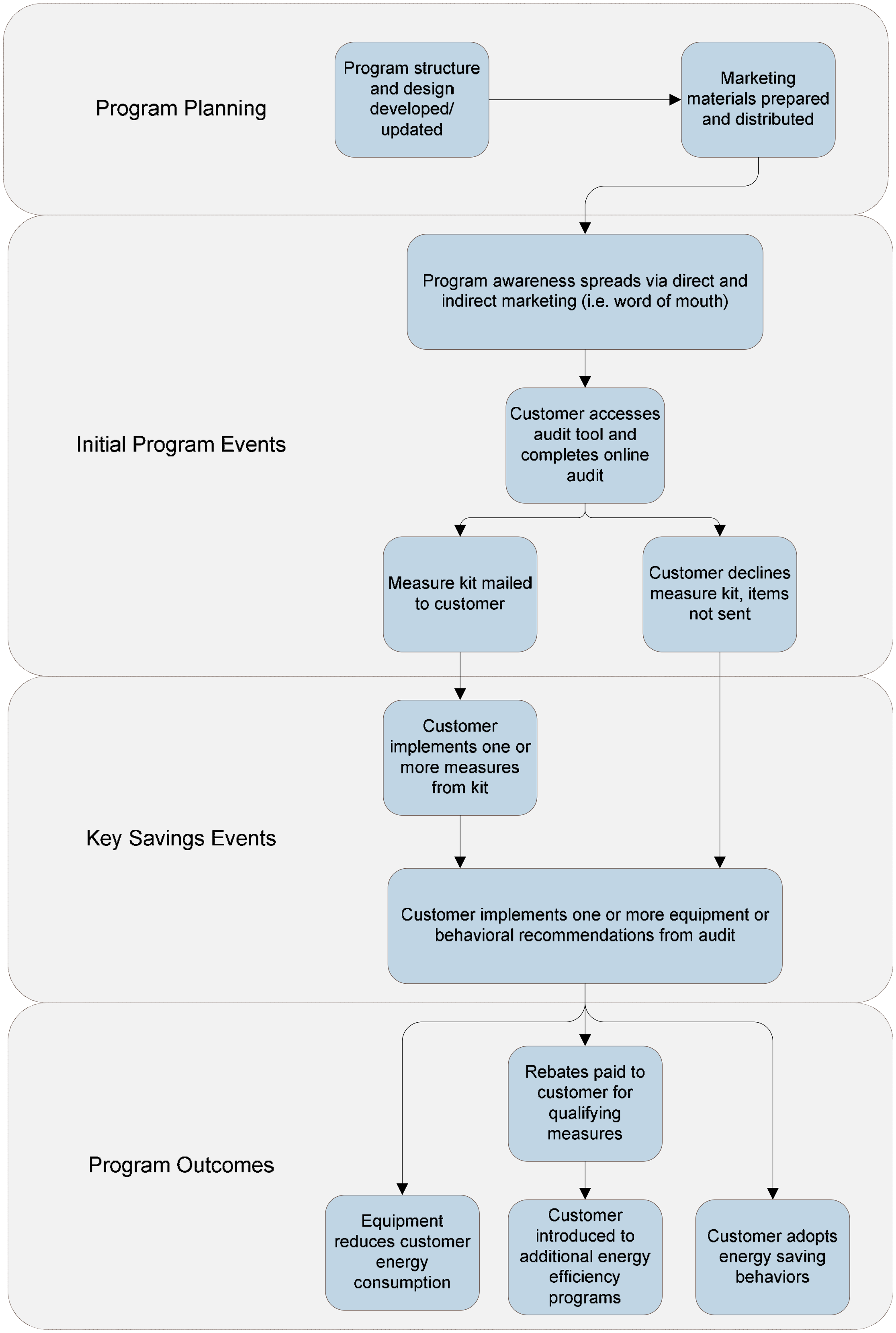


Figure 5-1 Online Energy Check-Up Program Logic Model

5.3.5 Program Participation and Residential Characteristics

This section summarizes the 2013 program activity and is based on an analysis of the program tracking data provided to ADM by I&M. Additional details regarding participation rates are described below.

5.3.5.1 Program Activity

The evaluators reviewed the program tracking data for the 2013 program year in order to determine overall performance, identify participation seasonality, and gauge participation from specific customer types. Figure 5-2 shows the number of energy savings kits mailed by when the audit was completed, with separate lines for electric and gas kit recipients. The largest number of customers participated in October 2013 (3,992 kits). Moreover, the months with the highest level of program activity were January, April, July, and the last three months of the year. These periods of higher program activity coincided with bill mailings sent to customers to promote the program. Specifically, two waves of bill mailings occurred during the program year, the first during January, April, and July, and the second during October and November. The increased levels of program activity at these times suggest that this marketing tactic was effective in driving program participation. Additionally, the fact that the highest levels of activity occurred during the period when the LED bulb was offered in the kit may also suggest that this measure was attractive to customers.

Overall, there were more electric kit recipients than natural gas kit recipients, although the participation rates for each kit type were very similar to during much of the program year. However, there was some divergence in the number of each kit types sent at the end of the program year. Natural gas kits remained steady from October to December, while electric heating kits declined during the period.

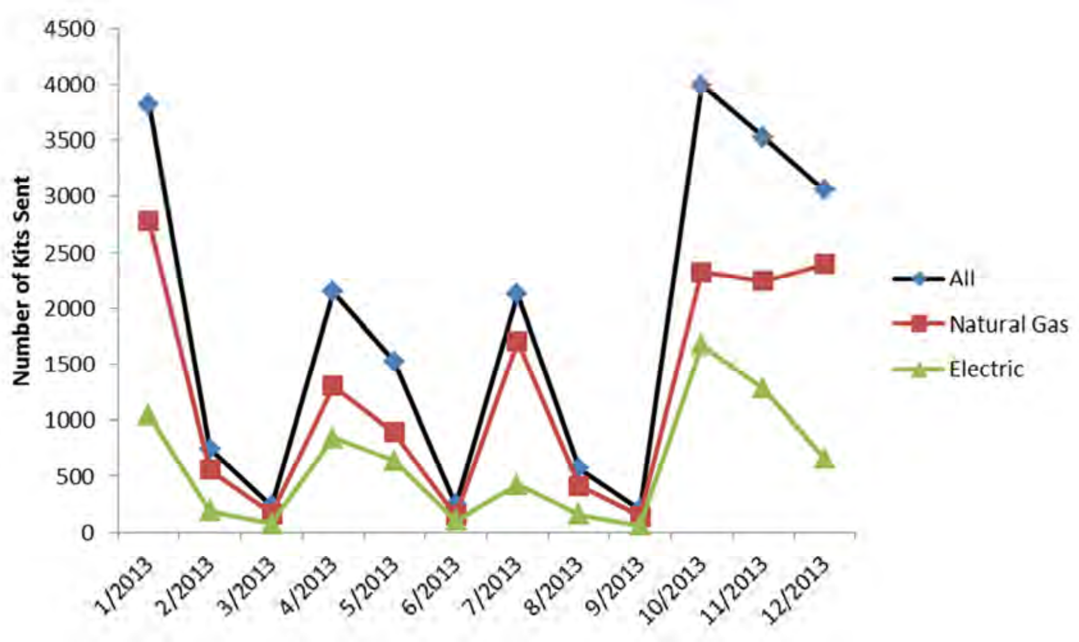


Figure 5-2 Number of Audits Completed by Month

5.3.5.2 *Household Characteristics*

Table 5-19 thru Table 5-21 display the home heating and cooling technologies used by participants in the program. As with the prior program year, the majority of households participating in the Online Energy Check-Up program in 2013 heated their homes with natural gas (77.5%). Twelve percent of participants reported cooling their homes with a window air conditioner, while between two and four percent of participant cited the use of a geothermal or air source heat pump.

Table 5-19 Participant Home Heating Type

Home Heating Type	*Percent of Participants*
Natural Gas	77.5%
Electric	10.5%
Propane	3.7%
Heat Pump	3.6%
Geothermal Heat Pump	2.1%
None	0.2%
Other	2.4%

Table 5-20 Participant Home Cooling Type

Home Cooling Type	*Percent of Participants*
Electric	76.2%
Window Unit	11.9%
None	5.8%
Heat Pump	4.5%
Geothermal Heat Pump	1.6%

Unlike in 2012, the majority of participants reported the use of gas water heaters in their homes. The greater occurrence of gas water heating correlates with the number of participants who received gas-participant kits through the program.

Table 5-21 Participant Water Heating Type

Water Heating Type	*Percent of Participants*
Natural Gas	66.5%
Electric	32.0%
Heat Pump	0.1%
Propane	1.1%
None	< 1%
Other	0.4%

5.3.6 Review of Audit Tool

The evaluation of the 2011 program year included a review of the audit tool administered through the Online Energy Check-up program. This review was based on a comparison of best practices regarding audit instruments[46] and an assessment of the tool's ability to meet program needs. Specifically, the audit tool review was designed to evaluate several effectiveness criteria, including:

- Accessibility and user-friendliness;
- Recommendation and information comprehensiveness;
- Ability to provide accurate and credible results; and
- Flexibility and relevance to different types of customers.

For the most part, the 2011 program year review concluded that the audit tool was comprehensive, accessible, and accurate in providing information to customers. There were no

[46] Specifically, the evaluators' references included a 2004 report entitled Evaluation of Home Energy Audit Tools by The Center for Energy, Economic & Environmental Policy, a 2002 report by Evan Mills entitled Review and Comparison of Web- and Disk-based Tools for Residential Energy Analysis, and a 2001 report by John Westerman entitled Home Energy Analysis Software Study.

notable changes or improvements to the audit tool for the 2012 or 2013 program year, and it has continued to serve as an effective aspect of program operation. As mentioned in the 2011 program year evaluation, customers may benefit from receiving additional information regarding the relative costs (such as payback periods) of the recommended energy efficiency improvements. Additionally, it may be useful to provide customers with information regarding non-energy benefits that can be gained through energy efficiency improvements, such as increased comfort, property values, or operational quality associated with the recommended equipment and measures.

5.3.7 Participant Survey Findings

The following section presents key findings from surveys conducted with customers who participated in the 2013 Online Energy Check-Up program through I&M. ADM conducted telephone surveys with program participants as part of the evaluation effort for the 2013 Online Energy Check-Up program. This survey was designed to gather information regarding the participant perspective on program operations and delivery, as well as to characterize specific energy efficiency measures and behaviors resulting from customer participation in the online audit process. Data collected via participant surveying is used in evaluating:

- Customer awareness of the program;
- Customer implementation of energy efficient equipment and energy saving behaviors;
- Customer decision making; and
- Customer satisfaction with the program.

In order to preserve consistency with prior evaluations, the participant survey format and content were primarily unchanged from the instruments used for the 2012 program year. However, minor modifications were made to the survey instrument in order to either improve the level of detail obtained through the survey or to minimize response biases or other potential inaccuracies.

In total, 424 customer participants who had received an Online Energy Check-Up kit of energy efficiency measures through the program responded to the survey.

5.3.7.1 Customer Awareness of Program

Survey participants were first asked how they learned about the Online Energy Check-Up program. As shown in Table 5-4, respondents most commonly reported that they had learned of the program from an informational brochure; 55% of participants reporting learning of the program this way Approximately twenty percent of respondents reported learning of the program through the I&M website. The utility website and brochures seem to be the most effective methods of informing customers about the program.

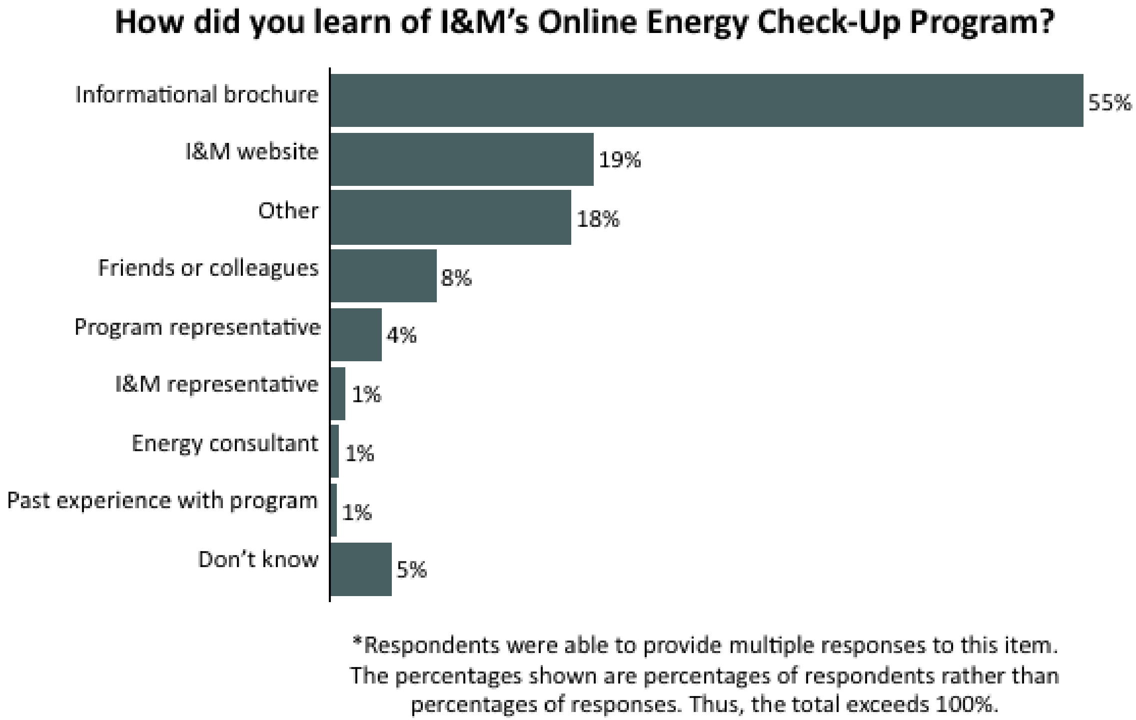


Figure 5-3 How Customers Learned about the Program

5.3.7.2 Customer Installation of Measures

Participant survey respondents were asked which items in the energy efficiency kit had been installed in their homes. These responses were used to develop the installation rates for the program. Table 5-22 and Table 5-25 present reported installation rates based on the total available measures of each type among participants. As the contents of these kits varied based on whether the participant had gas or electric water heating, the installation rates are presented for each category separately.

For participants receiving the gas water heating kit type, the refrigerator/freezer thermometer cards had the highest initial installation rate at 75%. The refrigerator/freezer thermometer for the electric kits also had the highest initial installation rate (72%) for respondents who received the electric water heating kit type. As the refrigerator/freezer thermometer cards are designed to provide initial baseline readings to customers, the removal of these measures after one use does not necessarily indicate reduced savings over time.

Participants with gas water heat and electric water heat reported similar initial installation rates for measures received through the program. Similarly, when taking participant removal of measures into account, gas and electric kit recipients showed fairly similar current installation rates for comparable measures.

For the participants with electric water heat, who received measures related to water usage efficiency, the lowest reported installation rates were for bathroom aerators, as well as showerheads. The lack of initial implementation or later removal of these measures may be attributable to the fact that customers may prefer the water flow provided by standard fixtures, rather than that of aerators and low flow showerheads.

Table 5-22 Overall Installation Rate of Online Energy Check-Up Measures, Gas Water Heat Participants

Measure	*Reported Installation Rates*		*N*
	Initial	*Current**	
1-13w CFL	61%	60%	225
1-20w CFL**	52%	51%	225
1-18/20w CFL (cool white)**	47%	46%	225
1-23w CFL	40%	41%	225
1 LED bulb	55%	70%	105
2 LED Nightlights w/photocell	67%	60%	450
1 refrigerator/freezer thermometer card	75%	-	225

*Accounts for participant removal of measures.
**The kit distributor switched to shipping 18w CFLs from 20w CFLs at some unspecified point during the early part of the program year.

Table 5-23 Overall Installation Rate of Online Energy Check-Up Measures, Electric Water Heat Participants

Measure	*Reported Installation Rates*		*N*
	Initial	*Current**	
1-13w CFL	70%	67%	199
1-18/20w CFL**	56%	55%	199
1-18/20w CFL (cool white)**	53%	49%	199
1-23w CFL	54%	49%	199
1 LED bulb	50%	74%	100
2 low flow shower heads	37%	35%	398
2 bathroom aerators	38%	36%	398
1 kitchen aerator	54%	45%	199
1 refrigerator/freezer thermometer card	72%	-	199
1 hot water temperature card	50%	-	199

*Accounts for participant removal of measures.
** The kit distributor switched to shipping 18w CFLs from 20w CFLs at some unspecified point during the early part of the program year.

The 382 respondents who reported that they had not initially installed all of the available measures in the kits were asked why they had chosen not to install certain measures. As shown in

Table 5-26, one-third of these respondents reported that they already had a measure installed or were waiting for current units to require replacement. For participants who had not installed all of the CFLs included with the kit, a common response to this question was that they were waiting for their current lighting to require replacement. This subset of respondents who are waiting to install the kit measures likely view the measure kits as surplus items for them to use when they need them. If these respondents currently use CFLs, then they will not be achieving immediate additional savings by replacing their bulbs when they burn out.

The next most common response to this question for 2013 program year respondents was that they had not had time to install a measure (18%). This is a commonly cited reason, and it is unclear whether these respondents will actually move forward with installing the remaining measures. It should also be noted that some respondents likely stored the measure kits upon receiving them, and may not have thought about implementing the items until they were contacted for the participant survey. Other responses included having no appropriate location to install measures and not needing the measures. Further, participants noted that the measures were incompatible with existing equipment. This was especially pervasive with the aerators that did not fit many faucets.

Additionally, 2% of respondents reported that they had not received one or more of the measures mentioned during the survey. The most common type of measure not received was the thermometer card. These respondents may have misplaced these items or may have been unable to recall which items they had received, but it is possible that some respondents may be receiving incomplete kits.

Overall, general findings show that a portion of participants are unlikely to install all of the measures from the kit. Some participants may continue to install and use their remaining measures over time, either as their current items begins to require replacement or when they have time to replace their existing items. However, some participants may have forgotten about the kits after receiving them, and it is unclear whether they intend to install the measures at a later date. Additionally, participants whose homes have only one bathroom may not have the opportunity to use the second shower head and bathroom aerator, but may store the additional unit for future use.

Table 5-24 Reasons for Choosing not to Install Measures

	Response	*Percentage of respondents (N = 382)*
Why did you choose not to use the remaining measures?	Had already installed measure / Waiting for current units to require replacement	30%
	Didn't have time to install measure	18%
	Did not need measure	13%
	No appropriate location to install measure/ Measure incompatible with existing equipment	12%
	Other	7%
	Personal preference	4%
	Did not receive measure	2%
	Measure did not function properly	2%
	Did not know how to install measure	2%

*Respondents were able to provide more than one response. The percentages shown are the percentages of responses, rather than the percentages of respondents. Thus, the total exceeds 100%.

As the Online Energy Check-Up program provides energy efficiency information and equipment to customers, it has the opportunity to motivate participants to independently implement energy saving improvements or make energy efficient purchases after participating in the program. In order to identify these potential energy saving impacts, the survey included questions to determine whether participants had purchased and installed additional energy efficient measures or initiated energy saving behaviors in their home. First, participants were asked about the recommendations they had received as part of their completion of the online audit tool, and whether they had then implemented these recommendations. As shown in Table 5-25, participants reported receiving a variety of recommendations through the online audit, the most commonly cited being thermostat modifications. Approximately one-third of respondents reported that they had received weatherization recommendations such as adding insulation or reducing air infiltration by sealing around doors and windows, installing energy efficient lighting, and adjusting the temperature of their water heater. As this question required participants to recall the audit recommendations from memory, it is likely that a higher percentage of respondents received recommendations in each category than is shown in the table. Overall, the majority of participants were able to identify more than one audit recommendation that they had received, but few were able to recall more than two recommendations.

In terms of actual implementation of the Online Energy Check-Up program audit recommendations, Table 5-27 shows that respondents most actively followed through with a lighting recommendation from the audit tool, although as they received bulbs through the measure kits, these respondents may have been referring to the fact that they had installed the provided bulbs rather than implementing additional CFLs or LEDs. Eleven percent of respondents engaged in weatherization of their home, while 8% modified their thermostat or heater settings.

Smaller percentages of respondents reported replacing items such as windows (3%) or appliances (1%). These energy efficiency improvements are typically costly and may require significant effort on the part of customers, it is less likely that the program would directly motivate customers to make these changes. These results suggest that the Online Energy Check-Up program is particularly effective in encouraging customers to make low cost energy saving improvements to their homes.

Table 5-25 Customer Purchase of Measures since Receiving Energy Efficiency Kit

Measure/behavioral recommendation category	*Percentage of respondents (N = 424)*	
	Received recommendation	*Implemented recommendation*
Modifying thermostat or heater settings	43%	8%
Weatherizing your home	33%	11%
Replacing lighting in your home	34%	15%
Modifying water heater temperature	32%	6%
Window replacement	23%	3%
Replacing refrigerators or freezers	26%	1%
Other	10%	-

Table 5-28 suggests that the majority of participants valued the information provided by the online energy check-up procedure, with 85% of respondents indicating that they found the associated recommendations to be at least somewhat useful. A portion of the two percent of respondents who reported that the recommendations were not at all useful explained they rented their homes so it was difficult to make any major changes. Another portion of the individuals who did not find the recommendations useful were already aware of the information provided.

Table 5-26 Perceived Usefulness of Energy Audit Recommendations

	Response	*Percentage of Respondents (N = 424)*
How useful did you find the recommendations that were provided by the online energy check-up?	Very useful	50%
	Somewhat useful	35%
	Slightly useful	8%
	Not at all useful	2%
	Don't know	5%

Additional commentary regarding the usefulness of energy audit recommendations included:

"We are already aware of what needs to be done. We just need the money to replace items."

"I would have liked more information about heat."

"Local contractor recommendations would have been useful."

5.3.7.3 Factors Affecting Customer Decision Making

Survey respondents were asked a series of questions related to their decision making behaviors involving energy efficiency. As displayed in Figure 5-4, 60% of respondents indicated that they chose to participate in the program in order to save money on their energy bills. This finding suggests that participants are primarily concerned with lowering their energy bills. This is expected, as the Online Energy Check-Up program is offered as a beneficial tool in reducing residential energy usage and the costs associated with utility bills over time. Another 21% of respondents indicated that they participated because the measures in the energy efficiency kit were provided free of charge. Additionally, 8% of the respondents cited environmental concerns as the reason for participating.

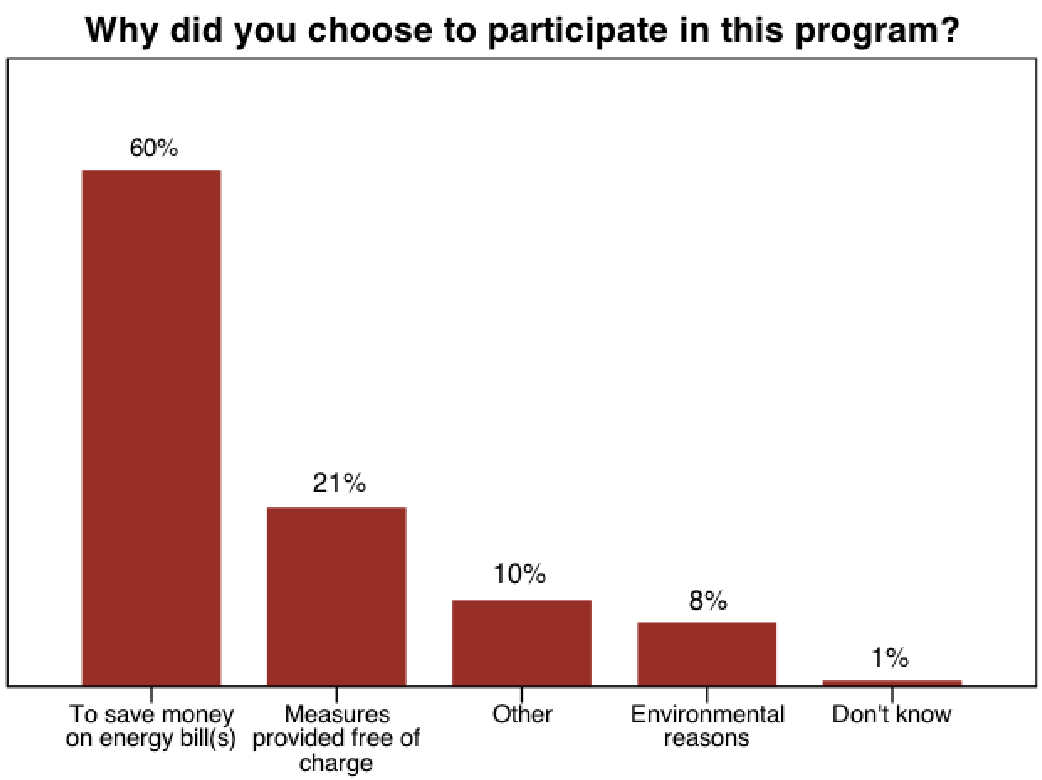


Figure 5-4 Reported Reasons for Participating in the Online Energy Checkup Program

In order to gauge participants' prior experiences with energy efficient measures and behaviors, the survey included a question related to specific past purchases made to save energy. Three hundred and twenty respondents out of the total 424 noted that they had purchased and used energy efficiency measures in their home prior to participation in the program. Table 5-29 displays the types of energy efficiency measures they used. The results show that the most common prior purchase involved energy efficient lighting such as LEDs and CFLs. Relatively few participants reported that they had made any other energy efficiency improvements prior to participating in the program, with large appliances and insulation being cited by only 9% of respondents, respectively.

Customers had the most experience with energy efficient lighting and relatively little experience with in-depth or costly energy efficiency projects such as home weatherization. Therefore, participants in the Online Energy Check-Up are likely most familiar with the types of energy efficiency improvements that are provided in the program measure kits. However, it is noteworthy that about one-third of participants did not report having previously purchased LED lighting or CFLs, which suggests that the kits may be encouraging customers to try energy efficient forms of lighting for the first time.

Table 5-27 Specific Energy Efficient Measures Previously Purchased

	Response	*Percentage of respondents (N = 320)*
What energy efficient measures had you previously purchased and used?	LED lighting/CFLs	65%
	Large appliances	9%
	Insulation	9%
	Shower heads/aerators	8%
	Windows	6%
	Misc. weatherization	5%
	Water heater	4%
	Furnace	3%

*Respondents were able to provide multiple responses to this item. The percentages shown are percentages of respondents rather than percentages of responses. Thus, the total exceeds 100%.

In order to gauge participants' past involvement with energy efficiency rebates and other incentives, respondents were then asked whether they had applied for financial incentives for the energy efficient equipment they had purchased prior to participating in the Online Energy Check-Up program. Of the 320 respondents that purchased and used energy efficiency measures in their home prior to participation in the program, 90% (289) stated that they had not applied for or received financial incentives for these previous energy efficiency purchases. As shown in Table 5-30, over half these respondents indicated that they had not been aware of existing financial incentives for these prior purchases. As the nature of these purchases was typically LEDs and CFLs, there may not have been opportunities to receive rebates or incentives at the time of purchase. Additionally, it is possible that these customers purchased discounted light bulbs without realizing that the price was marked down by a utility efficiency program. These results suggest that participants were previously willing to expend their own funds for energy efficient purchases, without the receipt of rebates or other incentives. While the program participants may have been willing to independently purchase some of the items they ultimately received through the measure kits, they may not have been aware of the various types of low-cost energy efficient improvements (e.g. various wattages or types of CFLs) if they had not participated in the Online Energy Check-Up program.

Table 5-28 Reasons for Not Receiving Financial Incentives for Prior Equipment Purchased

	Response	*Percentage of respondents (N = 289)*
Why didn't you receive a financial incentive for those items?	Did not know about the financial incentives	53%
	No incentives were offered for the measures	27%
	Did not know whether measures qualified for incentives	7%
	The financial incentive was insufficient	1%
	Other / Don't know	12%

As a follow-up to asking about participants' energy efficiency behaviors prior to completing the online audit, respondents were asked whether they had independently made any energy efficient purchases after participating in the Online Energy Check-Up program. According to Table 5-31, 76% of respondents reported that the program has not led them to purchase any energy efficient equipment for which they have not received a rebate or incentive. The majority of the 21% of respondents who reported making additional purchases cited the purchase of additional CFLs. A significantly smaller percentage cited the purchase of appliances. This suggests that the program may be more effective at directly motivating customers to implement no-cost measures that they receive in the kits than motivating them to make further purchasing decisions.

As participants consistently indicated that they are focused on cost savings and financial benefits of energy efficiency, they may not be interested in making the initial investment to implement additional energy saving equipment. While the Online Energy Check-Up program provides participants with information regarding behavioral improvements and low-cost measures, it may be beneficial to provide further information to participants regarding the long-term costs and savings associated with additional energy efficiency projects. If customers are able to calculate their likely energy and cost savings over time, they may be more likely to independently invest in energy efficient appliances and projects. However, in terms of low-cost measures, it is likely that customers will purchase and install additional low-cost measures as their current units reach the end of their usable life and require replacement.

Table 5-29 Program Influence on Customer Purchasing Behavior

Has your experience with I&M's Online Energy Check-Up program led you to buy any energy efficient equipment or items for which you did not apply for a financial incentive?	*Response*	*Percentage of Respondents (N = 424)*
	No	76%
	Yes	21%

Respondents were asked about their likelihood to purchase energy efficient measures in the future without incentives. More than 90% of respondents stated that they would be willing to purchase energy efficient items in the future, even if no financial incentives were available. Although this suggests that customers may be likely to replace their Online Energy Check-Up bulbs and other measures with energy efficient measures as necessary, this question involves a level of speculation on the part of participants and it is unclear whether respondents would actually initiate and complete these purchases.

5.3.7.4 Customer Satisfaction

Survey respondents were asked about their levels of satisfaction with selected elements of the Online Energy Check-Up program experience. Results are provided on a scale of 1 to 5, with 1 representing "very dissatisfied" and 5 representing "very satisfied". As displayed in Table 5-32 respondents generally reported high satisfaction levels with the majority of these program elements. Satisfaction ratings were very similar among the majority of program elements, with participants reporting the highest satisfaction with the contents of their kit and the overall program experience.

Comparatively, respondents provided lower satisfaction ratings for the savings on their monthly bills and the recommendations provided during the online audit. Only 16% of respondents indicated that they were very satisfied with monthly bill savings; two percent of respondents reported that they were somewhat or very dissatisfied with this aspect of the program. Respondents reporting dissatisfaction for this item were mainly concerned that they had not noticed very significant reductions in their utility bills or had even seen increases on their bills.

It is not atypical for residential participants to provide relatively low satisfaction ratings for monthly energy savings, as they may not have had time to observe a significant reduction in energy bills. Additionally, the measures provided through the Online Energy Check-Up program were designed as low-cost, incremental improvements that may not significantly impact the total energy usage of a household. It is likely that many customers have experienced a reduction in monthly energy costs, but that the amount has been a small percentage of their overall energy load.

Table 5-30 Customer Satisfaction with Selected Program Elements

Element of program Experience	*Satisfaction Rating*						*N*
	Very satisfied	*Somewhat satisfied*	*Neutral*	*Somewhat dissatisfied*	*Very dissatisfied*	*Don't know*	
Contents of the Online Energy Check-up Kit	79%	14%	4%	1%	1%	1%	424
The effort required for completing the online energy check-up	69%	15%	10%	1%	1%	4%	424
Overall program experience	71%	21%	6%	-	1%	1%	424
Performance of the measures installed	65%	23%	7%	1%	1%	3%	424
Recommendations provided in the Online Energy Check-up	57%	23%	13%	1%	2%	4%	424
Savings on your monthly bill	16%	16%	37%	2%	2%	27%	424

During the program year, a limited number of participants received an LED light bulb as part of the kit contents. To assess participants' reactions to the LED light bulb, survey respondents were asked to indicate whether or not they preferred the LED bulb to CFL bulbs. Table 5-31 highlights participant responses. The majority of respondents (63%) preferred the LED bulbs over the CFL bulbs. Approximately one third of respondents liked the LED bulbs equally as much as the CFLs. Those who preferred the LED bulbs to the CFLs stated several reasons for their preference. The most popular reasons were that the LEDs are brighter than the CFLs, the LEDs use less energy than the CFLs, the LEDs last longer than the CFLs, and the LEDs do not contain mercury like the CFLs.

Table 5-31 Preference for LED bulbs over CFL bulbs

	Response	*Percentage of Respondents (N =108)*
Do you prefer the LED bulb more, less, just the same, compared to the CFL bulbs?	More	63%
	Less	5%
	Just the same	27%
	Don't know	5%

Table 5-32 displays the average level of satisfaction with the performance of the measures and the kit contents for participants who did, and did not, receive an LED light bulb. Customers who received the LED light bulb reported slightly higher satisfaction with the performance of the measures and kit contents, although the difference was only statistically significant for the performance of the measures.

Table 5-32 Satisfaction with Measures and Kit Contents by Receipt of LED

	Performance of Measures	*Kit Contents*
Received LED, ns	4.6	4.8
Did Not Receive LED*	4.5	4.7

*p < .10

Respondents also provided a variety of open-ended commentary regarding their overall experiences with the Online Energy Check-Up program. These comments included some suggestions for improving the program, with several respondents recommending specific information on incentives. These customers may require additional guidance or referrals to equipment vendors or contractors. A few respondents explained that they had not needed several of the items provided through the kit, and would have preferred being asked which items they needed before the kits were mailed out. Specific examples of commentary provided by survey respondents included:

> *"I wish they would offer colored lights in the kits."*

> *"[I&M] should try to come up with other methods for saving energy."*

> *"They should send more light bulbs instead of the nightlights."*

> *"The faucet aerators that are provided do not fit right or look right on some people's fixtures."*

Many of the survey respondents provided strong praise for the Online Energy Check-Up program, mentioning that they were very happy to have the opportunity to participate. Several respondents stated that they would like the program to be more widespread in the community, and that many others could benefit from its services. Such commentary included:

> *"Thanks for the opportunity to try out new products!"*

> *"This is a wonderful thing to do to get people to understand about not using too much energy."*

> *"The program allows me to make more intelligent decisions."*

> *"I do like how the program is set up. It is informative."*

> *"I was surprised at what was in the box. It was a good incentive for people who can't afford them."*

Overall, the program generated much more positive feedback than negative remarks, and the survey findings suggest that customers are generally satisfied with their program experiences. The occasional negative feedback regarding effectiveness of recommendations or performance of measures was limited to a small percentage of customers, and does not suggest that there are any systematic issues with how the program offerings or services are designed or delivered.

5.3.8 Program Operations Perspective

This section summarizes the core findings from interviews conducted with I&M program staff and staff from Niagara Conservation (Niagara), the firm that fills the orders for the efficiency kits.

Interviews were conducted with program staff to gain insight into program operations and overall market trends, and to identify any notable program changes from the prior year. Specifically, the interviews focused on program management activities, the overall effectiveness of the program process, and the identification of areas for future program improvement.

Respondents shared their perspectives on how the program has performed in its most recent year, and how it has operated since its initial implementation and ramp-up period. Interview questions related to the respondents' individual roles in administering the program and their perceptions of overall program strengths, weaknesses, and opportunities for future years.

5.3.8.1 Summary of Interview Findings

Key program features and trends addressed by respondents include:

- **Change in program marketing:** program activity in 2013 was much greater than in 2012. Program staff noted that this increase in program activity may be due to the use of mailings sent to I&M customers promoting the program. Bill mailings were sent to all I&M customers who had not previously participated in the program. Two waves of mailers were sent during the program year. The first occurred during January, April, and July. The second occurred during October and November. In addition to the mailings, the program began promoting the program through social media in December of 2013. The utility's August newsletter also contained an article on the program.
- **Promotional LED bulb offering:** During the October through December period the program offered an LED bulb in the kit as a promotional item. Program staff reported they are waiting for customer feedback on installation rates and customers response to the LEDs to evaluate whether or not to offer the LEDs in the future.
- **Change in CFL wattage:** The firm that fulfills the kit orders changed the CFLs that were distributed through the kits without notifying I&M staff. Specifically, the 20w CFLs were replaced with 18w CFLs. I&M staff became aware of the change when customers with broken lights contacted them for replacements. The change to the 18w occurred as a result of industry changes in what is considered the equivalent of the same 60w incandescent bulb. The industry has determined that the 18w bulb saves more energy than the 20w CFL and the

lighting is not compromised. I&M's representative at Niagara reported that the failure to communicate the change was an oversight and indicated that it would not happen again. However, the company has not made any process or procedural changes to ensure that this issue does not occur in the future.

- **Supplier sends list of returned kits to I&M:** In the current process, the supplier of the kits sends a list of returned kits to I&M. This typically occurs every two months. However, the supplier acknowledged that this is something that needs to occur more frequently, such as monthly. This will provide I&M with the most updated information on the status of the kits.

6. Residential Peak Reduction Program

This chapter addresses the methodologies and impact findings of gross and net kWh savings and peak kW reductions resulting from the Residential Peak Reduction Program during the period January 2013 through December 2013.

6.1 Program Specific M&V Methodologies

The M&V approach for the Peak Reduction program (PRP) is aimed at determining the following:

- Numbers of homes that participated in the program;
- Number of homes that opted out of the program;
- Average annual kWh savings per home;
- Average kW reduction per home; and
- Estimating cost effectiveness of the PRP in 2013.

Table 6-1 below summarizes the inputs needed for gross savings calculations and the source of each input.

Table 6-1 Data Sources for Gross Impact Parameters – Peak Reduction Program

Parameter	*Source*
Number of Participants	Program Tracking Data/ Participant Surveying
Number of Opt Outs/ Account closures	Program Tracking Data
Hourly kWh Consumption	I&M Residential Billing Database
Hourly kW Consumption	I&M Residential Billing Database
Date of Events	I&M program Tracking Data
Number of Participants Part of Each Event	I&M/Honeywell Event Program Counts
Daily Weather Data (HDD and CDD)	Direct Pull From KFWA (Fort Wayne Airport) Weather Station

6.1.1 Verification of Participation in Program

A first aspect of conducting measurements of program activity is to verify if participants of the program did participate in the program. ADM takes several steps in verifying participation, which consists of the following:

- Validating program tracking data provided by Honeywell by checking for duplicate or erroneous entries;
- Verifying that participants were part of the program according to the agreed-upon process between Honeywell and I&M; and
- Conducting verification surveys with a statistically valid sample of program participants. The focus of these verification surveys are to verify that customers listed in the program tracking database did indeed participate. Participants are also asked about their opinions on events administered and if participating in the program was an inconvenience in any way to their lifestyle.

6.1.2 Calculating Gross Annual kWh/kW Savings

The residential component of the PRP was evaluated through use of a control group. Honeywell developed a sample for metering, weighted to be sufficiently representative of the Indiana Michigan Power regions. The sample is metered for the length of the control season (June 1 – September 30). Determining the total peak demand reduction provided by the PSP is done through the following steps:

(1) Comparison of kW/Ton values of curtailment and control groups over the range of the events;

(2) Calculating the highest kW reduction over a 15-minute rolling average of 5-minute intervals;

(3) Multiplying the resulting kW/Ton by total residential population tonnage

6.1.3 Calculating Net Energy (kWh) and Peak Demand (kW) impacts

The program assumed no free-ridership; therefore net savings are equal to gross savings. (NTG=1)

6.2 Impact Results

ADM estimated ex post gross electric savings and peak demand reductions through detailed analysis of participant billing data and participant survey data. The estimated gross impacts resulting from the PY4 Peak Reduction program are summarized in Table 6-2. Table 6-3 and Table 6-4 show the audited and verified savings.

Table 6-2 Gross Impact Summary

Program	PY4 Program Goals (kWh)	Peak Demand Savings (kW)		Annual Energy Savings, (kWh)		Realization Rate
		Ex Ante	Ex Post	Ex Ante	Ex Post	
Peak Reduction	207,000	-		213,356	91,946	43%

Table 6-3 Gross Impact kWh

Ex Ante Gross kWh Savings	Gross Audited kWh Savings	Gross Verified kWh Savings	Ex Post Gross kWh Savings	Realization Rate
213,356	213,356	213,356	91,946	43%

Table 6-4 Gross Impact kW

Ex Ante Peak kW Savings	Audited Peak kW Savings	Verified Peak kW Savings	Ex Post Peak kW Savings
-	-	-	2,993

Table 6-5 Summary of Savings

	7/15	7/16	7/17	7/18	8/26	8/28	8/29	8/30	9/10	9/11
kWh participant-day without snapback	2.70	3.10	2.31	2.18	0.83	1.36	1.42	0.42	1.47	2.33
kWh participant-day with snapback	2.01	2.43	1.68	2.01	-0.17	0.82	0.64	0.58	0.34	2.11
kW at hour ending 4 PM	0.47	0.54	0.55	0.63	0.20	0.39	0.31	0.32	0.35	0.37
MAX kW (anytime during event)	0.51	0.58	0.61	0.63	0.27	0.49	0.41	0.42	0.38	0.48
Average kW over event	0.45	0.52	0.58	0.55	0.21	0.45	0.35	0.42	0.37	0.39

The program assumed no free-ridership; therefore net savings are equal to gross savings. (NTGR=1)

6.2.1 Verification of Participation in program

As a first step toward estimating program level kWh and kW impacts, ADM reviewed program tracking data provided by Honeywell for accuracy. No duplicate entries were discovered. Table 6-6 lists total participation for the 2013 program year.

Table 6-6 Total Program Participants

Variable	*# of Participants*
2012 participants	2,158
2012 dropouts	1
2013 participants	4,551
2013 dropouts	194
Total 2013 participants	6,514[47]

To verify that the number of homes in the program tracking database claiming to have participated in the program was accurate, ADM administered a telephone survey with 446 program participants. All respondents who completed the participant survey verified that they participated in the program during 2013. ADM applied a verification rate of 100% to the program.

6.2.2 Gross Annual kWh Savings and Peak kW Reduction

The impacts of the PY4 Peak Reduction program were determined through analysis of metered run-time data from a random sample of 95 program participants. The metered run-times are converted to hourly kWh values based on the condensing units' cooling capacities[48]. ADM aggregated the hourly kW values from all 95 units, and then created a regression model to estimate the baseline hourly energy usages. The regression model cast the average hourly kWh value as the dependent variable, and the hourly weighted temperature humidity index as independent variable

$$\mathrm{kWh_i} = \propto \times\ \mathrm{kWh_{min}} + \beta^{\mathrm{i}}\mathrm{WTHI_i}$$

Where,

$\mathrm{kWh_i}$ is the kWh usage for the *i*th hour

$\mathrm{kWh_{min}}$ is the daily minimum hourly kWh

[47] Not all 2013 participants participated in events, as some participants signed up after the last event of the season was called.

[48] The average ratio of connected load, in kW, to unit capacity, in tons, is 1.0. This corresponds to an average EER of 10.

α is a constant of proportionality to kWh_{min}

$WTHI_j$ is the weighted temperature-humidity index[49] for the *i*th hour

β^i is a constant of proportionality to $WTHI_i$ (each hour has a separate constant of proportionality)

The above model is fit for non-event days with maximum weighted temperature –humidity indices above 77.

The model is improved upon through a ***same-day calibration*** process as follows:

1. For the hours ending 12 to 21, the modeled kW is augmented by the value: $\frac{kW_{noon-actual}}{kW_{noon}-modeled}$ This scale factor attempts to compensate model over-estimation or under-estimation by comparing actual to predicted values at noon on the event day.

A comparison of actual and modeled kW for the event day of July 16, 2013, is shown in Figure 6-1 below. In the figure, the solid black line represents the average hourly kW as reconstructed from data loggers. The dotted red line is the hourly WTHI. The dashed blue line represents the modeled hourly kW, which attempts to reconstruct the hourly kW that would have transpired in the absence of the curtailment event. The double-line black profile indicates the duration of the curtailment event.

[49] The temperature humidity index results from modifying the dry-bulb (DB) temperature for all values of DB above 58 F. THI is calculate as: THI = DB - 0.55 * (1 – HUM) * (DB – 58), where HUM is the percent relative humidity. The Weighted THI for a given hour is defined as equal to (10 * Today's THI + 3 * Yesterday's THI + Two Days' Ago THI) / 14

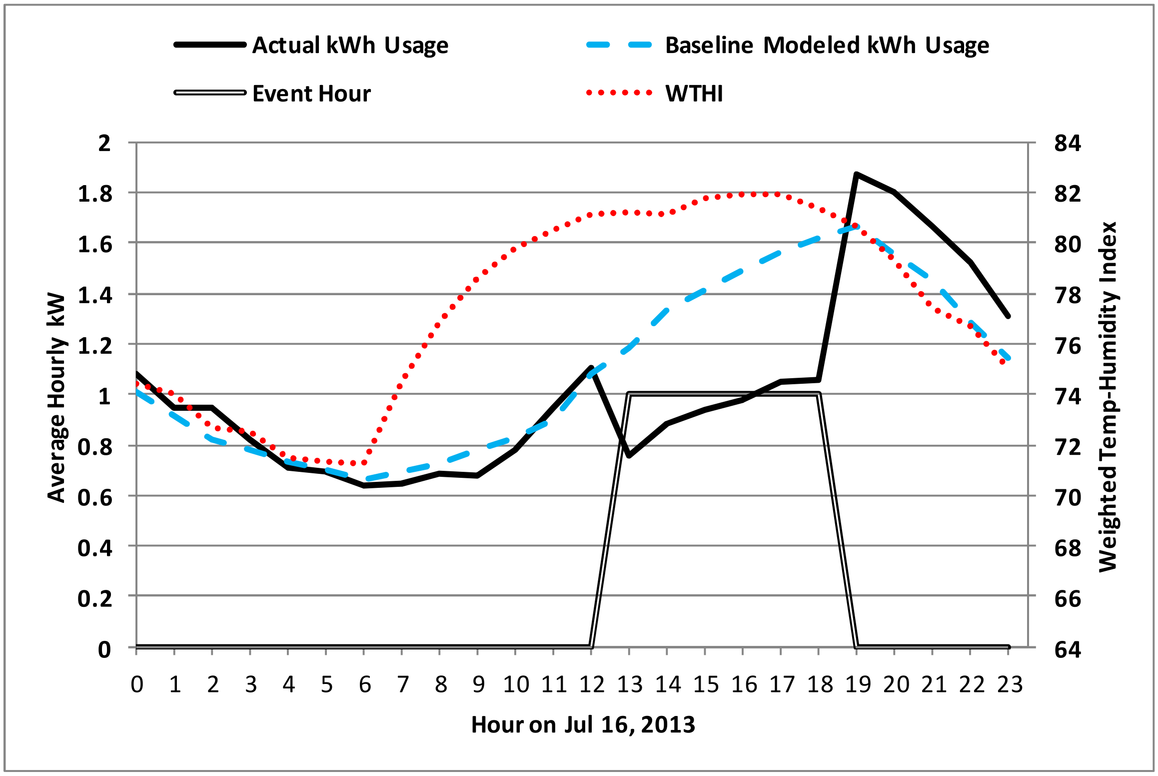


Figure 6-1 Actual and modeled kW on July 16, 2013

Demand Reduction:

The demand reduction per participant for each event hour is taken as the difference between the baseline model's predicted kW (adjusted by the same-day calibration process described above) and the kW as reconstructed from the data loggers. The program level demand reduction results by using the exact number of participants cycled during each event which was provided by Honeywell. The program achieved 2,993 kW of load curtailment (approximately 0.63 kW per participant) during the hour ending 4PM on July 18, 2013.

Total Energy Savings:

The total energy savings is taken as the sum of the total kW reductions for each event hour, adjusted by negative kW values that account for increased usage immediately following a curtailment event. Referring to Figure 6-1, one may note increased energy usage immediately after the event ends. The increased energy usage is attributable to greater than typical AC energy usage needed to restore the home's typical indoor temperature. This phenomenon is called "snapback". The snapback contributions are calculated for three post-event hours. Over the ten event days, the program achieved 62,404 kWh of energy savings. The total savings during the event periods was 91,946 kWh, but the savings net of snapback are 62,404 kWh.

Table 6-7 below summarizes the annual kWh savings calculation. The total verified kWh savings are considerably lower than ex ante estimations. Three potential reasons for the relatively low realization rate are discussed below.

(1) Coincidence Factor: The coincidence factor is the likelihood that a given AC unit is operating during a given period. It is interesting to note that, even on relatively hot days, the coincidence factor ranges from 45% to 67%, with the weighted average coincidence factor being 54%.

(2) Event Savings Factor: The energy savings achieved by curtailment events, on average, was 33%. During the July15-18 events, the average savings was 36%, although the cycle percentage was 50%. This may indicate that the cycle percentage is not directly proportional to percent demand reduction achieved.

(3) Snapback: For residential direct load control programs, snapback tends to reduce the energy savings by about one third to one half.

Table 6-7 Summarization of Savings

Parameter	*Value*	*Source*
Total Event Hours	42	Event Records (rounded up on 9/11/2013)
Average # of Participants	5,197	Event Records (weighted by savings)
Average System Capacity (Tons)	2.43	Review of Nameplate Data
Average kW/ton	1.00	Engineering Calculation
Average Coincidence Factor During Events	53%	Calculated from logger Data
Average Demand Reduction During Events	33%	Estimated from comparison of logger data to modeled baseline during events
Estimated Energy Savings kWh (not counting snapback)	91,946	
Estimated Energy Savings kW (not counting snapback)	2,993	
Snapback	29,946	Estimated from comparison of logger data to modeled baseline after events
Estimated Energy Savings (including snapback)	62,404	

Table 6-8 and Table 6-9 show the hourly kW reduction per unit and program level hourly kW reductions.

Table 6-8 Hourly kW Reduction per Unit

Hourly kW Reduction Per Unit										
Hour Ending\Date	7/15	7/16	7/17	7/18	8/26	8/28	8/29	8/30	9/10	9/11
13	0.41	0.46	0.00	0.48	0.00	0.00	0.00	0.00	0.00	0.00
14	0.37	0.48	0.00	0.51	0.00	0.48	0.41	0.00	0.00	0.20
15	0.43	0.51	0.59	0.56	0.27	0.49	0.39	0.42	0.38	0.42
16	0.47	0.54	0.55	0.63	0.20	0.39	0.31	0.32	0.35	0.37
17	0.50	0.54	0.56	-0.16	0.18	-0.32	0.31	0.30	0.37	0.39
18	0.51	0.58	0.61	-0.09	0.18	-0.14	-0.36	-0.45	0.37	0.47
19	-0.11	-0.20	-0.27	0.07	-0.50	-0.09	-0.26	0.00	-0.45	0.48
20	-0.28	-0.25	-0.20	0.00	-0.31	0.00	-0.16	0.00	-0.41	0.12
21	-0.29	-0.22	-0.16	0.00	-0.20	0.00	0.00	0.00	-0.27	-0.33

Table 6-9 Program Level Hourly kWh Reduction

Program Level Hourly kWh Reduction										
Net Installs	4,698	4,709	4,689	4,732	5,409	5,447	5,467	5,491	5,650	5,681
Opt Outs	3	10	4	11	1	0	4	0	4	0
Hour Ending\Date	**7/15**	**7/16**	**7/17**	**7/18**	**8/26**	**8/28**	**8/29**	**8/30**	**9/10**	**9/11**
13	1,929	2,145	0	2,275	0	0	0	0	0	0
14	1,747	2,253	0	2,414	0	2,619	2,236	0	0	1,159
15	2,008	2,397	2,753	2,649	1,478	2,689	2,152	2,309	2,132	2,383
16	2,220	2,514	2,583	2,986	1,076	2,119	1,685	1,739	1,993	2,086
17	2,356	2,541	2,623	-774	968	-1,725	1,680	1,635	2,098	2,216
18	2,416	2,744	2,853	-407	984	-774	-1,952	-2,477	2,105	2,648
19	-537	-943	-1,254	343	-2,694	-478	-1,431	0	-2,536	2,726
20	-1,316	-1,182	-940	0	-1,650	0	-884	0	-2,336	663
21	-1,380	-1,020	-735	0	-1,097	0	0	0	-1,532	-1,866

The model output for reference:

```
Dependent variable: kW

             coefficient    std. error    t-ratio    p-value
  --------------------------------------------------------------
  h1          0.00479209    0.000738494    6.489    4.93e-010 ***
  h2          0.00289958    0.000742782    3.904    0.0001    ***
  h3          0.00191869    0.000747982    2.565    0.0109    **
  h4          0.00125928    0.000751664    1.675    0.0952    *
  h5          0.000800899   0.000756482    1.059    0.2908
  h6          0.000415989   0.000755681    0.5505   0.5825
  h7         -0.08277e-05   0.000755585   -0.1202   0.9044
  h8         -9.45758e-05   0.000738691   -0.1280   0.8982
  h9          0.000176320   0.000719724    0.2450   0.8067
  h10         0.000961453   0.000699269    1.375    0.1704
  h11         0.00168151    0.000686316    2.450    0.0150    **
  h12         0.00272113    0.000674100    4.037    7.30e-05  ***
  h13         0.00395041    0.000666489    5.927    1.07e-08  ***
  h14         0.00513174    0.000665488    7.711    3.35e-013 ***
  h15         0.00679985    0.000664947   10.23     1.35e-020 ***
  h16         0.00768539    0.000661621   11.62     5.02e-025 ***
  h17         0.00838985    0.000664303   12.63     2.37e-028 ***
  h18         0.00917678    0.000665676   13.79     3.32e-032 ***
  h19         0.00980675    0.000668618   14.67     3.62e-035 ***
  h20         0.0102417     0.000680954   15.04     2.00e-036 ***
  h21         0.00907390    0.000692876   13.10     6.70e-030 ***
  h22         0.00805756    0.000709200   11.36     3.35e-024 ***
  h23         0.00754185    0.000719218   10.49     2.07e-021 ***
  h24         0.00592101    0.000731410    8.095    2.91e-014 ***
  MinkW       1.05764       0.0731255     14.46     1.76e-034 ***

Mean dependent var   0.802911   S.D. dependent var   0.335139
Sum squared resid    4.542096   S.E. of regression   0.137857
R-squared            0.977259   Adjusted R-squared   0.974975
F(25, 239)           410.8260   P-value(F)           3.4e-181
Log-likelihood       161.6582   Akaike criterion    -273.3164
Schwarz criterion   -183.9177   Hannan-Quinn        -237.3933

P-value was highest for variable 44 (h7)

model1 saved
```

6.2.3 Calculating Net Annual kWh/kW Savings

The program assumed no free-ridership, therefore net savings are equal to gross savings. (NTG=1)

6.3 Process Evaluation

This chapter presents the results of the process evaluation of I&M's Peak Reduction program during program year four (PY4). As no peak reduction events were called during PY3, PY4 marked the first year that the program achieved energy savings. Thus, the PY4 process evaluation revisits topics from the PY3 evaluation such as program design and operational characteristics, but also addresses program performance and customer response to event activity.

As with the prior year, the purpose of the PY4 process evaluation is to assess the design and recent results of the program in order to determine how effectively it is achieving its intended outcomes. This evaluation is based upon analysis of program structure and tracking data, and interviews and surveys of current program participants, opt-out customers, I&M program staff, and program implementation contractor staff.

This chapter begins with a description of the process evaluation objectives, and a summary of the program design, background, and participation activity. This is followed by a discussion of the results from the participant survey and survey of customers who opted out of the program. The chapter continues by presenting the results of interviews that were conducted with I&M program staff and Honeywell, Inc. staff. The chapter concludes by highlighting key findings and program recommendations resulting from the process evaluation.

6.3.1 Evaluation Objectives

The process evaluation seeks to examine program operations and results for the current program operating year, and to identify potential program improvements that may prospectively increase program delivery efficiency or effectiveness in terms of customer participation and satisfaction levels. This process evaluation was designed to document the operations and delivery of the Peak Reduction program during PY4.

Key research questions to be addressed by this evaluation of PY4 activity include:

- How do participants learn about the program? What barriers to participation exist?
- Why did customers participate in the program?
- What communication between I&M, Honeywell, Inc., and customers exists? Do customers find that level of communication sufficient? Are events communicated appropriately to maximize program participation?
- How effectively has the program performed now that events are being called? How have customers responded to event activity?
- How satisfied are participants with the program overall? What was their level of satisfaction with different elements of the program; from the enrollment process to the receipt of the monthly bill credit?

During the evaluation, data and information from multiple sources were analyzed to achieve the stated research objectives. Insight into the customer experience with the Peak Reduction program is developed from a telephone survey of program participants, as well as a telephone survey of customers who previously opted out of participating in the program. The internal organization and operational efficiency of program delivery is examined through analysis of interviews conducted with I&M program staff and interviews with Honeywell staff. Further insight into the program’s internal structure is obtained through a review of program documentation such as marketing literature and participant tracking data.

6.3.2 Summary of Primary Data Collection

- **Review of program documentation and relevant literature:** ADM reviewed relevant program planning documents and program tracking data in order to assess the current state of program documentation and to note any significant changes in data content or structure.
- **Participant surveys:** Participant surveys were the primary data source for the process evaluation, and served as the foundation for understanding the customer perspective. The participant surveys provided customer feedback and insight regarding customer experiences with the Peak Reduction program. Participants also relayed their experiences responding to peak reduction events, Respondents also reported on their satisfaction with the program, contractor professionalism when installing the switch and the different elements of the program from enrollment to scheduled visit to monthly bill credit receipt.
- **Program drop-out surveys:** Surveys with I&M customers who previously enrolled in the program but decided to drop-out of program services provide information regarding barriers to participation and potential opportunities for program improvement. Additionally, these surveys provide an opportunity to compare opt-out customers with current participants in order to identify any significant differences in customer characteristics and perspectives.
- **Interviews with program staff members:** Interviews with I&M staff members and Honeywell, Inc. staff, provided insight into various aspects of the program and its organization. Honeywell, Inc. staff provided insight into key program metrics and addressed various areas of program performance and delivery. I&M staff members also provided information regarding future plans for the program and its interaction with other I&M programs.

6.3.3 Program Theory and Activities

The overall design of the Peak Reduction program has remained largely unchanged since the prior program year. The program is designed to reduce energy consumption by providing demand reduction cycling events to customers who agree to have a switch installed on their central air conditioning unit. Customers who agree to the installation of the switch are given a monthly bill credit on their statement for the months of May through September.

In PY4, the key program phases for the Peak Reduction program were:

- Making any necessary adjustments to program operations;
- Promoting the program;
- Customers signing up for the program;
- Contractors installing switches on participants air conditioning units; and
- Events being called.

As with PY3, the PY4 Peak Reduction program was administered by Honeywell, Inc. (Honeywell). Honeywell is responsible for coordinating program delivery mechanisms such as contractor management, program marketing, and peak event management. I&M coordinates with Honeywell in order to monitor program performance and discuss necessary modifications to program delivery or structure. I&M is also involved in program promotion and has a website for the program that customers can access through the utilities residential energy efficiency programs website.

In PY4 and PY3, the program was primarily marketed through direct mail and bill inserts. Program staff noted that this strategy has worked well, and that these methods will likely continue to represent the bulk of program marketing materials.

A total of 2,158 customers enrolled in the program during PY3, and an additional 4,551 participants enrolled during PY4. The program experienced a low drop-out rate, with a total of 195 customers deciding to drop out of the program during PY3 and PY4. Only one of these drop-outs occurred in PY3, when no events were called, which suggests that the majority of customers who have dropped out of the program did so due to their experiences with peak events.

During PY4, a total of 10 events were called. One of these events was classified as an emergency event, during which customers are not allowed to opt out. Another one of these events was classified as a non-emergency event, but later became an emergency event. The attrition rate, or percentage of participants who requested to leave the program during the cycling season, was 1.37% for the program year.

6.3.4 Participant Survey Findings

The following section presents key findings from surveys conducted with customers who participated in PY4 of the I&M Residential Peak Reduction program (Peak Reduction program). This section also highlights any notable comparisons between PY3 and PY4 program participants.

ADM conducted online surveys with program participants as part of the evaluation effort for the PY4 Peak Reduction program. As with the prior year, this survey was designed to gather information regarding the participant perspective on their experiences in the program, as well as to characterize customer preferences and decision making with regard to energy efficiency. As PY4 marked the first year that peak events were called, the survey also asked participants about their experiences during and perspectives on the event procedures and associated usage reductions. Specifically, data collected via participant surveying are used in evaluating:

- Customer awareness of the program;
- Customer decision making behaviors; and
- Customer satisfaction with the program.

In total, 400 customer participants who enrolled in the program and participated in peak events during PY4 responded to the survey.

6.3.4.1 Participant Awareness of Program

Survey participants were first asked how they learned about the Peak Reduction program. As shown in Figure 6-2, the majority of respondents reported that they had learned of the program from utility bill inserts and direct mail. This is consistent with the program's marketing efforts, and with the participant survey findings from PY3. Very few respondents reported learning of the program through word of mouth or through the I&M website. It appears that direct marketing efforts have been the most effective promotional activity thus far, with potential opportunities existing for increasing promotion through electronic channels.

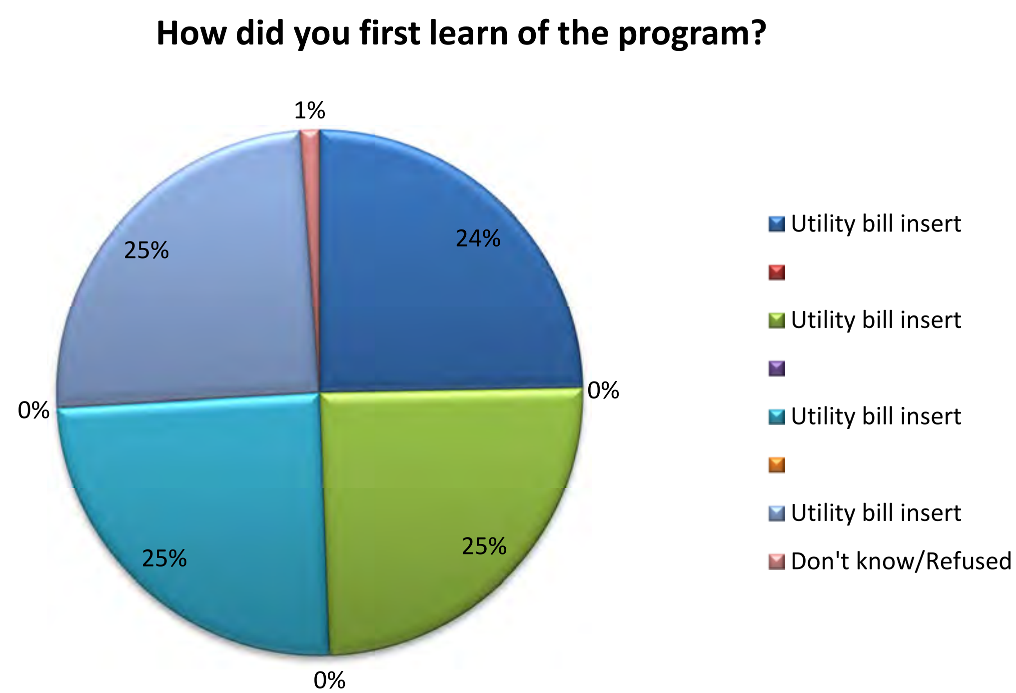


Figure 6-2 How Customers Learned about the Program

6.3.4.2 *Factors Affecting Participation*

Survey respondents were asked a series of questions related to their decision making behaviors involving energy efficiency. As displayed in Figure 6-3, respondents most commonly indicated that they chose to participate in the program in order to save money on their energy bills. Additionally, 21% of respondents indicated that they participated in order to save energy in their home. These results are fairly consistent with findings from PY3, and suggest that participants are most concerned with the financial benefits of reducing their energy usage.

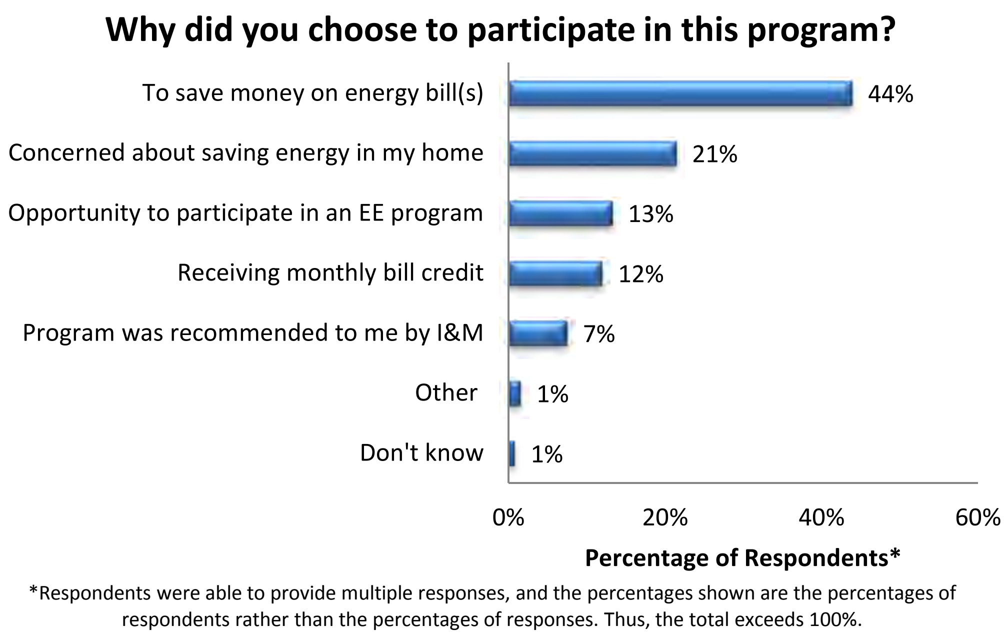


Figure 6-3 Reported Reasons for Participation in Peak Reduction Program

Participant survey respondents were then asked whether they had any initial concerns about participating in the Peak Reduction program. The majority of respondents (80%) reported that they did not have any such concerns. The remaining 76 respondents were asked to elaborate on these initial concerns, and as shown in the following figure, provided a range of responses. These respondents most commonly indicated that they had been concerned about their level of comfort during peak events.

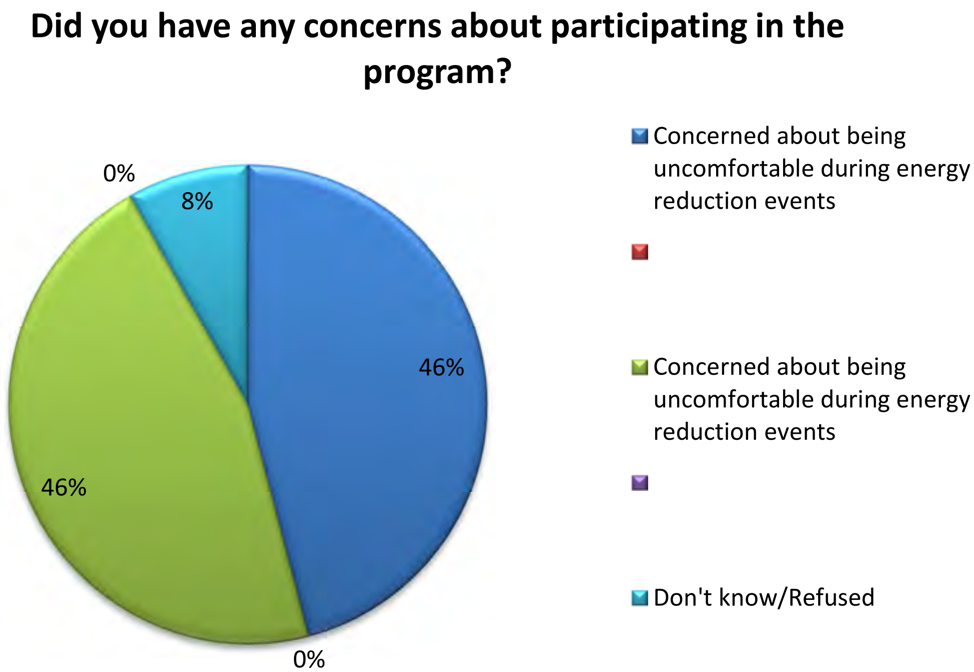


Figure 6-4 Initial Participation Concerns

Twenty percent of these respondents provided responses of 'other' and elaborated with open-ended commentary. Examples of these comments include:

> *"I could not get any information about what was going to happen. No one I talked to could give me any clear answers about what was to come."*
>
> *"I have a smart thermostat and I was concerned about what effect the program would have on it."*
>
> *"I was unsure if the program was real or if it was a scam."*
>
> *"I was concerned about the air conditioner being cycled off for a long period. They answered that question to my satisfaction."*

These results suggest that some customers have initial questions about the program that may cause concern prior to their participation. Although I&M provides detailed program information on the I&M website, including a "Frequently Asked Questions" document, it appears that some customers do not feel sufficiently informed during the initial stages of participation. It should be noted, however, that this represents a minority of survey respondents and that the majority of respondents did not indicate this concern.

6.3.4.3 Participant Experiences during Reduction Events

Participant survey respondents were then asked a series of questions related to their experiences during the PY4 peak reduction events. Respondents were first asked how many events they had noticed during the program year, as shown in the following figure. Respondents most commonly stated that they had not noticed any events during the year, and only 14% of respondents reported noticing at least one event. This is likely favorable for the Peak Reduction program, as high participant awareness of events may correlate with perceived inconvenience or discomfort with regard to home temperature levels.

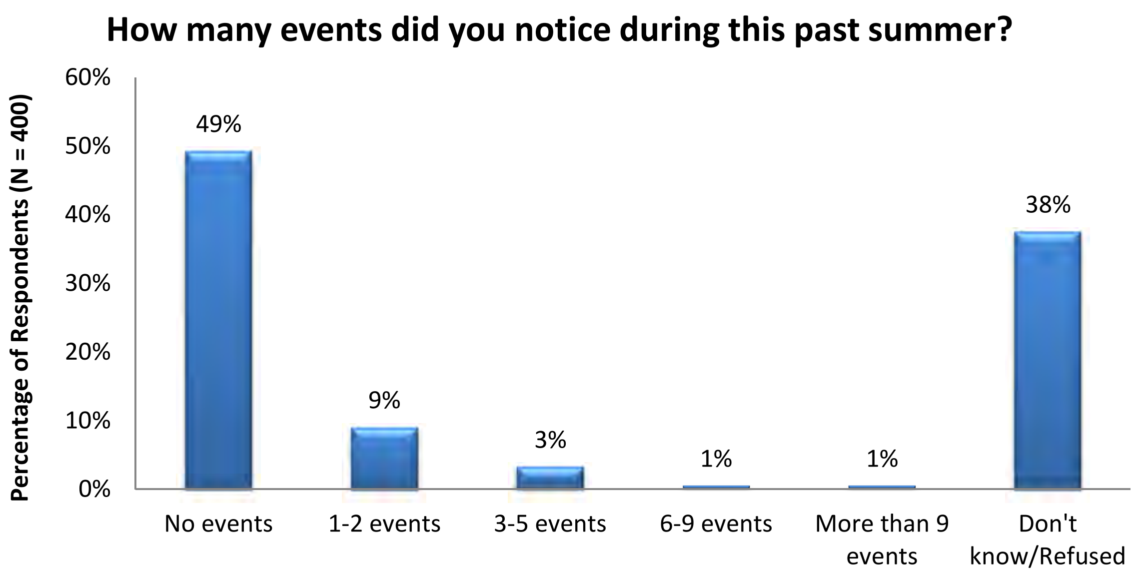


Figure 6-5 Participant Awareness of Reduction Events

The participants who reported being aware of at least one peak reduction event were asked follow-up questions about their experiences. First, respondents were asked to identify the temperature increase that had occurred during event periods. As shown below, approximately two-thirds of these respondents indicated that the temperature had increased between one and three degrees. This is a minimal increase that is unlikely to result in discomfort.

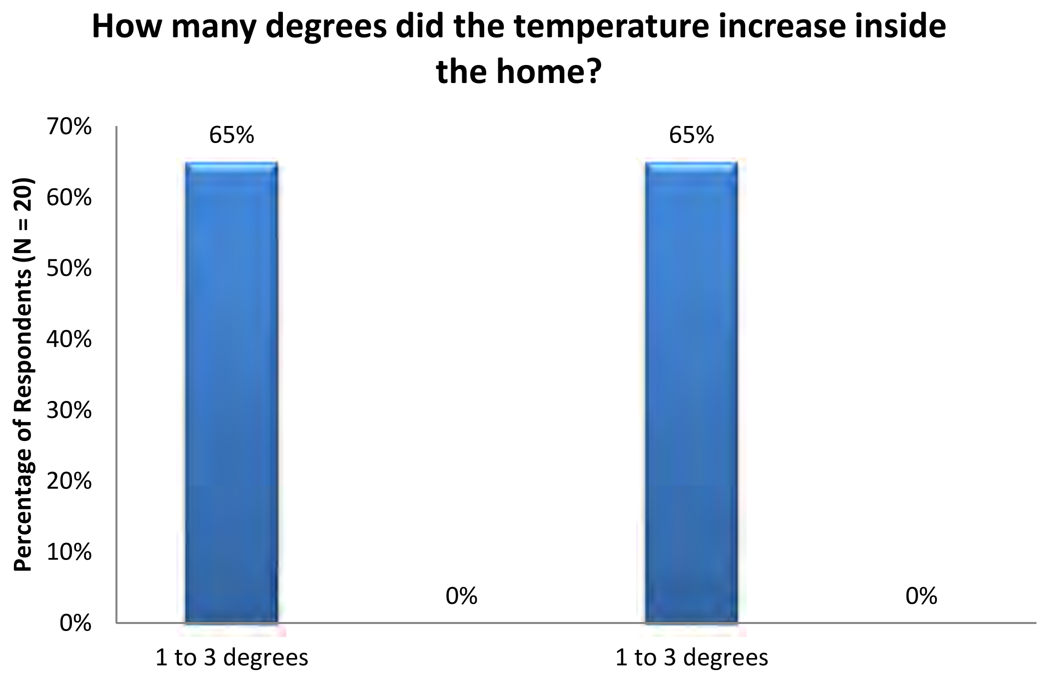


Figure 6-6 Reported Temperature Increases During Events

Forty percent of participants indicated that they had been at home during one or more reduction events. Although most of these respondents could not state how they knew an event had been called, 18% of them reported that they noticed the air conditioner running less often. Another 15% reported that they knew an event had occurred when house became uncomfortably warm.

Only nine percent of respondents reported that they were aware of an event that had occurred while they were out of the house. These respondents mainly reported that they knew an event had occurred because the house was warm when they returned home, or the air conditioner was not running when they returned home.

Overall, these results indicate that the majority of participants were not aware of individual peak reduction events or the effect that these events were having on their home.

6.3.4.4 Participant Behavior during Cycling Season

When asked whether they had expected more or fewer events to occur during PY4, respondents most commonly reported that they did not know how many events to expect. The remaining responses were fairly evenly split, with some respondents stating that they expected more events and others reporting that they expected fewer events.

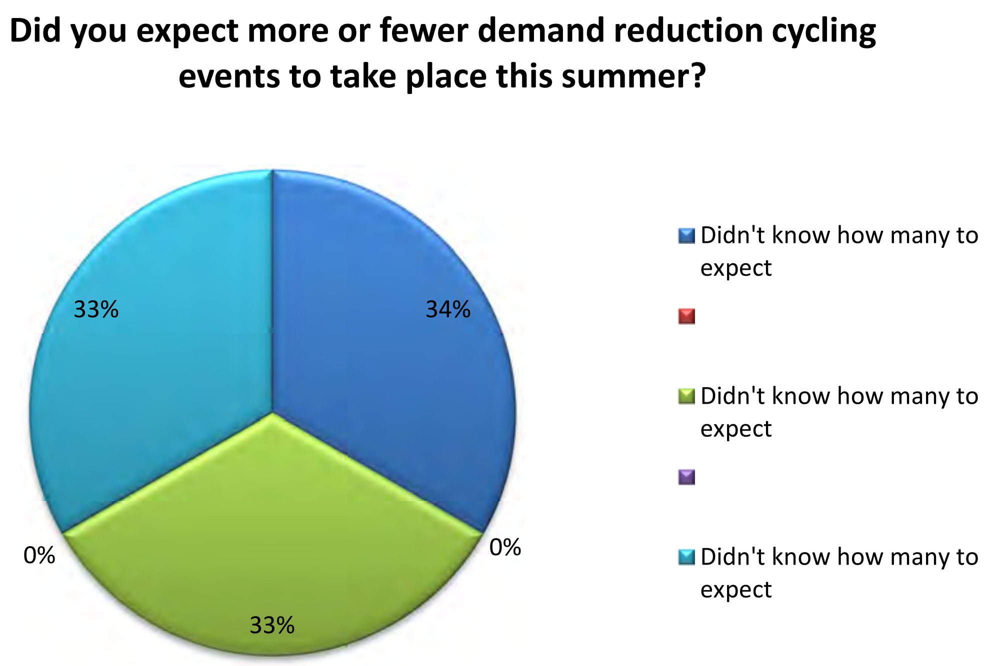


Figure 6-7 Participant Expectation of Event Quantity

Additionally, three-quarters of respondents indicated that they were happy with the number of events that had been called. Only five percent of respondents specifically stated that they were not happy with the number of peak reduction events.

Only two percent of respondents indicated that they opted out of one or more events during the 2013 event season. When asked why they opted out, these participants most commonly stated that the temperature change would have been uncomfortable. One respondent reported that they thought the events would damage their air conditioner system.

Respondents were next asked if there was a change in their energy usage behavior in anticipation of events, and only seven percent reported that they had done this. Twenty-five respondents provided commentary explaining how they had changed their energy usage behavior, including:

> *"I cut back on lights and air conditioning."*
>
> *"I did not rely so much on the air conditioner, I used the fans."*
>
> *"I have kept my air conditioner off lately."*
>
> *"I'm making sure the lights are off and all electronics are unplugged."*

It should be noted that although customers cited these behaviors during the survey, it is unclear whether these actions were due to customers' participation in the Peak Reduction program. It is possible that customers may have engaged in these behaviors even if they had not participated in this program. However, these comments indicate that some participants are actively aware of their energy use and are making attempts to lower usage or prepare for peak reduction events.

6.3.4.5 Participant Satisfaction

Survey respondents were first asked about their levels of satisfaction with selected elements of the Peak Reduction program experience in regards to the contractor who visited their home to install the switch on the participant's air conditioner. Results were provided on a scale of 1 to 5, with 1 representing "very dissatisfied" and 5 representing "very satisfied". As displayed in Table 6-10, respondents generally reported high satisfaction levels with the contractor visits. The who reported a level of dissatisfaction with elements of the contractor visit typically noted that the contractor had left a mess in the work area, had initially installed the switch incorrectly, or had taken too long to install the switch. These results suggest that there are minor areas of potential improvement for the contractor installation process, although instances of dissatisfaction were very infrequent. For the most part, participants appear to be highly satisfied with the control switch installation process. This is consistent with findings from the prior program year.

Table 6-10 Participant Satisfaction with Contractor Visit Elements

Element of Contractor Experience	*Satisfaction Rating*						*N*
	Very satisfied	*Somewhat satisfied*	*Neutral*	*Somewhat dissatisfied*	*Very dissatisfied*	*Don't know*	
Professionalism of the contractor who installed the cycling switch	65%	8%	11%	0%	1%	16%	400
How quickly the contractor installed the cycling switch	65%	9%	8%	0%	0%	18%	400
Quality of work conducted by the contractor	77%	8%	4%	1%	2%	10%	400

Survey respondents were then asked about their levels of satisfaction with selected elements of the Peak Reduction program experience. Results were also provided on a scale of 1 to 5, with 1 representing “very dissatisfied” and 5 representing “very satisfied”. As displayed in Table 6-11, respondents generally reported high satisfaction levels with the majority of these program elements. Respondents reported being the most satisfied with the application process, followed by the scheduling of the control switch installation.

Table 6-11 Participant Satisfaction with Selected Program Elements

Element of program Experience	*Satisfaction Rating*						*N*
	Very satisfied	*Somewhat satisfied*	*Neutral*	*Somewhat dissatisfied*	*Very dissatisfied*	*Don't know*	
The effort required for the program application process	75%	14%	8%	1%	0%	2%	400
Scheduling process for equipment installation	75%	12%	7%	1%	1%	4%	400
Date and time of scheduled visit	75%	9%	8%	1%	1%	7%	400
The initial enrollment process for the program	74%	15%	8%	0%	1%	2%	400
Receipt of monthly bill credit	63%	9%	14%	2%	3%	11%	400
Interaction with call center staff	60%	12%	13%	1%	1%	14%	400

Respondents were somewhat less satisfied with the receipt of the monthly bill credit; these respondents did not elaborate on their responses but it is possible that they have not noticed the bill credit or expected a larger bill credit to be provided. Other comments explaining the few instances of dissatisfaction include:

> *“The box on the air conditioner was supposed to have a light that went on during events but it did not. I was not aware that I would be so uncomfortable in my home during the peak periods.”*
>
> *“When a cycle occurs in my house during a very hot day, it makes my house uncomfortably hot and I do not like it.”*
>
> *“[The air conditioner] did not seem like it went down like I thought it would.”*

As with the PY3 evaluation, many of the survey respondents provided strong praise for the Peak Reduction program, mentioning that they enjoyed participating in the program and would like to pursue additional energy efficiency opportunities with I&M. Specific commentary included:

> *"We have been with I&M many years and have never had problems with their service or programs."*
>
> *"We were pleased with the program and will be using the program next year."*
>
> *"It was a very seamless and transparent program… I was always comfortable with the temperature in my home."*
>
> *"I am very thankful because we have very few instances of outages. We are thankful to I&M as our company."*
>
> *"I would like them to compare how efficient people's homes are compared to their neighbors'."*
>
> *"I am happy to participate in any program that would help people take care of our energy usage."*

When asked how their experiences with the program had affected their satisfaction with I&M as their utility provider, only two percent of all respondents indicated that the program had negatively affected their satisfaction with I&M. Nearly half of the survey respondents stated that the program had actually increased their satisfaction in this regard, which further emphasizes participants' positive reception of the program during PY3 and PY4.

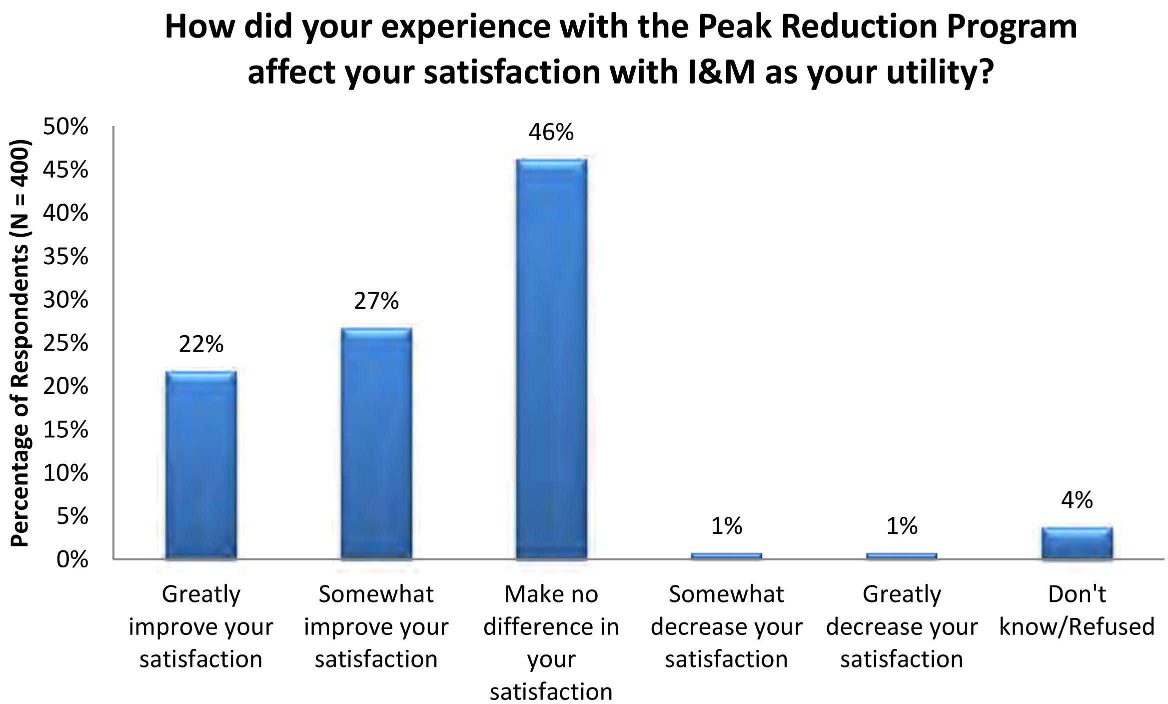


Figure 6-8 Change in Satisfaction with I&M as Utility Provider

Overall, the satisfaction results indicate that a large majority of participants did not experience significant difficulties or inconveniences during PY4, and that few customers have persisting concerns about participating in the future. Instances of dissatisfaction were very infrequent and participants in both PY3 and PY4 reported high levels of satisfaction with each program element.

Finally, respondents were asked whether they had visited the I&M website in order to pursue further energy efficiency advice and opportunities. Twenty-eight percent of respondents indicated that they had done this, and were asked to rate the usefulness of the information they had seen. Responses were provided on a 10-point scale where 1 represented “not very useful” and 10 represented “very useful”. As shown in the following figure, the majority of respondents provided a response of 5 or higher, with more than one-quarter of respondents specifically stating that the information was “10 – very useful”. These results indicate that while a minority of respondents has pursued additional energy efficiency information through I&M, the majority of this subgroup finds the information to be fairly useful.

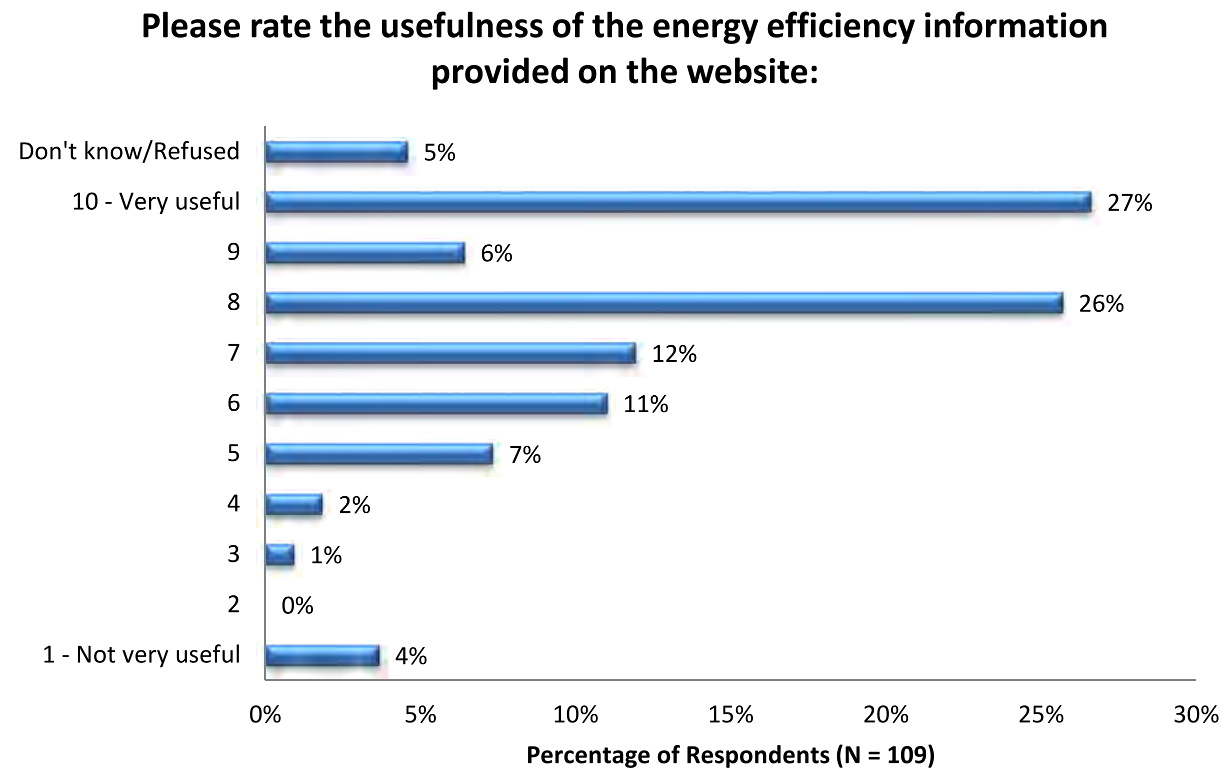


Figure 6-9 Reported Usefulness of I&M Website Information

Lastly, respondents were asked if they were planning on continuing their participation in the program in 2013. As shown in Table 6-12, ninety percent of respondents replied "yes" to participating in the program during 2014. Five percent of respondents answered "don't know", and five percent answered "no". These responses are very similar to those from the PY3 evaluation, and confirm that a large majority of participants are interested in continuing their participation after experiencing a full program year.

Table 6-12 Participants Continuing Participation Next Year

	Response	*Percentage of respondents (N = 400)*
Do you plan to continue participation in the program next year?	Yes	90%
	No	5%
	Don't Know	5%

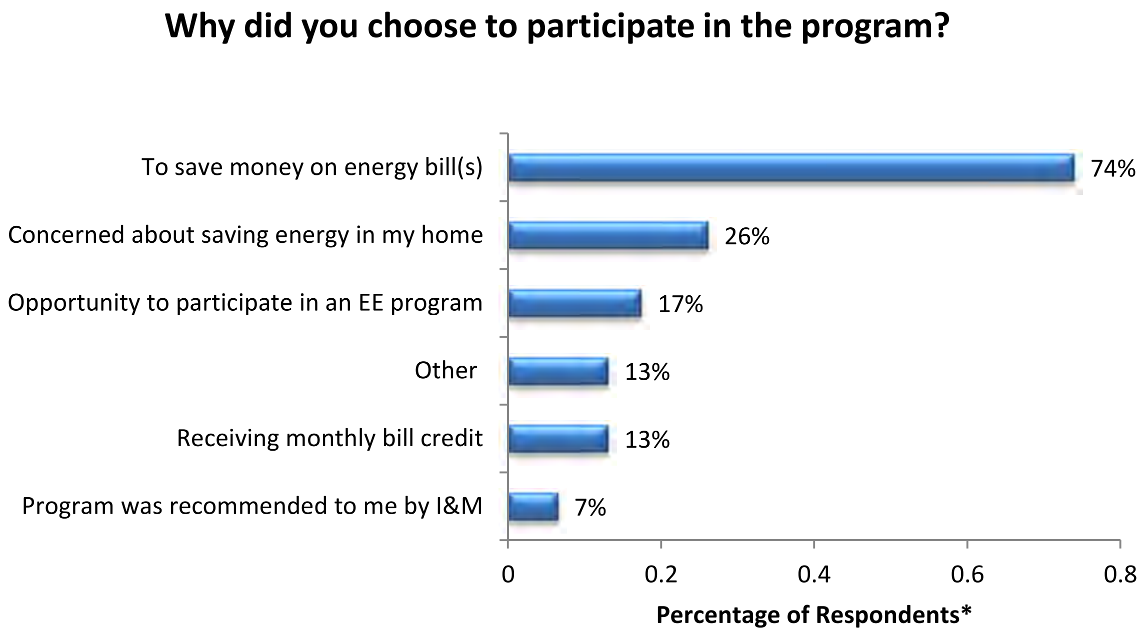
6.3.5 Program Drop-out Findings

ADM conducted a telephone survey with I&M customers who had initially enrolled in and participated in the Peak Reduction program, but later decided to leave the program and have their control switch removed. The purpose of this survey was to address existing barriers to participation for customers who decided to drop out of the program, as well as to identify any notable differences between decision making and other characteristics for drop-out participants as compared to continuing program participants. In total, 46 I&M customers who had dropped out of the Peak Reduction program responded to the telephone survey.

6.3.5.1 Initial Program Awareness and Motivations

Respondents were first asked how they learned about the program, and the majority of respondents (85%) reported that they had learned about the program through a utility bill insert or through direct mail from the utility. This is consistent with responses provided through the participant survey. A majority of respondents also stated that they would like to receive future information about I&M programs through direct mail or bill inserts, suggesting that the current marketing channels are viewed as favorable by most participants and participant program drop-outs.

Respondents were then asked why they initially decided to participate in the Peak Reduction program. As displayed in the following figure, the majority of respondents indicated that they wanted to save money on their energy bills. These results are nearly identical to those obtained through the participant survey, suggesting that participants and participant program drop-outs initially had the same motivations for enrolling in the program.



*Respondents were able to provide multiple responses, and the percentages shown are percentages of respondents rather than percentages of responses. Thus, the total exceeds 100%.

Figure 6-10 Reasons for Participation in Peak Reduction Program, Program Drop-outs

When asked if they had any initial concerns about participating in the program, 83% of program drop-out survey respondents indicated that they did not have any concerns. This is also consistent with participant survey responses. When asked to explain their initial concerns, respondents mainly reported that they were concerned about being uncomfortable during energy reduction events.

6.3.5.2 Program Drop-out Experiences During Reduction Events

Respondents were then asked a series of questions related to their experiences during the peak reduction events. When asked whether they were at home during any of the events, approximately two-thirds of respondents reported that they were at home during at least one event. This somewhat varies from the participant survey response, where 40% of participants indicated that they had been home during an event.

Respondents who reported being at home during an I&M peak reduction event were then asked how they knew that their air conditioner was cycling and that an event was taking place. As shown below, 70% of these respondents stated that they knew an event was taking place because the house became uncomfortably warm.

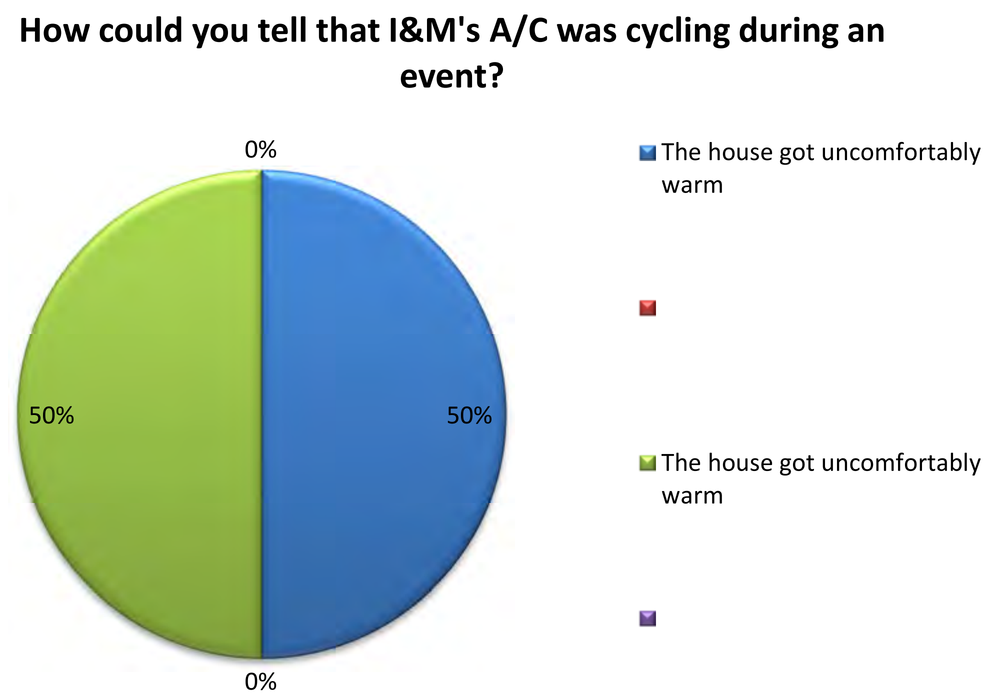


Figure 6-11 Drop-out Participant Event Awareness Indicators

Overall, these findings show that approximately 46% of participant drop-out respondents were home during an event and perceived the house as uncomfortably warm during the event period. In contrast, only six percent of respondents in the main participant survey shared this set of responses. Thus, the comfort level during peak events may have been a primary motivator for participant drop-outs to end their participation in the program.

In order to further gauge perceived comfort levels during event periods, respondents were asked to rate their level of comfort during event time frames. Responses were provided on a 10-point scale, with 1 representing “very uncomfortable” and 10 representing “very comfortable”. Respondents most commonly reported that they were “very uncomfortable” during the peak reduction events, with the majority of respondents providing responses indicating that they were at least somewhat uncomfortable with their home’s temperature during event periods. This further supports home comfort as being a potentially significant issue for participant drop-outs.

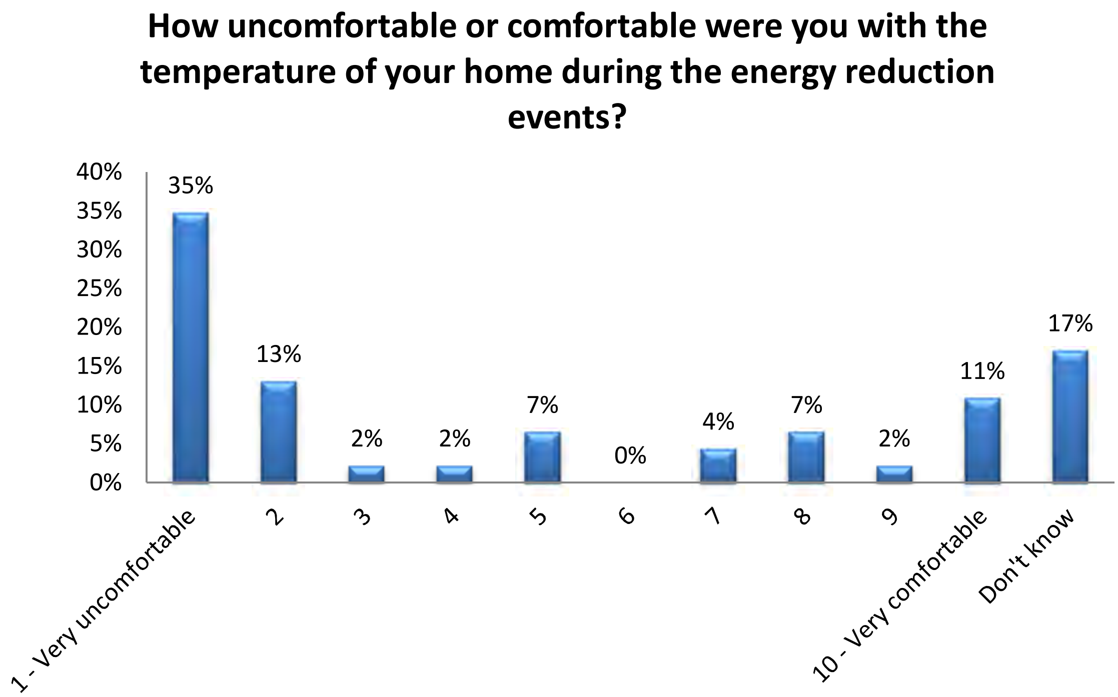


Figure 6-12 Drop-out Participant Comfort Level during Peak Reduction Events

Additionally, participant drop-out respondents were asked whether they had opted out of any events during the program year. The majority of respondents (59%) stated that they had opted out of at least one event, and two-thirds of these respondents reported that they had opted out due to the uncomfortable temperature increase.

6.3.5.3 Barriers to Continuing Participation

In order to explicitly understand why these participants dropped out of the program, drop-out respondents were asked why they had decided to end their participation. As shown in the following table, approximately two-thirds of respondents indicated that their decision to drop out of the program was due to the temperature increase being too uncomfortable during peak events.

Table 6-13 Drop-out Participant Reasons for Exiting Program

	Response	*Percent of Respondents (n = 46)*
Why did you decide to drop out of the program?	The temperature increase was/would be uncomfortable	65%
	Other	22%
	Afraid it might damage my central air conditioner	9%
	Didn't want I&M to control my energy use	9%
	Health reasons	9%
	Problems with the Peak Reduction program device installation	7%
	Didn't understand how the program worked	2%
	Didn't understand what the program was trying to accomplish	2%

*Respondents were able to provide multiple responses, and the percentages shown are the percentages of respondents rather than the percentages of responses. Thus, the total exceeds 100%.

Respondents providing a response of ‘other’ indicated a variety of other reasons for dropping out of the program, including:

> *“Our neighbors said it was not a good program so we never used it.”*
>
> *“I wanted fewer events.”*
>
> *“[We were] not saving money.”*

Overall, drop-out participants’ responses indicate that the primary reason for choosing to exit the program was related to the home temperature increase during event periods.

When asked whether there was anything that could be changed about the program in order to encourage them to participate, drop-out participants provided a variety of responses as shown below. Respondents most commonly stated that no changes would have encouraged them to remain in the program, which suggests that these customers would be unlikely to participate in any residential demand response opportunities. Some respondents indicated that they would have preferred shorter event length or fewer event days, which is related to the comfort level issue discussed above.

Table 6-14 Potential Program Modifications to Encourage Continued Participation

	Response	*Percent of Respondents (n = 46)*
What could have been done differently to encourage you to remain in the program?	Nothing	41%
	Other	33%
	Better explained the program	13%
	Shorter event lengths	13%
	Fewer event days	9%
	Increase the amount of the incentive	7%
	Don't know/Refused	4%

*Respondents were able to provide multiple responses, and the percentages shown are percentages of respondents rather than percentages of responses. Thus, the total exceeds 100%.

Additionally, approximately one-third of respondents indicated a response of ‘other’ and provided open-ended explanations. Samples of these comments include:

> *“Maybe something like a 10% reduction as opposed to a 20% reduction.”*
>
> *“I would have liked the company to wait more than a couple of weeks before calling to see if the program was working.”*
>
> *“We could not get our air conditioner to turn on when we needed it, and as soon as we had [the control switch] taken off it turned on.”*

These responses, and the results illustrated above, indicate that participant drop-out respondents experienced a variety of issues with the program, and that they were most often related to the temperature change within the home.

6.3.5.4 Program Drop-out Satisfaction

Following this, respondents were asked to state their satisfaction level with several aspects of the control switch installation process. Results were provided on a scale of 1 to 5, with 1 representing “very dissatisfied” and 5 representing “very satisfied”. As displayed in the following table, respondents generally reported high satisfaction levels with the contractor visits.

Compared to the participant survey, drop-out respondents provided a higher percentage of ‘don’t know’ responses for these items. However, instances of dissatisfaction are less prevalent in the drop-out survey for two out of the three contractor program elements.

For the quality of work conducted by the contractor, six percent of drop-out respondents indicated a level of dissatisfaction. This represented three individuals, all of whom explained that the contractor had drilled several holes in their siding in order to install the unit. As these participants later dropped out of the program, they are likely dissatisfied with the fact that the holes in the siding were not repaired once the control switch was removed. This represents a potential program issue, but does not represent a barrier to continued participation.

Table 6-15 Drop-out Participant Satisfaction with Contractor Visit Elements

Element of Contractor Experience	*Satisfaction Rating*						*N*
	Very satisfied	*Somewhat satisfied*	*Neutral*	*Somewhat dissatisfied*	*Very dissatisfied*	*Don't know*	
Professionalism of the contractor who installed the cycling switch	43%	9%	20%	0%	0%	28%	46
How quickly the contractor installed the cycling switch	41%	11%	22%	0%	0%	26%	46
Quality of work conducted by the contractor	52%	11%	11%	4%	2%	20%	46

Participant drop-out respondents were then asked about their levels of satisfaction with selected elements of the Peak Reduction program experience. Results were also provided on a scale of 1 to 5, with 1 representing "very dissatisfied" and 5 representing "very satisfied". Satisfaction levels were varied among program elements, and instances of dissatisfaction were much more common for participant drop-outs than for continuing participants. These respondents were relatively more satisfied with the initial phases of the program than with the later phases, as satisfaction ratings were highest for the initial enrollment process, the timing of the contractor visit, and the effort required for the application process.

It appears that participant drop-outs were more dissatisfied with their interactions with call center staff, the receipt of bill credits, and their understanding of program requirements. In terms of understanding program requirements, several participant drop-out respondents noted that the program ultimately operated differently than they had expected, and that they did not initially realize the frequency, process, and consequences of peak reduction events. Overall, satisfaction ratings from participant drop-out respondents were lower than ratings from continuing participants.

Table 6-16 Drop-out Participant Satisfaction with Selected Program Elements

Element of program Experience	*Satisfaction Rating*						*N*
	Very satisfied	*Somewhat satisfied*	*Neutral*	*Somewhat dissatisfied*	*Very dissatisfied*	*Don't know*	
The initial enrollment process for the program	57%	9%	22%	2%	4%	7%	46
Date and time of scheduled visit	54%	11%	28%	2%	2%	1%	46
The effort required for the program application process	52%	13%	22%	4%	2%	7%	46
Interaction with call center staff	52%	7%	15%	2%	11%	13%	46
Scheduling process for equipment installation	50%	24%	20%	4%	2%	0%	46
Receipt of monthly bill credit	50%	7%	15%	4%	13%	11%	46
Understanding the program requirements	30%	11%	28%	9%	15%	7%	46

Participant drop-out respondents were then asked how their experience with the program has affected their perception of I&M as a utility provider. As shown in the following figure, the majority of respondents reported that the program has not affected their satisfaction with I&M. This suggests that participant drop-out dissatisfaction is predominantly contained within the program itself.

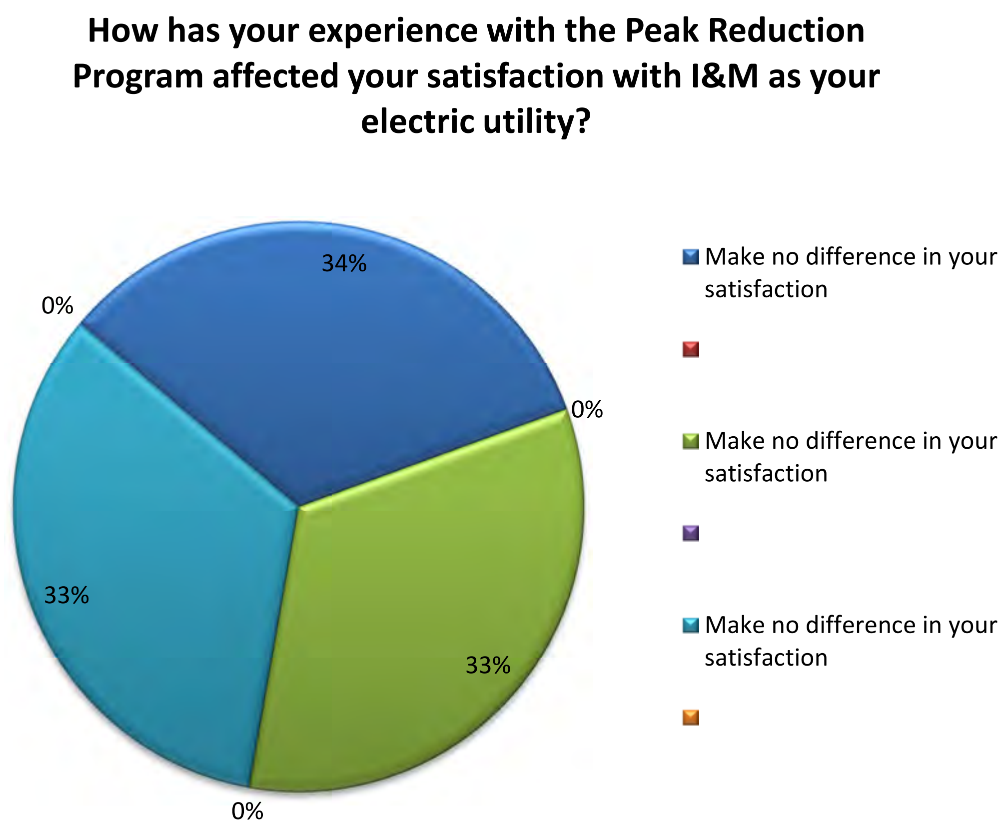


Figure 6-13 Changes in Satisfaction with I&M as Utility Provider, Program Drop-outs

6.3.5.5 Overall Program Drop-out Results

The main conclusions from the participant drop-out survey are that many of these customers did not initially understand how their home would be affected during peak events, and that they disliked the temperature increases that occurred during event periods. The findings from this survey do not appear to reflect a systematic issue with program structure or operation; rather, some customers would prefer to have full control over their air conditioning at all times, and would like to maintain cooler temperatures in their homes.

It may be difficult to effectively modify the program to accommodate these individuals, although ensuring that customers understand the potential frequency, duration, and consequences of peak events prior to their participation may assist in minimizing participant dissatisfaction for both drop-out and continuing participants.

6.3.6 Program Operations Perspective

This section summarizes the core findings from interviews conducted with I&M program staff for the purposes of developing program management and operational perspectives.

Interviews were conducted with program staff, including utility program managers and staff from Honeywell, Inc., to gain insight into program structure and operational changes or trends. ADM previously conducted program staff interviews for the 2012 program year evaluation, which occurred during the first year of the Peak Reduction program.

During the 2012 evaluation, interview respondents focused on the program launch and how it has taken shape during its first year of implementation. Prior interview topics related to the respondents' individual roles in administering the programs and their perceptions of overall program strengths, weaknesses, and opportunities in the early stages of program development.

The 2013 interview process seeks to identify any notable changes to program design, performance, or delivery since the prior year. Additionally, the interviews revisit findings from the 2012 evaluation in order to follow up on the status of key conclusions and recommendations.

Key program features and trends addressed by respondents include:

- **Minimal attrition during cycling season:** program staff reported that customer reception of the program has been positive, with very few participants requesting to have their control switch removed during the cycling year. Specifically, Honeywell staff indicated that attrition from the program during the year was less than 1.5%. Attrition from the program mainly occurred within the first four reduction events, and program staff noted that there was a particularly hot week in July that likely caused some customers to request a switch removal. Program staff acknowledged that some attrition is likely to occur during markedly hot periods, but that thus far the attrition levels are well within acceptable ranges.
- **High participant retention across years:** program staff noted that repeat participation from year to year is typical, as only 195 customers requested removal of the device at the end of the program year. These residences had usually completed an entire operating year but chose to opt out of the program for 2014. When asked whether there were any common factors contributing to customer switch removal requests, program staff explained that many of these homes changed tenants or owners and that new occupants sometimes request switch removals. I&M staff also noted that customers are contacted prior to the cycling season in order to remind them that reduction events may be called, which is intended to reduce customer dissatisfaction. This suggests that the control switch and associated events have not inconvenienced many customers, and that a large majority of participants are willing to continue with the program after experiencing a full year of reduction events.
- **Resolved contractor permitting issue:** During the PY3 evaluation, program staff discussed issues involving the installation contractor permitting process. This process had caused delayed in program launch due to county requirements regarding recruitment and certification of licensed electricians. Program staff reported that this issue has been resolved, and that there were no permitting challenges during PY4. This allowed the program to initiate as planned, with contractors increasing the total number of program installations to 6,180 by October of 2013.

- **Consistent marketing strategy:** Honeywell staff reported that marketing for the program has remained focused on direct mail and bill inserts, which appears to have effectively recruited substantial participation thus far. Program staff continually monitors participation levels and considers alternative marketing modifications, but no major campaigns are planned at this time. Program staff noted that the current marketing strategy is expected to generate sufficient participation to meet goals in the coming year, especially due to the fact that the program has retained such a high percentage of PY3 and PY4 participants.
- **Effective operational partnership:** I&M program staff reported that Honeywell, Inc. has effectively implemented the program during PY3 and PY4. Active communication between the two entities has been maintained through PY4, and I&M and Honeywell, Inc. continue to hold regular meetings in order to discuss program updates. Neither I&M nor Honeywell reported any communication or collaboration difficulties for the current program year, and the overall working relationship appears conducive to meeting program objectives.

6.3.7 Conclusions and Recommendations

This section presents the overall conclusions, and any associated recommendations, from the PY4 process evaluation of the I&M Peak Reduction program. These findings are based on the full scope of evaluation activities, including document review, participant and program drop-out surveys, and program staff interviews.

Key conclusions and recommendations from the PY4 evaluation are as follows:

- **High participant satisfaction:** The participant survey findings indicate that a large majority of program participants are highly satisfied with each aspect of their experience in the program. Although some participants indicated that they would like to have received additional information about what to expect during peak reduction events, I&M already provides this information through the Electric Ideas website. Very few continuing participants indicated that the cycling season was inconvenient or uncomfortable, and many participants provided open-ended comments that praised the program for its efficient operation and effectiveness.
- **Program drop-out discomfort:** The majority of program drop-out survey respondents indicated that they did not initially understand how their home would be affected during peak events, and that they disliked the temperature increases that occurred during event periods. The findings from this survey do not appear to reflect a systematic issue with program structure or operation; rather, some customers would prefer to have full control over their air conditioning at all times, and would like to maintain cooler temperatures in their homes. It may be difficult to effectively modify the program to address this primary participation barrier, although ensuring that customers understand the potential frequency, duration, and consequences of peak events prior to their participation may assist in minimizing participant dissatisfaction for both drop-out and continuing participants.
- **Effective program development:** As 2013 was the first year of initiating peak reduction events, it was the first opportunity to fully gauge the effectiveness of program operation and

delivery. The program appears to have functioned well, and there were few substantial operational issues during the program year. According to program management and implementation staff, the Peak Reduction program operated efficiently during the 2013 program year, generating additional participation and retaining a large percentage of prior participants. Program staff reported that program start-up issues encountered during the 2012 operating year had been for the most part resolved, which allowed I&M and Honeywell to focus on managing reduction events and generating additional participation. It appears that the program is currently suited to meeting its objectives in future years.

7. Renewables and Demonstrations Program

This chapter addresses the methodologies and impact findings of gross and net kWh savings and peak kW reductions resulting from the Renewables and Demonstrations Program during the period January 2013 through December 2013.

7.1 Program Specific M&V Methodologies

The M&V approach for the Renewables and Demonstrations Pilot program (R&D) is specific to the technology installed. Table 7-1 lists the quantity of participants by technology installed during 2013. A total of seven customers participated in the R&D program during its first year. The breakdown by existing homes and new construction are also presented in the table.

The M&V approach for the Renewables and Demonstrations program (R&DP) is aimed at determining the following:

- Numbers of homes that participated in the program;
- Measures that were installed through the program;
- Average annual kWh savings per home;
- Average kW reduction per home; and
- Estimating cost effectiveness of the R&DP program in 2013.

Table 9-1 below summarizes the inputs needed for gross savings calculations and the source of each input.

Table 7-1 Data Sources for Gross Impact Parameters – R&D Program

Parameter	*Source*
Number of Participants	Program Tracking Data/ Participant Surveying
Type of Measures Installed	Program Tracking Data/Participant Surveying
Monthly kWh Consumption	System Advisor Model
Daily Weather Data	Direct Pull From KFWA (Fort Wayne Airport) Weather Station

7.1.1 Verification of Participation In program

A first aspect of conducting measurements of program activity is to verify if participants of the program did participate in the program. ADM takes several steps in verifying participation, which consists of the following:

- Validating program tracking data provided by Honeywell by checking for duplicate or erroneous entries;

- Verifying that participants were part of the program according to the agreed-upon process between Honeywell and I&M; and
- Conducting verification surveys with a statistically valid sample of program participants. The focus of these verification surveys are to verify that customers listed in the program tracking database did indeed participate. Participants are also asked about their opinions on events administered and if participating in the program was an inconvenience in any way to their lifestyle.

7.1.2 Calculating Gross Annual kWh/kW Savings

7.1.2.1 Ground Source Heat Pump

Energy savings for Ground-source Heat Pumps (GSHP) are evaluated based on unit capacity, and location and must meet ENERGY STAR efficiency standards. Baseline equipment is assumed to be an Air Source Heat Pump meeting the Federal Standard efficiency level; 13 SEER and 11 EER.

Annual savings for a Ground Source Heat Pump are calculated as:

Annual kWh Savings = (FLHcool * BtuH * (1/SEERbase – (1/(EERee * 1.02))/1000
+ (FLHheat * BtuH * (1/HSPFbase – (1/COPee * 3.412))/1000

Where,

FLHcool = Full load cooling hours

BtuH = Size of equipment in Btuh (note 1 ton = 12,000Btuh) = Actual installed

SEERbase = SEER Efficiency of baseline unit= 13

EERee = EER Efficiency of efficient unit= Actual installed

1.02 = Constant used to estimate the SEER based on the efficient unit's EER

FLHheat = Full load heating hours

HSPFbase =Heating Season Performance Factor for baseline unit=7.7

COPee = Coefficient of Performance of efficient unit = Actual Installed

3.413 = Constant to convert the COP of the unit to the Heating Season Performance Factor HSPF)

The peak summer coincident demand savings is calculated using the following equation.

Peak kW Reduction for a Ground Source Heat Pump = BtuH * (1/EERbase - 1/(((EERee * 1.02) * 0.37) + 6.43))/1000 * CF

Where:

EERbase = EER Efficiency of baseline unit = 11

CF = Coincidence Factor = 0.88

Gross peak demand savings were calculated based on the critical peak demand definition provided by I&M. Specifically, I&M established an on-peak period of 7:00 a.m. - 9:00 p.m. during weekdays (a 14 hour period each weekday). There are a total of 3,640 hours per year that meet the criteria of I&M's on-peak period definition. Hourly Typical Meteorological Year dry-bulb temperature data is used to developed full load heating and cooling hours for the critical peak demand period. The peak demand savings is calculated by taking the Critical Peak Period FLHcool and FLHheat and substituting them into the "annual kWh savings" equation and then dividing by 3,640 hours.

7.1.2.2 Solar Photovoltaic Systems

Energy savings for Solar Photovoltaic (PV) systems are estimated using the System Advisor Model[50] (SAM) simulation software. Inputs that are used by the model for project savings determination include:

- Panel manufacturer & model
- Number of modules per string
- Number of strings in parallel
- Capacity (kWdc)
- Inverter manufacturer, model, & voltage output
- Number of inverters
- Tilt (degrees from horizontal)
- Azimuth (degrees from north, clockwise)
- City and state of PV installation
- Shading

Azimuth can be obtained by internet satellite map views if the panels are being located onto a roof of an existing house. Shading information is harder to accurately convey. Estimations can be made from site photos of the surrounding area and horizon or a descriptive account of obstacles will be used as shading input. This would include using angles(s) and direction(s) of obstacles such as trees and buildings that will produce shading at the PV array location.

The SAM model provides 8,760 hours of annual power production based on typical weather data for the location.

[50] System Advisor Model. Also known as Solar Advisor Model, developed by National Renewable Energy Laboratory (NREL). It is available free of charge at: https://sam.nrel.gov/

Gross electric peak demand savings (kW}) were calculated based on the critical peak demand definition provided by I&M. Specifically, I&M established an on-peak period of 7:00 a.m. - 9:00 p.m. during weekdays (a 14 hour period each weekday). There are a total of 3,640 hours per year that meet the criteria of I&M's on-peak period definition. Measure specific normalized 8,760 hour load savings shapes were used to identify the average savings demand during this on-peak period. Solar PV generation profiles developed as part of the SAM simulation were used to estimate the percentage of kWh savings occurring during those 3,640 on-peak hours.

7.1.3 Calculating Net Energy (kWh) and Peak Demand (kW) impacts

The purpose of the Renewables and Demonstrations program is to help customers who would benefit from measures such as ground-source heat pumps, Solar Photovoltaics, and solar hot water. However, some homes that were part of the program might have installed the same measures without the program. These homes would represent free-ridership. Thus the question to be addressed in the net savings analysis was what proportion of gross savings resulting from the implemented these Renewables and Demonstrations measures was directly attributable to the R&DP. Rather than apply a binary scoring (0% vs. 100% free-ridership), ADM applied a free-ridership probability to program participants, based upon four factors below with the survey questions included that pertain to them:

- Financial Ability to purchase measures absent program assistance

Question 10: Would you have been financially able to install this (Solar Photovoltaic or Ground Source Heat Pump) without the Renewables and Demonstrations program from I&M?

If the customer answered "No" to this, then they are assigned 0% free-ridership, as without the financial ability to purchase the measures in the kit, other factors in the decision making process are not relevant. Having financial ability does not inherently make one a free-rider, however, as they could still have been program-induced.

- Importance Of program assistance in the decision-making process

Question 7: For the (Solar Photovoltaic or Ground Source Heat Pump) that was installed in your home, would you still have installed this measure at your home if you had not participated in the I&M Renewables and Demonstrations program?

If the respondent answers in Question 7 "No", then the respondent is considered to have not been planning to purchase any of the measures and is 0% free-rider.

- Prior Planning to purchase weatherization measures

Question 7A: When did you learn of the Renewables and Demonstrations program?

Question 6: For the (Solar Photovoltaic or Ground Source Heat Pump) installed in your home, did you have plans to install this measure at your home before participating in the I&M Renewables and Demonstrations program?

If the respondent answers in Question 7 “Yes” and indicated that they learned of the rebate “After deciding to install the (Solar Photovoltaic or Ground Source Heat Pump) in my home with these energy efficiency (measures) but before I had purchased these measures on my own”, then the respondent is considered to have been planning to purchase the same quantity of measures with or without the rebate and is thus a partial free-rider. If the respondent answers in Question 7 “Yes” and indicated that they learned of the rebate “After I had purchased the (Solar Photovoltaic or Ground Source Heat Pump) on my own but before I had installed them”, or “After I had already replaced the (Solar Photovoltaic or Ground Source Heat Pump) in my home”, then the respondent is considered to have been planning to purchase the same quantity of measures and already did with or without the rebate and is thus 100% free-rider.

If the respondent answers in Question 6 “Yes”, then the respondent considered to have been planning to purchase the measures and is considered a free-rider.

- Demonstrates Behavior In Purchasing Similar Equipment absent program assistance

Question 11: Did you install this (Solar Photovoltaic or Ground Source Heat Pump) earlier than you otherwise would have without the program?

Question 11A: When would you otherwise have installed the measures?

If the respondent indicates in Question 11 “Yes”, and for Question 11A chooses an option of “over 1 year”, then they are considered to have been motivated by the energy efficiency program and are thus 0% free-rider. If respondents who indicated in Question 11A “less than 6 months” or “6-12 months”, these respondents are considered partial free-riders. If the respondent indicated in Question 11 “No”, then they are a free-rider because the program retrofit did not affect timing of purchase and installation of measures.

For residential programs, free-ridership is calculated as the average score determined for the sample of participants surveyed. Once free-ridership is determined, ADM then estimates the Net-to-Gross Ratio (NTGR), calculated as:

NTGR = 1 – % Free-Ridership

7.2 Impact Results

ADM estimated ex post gross electric savings and peak demand reductions through detailed analysis of program tracking data and participant survey data. The estimated gross impacts resulting from the PY4 Renewables and Demonstrations program are summarized in Table 7-2. Table 7-3 and Table 7-4 show the audited and verified savings.

Table 7-2 Gross Impact Summary

Technology Type	*PY4 Program Goals (kWh)*	*Number of Participants*	*Annual Savings (kWh)*	*Peak Demand Savings (kW)*
Ground Source Heat Pumps	31,000	5	23,195	2.66
Solar PV[51]		2	35,643	7.09
Total		7	58,838	9.75

Table 7-3 Gross Impact kWh

Ex Ante Gross kWh Savings	*Gross Audited kWh Savings*	*Gross Verified kWh Savings*	*Ex Post Gross kWh Savings*	*Gross Realization Rate*
58,978	58,978	58,978	58,838	99%

Table 7-4 Gross Impact kW

Ex Ante Peak kW Savings	*Audited Peak kW Savings*	*Verified Peak kW Savings*	*Ex Post Peak kW Savings*
-	-	-	9.75

In addition to gross savings, ADM estimated associated net-to-gross ratios (NTGRs) for both ground-source heat pumps and solar PV based on results from the participant survey. Applying the estimated NTGRs of 67% for Ground Source Heat Pumps and 100% for Solar Photovoltaics to the gross savings reported in Table 7-5 results in the net savings detailed in Table 7-5 below. The net realization rate is 87%.

Table 7-5 Net Impact Summary

Technology Type	*PY4 Program Goals (kWh)*	*Ex Ante Net kWh Savings*	*Net-to-Gross Ratio*	*Net Annual Savings (kWh)*	*Net Peak Demand Savings (kW)*
Ground Source Heat Pumps	31,000	58,978	67%	15,541	1.78
Solar PV			100%	35,643	7.09
Total			-	51,184	8.87

The calculations leading to these results are detailed in the sub-sections to follow.

[51] Note – One of the PV systems was 14 times larger than the other even though they were both residential.

7.2.1 Calculating Gross Annual kWh/kW Savings

7.2.1.1 Ground Source Heat Pump

Ex ante savings for the ground-source heat pumps in the R&D program were determined to be 23,383 kWh per year based on savings using the methods provided in the Indiana TRM[52].

Energy savings for Ground Source Heat Pumps (GSHP) are evaluated based on unit capacity, and location. The GSHP must meet ENERGY STAR efficiency standards. Baseline equipment is assumed to be an Air Source Heat Pump meeting the Federal Standard efficiency level; 13 SEER and 11 EER.

Annual savings for a Ground Source Heat Pump are calculated as:

Annual kWh Savings = (FLHcool * BtuH * (1/SEERbase – (1/(EERee * 1.02))/1000
+ (FLHheat * BtuH * (1/HSPFbase – (1/COPee * 3.412))/1000

Where,

FLHcool = Full load cooling hours

BtuH = Size of equipment in Btuh (note 1 ton = 12,000Btuh) = Actual installed

SEERbase = SEER Efficiency of baseline unit= 13

EERee = EER Efficiency of efficient unit= Actual installed

1.02 = Constant used to estimate the SEER based on the efficient unit's EER

FLHheat = Full load heating hours

HSPFbase =Heating Season Performance Factor for baseline unit=7.7

COPee = Coefficient of Performance of efficient unit = Actual Installed

3.413 = Constant to convert the COP of the unit to the Heating Season Performance Factor HSPF)

The full load cooling and heating hours are specific to the climate zone of the installation. For GSHPs, the ex post savings was calculated to be 23,195 kWh. This is a realization rate of 99.2%. The ex post savings for the five GSHP sites ranged from 3,953 kWh to 5,753 kWh per site. Although the ex ante calculation used the same methodology, one of the sites used a $SEER_{base}$ of 11 rather than 13, thus inflating the savings.

The peak summer coincident demand savings is calculated using the following equation.

[52] Indiana Technical Resource Manual, December 5, 2012, GSHP deemed savings method, p 102.

Peak kW Reduction for a Ground Source Heat Pump = BtuH * (1/EERbase - 1/(((EERee * 1.02) * 0.37) + 6.43))/1000 * CF

Where:

EERbase = EER Efficiency of baseline unit = 11

CF = Coincidence Factor = 0.88

The full load cooling hours are dependent on location as shown in Table 7-6.

Table 7-6 Full Load Cooling Hours by Location

Location	FLH_{cool}
Indianapolis	487
South Bend	431
Evansville	600
Ft. Wayne	373
Terre Haute	569

The full load heating hours are dependent on location as shown in Table 7-7.

Table 7-7 Full Load Heating Hours by Location

Location	FLH_{heat}
Indianapolis	1341
South Bend	1427
Evansville	982
Ft. Wayne	1356
Terre Haute	804

Summer coincident peak demand savings of 5.87 kW for the five systems combined.

Gross peak demand savings were calculated based on the critical peak demand definition provided by I&M. Specifically, I&M established an on-peak period of 7:00 a.m. - 9:00 p.m. during weekdays (a 14 hour period each weekday). There are a total of 3,640 hours per year that meet the criteria of I&M’s on-peak period definition. Hourly Typical Meteorological Year dry-bulb temperature data is used to developed full load heating and cooling hours for the critical peak demand period. This provides 8,760 hours of data to proportion the annual FLHcool and FLHheat. Heating hours used a base of 65 ºF and cooling hours used a base of 75 ºF. The full load hours for the defined critical peak period are dependent on location as shown in Table 7-8.

Table 7-8 Critical Peak Period Full Load Hours by Location

Location	*$CPPFLH_{cool}$*	*$CPPFLH_{heat}$*
South Bend	278	537
Ft. Wayne	241	515

The peak demand savings is calculated by taking the Critical Peak Period FLHcool and FLHheat and substitute them into the Energy Savings equation in section 7.1.2 and then divide it by 3,640 hours. For the ground-source heat pumps, the ex post critical peak period demand savings was calculated to be 2.66 kW.

7.2.1.2 Solar Photovoltaics

Ex ante savings for the Solar Photovoltaics in the R&D program were determined to be 35,812 kWh per year.

Energy savings for Solar Photovoltaic (PV) systems are estimated using the System Advisor Model[53] (SAM) simulation software. Inputs that are used by the model for project savings determination include:

- Panel manufacturer & model
- Number of modules per string
- Number of strings in parallel
- Capacity (kWdc)
- Inverter manufacturer, model, & voltage output
- Number of inverters
- Tilt (degrees from horizontal)
- Azimuth (degrees from north, clockwise)
- City and state of PV installation
- Shading

Azimuth can be obtained by internet satellite map views if the panels are being located onto a roof of an existing house. Shading information is harder to accurately convey. Estimations can be made from site photos of the surrounding area and horizon or a descriptive account of obstacles will be used as shading input. This would include using angles(s) and direction(s) of obstacles such as trees and buildings that will produce shading at the PV array location.

The SAM model provides 8,760 hours of annual power production based on typical weather data for the location. For solar PVs, the ex post savings was calculated to be 35,643 kWh. This is a

[53] System Advisor Model. Also known as Solar Advisor Model, developed by National Renewable Energy Laboratory (NREL). It is available free of charge at: https://sam.nrel.gov/

realization rate of 99.5%. The ex post savings for the two solar PV sites ranged from 2,432 kWh to 33,211 kWh per site. Although the ex ante calculation used the same methodology, no shading was estimated on a ground mounted panel at a site that has a barn and trees to the west. The ex post SAM simulation included an estimation of shading for one of the sites that has a barn and trees to the west. This only had a small shading impact on the horizon.

Gross electric peak demand savings (kW}) were calculated based on the critical peak demand definition provided by I&M. Specifically, I&M established an on-peak period of 7:00 a.m. - 9:00 p.m. during weekdays (a 14 hour period each weekday). There are a total of 3,640 hours per year that meet the criteria of I&M's on-peak period definition. Measure specific normalized 8,760 hour load savings shapes were used to identify the average savings demand during this on-peak period. Solar PV generation profiles developed as part of the SAM simulation were used to estimate the percentage of kWh savings occurring during those 3,640 on-peak hours.

For Solar PVs, the ex post critical peak period demand savings was calculated to be 7.09 kW. This compares to an absolute peak demand savings of 30.9 kW for both systems combined.

7.2.2 Net Energy (kWh) and Peak Demand (kW) Impacts

To obtain net savings for the PY4 Renewables and Demonstrations program, ADM surveyed program participants to develop estimates of free-ridership. As detailed in Section 7.1.3, developing free-ridership estimates for the R&DP is dependent upon survey questions addressing financial ability, prior planning, importance of the rebate in decision making, and likelihood of installing similar equipment absent the program. Table 7-9 through Table 7-12 below summarizes the responses to questions addressing free-ridership for the 2013 R&DP.

Table 7-9 R&DP Financial Ability Results

Component	Question	Yes	No	Don't Know
Financial Ability	Question 10: Would you have been financially able to install the (Solar Photovoltaic or Ground Source Heat Pump) without the R&D program?	60%	40%	-

Table 7-10 R&DP Importance of Program Results

Component	Question	Yes	No	Don't Know
Importance of program	Question 7: For the (Solar Photovoltaic or Ground Source Heat Pump) that was installed in your home, would you still have installed this measure at your home if you had not participated in the I&M R&D program?	20%	80%	-

Table 7-11 R&DP Prior Planning Results

Component	Question	After deciding but before replacing	Yes	No
Prior Planning	Question 7A: When did you learn of the Renewables and Demonstrations program?	20%	-	-
	Question 6: For the (Solar Photovoltaic or ground source head pump)that was installed in your home, did you have plans to install this measure at your home before participating in the I&M R&D program?		60%	40%

Table 7-12 R&DP Behavior Absent Program Results

Component	Question	Yes	No	-	-	-
Importance of Rebate	Question 11: Did you install this (Solar Photovoltaic or Ground Source Heat Pump) earlier than you otherwise would have without the program?	80%	20%	-	-	-
	Question	Less than 6 months	6-12 months	1-2 years	3-5 years	More than 5 years
	Question 11A: When would you have otherwise installed the measures?	-	-	-	75%	25%

The resulting NTGR for this program was 67% for Ground Source Heat Pumps and 100% for Solar Photovoltaic's, lower than the value of 100% for both measures anticipated by Indiana Michigan Power. This value was applied in discounting annual kWh and peak demand savings for the 2013 R&DP.

7.3 Process Evaluation

This chapter presents the results of the process evaluation of I&M's Renewables and Demonstrations program during program year four (PY4). As PY4 is the first year of operation for the Renewables and Demonstrations program, the process evaluation reviews program design features, program objectives, and initial program performance characteristics. In other words, the purpose of the PY4 process evaluation is to assess the design and recent results of the program in order to determine how effectively it is achieving its intended outcomes.

The process evaluation of the Renewables and Demonstrations program is based upon analysis of program structure and tracking data, and interviews and surveys of current program participants and I&M program staff.

This chapter begins with a description of the process evaluation objectives, and a summary of the program design, background, and participation activity. This is followed by a discussion of the results from the participant survey. The chapter continues by presenting the results of interviews that were conducted with I&M program management staff. The chapter concludes by highlighting key findings and program recommendations resulting from the process evaluation.

7.3.1 Evaluation Objectives

The process evaluation seeks to examine program structure and results for the initial program operating year, and to identify potential program improvements that may prospectively increase program delivery efficiency or effectiveness in terms of customer participation and satisfaction levels. This process evaluation was designed to document the operations and delivery of the Renewables and Demonstrations program during PY4.

Key research questions to be addressed by this evaluation of PY4 activity include:

- What are the main tasks and activities involved in operating, managing, and delivering program services?
- How are incentive levels structured, and savings estimates determined?
- How effective is the program marketing? How do participants learn about the program and what are their reasons for participating? What barriers to participation exist?
- Has the program performed as intended? Are there opportunities for increasing participation, or ensuring future program success?
- How satisfied are participants with the program overall? What was their level of satisfaction with different elements of the program; from the enrollment process to the receipt of the incentive?

During the evaluation, data and information from multiple sources were analyzed to achieve the stated research objectives. Insight into the customer experience with Renewables and Demonstrations program is developed from a telephone survey of program participants. The internal organization and operational efficiency of program delivery is examined through analysis of interviews conducted with I&M program management staff. Further insight into the program's internal structure is obtained through a review of program documentation such as marketing literature, program applications, and site inspection forms.

7.3.2 Summary of Primary Data Collection

- **Review of program documentation and relevant literature:** ADM reviewed relevant program planning documents and program tracking data in order to assess the current state of program documentation.
- **Participant surveys:** Participant surveys were the primary data source for the process evaluation, and served as the foundation for understanding the customer perspective. As there were only seven participants in the program during 2013, the sample size for the surveys was limited. ADM conducted participant surveys with five customers who received rebates through the program. Respondents provided insight into their decision making processes and

their overall experiences with the program, including the enrollment process and project implementation. Responses from the participant survey were also used to inform the net savings analysis.

- **Interview with program staff:** An interview with I&M program management staff provided insight into program operation and management. Staff provided insight into key program metrics, such as incentive and savings calculations, and explained the key features and scope of the program. I&M staff also provided information regarding the prospective future of the program, including estimated performance levels and potential expansion of incentivized measure types.

7.3.3 Program Theory and Activities

The Renewables and Demonstrations program is designed to allow customers to take advantage of renewable energy and emerging technologies. This program is intended to assist customers in making a decision to choose a higher efficient system or install a renewable energy option. The program is open to customers that install the following technologies:

- Solar Photovoltaic
- Solar Hot Water
- Ground Source Heat Pump
- LED parking lot or street lighting

Other technologies may also be considered, although during the first year of the program all projects were either Solar Photovoltaic or Ground Source Heat Pump systems. This is the first year this program is available to customers, and the program is open to both residential and business customers.

Customers typically submit applications through the mail, although there is an online application that is used by a smaller portion of customers. The enrollment application is fairly detailed, and requests various pieces of information regarding the customer and the proposed project. The application is divided into six sections as follows:

- Customer Information: Includes fields for customer name, I&M account number, contact information, and residence characteristics
- Project Information: Includes fields to indicate project type, a description of the proposed project, the proposed installation location and anticipated completion date, and equipment capacity and cost estimates
- Contractor/Installer: Includes fields for the contractor company name, contact person, and contact information
- Terms & Conditions: Provides the terms of the program agreement and includes a field for applicant signature

- Program Rules and Initial Eligibility Requirements: Provides an itemized list describing guidelines, restrictions, and program procedures such as the onsite inspections and data collection requirements. Includes a second set of fields for applicant signature.

A copy of the full program enrollment application can be found in Appendix B under "Program Application".

When an application is received, program staff conducts a preliminary review in order to determine whether additional information is needed from the customer. Additional clarification is almost always necessary in order to determine customer eligibility. Overall, I&M actively communicates with participants from the point of application submission to the point of incentive receipt.

Once I&M gathers sufficient information from the customer to determine eligibility, program staff conducts a pre-inspection visit to the customer's residence. The purpose of this visit is to gather all necessary information for calculating potential measure savings and estimating incentive payments. There are specific forms for individual equipment types. The visit also serves to verify the information that was submitted within the program application. The pre-inspection checklist for both geothermal projects and solar projects include the following fields:

- Project type (specific end-use, including available equipment specifications)
- Pre-inspection date
- Inspector name (I&M program staff member)
- Customer information (customer name, contact information, utility account number etc.)
- Pictures taken (I&M staff inserts digital copies of premise photos taken during the visit)
- Additionally, the pre-inspection checklist for solar projects includes specific fields related to Solar Photovoltaic equipment, including:
- Shading (whether the location is shaded from the sun)
- Tilt and azimuth (angular reference)
- Solar panel location

After the pre-inspection visit, I&M calculates the incentive payment for the individual project through the use of tools such as the System Advisory Model (SAM) developed by the National Renewable Energy Laboratory. The incentive calculation incorporates measure-specific information such as measure life, efficiency, and cost effectiveness metrics. Prior to this calculation, customers do not typically know how much their incentive payment will be. As program provides rebates for a wide range of projects with varying savings levels, I&M does not provide prospective participants with an expected incentive level.

Once the project is approved and incentives are estimated, participants proceed with measure implementation and retain all relevant purchasing and installation documentation. Upon installation, program staff conducts a post-inspection in order to verify that the measure was installed as specified, and that there were no significant modifications to the project.

The post-inspection also involves a checklist to verify specific aspects of project completion. For solar projects, fields included in the checklist are as follows:

- Post-inspection date
- Inspector name (I&M program staff member)
- Correct number of panels
- Correct panel install location
- Correct panel mounting
- Pictures taken (including equipment nameplate pictures)
- The post-inspection checklist for geothermal projects is similar, and includes the following fields:
- Post-inspection date
- Inspector name (I&M program staff member)
- Equipment model
- Equipment serial number
- Pictures taken (including equipment nameplate pictures and complete system pictures)

A copy of the pre-inspection and post-inspection checklists can be found in Appendix B under “Inspection Forms”.

After I&M completes the post-inspection and receives the final invoice from the customer, I&M finalizes and processes the project, and sends the incentive to the participating customer. The ultimate goal of the program is to provide options to customers that want to actively reduce their energy needs and carbon footprint. The program goal for 2013 was to provide 31,000 kWh in energy savings.

7.3.4 Program Documentation Review Summary

In addition to data collection and enrollment documentation described above, I&M provides information regarding the Renewables and Demonstrations program through its incentive program website. Recently finalized and released by I&M, www.electricideas.com (Electric Ideas) is separate from the main I&M site and focuses exclusively on I&M’s portfolios of energy efficiency programs. Specifically, Electric Ideas provides descriptions, eligibility requirements, and application links for I&M energy efficiency programs in the residential, commercial, and schools sectors. Electric Ideas also unifies I&M efficiency programs under a single brand, allowing for cross-promotion and likely encouraging cross-participation in multiple programs.

For the Renewables and Demonstrations program, Electric Ideas summarizes program parameters and eligibility requirements, and provides prospective participants with resources for obtaining additional information. A sample screenshot of the site can be found in Appendix B under “program Website Sample”. Although the program began in 2013 and is likely in its early stages of growth, it appears that I&M has developed a fairly robust level of documentation, procedures, and other resources. This is likely partially due to the fact that I&M has operated other incentive programs in prior years, and is experienced in developing marketing materials, application documents, and other program resources.

After reviewing the data collected during onsite pre- and post-inspections, ADM determined that the existing data collection procedures are sufficiently thorough and accurate. The pre-inspection form allows program staff to verify information that was submitted with the enrollment application and to collect sufficient details for estimating project savings and calculating the appropriate incentive level. The procedure of conducting a post-inspection is an effective method of verifying proper and complete project implementation. Additionally, the post-inspection checklists serve to verify specific equipment characteristics including models and serial numbers. Overall, ADM did not identify any major issues with the existing program documentation or data collection and project verification procedures.

7.3.5 Participant Survey Findings

The following section presents key findings from surveys conducted with customers who participated in PY4 of the I&M Renewables and Demonstrations program.

ADM conducted telephone surveys with customers who had implemented solar, geothermal, or LED lighting projects through the Renewables and Demonstrations program during 2013. In total, five out of seven of the 2013 program participants responded to the survey. These surveys were focused on gaining insight into the participant perspective, including participant satisfaction, program awareness and enrollment procedures, and aspects of the equipment incentive offerings. Additionally, these surveys included questions that informed ADM’s free-ridership analysis in order to determine overall program net savings levels. This section highlights findings from the participant survey, while a summary of the free-ridership responses and analysis can be found in the net savings chapter of this report.

It should be noted that while the survey represents the majority of the 2013 participant population, there were only seven participants in the Renewables and Demonstrations program during 2013. Due to the limited sample frame, the survey results are not intended to present widespread trends that can be extrapolated to a larger group. As such, these results should be viewed as representative of the 2013 Renewables and Demonstrations program participant population, rather than as representative of the overall I&M customer population or prospective participant population.

7.3.5.1 Program Awareness and Participant Motivations

Respondents were first asked how they first learned of the Renewables and Demonstrations program. Two of the five respondents reported that they learned of the program through the I&M website, which hosts detailed information regarding eligibility requirements and enrollment procedures. One respondent stated that they learned of the program through an equipment vendor or contractor. As indicated by program staff, some vendors and contractors in the I&M service territory have used the Renewables and Demonstrations program as a sales tool to promote Solar Photovoltaic or geothermal equipment. The two remaining respondents each reported that they had learned of the program through friends or colleagues; one specifically mentioned learning of the program through the workplace.

In order to gain insight into participants' motivations and decision making preferences, respondents were then asked why they decided to participate in the program. The response options for this question included the following:

- To save money on energy bills;
- Environmental reasons;
- I&M paid a portion of the total cost of the measures installed;
- Other; and
- Don't know.

Four out of the five respondents indicated that their main reason for participating was to save money on energy bills, while the remaining respondent stated that they participated because I&M paid a portion of the measure cost. Additionally, two of the respondents explained that they also participated due to environmental reasons. These responses place an emphasis on the financial benefits of energy efficiency improvements, particularly in terms of long-term cost savings.

7.3.5.2 Prior Experiences with Energy Efficiency

In order to gauge participants' prior involvement with energy efficiency, respondents were asked whether they had purchased and used any energy efficient measures in their home prior to participating in the Renewables and Demonstrations program. All but one of the respondents reported that they had previously installed energy saving measures, and these individuals were asked to elaborate on this experience.

Two of the respondents, both of whom had installed a Solar Photovoltaic projects through the program, noted that they had previously purchased geothermal heat pumps. Additionally, one of these respondents indicated that they had purchased a new energy efficient water heater and had received a financial incentive for doing so. Two of the respondents who had installed Ground Source Heat Pumps through the program in 2013 indicated that they previously purchased Energy Star® appliances such as refrigerators. Neither of these respondents reported receiving incentives or rebates for these prior purchases.

These responses suggest that participants have a moderate level of prior experience with energy efficiency improvements, and that they have previously made fairly large investments in energy saving equipment. In terms of general purchasing behavior, all respondents also reported that they are very likely to replace existing equipment with energy efficient equipment when purchasing appliances and other measures.

7.3.5.3 Additional Energy Efficiency Involvement

Respondents were then asked whether their experiences with the I&M Renewables and Demonstrations program had led them to purchase any additional energy efficient equipment without receiving a financial incentive. Two of the respondents reported that the program has motivated them to purchase additional items; one of these respondents provided further information indicating that they had purchased an energy efficient water heater and LED lighting for their home. It is not fully clear how the Renewables and Demonstrations program has influenced the purchase of these items. Some participants may be motivated to further reduce energy usage after observing the monthly savings achieved through their solar or geothermal projects, or after learning about other energy efficiency opportunities from I&M marketing materials or discussions with program staff.

When asked whether they would buy energy efficient measure in the future, even in the absence of financial incentives, two of the respondents reported that they would do this. The remaining three respondents did not indicate that they would purchase efficient measures without an incentive, although earlier in the survey all three of these participants indicated that they had done so in the past.

7.3.5.4 Participant Satisfaction

The survey included a participant satisfaction instrument that focused on individual program components as well as the program as a whole. Participants indicated their level of satisfaction with each selected program element, and responses were recorded on a five-point scale ranging from very satisfied to very dissatisfied. The specific program elements addressed by the participant satisfaction instrument include:

- Performance of the measures installed;
- Savings on your monthly bill;
- The effort required for the program application process;
- Information provided by I&M;
- Quality of work conducted by the contractor; and
- Overall program experience.

Overall, respondents reported fairly high levels of satisfaction, and did not indicate any instances of dissatisfaction for any of the program elements. A summary of participant satisfaction results is shown in the following table. Although the percentages represent a total of only five individuals, these results display a clear tendency towards high satisfaction for each element. Other than their overall program experience, respondents on average reported being most satisfied with the information provided by I&M. I&M provides information about the program and energy efficiency opportunities via several methods including the I&M website, program marketing literature, and discussions with program staff members.

Fewer respondents reported being very satisfied with the savings on their monthly bill, although this may be due to the fact that seasonal factors and other usage variables may obscure the direct energy savings that result from individual projects. One Solar Photovoltaic project participant specifically commented on their monthly usage, noting that their electricity bill has recently increased due to weather effects.

The results of this participant satisfaction instrument indicate that the program is being effectively delivered to its participants. Additionally, these results do not suggest the need for any specific changes to program design or operation.

Table 7-13 Participant Satisfaction by Program Element

Element of program Experience	*Very Satisfied*	*Somewhat Satisfied*	*Neutral*	*Somewhat Dissatisfied*	*Very Dissatisfied*	*Don't Know*
Performance of the measures installed	60%	20%	20%	-	-	-
Savings on your monthly bill	40%	20%	20%	-	-	20%
The effort required for the program application process	60%	20%	20%	-	-	-
Information provided by I&M	80%	20%	-	-	-	-
Quality of work conducted by the contractor	60%	40%	-	-	-	-
Overall program experience	80%	20%	-	-	-	-

7.3.5.5 Additional Feedback

Respondents were also given the opportunity to provide further commentary, suggestions, or questions regarding I&M's Renewables and Demonstrations program. Nearly all of the respondents used this opportunity to provide praise for the program, noting the helpful support received through I&M and the high quality of work conducted by equipment contractors. Specific commentary of this nature included:

> *"[The] contractor did a great job… I have also been doing as much as possible to save energy."*

> *"The program representatives were helpful and cordial."*

> *"[I am] very pleased with the results and the support from I&M."*

One respondent provided commentary indicating that the program is somewhat vague in terms of what will be required of customers during the participation process. This participant noted that the participation process is lengthy, and that they did not initially know what participating in the program would entail. During the program staff interview, the program manager explained that the expected incentive amounts are not specified initially, as there is a wide range in potential project types and savings levels.

This may contribute to a perceived vagueness from the customer perspective, and is difficult to resolve without raising false customer expectations. However, it will be important to continue fully informing prospective participants of their role and responsibilities (e.g. participating in the pre-inspection and post-inspection, completing enrollment paperwork, etc.) early in the application process.

7.3.5.6 Participant Demographics and Other Characteristics

Finally, respondents were asked a series of questions relating to demographics and residence characteristics. Although the ability to identify meaningful trends is limited by the survey sample frame, responses to these questions are recorded for general participation characterization purposes.

- Home ownership: 100% of respondents reported that they own their home.
- Number of residents: Respondent households consist of 2-4 individuals, with an average of 3 individuals per home.
- Age of residents: Out of 15 total residents reported by respondents, five are age 55 or older, four are between ages 35 and 55, and six are younger than age 35.

7.3.5.7 Overall Participant Survey Findings

The results of the participant survey suggest that participants are very satisfied with their experiences in the Renewables and Demonstrations program, and that they have few to no negative perceptions about any specific aspect of the program. The participant survey results did not identify any systematic issues with program operation or delivery, and information conveyed through the survey is in agreement with information gathered through other activities within the program evaluation such as the program staff interview. The majority of participant commentary was positive in nature, and respondents were able to recall specific aspects of the program that contributed to their satisfaction.

The only potential issue identified within respondent remarks was that some customers may not understand what will be required of them during the participation process. This was only mentioned by one customer, and program staff could likely mitigate this issue by ensuring that initial discussions with prospective participants include details about the pre-inspection, post-inspection, data collection requirements, and expected lead time for receiving the incentive payment. Although these procedures and participation phases are itemized within the program application, reiterating details to participants assists in minimizing delayed confusion and/or dissatisfaction on the part of the customer.

7.3.6 Program Operations Perspective

This section summarizes the core findings from an interview conducted with I&M program management staff for the purposes of developing a program management and operational perspective.

The staff interview focused on the program launch and how it has taken shape during its first year of implementation. Topics were related to I&M's role in administering the program and staff perceptions of overall program strengths, weaknesses, and opportunities in the early stages of program development.

7.3.6.1 Summary of Interview Findings

Key program findings from the I&M program management staff interview include:

Program performance: The Renewables and Demonstrations program significantly exceeded its goals for the 2013 program year while remaining within budget constraints. Additionally, program staff reported that the savings goals for the upcoming program year are lower than those of 2013. Although the program surpassed its savings goals by a wide margin in 2013, this was mainly due to a single project. Without this project, program savings would likely have been much closer to the 2013 target. As there are several projects in the pipeline that will likely be completed early in 2013, program staff do not anticipate difficulties in meeting the new targets.

Program budgeting: In terms of budget management, program staff reported that the program's pre-approval process for projects allows I&M to accurately anticipate and control incentive budget expenditures. Additionally, program staff noted that customers would be notified through the I&M website in the event that the incentive budget for the Renewables and Demonstrations program had been expended during a given year.

Variety of measure offerings: When asked about the range of measure types that may be eligible for program rebates, program staff reported that the program has exclusively focused on geothermal, Solar Photovoltaic systems, LED lighting, and solar hot water projects thus far. However, there may be opportunities for additional measure types such as biowaste projects. program staff indicated that while the Renewables and Demonstrations program could theoretically provide rebates to a wide range of measures, it would likely be necessary for I&M management staff to carefully review the cost effectiveness and savings potential of any new measure types before approving such a project.

Program marketing methods: The program manager reported that the most common form of promotion for the Renewables and Demonstrations program is in the form of hardcopy paper handouts that are provided to customers. These handouts contain information about several I&M programs, and are distributed to customers at events such as home and garden shows and other community venues. Additionally, the program is marketed through the use of promotional yard signs that customers can agree to place on their lawn. This sign is intended to increase program awareness towards participants' friends and neighbors.

In addition to direct marketing efforts, program staff also noted that installation contractors and vendors in the I&M service territory have used the Renewables and Demonstrations program as a sales tool. The level of program engagement varies among contractors, with some contractors actively promoting incentives to prospective customers and others providing program information upon request. Program staff noted that while contractors are not able to provide their customers with specific estimates of incentive amounts, contractors have included the program incentive as a qualitative line item on project cost estimates. Contractors using the Renewables and Demonstrations program as a sales tool have also informed their customers of available tax credits that may be applicable to solar and geothermal projects. By incorporating the tax credits and the program incentive into project planning discussions, contractors are able to present significant cost offsets to their customers.

Application processing and free-ridership control: In terms of application verification and eligibility, program management staff reported that they had denied seven applications during the 2013 program year. As seven total projects were actually completed through the program, this represents half of the total number of applications received. Program staff explained that the primary reason for denying incentive applications was that customers had already implemented their projects prior to submitting the application. This is not allowed under program guidelines, as customers must receive approval from I&M prior to installing the eligible equipment.

This requirement is enforced as a free-ridership control, as customers who have already implemented their projects prior to incentive approval are highly likely to be classified as free-riders. Program staff noted that the program is specifically oriented towards minimizing free-ridership, as each project represents a large portion of the program incentive budget and total savings. Program staff carefully reviews each application for indications of free-ridership, and have previously disqualified participants due to free-ridership risk. These practices appear to have functioned as a fairly effective free-ridership screen, as ADM only identified one participant associated with free-ridership risk for the 2013 program year.

Program kickoff and early development: 2013 was the first year of operation for the Renewables and Demonstrations program. When asked about overall program operational efficiency thus far, program staff noted that the 2013 year presented several program kickoff challenges that have for the most part been resolved. These challenges mainly related to individual equipment types, as each category requires separate analytical and engineering knowledge in order to accurately calculate incentives and conduct project verification procedures.

program staff reported that after working with approximately two projects within an individual equipment category, staff has the necessary procedures and skills to proficiently continue working with that category. Thus, the program manager reported that the program is now very familiar with solar and geothermal projects, while LED projects have been less common and still present a slight learning curve.

7.3.6.2 Overall Interview Results

Overall, program staff reported that the Renewables and Demonstrations program has operated successfully during 2013, and is anticipated to maintain is performance levels in 2014. Staff identified few issues with program design or operation, and provided details indicating that the program has sufficient resources and operational procedures to meet its intended objectives.

7.3.7 Conclusions and Recommendations

This section summarizes key conclusions, and any associated recommendations, resulting from the PY4 evaluation of the Renewables and Demonstrations program. These conclusions and recommendations are based on the full set of evaluation activities, including participant surveys, the staff interview, savings impact analysis, and program documentation review.

Key findings and recommendations for the PY4 Renewables and Demonstrations program evaluation include:

Sufficient program documentation: ADM’s review of program documentation determined that the current set of program documents is sufficient for meeting program requirements and objectives. The enrollment application is thorough and provides detailed information to the customer regarding program terms and participation expectations. Additionally, the application collects both broad and in-depth information regarding prospective projects. This allows program staff to become somewhat familiar with the project prior to discussing additional details with customers. Overall, the enrollment application serves both as a comprehensive resource for I&M customers, and as a valuable data collection tool for program staff.

Additional solar shading detail: The existing pre-inspection forms include a section for identifying any shading that may obstruct the solar panels from direct sunlight. Shading on Solar Photovoltaic systems affects overall energy production and may require modifications to the estimated annual savings for the project. In the current program year, the pre- and post-inspection forms typically contained sufficient data for verifying savings. However, the Evaluators were not always able to definitively determine the presence or absence of shading at a given site based on the photos and details provided.

For future years, the Evaluators recommend that I&M staff include more photos that more clearly illustrate the area surrounding the proposed solar project. This will allow the Evaluators to conduct a more thorough review of each site and provide documentation that further supports the final savings estimates.

Contractor network involvement: The Renewables and Demonstrations program has generated interest both within the customer market and contractor industry, as several equipment vendors and contractors have become actively engaged in promoting the program. An active contractor network is an effective resource for increasing program awareness and maintaining program performance over time. Although the program will typically require only a small number of completed projects to reach annual savings goals, the relatively high cost of solar and geothermal systems likely discourages many customers who are not aware of available financial assistance opportunities.

As customers are likely to seek professional assistance when purchasing and installing eligible equipment, vendors and contractors are a key channel for promoting the program incentives. I&M should maintain the engagement of the existing contractor network, and encourage additional contractors to use the Renewables and Demonstrations program as a sales tool.

Active free-ridership controls: The program currently has several requirements and procedures that serve to minimize free-ridership activity. This includes the program rules, which do not allow customers to receive incentives if they have implemented the equipment prior to submitting an application, and prohibit customers from receiving rebates from other utility programs for the same project. Additionally, program staff reviews each application and discuss the project with customers in order to gauge whether the project poses a significant risk of free-ridership. If the program manager determines that a project is associated with a high risk of free-ridership, the project is deemed ineligible for a program incentive.

It should be noted that participants are able to receive additional financial assistance from non-utility sources, such as tax credits. While this may increase the likelihood of free-ridership for some customers, it is not feasible to eliminate all possible sources of informational, financial, and other assistance that potential free-riders may receive. The current evaluation results indicate that free-ridership has been fairly infrequent thus far, and I&M should maintain the current procedures that help to mitigate this issue.

Awareness of large projects: As noted by the I&M program manager and presented in the program savings totals, one of participants in the Renewables and Demonstrations program accounted for a much higher portion of savings than any other participant. While the incentive calculated for this participant did not comprise the bulk of paid incentives in 2013, it was more than 75% higher than the average incentive paid to all participants. The program is intended to operate with a small participant population, and any single high-savings participant may result in a substantial expenditure of program funds. If there is no existing maximum incentive level for individual projects, it may be beneficial for I&M to consider implementing an incentive ceiling. This would ensure that the program is able to provide services to several customers representing a range of project types.

Development of preliminary incentive estimates: I&M staff explained that it is difficult to notify prospective participants of the incentive level they can expect to receive, as eligible projects vary widely in scope, cost, and savings. However, the program is able to offset a large portion of the implementation cost for some projects, and some customers may be discouraged from participating in the program if they do not have an incentive range in mind.

As the program continues into future years and a larger number of projects are completed, I&M should analyze past incentive payments and determine whether a general relationship can be found (incentive as a portion of project cost, as a portion of energy savings achieved, etc.). Although current program participation is high enough to meet annual goals, providing a broad incentive range within marketing materials or directly to customers in future years may encourage prospective participants to enroll.

Overall program success: Although 2013 was the pilot year for the Renewables and Demonstrations program, it appears that reception to the incentives has been very positive. Program staff reported that meeting savings goals while remaining within program budgets has been a manageable process and that the program will likely continue to meet its goals in the coming year. Additionally, all participants reported being satisfied with the incentive levels and provided commentary indicating that they highly value the opportunity to participate in the program.

With regard to budgeting and participation forecasts, program staff is able to fairly accurately estimate upcoming program activity as each project is associated with a substantial lead time and must be pre-approved by I&M. The overall results from the 2013 program evaluation suggest that the Renewables and Demonstrations program is well suited to meeting its designated savings goals in the immediate future, and that the program has sufficient financial and non-financial resources to perform as intended.

As the program enters its second year and beyond, it will be important to continually monitor customer reception of program offerings, and to adjust goals and budgets according to forecasted participation activity.

8. Residential Home Weatherization Program

This chapter addresses the methodologies and impact findings of gross and net kWh savings and peak kW reductions resulting from the Residential Home Weatherization Program during the period January 2013 through December 2013.

8.1 Program Specific M&V Methodologies

The M&V approach for the Home Weatherization program (HWP) is aimed at determining the following:

- Numbers of weatherization measures installed;
- Average annual kWh savings per weatherization measure implemented;
- Average kW reduction per weatherization measure implemented;
- Providing estimates of net-to-gross savings and free-ridership; and
- Estimating cost effectiveness of the HW program in 2013.

Table 8-1 below summarizes the inputs needed for gross savings calculations and the source of each input.

Table 8-1 Data Sources for Gross Impact Parameters – Home Weatherization Program

Parameter	*Source*
Number of Participants	Program Tracking Data/ Participant Surveying
Participants with gas and electric heating	Program Tracking Data/ Participant Surveying
Pre-Post Insulation Values	Program Tracking Data/ Participant Surveying
HVAC efficiencies	Program Tracking Data/ Participant Surveying
Size of Homes	Program Tracking Data/ Participant Surveying
Length of Duct Work	Program Tracking Data/ Participant Surveying
Net-to-Gross Ratio	Participant Surveying

8.1.1 Verification of Weatherization Measures Installed

A first aspect of conducting measurements of program activity is to verify if participants of the program did participate in the program. ADM takes several steps in verifying the number of weatherization measures installed, which consists of the following:

- Validating program tracking data provided by CLEAResult by checking for duplicate or erroneous entries;

- Verifying that participants were part of the program according to the agreed-upon process between CLEAResult and I&M; and
- Conducting verification surveys with a statistically valid sample of program participants. The focus of these verification surveys are to verify that customers listed in the program tracking database did indeed participate and the number of measures installed was accurate.

8.1.2 Calculating Gross Annual kWh/kW Savings

Gross energy impacts and demand reductions for the Home Weatherization program were calculated (by measure) using engineering spreadsheet models originally developed by CLEAResult. ADM reviewed the spreadsheets and assessed the appropriateness of the engineering algorithms, and their level of rigor. In the course of this engineering review, ADM also reviewed the key assumptions for each measure. Such assumptions included weather variables, baseline equipment specifications, and expected operating conditions.

8.1.3 Calculating Net Energy (kWh) and Peak Demand (kW) impacts

The purpose of the Home Weatherization program is to help customers who would benefit from higher level standard home weatherization measures such as ceiling insulation, home infiltration, and duct sealing. However, some homes that were part of the program might have installed the same weatherization measures without the program. These homes would represent free-ridership. Thus the question to be addressed in the net savings analysis was what proportion of gross savings resulting from the implemented weatherization measures was directly attributable to the HWP. Rather than apply a binary scoring (0% vs. 100% free-ridership), ADM applied a free-ridership probability to program participants, based upon four factors below with the survey questions included that pertain to them:

- Financial Ability to purchase weatherization measures absent program assistance

Question 11: Would you have been financially able to install these energy efficiency measures without the Home Weatherization program from I&M?

If the customer answered “No” to this, then they are assigned 0% free-ridership, as without the financial ability to purchase the measures in the kit, other factors in the decision making process are not relevant. Having financial ability does not inherently make one a free-rider, however, as they could still have been program-induced.

- Importance Of program assistance in the decision-making process

Question 8: For the (measures) that were installed in your home, would you still have installed this measure (or these measures) at your home if you had not participated in the I&M Home Weatherization program?

If the respondent answers in Question 8 “No”, then the respondent is considered to have not been planning to purchase any of the measures and is 0% free-rider.

- Prior Planning to purchase weatherization measures

  Question 8A: When did you learn of the Home Weatherization program?

  Question 7: For the measures that was installed in your home, did you have plans to install this measure (or these measures) at your home before participating in the I&M Weatherization program?

If the respondent answers in Question 8 “Yes” and indicated that they learned of the rebate “After deciding to replace items in my home with these energy efficiency measures but before I had purchased these measures on my own”, then the respondent is considered to have been planning to purchase the same quantity of measures with or without the rebate and is thus a partial free-rider. If the respondent answers in Question 8 “Yes” and indicated that they learned of the rebate “After I had purchased these energy efficiency measures on my own but before I had installed them”, or “After I had already replaced some items in my home with these energy efficiency measures”, then the respondent is considered to have been planning to purchase the same quantity of measures and already did with or without the rebate and is thus 100% free-rider. Question 6 is also taken into consideration depending on how it is answered.

- Demonstrates Behavior In Purchasing Similar Equipment absent program assistance

  Question 12: Did you install these energy efficient measures earlier than you otherwise would have without the program?

  Question 12A: When would you otherwise have installed the measures?

If the respondent indicates in Question 12 “Yes”, and for Question 12A chooses an option of “over 1 year”, then they are considered to have been motivated by the energy efficiency program and are thus 0% free-rider. If respondents who indicated in Question 12A “less than 6 months” or “6-12 months”, these respondents are considered partial free-riders. If the respondent indicated in Question 12 “No”, then they are a free-rider because the program retrofit did not affect timing of purchase and installation of measures.

For residential programs, free-ridership is calculated as the average score determined for the sample of participants surveyed. Once free-ridership is determined, ADM then estimates the Net-to-Gross Ratio (NTGR), calculated as:

NTGR = 1 – % Free-Ridership

8.2 Impact Results

ADM estimated ex post gross electric savings and peak demand reductions through detailed analysis of participant tracking data and participant survey data. It should be noted that the number of participants listed on the December 2013 scorecard is different then what ADM found and calculated. It was agreed upon by the program implementer, I&M, and ADM that the correct number of participants is 33. The estimated gross impacts resulting from the PY4 Home Weatherization program are summarized in Table 8-2. Table 8-3and Table 8-4 show the audited and verified savings.

Table 8-2 Gross Impact Summary

Program	PY4 Program Goals (kWh)	Peak Demand Savings (kW)		Annual Energy Savings, (kWh)		Realization Rate
		Ex Ante	Ex Post	Ex Ante	Ex Post	
Home Weatherization	2,245,000	-	10.62	50,919	42,134	83%

Table 8-3 Gross Impact kWh

Ex Ante Gross kWh Savings	Gross Audited kWh Savings	Gross Verified kWh Savings	Ex Post Gross kWh Savings	Realization Rate
50,919	50,919	50,919	42,134	83%

Table 8-4 Gross Impact kW

Ex Ante Peak kW Savings	Audited Peak kW Savings	Verified Peak kW Savings	Ex Post Peak kW Savings
-	-		10.62

Table 8-5 Measure Summary

Measure Type	Verified Measures Installed	Ex post Annual Savings (kWh)	Realization Rate
Infiltration Reduction	28	4,620	26%
Duct Sealing	6	1,072	43%
Knee Wall Insulation	7	1,291	17%
Ceiling Insulation	29	22,160	168%
Exterior Wall Insulation	10	12,992	143%
Total	80	42,134	84%

In addition to gross savings, ADM estimated associated net-to-gross ratios (NTGRs) for the program from the participant survey. Applying the estimated NTGR of 91% to the gross savings reported in Table 8-2 results in the net savings detailed in Table 8-6 below.

Table 8-6 Net Impact Summary

Program	PY3Pprogram Goals (kWh)	Peak Demand Savings (kW)		Annual Energy Savings, (kWh)		Realization Rate
		Ex Ante	Ex Post	Ex Ante	Ex Post	
Home Weatherization	2,110,300	-	9.66	47,864	38,342	80%

8.2.1 Verification of Participation in Program

As a first step toward estimating program level kWh and kW impacts, ADM reviewed program tracking data provided by CLEAResult for accuracy. No duplicate entries were discovered. ADM did find that the number of participants listed on the December 2013 scorecard is different then what ADM found and calculated. It was agreed upon by the program implementer, I&M, and ADM that the correct number of participants is 33. To verify that the number of homes in the program tracking database claiming to have weatherization measures installed through the program was accurate, ADM administered a telephone survey with program participants.

All 14[54] respondents who completed the participant survey verified that they had participated in the program during 2013. All survey respondents also indicated that the measures installed were identical to what was claimed in the CLEAResult tracking database. Based on these results, the verification rates shown in Table 8-7 for each type of weatherization measure were determined.

Table 8-7 Verification Rates by Measure Type

Program	Weatherization Type			
	Infiltration Reduction	All types of Insulation	Duct Insulation	Duct Sealing
Home Weatherization	100%	100%	100%	100%

Based on these verification rates, Table 8-8 reports the numbers of homes that were weatherized through the program during PY4 that were verified as being program eligible participants.

54 ADM tried multiple times to reach program participants. Participants either did not pick up or had disconnected numbers. Only 14 participants were surveyed for the PY4 program year.

Table 8-8 Home Verified to have Weatherization Measures Completed and are Program Eligible Participants

Program	*Quantity of Homes Weatherized*	*Verification Rate*	*Quantity of Homes Weatherized for Customers Who Where Verified as program Eligible*
Home Weatherization	33	100%	33

8.2.2 Gross Annual kWh Savings and Peak kW Reduction

Gross energy and demand impacts were calculated using engineering spreadsheet models, as described briefly in chapter three of this report. All of the following methodologies employ Equivalent Full Load Hours (EFLH) or Cooling/Heating Degree Days (CDD/HDD). Since no primary data is available to accurately estimate EFLHs for residential homes in Indiana, ADM used DOE2.2 simulations of prototypical single family residences to calculate appropriate Indiana specific values. The prototypical models were sourced from the Database for Energy Efficiency Resources (DEER) but simulated with Indiana TMY3 weather data. The same weather data was used to calculate the HDD and CDD inputs. Heating and cooling degree days were calculated assuming base temperatures of 55 degrees F and 70 degrees F respectively. Heating and cooling degree days occurring during the shoulder months (spring and fall) were sorted out due to the fact that homeowners are likely to abstain from using their HVAC system during these periods.

The following sections describe the specific algorithms and inputs used to calculate savings for each measure in the program.

8.2.2.1 Air Infiltration Reduction Savings Calculations

Engineering equations were developed to calculate the annual savings from the reduction of infiltration loads in residential homes. The equations rely on Lawrence Berkeley Laboratory’s N-Factor, to convert blower door readings to natural CFM infiltration losses. The N-Factor is necessary as blower door testing is performed at a pressure of 50 Pascal.

Lawrence Berkeley Laboratory N-Factor

Dwelling Stories	*N-Factor*
1	18.5
1.5	16.7
2	14.8

The following equation was used to calculate the annual savings due to infiltration reduction:

$$kWh_{savings} = \frac{25.92 \times CFM_{50} \times HDD}{N \times 3412 \times COP_h} + \frac{25.92 \times CFM_{50} \times CDD}{N \times 1000 \times SEER_c} \qquad (1)$$

Parameters used in Equation 1 are as follows:

Parameter	*Description*
CFM50	CFM leakage of the house during blower door testing
HDD	Heating Degree Days, 3,807
CDD	Cooling Degree Days, 348
N	N-Factor
COPh	Coefficient of Performance for the heating system
SEERc	Seasonal Energy Efficiency Rating of the cooling system

Following this, ADM calculated peak kW savings. This is based upon I&M's defined peak of 7:00 a.m. – 9:00 p.m. during weekdays. Peak kW savings are calculated as:

$$\mathrm{kW}_{\mathrm{reduction}} = \frac{25.92 \times \mathrm{CFM}_{50} \times \mathrm{CDD}_{\mathrm{peak}} \times \mathrm{CF}}{\mathrm{N} \times 1000 \times \mathrm{SEER}_{\mathrm{c}}} \qquad (2)$$

Parameters used in Equation 2 are as follows:

Parameter	*Description*
CFM50	CFM leakage of the house during blower door testing
CDDpeak	Maximum Cooling Degree Day value during peak period, 0.56
CF	Coincidence Factor for cooling, 0.9
N	N-Factor
SEERc	Seasonal Energy Efficiency Rating of the cooling system

8.2.2.2 Insulation Savings Calculations

Engineering equations were used to calculate the annual savings due to insulation being installed in various locations of residential homes. HDD and CDD was used to inform the heat transfer based savings calculations as HDD and CDD are both a function of time and temperature difference between indoor and outdoor conditions.

The following equation was used to calculate the annual savings due to the installation of insulation:

$$kWh_{savings} = \frac{\left[\left(\frac{1}{R_{CB}} - \frac{1}{R_{CA}}\right) \times Cav_{\%} \times Area\right] \times 24 \times HDD}{3412 \times COP_h} + \frac{\left[\left(\frac{1}{R_{CB}} - \frac{1}{R_{CA}}\right) \times Cav_{\%} \times Area\right] \times 24 \times CDD}{1000 \times SEER_c} \qquad (3)$$

Parameters used in Equation 3 are as follows:

Parameter	*Description*
RCB	Baseline R-Value for the area in between framing

RCA	As-Built R-Value for the area in between framing
Cav%	% of overall area in which framing does not exist
Area	Total area of insulation installed, Ft2
HDD	Heating Degree Days, 3,807
CDD	Cooling Degree Days, 348
COPh	Coefficient of Performance for the heating system
SEERc	Seasonal Energy Efficiency Rating of the cooling system

Following this, ADM calculated peak kW savings. This is based upon I&M's defined peak of 7:00 a.m. – 9:00 p.m. during weekdays. Peak kW savings are calculated as:

$$kW_{reduction} = \frac{\left[\left(\frac{1}{R_{CB}} - \frac{1}{R_{CA}}\right) \times Cav_{\%} \times Area\right] \times 24 \times CDD_{peak} \times CF}{1000 \times SEER_c} \quad (4)$$

Parameters used in Equation 4 are as follows:

Parameter	*Description*
RCB	Baseline R-Value for the area in between framing
RCA	As-Built R-Value for the area in between framing
Cav%	% of overall area in which framing does not exist
Area	Total area of insulation installed, Ft2
CDDpeak	Maximum Cooling Degree Day value during peak period, 0.56
CF	Coincidence Factor for cooling, 0.9
SEERc	Seasonal Energy Efficiency Rating of the cooling system

8.2.2.3 Duct Sealing Savings Calculations

In order to determine the annual savings due to duct sealing, ADM used a modified version of the Equivalent Full Load Hour method used to determine savings for small HVAC retrofits. The equation was modified to reflect a change in duct leak losses instead of a change in HVAC unitary power. ADM assumed 400 ft2 of conditioned spaced per ton of cooling and heating.

The following equation was used to calculate the annual savings due to duct sealing:

$$kWh_{savings} = \frac{400 \times Area \times 12 \times (Leak_b - Leak_a) \times H_h}{3412 \times COP_h} + \frac{400 \times Area \times 12 \times (Leak_b - Leak_a) \times C_h}{1000 \times SEER_c} \quad (7)$$

Parameters used in Equation 7 are as follows:

Parameter	*Description*
Area	Area of conditioned space of home
$Leak_b$	Percent leakage of baseline duct work, 15%
$Leak_a$	Percent leakage of as-built duct work, 5%
H_h	Heating Hours, 1,986
C_h	Cooling Hours, 418

COP_h	Coefficient of Performance for the heating system
$SEER_c$	Seasonal Energy Efficiency Rating of the cooling system

Following this, ADM calculated peak kW savings. This is based upon I&M's defined peak of 7:00 a.m. – 9:00 p.m. during weekdays. Peak kW savings are calculated as:

$$kW_{red} = \frac{400 \times Area \times 12 \times (Leak_b - Leak_a) \times CF}{1000 \times SEER_c} \quad (8)$$

Parameters used in Equation 8 are as follows:

Parameter	*Description*
Area	Area of conditioned space of home
$Leak_b$	Percent leakage of baseline duct work, 15%
$Leak_a$	Percent leakage of as-built duct work, 5%
CF	Coincidence Factor for cooling, 0.9
COP_h	Coefficient of Performance for the heating system
$SEER_c$	Seasonal Energy Efficiency Rating of the cooling system

8.2.3 Net Energy (kWh) and Peak Demand (kW) Impacts

To obtain net savings for the PY4 Home Weatherization program, ADM surveyed program participants to develop estimates of free-ridership. As detailed in Section 8.1.3, developing free-ridership estimates for the HWP is dependent upon survey questions addressing financial ability, prior planning, importance of the rebate in decision making, and likelihood of installing similar equipment absent the program. Table 8-9 through Table 8-12 below summarizes the responses to questions addressing free-ridership for the 2013 HWP.

Table 8-9 HWP Financial Ability Results

Component	*Question*	*Yes*	*No*	*Don't Know*
Financial Ability	Question 11: Would you have been financially able to install these energy efficient measures without the Home Weatherization program from I&M?	67%	25%	8%

Table 8-10 HWP Importance of Program Rebate

Component	*Question*	*Yes*	*No*	*Don't Know*
Importance of program	Question 8: For the measures that was installed in your home, would you still have installed this measure (or these measures) at your home if you had not participated in the I&M Home Energy Weatherization program?	33%	77%	-

Table 8-11 HWP Prior Planning Results

Component	*Question*	*After deciding but before replacing*	*After purchased but before installing*	*After replaced*	*Yes*	*No*
Prior Planning	Question 8A: When did you learn of the Home Weatherization program?	33%	-	-	-	
	Question 7: For the measures that was installed in your home, did you have plans to install this measure (or these measures) at your home before participating in the I&M Weatherization program?				67%	33%

Table 8-12 HWP Behavior Absent Program Results

Component	*Question*	*Yes*	*No*	-	-	-
Importance of Rebate	Question 12: Did you install these energy efficient measures earlier that you otherwise would have without the program?	75%	25%	-	-	-
	Question	*Less than 6 months*	*6-12 months*	*1-2 years*	*3-5 years*	*More than 5 years*
	Question 12 A: When would you have otherwise installed the measures?	-	11%	45%	22%	22%

The resulting NTGR for this program was 91%, slightly lower than the value of 95% anticipated by Indiana Michigan Power. This value was applied in discounting annual kWh and peak demand savings for the 2013 HWP.

8.3 Process Evaluation

This chapter presents the results of the process evaluation for I&M's Home Weatherization program during PY4. The process evaluation focuses on the effectiveness of program policies and organization, as well as the program delivery framework. The purpose of the process evaluation is to assess the design and recent results of the program in order to determine how effectively it is achieving its intended outcomes. This evaluation is based upon analysis of program structure and interviews and surveys of participating I&M customers, I&M energy efficiency staff, and program tracking data.

The chapter begins with a discussion of the overall progress of the program. This is followed by an examination of certain issues important for the future success of the program. The chapter also presents strategic planning and process recommendations, and highlights key findings from the surveys of customer participants and interviews with program operations staff.

8.3.1 Evaluation Objectives

The purpose of the process evaluation is to examine program operations and results throughout the program operating year, and to identify potential program improvements that may prospectively increase program efficiency or effectiveness in terms of customer participation and satisfaction levels. This process evaluation was designed to document the operations and delivery of the Home Weatherization program during PY4.

Key research questions to be addressed by this evaluation of PY4 activity include:

- How effective is the program marketing? How do participants learn about the program?
- Why did customers participate in the program?
- How satisfied are participants with the program? What was their level of satisfaction with performance of the measures, the effort required to complete the application, and the quality of the work completed?

During the evaluation, data and information from multiple sources were analyzed to achieve the stated research objectives. Insight into the customer experience with the Home Weatherization program is developed from a telephone survey of program participants. The internal organization and operational efficiency of program delivery is examined through analysis of interviews conducted with I&M program staff, as well as the program implementer.

8.3.2 Summary of Primary Data Collection

- **Review of program documentation and relevant literature:** ADM reviewed relevant program documents, reports, and other materials to gain an understanding of program operation and structure. Documents reviewed included sample audit reports, sample program planning documents, program marketing materials and information provided to customers, and program tracking data. Reports from evaluations and papers on best practices for weatherization programs were also reviewed.

- **Interview with I&M staff members:** Interviews with I&M staff members, including program managers, provided insight into various aspects of the program and its organization. I&M staff members also provided information regarding future plans for the program.

- **Interview with CLEAResult staff:** CLEAResult program implementation staff was interviewed to provide information regarding program progress and observations regarding customers. The implementer was asked questions about how contractors became involved in the program, the program process and paperwork, program marketing, and provided information regarding future plans for the program.

- **Participant surveys:** Participant surveys served as the foundation for understanding the customer perspective. The participant surveys provided customer feedback and insight regarding customer experiences with the Residential Home Weatherization program. Respondents reported on how they learned about the program, their decision to participate, and satisfaction with the program.

8.3.3 Summary of Conclusions and Recommendations

The following presents a selection of key conclusions from the second year of program operations:

- **Late start to program Year 4:** The program was far from exceeding its goal, which is mainly attributable to the original implementation contractor dropping out from the program. This required I&M to find a new implementation contractor in early 2013, delaying program delivery. Additional programming changes in the NIPSCO territory further delayed program start-up, which ultimately occurred during May 2013.
- **High participant satisfaction:** Surveys of program participants found a high degree of satisfaction among all participants, with very few instances of negative feedback. This reflects positively on the design and outcomes of the program, and its overall interaction with customers.
- **Informative audit materials:** The majority of participants who participated in the Home Weatherization program found out about the program from the letter left behind during their Home Energy Assessment. This shows that the current marketing strategy used by CLEAResult is effectively recruiting participants.
- **Program monitoring is sufficient:** Implementation staff report that they inspect the first five jobs completed by each contractor, plus approximately 15% of all additional jobs. Verifications conducted CLEAResult did not identify any significant issues. Verification procedures appear to be effectively designed and operated.
- **Information lag time between audit and CLEAResult:** The program implementation contractor, CLEAResult, mentioned that there was a significant amount of time between when a participant received a Home Energy Assessment to when CLEAResult received the participant's information. Information for participants who completed the audits is sent monthly to CLEAResult, usually the 15th day of the month. Therefore, if a participant received an audit on February 1st, CLEAResult would not receive this participant's information until March 15th.

The evaluation team currently has the following recommendations for program improvement consideration.

- **Collect additional data from customers:** CLEAResult assumed that all customers had SEER 10 as their standard baseline. A more precise approach would be to collect the actual SEER for each individual participant.

- **Increase R-value baseline:** ADM's analysis showed that an R-0 was assumed as baseline for wall and roof insulation in a majority of sites. However, the minimum for wall insulation is R-2.73 without any additional insulation. Ex ante calculations should be updated to reflect this.
- **Expedite information transfer from HEA to CLEAResult:** CLEAResult mentioned that there was a significant lead time from when customers received a Home Energy Assessment to when CLEAResult received participant information. Due to this, some participants received weatherization measures much later than they could have and CLEAResult could not proceed with as many projects as could have otherwise been completed. . Transmitting audit information to CLEAResult twice per month would be more efficient.

8.3.4 Program Theory and Activities

The Home Weatherization program underwent a significant change in 2011. Prior to December 2011, the Residential Home Weatherization program was bundled with an in-home audit component. Customers who received an audit were offered incentives to implement insulation, duct sealing, and air infiltration measures that were recommended during the audit. In December of 2011, the State of Indiana launched its statewide core programs which included an in-home audit program. At this time I&M separated the audit component of the program from the incentivized insulation and air infiltration measures component. Because of this change, the program was required to re-solicit bids for an implementation contractor and discontinue offering insulation and air infiltration measures until a new implementation contractor could be selected.

In 2013, the State of Indiana launched its statewide core programs which included a Home Energy Assessment program, which is now the first step prior to participating in the Home Weatherization program. Participants find out about the Home Weatherization program during their Home Energy Assessment and are able to apply to the program once their HEA has been completed.

Before the launch of the 2013 program, the previous program implementation contractor resigned its role, requiring I&M to solicit bids for a new implementation contractor. During this time, insulation and air infiltration measure offerings were halted. Once a new implementation contractor was found during April 2013, the program re-launched. During November 2013, due to low participation, I&M launched a "limited time only" free of charge duct sealing direct install promotion to qualifying participants.

The program will be revamped when it re-launches in 2014. The current plan is to eliminate the Home Energy Assessment requirement, and to expand participation eligibility to mobile homes. In addition to the existing incentives, future program participants will also receive a LED bulb and thermostat. The "limited time only" duct sealing initiative from November 2013 will continue indefinitely and adjusting savings values for homes heated by heat pump will be added.

Figure 8-1 presents a logic model of the Home Weatherization program, including key events and outcomes. The logic model outlines the sources of program net savings and identifies the possible routes each participant may take through the program process.

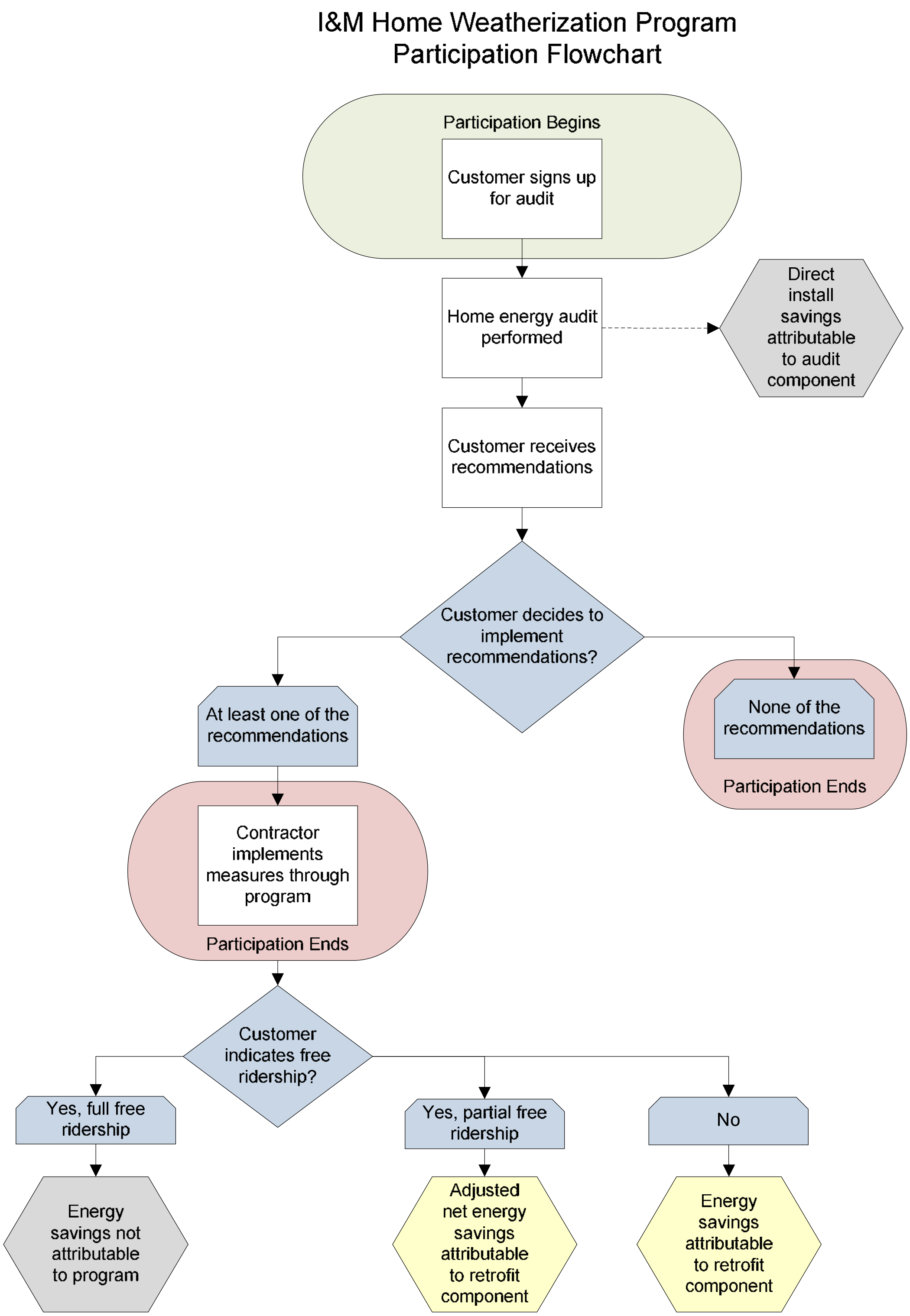


Figure 8-1 Home Weatherization Program Logic Model

8.3.5 Tracking Database Review

The evaluators received a tracking database that was evaluated for overall organization and content. The data received were sufficient. Most importantly for the purposes of process evaluation, the contact information and measure input variables were complete and accurate.

During PY4, the Home Weatherization program serviced a total of 33 homes. Services provided to residences included installation of insulation, infiltration reduction, and duct sealing. Figure 8-2 illustrates participation rates by month over the course of PY4. Participation in the HESP fluctuated throughout the program year, with peak activity occurring during December 2013 when the “limited time” duct sealing direct install was launched.

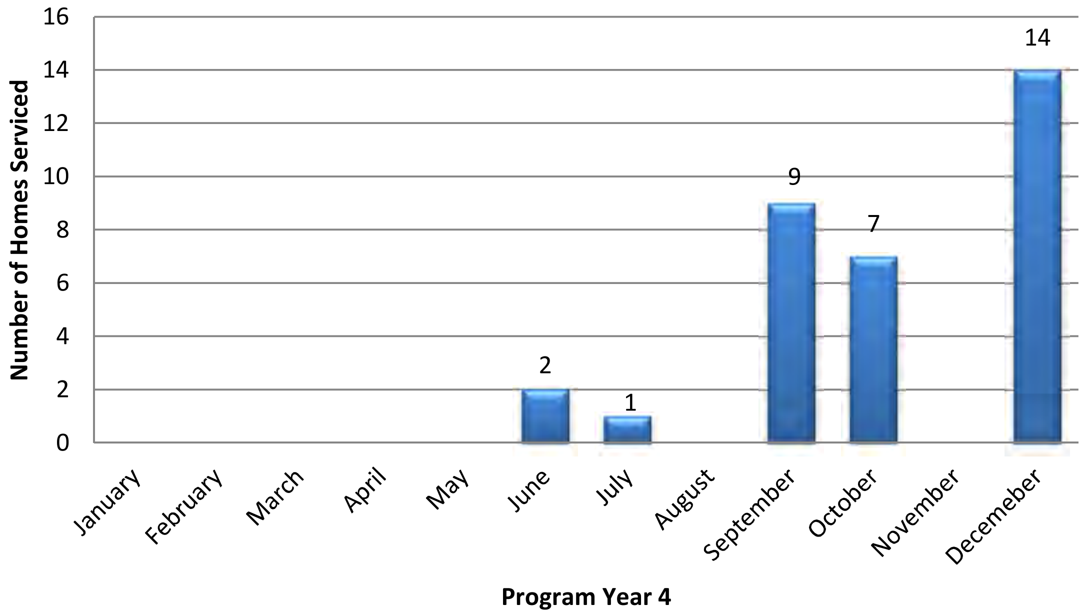


Figure 8-2 Participation Rates by Month, 2013

A total of 80 separate measure installations were performed during the fourth program year. Table 8-13 displays the number of installations by measure type, arranged by the most commonly installed measures. Ceiling insulation was the most commonly implemented measure, followed closely by infiltration reduction.

Table 8-13 Total Installations by Measure

Measure	*Number of Installations*
Ceiling Insulation	29
Infiltration Reduction	28
Exterior Wall Insulation	10
Knee Insulation	7
Duct Sealing	6
Total	80

8.3.6 Contractor Interviews

The evaluators spoke with two contractors who implemented the insulation and air sealing measures for the Home Weatherization program. The purpose of these interviews was to gauge the effectiveness of program operations from the contractors' perspectives. Contractor interviews addressed a variety of topics. These topics included:

- How contractors first became involved in the program;
- program paperwork and processes;
- program marketing;
- Customers' satisfaction with the program; and
- The program's effect on the contractor's business.

Overall contractors stated that the program is effectively operated, and highly rated their satisfaction with program components.

8.3.6.1 Contractor Involvement in the Program

Contractors were asked about how they initially became involved in the program. Both contractors stated that they previously worked on other programs within Energizing Indiana and Indiana Michigan Power and were referred by those program implementers to the HWP implementer, CLEAResult.

8.3.6.2 Program Paperwork and Processes

During the interviews, contractors were asked to discuss how the scope of work for customer projects was communicated, their process for scheduling and performing work, and the paperwork requirements once the project is finished. The contractors stated that the work performed was described in a work order that they received from CLEAResult. One contractor reported that over 50% of the customers cannot fully afford the work that is specified in the work order. This contractor explained that they then set up a payment plan with those participants who wanted to complete the work.

Contractors reported that they were typically able to schedule the work to be performed with the customer within a week of receiving the work order. The contractors normally sent between one to two staff to complete the project and that the majority of projects were completed within a single day. One contractor noted that on occasion they would note additional work that the customer could have performed that was not covered by the program and that customers would on occasion ask them to return and perform this work.

Upon completion of the project, the contractors provided invoices to the customer and to CLEAResult. Both contractors reported a long wait of 90 days or more to receive reimbursement checks from NIPSCO or I&M.

8.3.6.3 Program Marketing

Respondents indicated that they did not market the Residential Home Weatherization program, rather they saw this as a task for the implementation firm, CLEAResult.

Respondents did not have much awareness of marketing efforts for the program and reported that additional marketing effort is needed. One contractor responded that they refer family and friends to the Home Assessment program quite often and spread awareness of the HWP in that manner.

8.3.6.4 Customer Satisfaction

Contractors were asked about their perceptions of how satisfied customers were with the program and the work performed through it. Both respondents indicated that customers were very satisfied with the program and with the work performed.

8.3.6.5 Effect on Business

The interviewed noted that they performed work through other programs aside from I&M's Residential Home Weatherization program. Respondents reported that the I&M program, as well as the other programs, lead to additional sales for their business.

8.3.6.6 Conclusions

From the contractors' perspective, the Residential Home Energy program operated well. The work requirements were clearly communicated and there were not any problems in completing program paperwork. Both contractors noted that this program, in addition to other similar programs, increased their sales. The contractors reported that customers were satisfied with the program and the work performed.

8.3.7 Participant Survey Findings

ADM conducted telephone surveys with program participants as part of the evaluation effort for the 2013 Home Weatherization program. These surveys were designed to gather information related to both the impact and process components of the program evaluation. Data collected via participant surveying are used in evaluating:

- Customer demographics and characteristics;
- Customer implementation of energy efficient measures and behaviors;
- Customer decision making behaviors; and
- Customer satisfaction with the program.

In total, 14 customer participants who had received energy efficient weatherization retrofits through the program responded to the survey.

8.3.7.1 Customer Awareness of Program

Survey participants were first asked how they learned about the Residential Home Weatherization program. As shown in Figure 8-3, respondents most commonly reported that they had received a letter related to the program. Seventeen percent of respondents cited the I&M website as their initial source of information about the program. Very few respondents reported that they learned about the program through an equipment vendor or contractor, which is typical of residential customers who are less likely than commercial customers to have active working relationships with specific auditors.

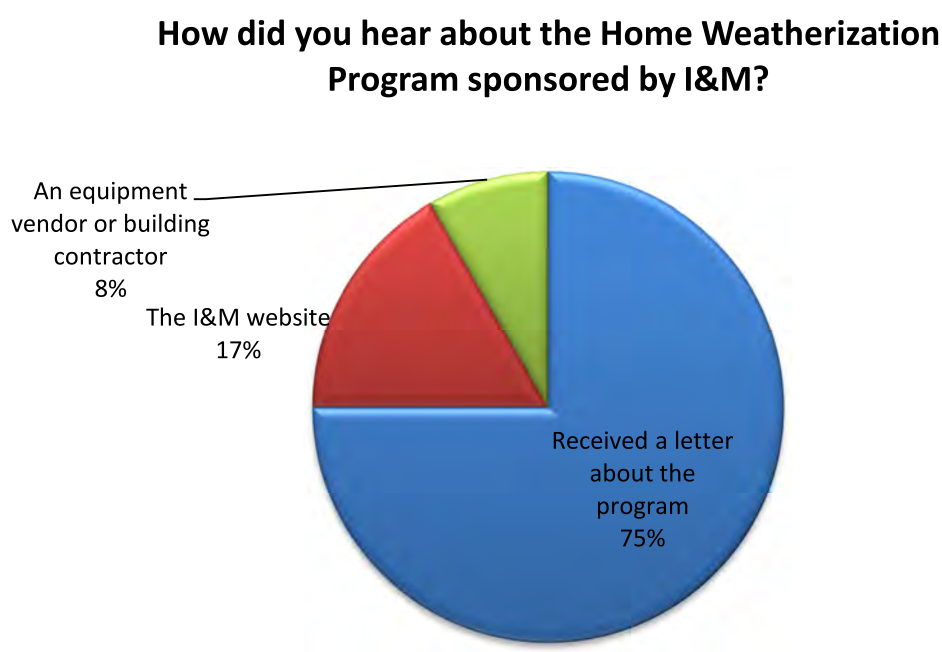


Figure 8-3 How Customers Learned about the Program

8.3.7.2 Factors Affecting Customer Decision Making

Survey respondents were asked a series of questions related to their decision making behaviors involving energy efficiency. As displayed in Figure 8-4, over three-quarters of respondents indicated that they chose to implement the energy efficient equipment in order to save money on their energy bills. These results suggest that participants are mainly concerned with the financial aspects of energy efficiency improvements, rather than indirect environmental impacts. This is typical of residential programs, where participants report that they primarily consider monthly energy savings or program financial incentives when deciding whether to make energy efficiency improvements.

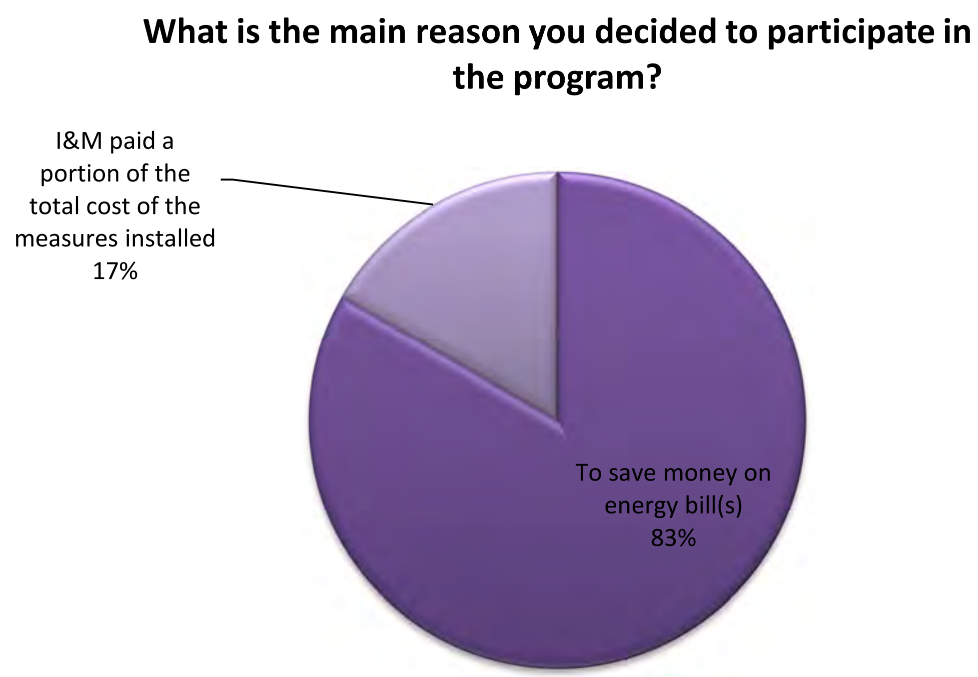


Figure 8-4 Reported Reasons for Installation of Home Weatherization Program Measures

Survey respondents were asked a series of questions designed to gauge the potential influence that the Residential Home Weatherization program may have had on customer decision making. First, respondents were asked whether they had prior plans to implement the energy efficient measures that they ultimately installed under the Residential Home Weatherization program. Approximately three-quarters (67%) of respondents indicated that they did have prior plans to install at least one of these measures. As a follow-up, 33% of respondents reported that they would have actually proceeded with the implementation of at least one measure without the assistance of the program. However, it is unclear whether these respondents would have implemented the exact types of weatherization measures as were recommended during the energy audit.

In order to determine the likelihood of customers proceeding with installations in the absence of the program, respondents were asked whether they would have gone ahead with their planned installations even if they had not participated in the initial energy audit phase. Table 8-14 shows that 25% of respondents reported that they probably would have installed these energy efficiency measures in the absence of the Home Weatherization program. Seventy five percent of respondents reported that they probably or definitely would not have installed their energy efficiency measures without the Home Weatherization program. These results suggest that although a substantial percentage of respondents indicated that they had prior plans to install the energy efficiency improvements, the majority of them likely would not have proceeded with these improvements without the assistance of the energy efficiency kit and overall program.

Table 8-14 Reported Likelihood of Proceeding with Implementation of Measures Absent Program

How likely is it that you would have hired a professional contractor to perform a home audit like the Home Weatherization program offers if you had not participated in the Home Weatherization program?	*Response*	*Percentage of Respondents (N = 14)*
	Definitely would have	0%
	Probably would have	25%
	Probably would not have	50%
	Definitely would not have	25%
	Don't know	-

In order to estimate further program influences upon customer decision making behavior, participants were asked whether the program caused them to install their energy efficient weatherization measures earlier than they otherwise would have. Three-quarters of respondents reported that they installed their respective energy efficiency measures earlier than they would have without the program; these participants were asked to provide further details regarding project timing. As illustrated in Figure 8-5, the majority of remaining respondents reported that it would have been at 1-2 years before they would have installed these energy efficient measures. These results suggest that the information and financial assistance provided through the Home Weatherization program have significantly influenced the timing of measure installation, even for customers who indicated having previous plans to implement these projects.

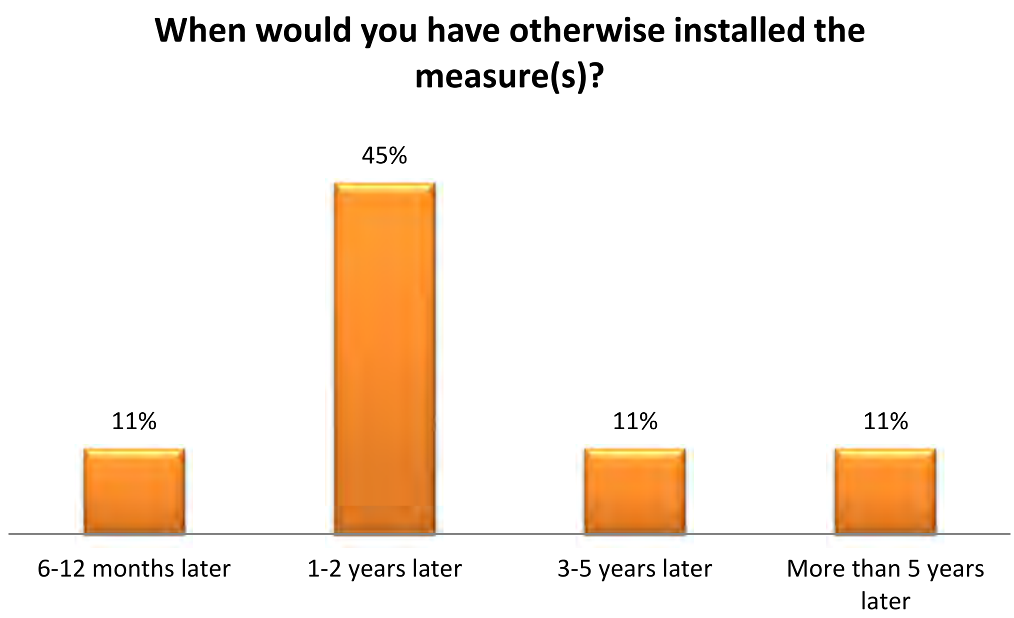


Figure 8-5 Timing of Installation in the Absence of the Program

8.3.7.3 Customer Purchasing Behaviors and Energy Efficiency

The survey instrument included multiple questions designed to gather information related to customer purchasing behaviors and attitudes towards energy efficiency. As displayed in Table 8-15, the majority of respondents stated that they are "very likely" to purchase and install energy efficient equipment upon replacement of old household equipment. Although responses to this question may be influenced by a level of response bias[55], participants indicated that they place a relatively high value on energy efficiency in their homes. From the results discussed above, this focus on energy efficiency is likely related to the financial savings that can occur when a home is equipped with energy efficiency improvements.

Table 8-15 Importance of Energy Efficiency in Customer Households

	Response	*Percentage of Respondents (N = 63)*
When you are replacing old equipment such as lights or appliances in your home, how likely are you to replace it with energy efficient equipment?	Very likely	84%
	Somewhat likely	8%
	Not at all likely	-
	Don't know	8%

[55] Specifically, social desirability bias is the tendency for respondents to answer questions in a way that is seen as socially acceptable, which may skew results. (Reference: Robinson, J. P., Shaver, P. R., & Wrightsman, L. S. (1991). Measurement and control of response bias. *Measures of social psychological attitudes, 1,* 17-59.)

Participants were then asked about their specific experience with energy efficient equipment. Table 8-16 shows that 75% of respondents reported having previously installed energy efficient measures. Along with the results discussed for Table 8-15, these findings suggest a relatively high awareness of and experience with energy efficiency improvements.

Table 8-16 Prior Purchasing and Installation of Energy Efficient Measures

	Response	*Percentage of Respondents (N = 14)*
Before you participated in the Indiana Michigan Power Home Weatherization program, had you purchased and used any energy efficient measures in your home?	Yes	75%
	No	25%

When asked to explain what energy efficient equipment they had previously installed, respondents provided a wide range of responses; results were categorized by measure and equipment type and are displayed in Table 8-17. The most commonly cited measures included large appliances and CFLs, and the majority of respondents who reported previous installation of CFLs also stated that they had purchased an energy efficient large appliance. These energy efficient appliances primarily consisted of washers, freezers, and refrigerators. Eight percent of respondents indicated that they had updated their windows with tinted or double paned versions, with several respondents reporting that they had replaced all of the windows in their home. Additionally, 16% of respondents cited other energy improvements such as air conditioners and insulation.

Table 8-17 Previous installation of Energy Efficient Measures

	Response	*Percentage of Respondents (N = 14)*
What had you previously installed?	Large appliances	58%
	CFLs	33%
	Windows	8%
	Air conditioner	8%
	Insulation	8%

*Respondents were able to provide multiple responses; the percentages shown are percentages of respondents rather than percentages of responses. Thus, the total exceeds 100%.

The respondents reporting prior installation of energy efficient items were asked whether they had applied for financial incentives for those, and all participants reported that they had not applied for incentives. When asked why they had not applied for incentives, these respondents explained that they either were not aware of any available financial incentives, or that no incentive had been offered at the time of the purchase. These results suggest that while a majority of participants have previous experience with energy efficiency improvements, all these purchases were primarily completed without the financial assistance offered by utility-sponsored efficiency programs.

In order to gauge the likelihood of future energy efficiency behaviors, respondents were asked whether their experience with the Residential Home Weatherization program has led them to purchase non-incentivized energy efficient measures. As shown in Table 8-18, three-quarters of respondents indicated that the program has not caused them to purchase additional measures without an incentive. Customers are typically more likely to install energy efficient measures when they are provided at very low or no-cost. As many respondents reported having already replaced several pieces of household equipment with energy efficient alternatives, they may not be aware of significant opportunities for further energy efficient improvements beyond the insulation, infiltration reduction, or duct sealing they received through the program.

Table 8-18 Program Influence on Customer Purchasing Behavior

Has your experience with the Indiana Michigan Power Home Weatherization program led you to buy any energy efficient equipment or items for which you did not apply for or receive a financial incentive?	*Response*	*Percentage of Respondents (N = 14)*
	Yes	25%
	No	75%
	Don't know	-

Respondents were asked about their likelihood to purchase energy efficient measures in the future without incentives. As shown in Table 8-19 more than 90% of respondents stated that they would still be willing to purchase energy efficient items in the future. While respondents did not provide further details regarding the types of energy efficient items they would be willing to purchase, it is likely that these purchases would fall into the categories listed in Table 8-17.

Table 8-19 Likelihood of Future Energy Efficiency Purchases

	Response	*Percentage of Respondents (N = 63)*
Given your experience with the Indiana Michigan Power Home Weatherization program, would you buy energy efficient measures in the future, even if financial incentives were not offered?	Yes	92%
	No	8%
	Don't know	-

8.3.7.4 Customer Satisfaction

Survey respondents were asked about their levels of satisfaction with selected elements of the Home Weatherization program experience. Results were provided on a scale of 1 to 5, with 1 representing “very dissatisfied” and 5 representing “very satisfied”. As displayed in Table 8-20, respondents generally reported high satisfaction levels with the majority of these program elements. Respondents reported being the most satisfied with the program information provided by I&M, followed by the effort required to complete the participant application. These program factors relate to customers’ ease of involvement with the program, and results suggest that participants have a favorable view of this process.

More than 47% of respondents indicated that they were very or somewhat satisfied with the performance of the installed measures, with no respondents reporting that they were at all dissatisfied with measure performance. Comparatively, respondents provided lower satisfaction ratings for the savings on their monthly bills. Only 25% of respondents indicated that they were “very satisfied” with monthly bill savings, and 8% of respondents stated that they were either “somewhat” or “very dissatisfied” with this program aspect. In open-ended responses, participants explained that they had expected a more noticeable change in their monthly bills as a result of installing these energy efficient measures, while one respondent explained that he had yet to see savings, and he believed that this problem may be due to an air vent problem that may be a byproduct of some electrical issues caused by the contractor.

The response from participants who expected a more noticeable change in their monthly bills is typical of residential retrofit programs, where customers may not have had time to observe a significant reduction in energy bills.

Table 8-20 Customer Satisfaction with Selected Program Elements

Element of program Experience	*Response and Percentage of respondents (N = 63)*					
	Very satisfied	*Somewhat satisfied*	*Neutral*	*Somewhat dissatisfied*	*Very dissatisfied*	*Don't know*
Performance of measures installed	58%	17%	25%	-	-	-
Savings on monthly bill	25%	17%	25%	-	8%	25%
The effort required for the program application process	83%	17%	-	-	-	-
Usefulness of the energy audit	58%	34%	8%	-	-	-
Information provided by I&M	67%	25%	8%	-	-	-
Quality of work conducted by the contractor	59%	25%	8%	-	8%	-
Overall program experience	67%	25%	8%	-	-	-

A few respondents also provided a variety of open-ended commentary regarding their experiences with the Residential Home Weatherization program. Specific commentary included:

> *"I appreciate the chance to receive incentives because it helped me save money and energy."*

> *"I'm grateful for the program. I was surprised that I&M offered these programs for customers. It shows that they care about their customers to give them savings on their bill.*

> *"Thank you, thank you, thank you! This program was very helpful."*

Overall, the program generated much more positive feedback than negative remarks, and the survey findings suggest that customers are generally satisfied with their program experiences.

8.3.7.5 Respondent Demographics

In order to characterize participant profiles and determine which customer segments are participating in the Home Weatherization program, participants were asked several questions related to their residences and overall demographics. As shown in Table 8-21, the majority of respondents indicated that their household was occupied by one resident, with no respondents reporting that four or more people lived in the household. This suggests that the Home Weatherization program is primarily gaining participation from individual couples and small families, who typically have a lower overall energy usage and potentially fewer bathrooms and appliances. The overall average number of household occupants was 1.9.

Table 8-21 Number of Occupants per Respondent Household

	Response	*Percentage of Respondents (N = 14)*
How many people, including you, live in your household?	One person	42%
	Two people	25%
	Three people	33%
	Four people	-
	Five people	-
	Six people	-
Average		1.9 people

Respondents were then asked about the age of the occupants in their household. Table 8-22 displays the overall results, identifying the percentage of total reported occupants for each of the selected age ranges. Nearly half of household occupants were reported to be 65 years of age or older. This, combined with the information from previous survey items, suggests that respondent households commonly consisted of individual, older couples rather than young families or multi-family dwellings.

Table 8-22 Respondent Household Occupant Age Ranges

Age categories	*Percentage of total reported occupants (N = 23)*
Under 25 years	26%
25 to 34 years	9%
35 to 44 years	4%
45 to 54 years	26%
55 to 64 years	9%
65 years or over	26%

Finally, Table 8-23 displays the reported ownership status of participant homes, all respondents indicating that they owned the household. This is not uncommon for weatherization programs, as renters may not have the authority to make certain energy efficiency improvements. Additionally, homeowners may be more interested in making long-term improvements to their households, as renters typically do not benefit from increasing household resale value and may not plan to reside in the household for an extended time period.

Table 8-23 Ownership Status of Participant Homes

	Response	*Percentage of Respondents (N = 14)*
Do you own or rent your household?	Own	100%
	Rent	-
	No response	-

8.3.8 Program Operations Perspective

This section summarizes the core findings of interviews conducted with I&M program staff for the purposes of developing internal program management perspectives.

In order to gain insight into the Home Weatherization program operation and delivery, interviews were conducted with key members of the utility. These interviews focused on program operations, the overall effectiveness of the program process, and the identification of areas for future program improvement. Other groups involved in managing or promoting the program were also spoken to.

Respondents shared their perspective on the program operations during PY4. Interview questions related the respondents' individual roles in administering the program as well as their perceptions of overall program strengths, weaknesses, and opportunities for the future.

8.3.8.1 Summary of Interview Findings

Key program features and trends addressed by respondents include:

- **Effective communication between I&M and CLEAResult :** I&M and CLEAResult discuss the program operations by telephone on a weekly basis. Additionally, I&M's CLEAResult contact meets with utility staff in person once per month. These formal meetings are supplemented with regular email exchanges to discuss issues and address any potential questions. Both staff from I&M and CLEAResult reported that this is sufficient communication frequency between the two organizations. In addition, program staff noted that the interactions were adequately meeting their needed objectives.

- **Substantial program developments:** Prior to December 2011, the Home Weatherization program was bundled with an in-home audit program. In December 2011, Indiana launched its statewide Core programs at which point the audit program became a separate Core program and the weatherization component was dropped. In 2013, this audit program was changed to a Home Energy Assessment (HEA) program. Participants of the Home Energy Assessment program primarily learned of the Home Weatherization program through this HEA program.

- **Program to undergo further changes in PY5:** Both implementation staff and I&M staff spoke about major planned changes to the program in PY5. Changes currently approved include providing participants with a LED bulb and thermostat in addition to their incentive, the “limited time only” duct sealing direct install has been made permanent in the program, allowing mobile homes to participate in program, and adjusting savings values for homes heated with a heat pump.

- **Delayed PY4 program launch:** Due to the original implementation contractor leaving the program in early 2013, the program did not launch until early May. The program is expected to re-launch in the first quarter of PY5.

- **Measures must pass cost-effectiveness testing:** A decision was made to only allow incentives for weatherization measures that passed cost effectiveness testing requirements. The cost effectiveness of each measure is calculated during the HEA, and the measures that meet these requirements are included in the recommended measures.

- **Small share of audits led to weatherization projects:** program staff report that during the second year only a small share of HEA’s led to Home Weatherization program projects. Although evaluating the HEA program is beyond the scope of this report, this suggests that the HEA program and the Home Weatherization program may not be sufficiently encouraging customers to implement efficiency measures.

- **Program monitoring is sufficient:** Implementation staff report that they inspect the first five jobs completed by each contractor, plus approximately 15% of all additional jobs. Verifications conducted CLEAResult did not identify any significant issues. Verification procedures appear to be effectively designed and operated.

9. Cost Effectiveness Testing

In evaluating the 2013 I&M Residential Portfolio, ADM performed cost-effectiveness testing at the program levels. In order to provide an evaluation of the overall impact of each of I&M's Residential programs relative to their costs, a portfolio of tests was conducted using the following inputs: verified gross kWh/kW savings, net kWh and kW savings, administration costs, incentive amounts, participant costs, cost of electric generation at peak and non-peak hours, market based prices of energy, I&M's weighted average cost of capital, and customer rate forecasts. The specific tests describe the impact of the program from varying perspectives. The five most widely accepted tests conducted in evaluations of energy efficiency programs across North America are summarized below[56]:

- Utility Cost Test (UTC): Comparison of program administrator costs to resource supply costs.
- Total Resource Cost Test (TRC): Comparison of program administrator and customer costs to utility resource savings.
- Ratepayer Impact Measure Test (RIM): Impact of the program on all ratepayers, including non-participants.
- Societal Cost Test (SCT): Comparison of total societal costs to resource savings and non-monetized benefits.
- Participant Cost Test (PCT): Comparison of costs and benefits from the perspective of the customer implementing the measures.

The key questions answered by each cost test are shown in Table 9-1.[57]

[56] National Action Plan for Energy Efficiency (2008). ***Understanding Cost-Effectiveness of Energy Efficiency Programs: Best Practices, Technical Methods, and Emerging Issues for Policy-Makers.*** Energy and Environmental Economics, Inc. and Regulatory Assistance Project. <www.epa.gov/eeactionplan>

[57] http://www.epa.gov/cleanenergy/documents/suca/cost-effectiveness.pdf

Table 9-1 Questions Addressed by the Various Cost Tests

Cost Test	*Questions Addressed*
Participant Cost Test	• Is it worth it to the customer to install energy efficiency? • Is the customer likely to want to participate in a utility program that promotes energy efficiency?
Ratepayer Impact Measure	• What is the impact of the energy efficiency project on the utility's operating margin? • Would the project require an increase in rates to reach the same operating margin?
Utility Cost Test (Same as program administrator cost test (PACT))	• Do total utility costs increase or decrease? • What is the change in total customer bills required to keep the utility whole?
Total Resource Cost Test	• What is the regional benefit of the energy efficiency project including the net costs and benefits to the utility and its customers? • Are all of the benefits greater than all of the costs (regardless of who pays the costs and who receives the benefits)? • Is more or less money required by the region to pay for energy needs?
Societal Cost Test	• What is the overall benefit to the community of the energy efficiency project including indirect benefits? • Are all of the benefits, including indirect benefits, greater than all of the costs (regardless of who pays the cost and who receives the benefits)?

Overall, the results of all five-cost effectiveness tests provide a more comprehensive picture than the use of any one test alone. The TRC and SCT cost tests help to answer whether energy efficiency is cost-effective overall. The PCT, UCT, and RIM help to answer where the selection of measures and design of the program is balanced from participant, utility, and non-participant perspectives respectively. The scope of the benefit and cost components included in each test ADM performed are summarized in Table 9-2[58].

[58] http://www.epa.gov/cleanenergy/documents/suca/cost-effectiveness.pdf

Table 9-2 Summary of Benefits and Costs Included in Each Cost-Effectiveness Test

Test	*Benefit*	*Costs*
PCT (Benefits and costs from the perspective of the customer installing the measure)	• Incentive payments • Bill Savings • Applicable tax credits or incentives	• Incremental equipment costs • Incremental installation costs
UCT (Perspective of utility, government agency, or third party implementing the program	• Energy-related costs avoided by the utility • Capacity-related costs avoided by the utility, including generation, transmission, and distribution	• program overhead costs • Utility/program administrator incentive costs • Utility/program administrator installation costs
TRC (Benefits and costs from the perspective of all utility customers in the utility service territory)	• Energy-related costs avoided by the utility • Capacity-related costs avoided by the utility, including generation, transmission, and distribution • Additional resource savings • Monetized environmental and non-energy benefits • Applicable tax credits	• program overhead costs • program installation costs • Incremental measure costs
SCT (Benefits and cost to all in the utility service territory, state, or nation as a whole.	• Energy-related costs avoided by the utility • Capacity-related costs avoided by the utility, including generation, transmission, and distribution • Additional resource savings • Non-monetized environmental and non-energy benefits	• program overhead costs • program installation costs • Incremental measure costs
RIM (Impact of efficiency measure on non-participating ratepayers overall)	• Energy-related costs avoided by the utility • Capacity-related costs avoided by the utility, including generation, transmission, and distribution	• program overhead costs • Utility/program administrator incentive costs • Utility/program administrator installation costs • Lost revenue due to reduced energy bills

9.1 Incremental Cost Calculations

Using the Database for Energy Efficient Resources (DEER)[59], ADM compiled incremental costs by measure. The incremental costs were scaled from the measure level to the program level using the quantity of each measure as verified by ADM. These incremental costs are included in the PCT, TRC and SCT tests.

9.2 Effective Useful Life Calculations

ADM calculated the Effective Useful Life (EUL) by measure referencing the DEER EUL database. Those values were aggregated at the program level using a weighted average of EUL by gross kWh savings.

9.3 Cost Effectiveness Results by Program

Using the inputs sent to ADM from I&M and the software package DSMore, ADM calculated results for each of the 5 cost effectiveness tests. The results of the above cost effectiveness tests and their corresponding benefits (numerator of each cost test) are presented in Table 9-3 and Table 9-8 below.

Table 9-3 Appliance Recycling Program Cost Effectiveness Test Results

Test	*Score*	*Benefits (2013 dollars)*
Utility Cost Test	1.14	$774,438.54
Total Resource Cost Test	1.44	$774,438.54
Ratepayer Impact Measure Test	0.33	$774,438.54
Societal Cost Test	1.60	$803,468.73
Participant Test	-	$2,175,638.08

[59] The DEER database can be downloaded here: http://www.energy.ca.gov/deer/

Table 9-4 Home Energy Reporting Program Cost Effectiveness Test Results

Test	*Score*	*Benefits (2013 dollars)*
Utility Cost Test	0.86	$710,172.37
Total Resource Cost Test	0.86	$710,172.37
Ratepayer Impact Measure Test	0.24	$710,172.37
Societal Cost Test	0.95	$710,172.37
Participant Test	-	$2,175,098.92

Table 9-5 Online Energy Check-Up Program Cost Effectiveness Results

Test	*Score*	*Benefits (2013 dollars)*
Utility Cost Test	4.87	$3,947,777.96
Total Resource Cost Test	4.87	$3,947,777.96
Ratepayer Impact Measure Test	0.41	$3,947,777.96
Societal Cost Test	5.58	$4,208,785.48
Participant Test	-	$8,315,558.64

Table 9-6 Peak Reduction Program Cost Effectiveness Results[60]

Test	*Score*	*Benefits (2013 dollars)*
Utility Cost Test	0.39	$3,025,150.97
Total Resource Cost Test	0.59	$3,025,150.97
Ratepayer Impact Measure Test	0.38	$3,025,150.97
Societal Cost Test	0.55	$3,041,604.31
Participant Test	-	$96,670.08

Table 9-7 Renewables and Demonstrations Program Cost Effectiveness Results

Test	*Score*	*Benefits (2013 dollars)*
Utility Cost Test	0.64	$59,641.78
Total Resource Cost Test	0.67	$59,641.78
Ratepayer Impact Measure Test	0.31	$59,641.78
Societal Cost Test	0.81	$69,320.17
Participant Test	-	$71,562.39

[60] In the absence of a fixed long-term avoided cost agreement, a longer EUL is an appropriate proxy to capture the fact that load control programs provide benefits in7 multiple years, most of which have higher avoided costs than observed in 2013. The EUL used for this program is 10 years. It is the initial total program life as set out in the cost benefit analysis performed by I&M during the design phase.

Table 9-8 Home Weatherization Program Cost Effectiveness Results

Test	*Score*	*Benefits (2013 dollars)*
Utility Cost Test	0.13	$41,672.76
Total Resource Cost Test	0.13	$41,672.76
Ratepayer Impact Measure Test	0.11	$41,672.76
Societal Cost Test	0.15	$45,830.65
Participant Test	-	$47,280.04

Table 9-9 summarizes the cost effectiveness testing results by program for each test performed.

Table 9-9 Cost Effectiveness Test Scores by Program

Program	*UCT*	*TRC*	*RIM*	*SCT*	*PCT*
Appliance Recycling	1.14	1.44	0.33	1.60	-
Home Energy Reporting	0.86	0.86	0.24	0.95	-
Online Energy Check-Up	4.87	4.87	0.41	5.58	-
Peak Reduction	0.39	0.59	0.38	0.55	-
Renewables and Demonstrations	0.64	0.67	0.31	0.81	-
Home Weatherization	0.13	0.13	0.11	0.15	-

Appendix A: Appliance Recycling Program Participant Survey Instrument

Indiana Michigan Power

Appliance Recycling Program 2013

Participant Telephone Survey

Interviewer: ______________________ Date of Interview: _____/_____/_____
Respondent: _____________________ Address: _________________________

Hello. May I please speak with [CONTACT NAME]:____________________________)?

Hello. My name is _____ and I am calling on behalf of Indiana Michigan Power (I&M) about the Appliance Recycling program that your household participated in back in ___ [Month/Year]. Are you the person who is most familiar with having a refrigerator or freezer picked up for recycling through I&M's program?

(IF NOT RIGHT PERSON) *May I please speak to the person who would know the most about the appliance that was picked up for recycling?*

REPEAT INTRODUCTION AND CONTINUE
(IF RIGHT PERSON) *We are conducting a study to evaluate I&M's Appliance Recycling program. I&M will use the results of this evaluation to determine the effectiveness of the program and to make improvements. We would like to include your opinions about the program in our evaluation. The interview will take approximately 15 minutes. May I ask you a few questions?*
IF REFUSAL: THANK AND TERMINATE

VERIFICATION

1. Our program records indicate that you had **__ (quantity of refrigerators or freezers)** picked up for recycling through the Appliance Recycling program around ***[Month/Year]***. Is that correct?

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

[ASK IF Q1=2]

2. How many refrigerators or freezers did you have recycled through the Appliance Recycling program?

1. __________________ **[Record Quantity of Each Appliance] ->*[TOT_QTY]***
98. Don't know

99. Refused

AWARENESS

3. How did you first learn about **I&M**'s appliance pick-up and recycling program? **[DO NOT READ, PROMPT IF NECESSARY. CHOOSE ONE.]**

1. Newspaper/magazine/print media
2. Bill insert
3. Friend or Relative (word-of-mouth)
4. TV ad
5. I&M Representative
6. I&M Brochure
7. Retailer/store
8. Other **[Specify]______________________________**.

Don't know

Refused

4. Did you hear about the program from any other sources? If so, which sources? [Check all that apply.]

1. No other sources
2. Newspaper/magazine/print media
3. Bill insert
4. Friend or Relative (word-of-mouth)
5. TV ad
6. I&M Representative
7. I&M Brochure
8. Retailer/store
9. Other **[Specify]______________________________**.

Don't know

Refused

FIRST APPLIANCE DESCRIPTION AND RECYCLING DECISION

5. IF [TOT_QTY] = 1: Now I'm going to ask you some specific questions about the [refrigerator, freezer] that was picked up and recycled by **I&M.**

IF [TOT_QTY] > 1: Now I'd like to focus on one of the appliances you recycled through **I&M**'s program. It does not matter which appliance you choose, just that you respond only with that appliance in mind. Can you tell me which appliance you've selected to tell me about?

1. ____ Refrigerator
2. ____ Freezer

6. How old was your **[refrigerator, freezer]**? **[RECORD RESPONSE IN YEARS, ENTER "00" IF LESS THAN ONE YEAR]**?

1. **______ [Record years]**

98. Don't know
99. Refused

7. Was the old **[refrigerator, freezer]** your primary or secondary (spare, auxiliary) unit?

1. Primary
2. Secondary

98. Don't know
99. Refused

8. Did you replace the old **[refrigerator, freezer]** with a new unit?

1. Yes
2. No

98. Don't know
99. Refused

9. For the majority of 2011, where within your home was the **[refrigerator, freezer]** located?

1. Kitchen
2. Garage
3. Porch/patio
4. Basement
5. Living room
6. Family room
7. Bedroom
8. Hallway
9. Other **[Specify] ____**

98. Don't know
99. Refused

10. Thinking about the year prior to recycling the [refrigerator, freezer]**,** was it plugged in and running … **[READ ALL]**

1. …All the time **[Go to Q12]**
2. …For special occasions only
3. …During certain months of the year only, or
4. …Never plugged in or running **[Go to Q12]**

98. Don't know
99. Refused

11. If you were to add up the total amount of time it was running in the year prior to being picked up, how many months would that be? Your best estimate is okay. **[Get nearest month]**

1. **_____ [RECORD NUMBER OF MONTHS 1-11]**
2. All the time

98. Don't know
99. Refused

12. Was the **[refrigerator, freezer]** still in working condition when it was picked up (by working condition I mean did the unit turn on and produce cold air)?

1. Yes **[Skip to Q14]**
2. No
3. It worked but had some problems

98. Don't know **[Skip to Q14]**
99. Refused **[Skip to Q14]**

13. What was wrong with the unit? (If respondent is unsure, ask "would it turn on and produce cold air?")

1. Wouldn't turn on
2. Wouldn't keep food/room cold ENOUGH
3. Wouldn't keep food/room cold at all
4. Too loud
5. Don't know, but would produce cold air
6. Don't know, but would NOT produce cold air
7. Other **[Specify] ____**

98. Don't know
99. Refused

14. Had you already considered disposing of the **[refrigerator, freezer]** before you heard about **I&M**'s appliance recycling program? By dispose of, I mean getting the appliance out of your home by any means including selling it, giving it away, having someone pick it up, or taking it to the dump or a recycling center yourself.

1. Yes
2. No

98. Don't know
99. Refused

15. What would you have most likely done with the **[refrigerator, freezer]** had you not disposed of it through **I&M'**s program?

[Read list unless respondent indicates choice without reading the list]

1. Sold it to a private party

2. Sold it to a used appliance dealer
3. Kept it and continued to use it
4. Kept it and stored it unplugged
5. Given it away to a private party, such as a friend or a neighbor
6. Given it away to a charity organization, such as Goodwill Industries or a church
7. Put it on a curb with a "Free" sign on it
8. Had it removed by the dealer you got your new or replacement [refrigerator, freezer] from
9. Taken it to a dump or recycling center
10. Hired someone to take it to a dump or recycling center
11. Gotten rid of it some other way [**Specify**]_____________
98. Don't know
99. Refused

16. What is the MAIN reason you chose to get rid of your **[refrigerator, freezer]** through **I&M**'s program over other methods of disposing of your appliance? **[If multiple are mentioned, ask: "Of those, which is the main reason?" Do not read, accept one answer only.]**

[If respondent says: "I didn't need or want the [refrigerator, freezer]," respond "Yes, but why did you choose to discard it through I&M's program rather than through another method?"]

1. Cash/incentive payment
2. Free pick-up service/others don't pick up/don't have to take it myself
3. Environmentally safe disposal/recycled/good for environment
4. Recommendation of a friend/relative
5. Recommendation of retailer/dealer
6. Utility sponsorship of the program
7. Easy way/convenient
8. Never heard of any others/only one I know of
9. Other **[Specify]**
98. Don't know
99. Refused

17. Would you have participated in the program if the amount of the rebate had been less?

1. Yes
2. No **[Go to Q19]**
3. Maybe
98. Don't know
99. Refused

18. Would you have participated in the program with no rebate check altogether?

1. Yes
2. No

98. Don't know
99. Refused

FIRST REPLACEMENT UNIT (Skip if QError! Reference source not found. = 2, 98, 99)

Please think about the [refrigerator, freezer] that *replaced* the one that was removed.

19. Was the replacement [refrigerator, freezer] that replaced the one that was removed one that …
1. You bought New
2. You bought Used
3. You moved from somewhere else in the house
4. You moved from another home, or
5. You received from someone else?
98. Don't know
99. Refused

20. **[IF QError! Reference source not found. = 1, 2, 4, OR 5]** Did you acquire the replacement [refrigerator, freezer] before or after the old [refrigerator, freezer] was picked up? **[RECORD ONLY ONE RESPONSE]**
1. Before
2. After
3. Got it the same day
98. Don't know
99. Refused

21. **[ASK IF QError! Reference source not found. = 1 OR 2]** How long **[BEFORE / AFTER FROM A11]** the old one was picked-up did you get the replacement [refrigerator, freezer]? **[READ RESPONSE LIST; RECORD ONLY ONE RESPONSE]**
1. Within one to two weeks
2. Over two weeks, but less than two months
3. Within two to three months
4. Within four to six months
5. Within seven to twelve months (one year)
6. More than twelve months (one year)
7. Other (Please specify) [DO NOT READ] ______________
98. Don't know [DO NOT READ]
99. Refused [DO NOT READ]

22. **ASK IF (QError! Reference source not found. = 2) OR (QError! Reference source not found. = 1, QError! Reference source not found. = 1 AND QError! Reference source not found. = 6)]** How old is this replacement [refrigerator, freezer]?
[NUMERIC OPEN END; RECORDED IN YEARS]
1. Less than one year
98. Don't know
99. Refused

23. Please keep thinking about the [refrigerator, freezer] that replaced the [refrigerator, freezer] removed by I&M or JACO. Does this replacement

[refrigerator, freezer] have … **[READ LIST FOR SPECIFIC EQUIPMENT TYPE; RECORD ONLY ONE RESPONSE]**
FOR REFRIGERATORS, READ:
1. A single door, with a freezer compartment inside
2. Two doors, side by side, with a freezer on one side
3. Two doors, top and bottom, with a freezer on the top
4. Two doors, top and bottom, with a freezer on the bottom
5. Three doors with a freezer door on the bottom
6. Other-specify **______________**
98. Don't know
99. Refused

FOR FREEZERS, READ:
7. A chest freezer
8. An upright freezer
9. Other-specify **______________**
98. Don’t know
99. Refused

24. Is the replacement [refrigerator, freezer] frost-free or manual defrost? **[DO NOT READ RESPONSE LIST; RECORD ONLY ONE RESPONSE]**
1. Frost free
2. Manual defrost
3. Other-specify **______________**
98. Don't know
99. Refused

25. Is your replacement [refrigerator, freezer] larger, smaller or about the same size as the one that the program removed for you? **[DO NOT READ RESPONSE LIST; RECORD ONLY ONE RESPONSE]**
1. Larger
2. Smaller
3. About the Same Size
98. Don't know
99. Refused

SECOND APPLIANCE DESCRIPTION AND RECYCLING DECISION

(SKIP TO PROGRAM SIGN-UP SECTION IF RESPONDENT ONLY RECYCLED ONE UNIT THROUGH THE PROGRAM)

26. IF [TOT_QTY] >1: Now I'm going to ask you some specific questions about the other unit that was picked up and recycled by **I&M.**

27. How old was your **[refrigerator, freezer]**? **[Record response in years, enter “00” if less than one year]**?

1. ______ **[Record years]**
98. Don't know
99. Refused

28. Was the old **[refrigerator, freezer]** your primary or secondary (spare, auxiliary) unit?
1. Primary
2. Secondary
98. Don't know
99. Refused

29. Did you replace the old **[refrigerator, freezer]** with a new unit?
1. Yes
2. No
98. Don't know
99. Refused

30. For the majority of 2011, where within your home was the **[refrigerator, freezer]** located?
1. Kitchen
2. Garage
3. Porch/patio
4. Basement
5. Living room
6. Family room
7. Bedroom
8. Hallway
9. Other **[Specify] ____**
98. Don't know
99. Refused

31. Thinking about the year prior to recycling the [refrigerator, freezer]**,** was it plugged in and running … **[Read all]**
1. All the time **[Go to QError! Reference source not found.]**
2. For special occasions only
3. During certain months of the year only, or
4. Never plugged in or running **[Go to QError! Reference source not found.]**
98. Don't know
99. Refused

32. If you were to add up the total amount of time it was running in the year prior to being picked up, how many months would that be? Your best estimate is okay. **[Get nearest month]**

1. **_____ [Record number of months 1-11]**
2. All the time

98. Don’t know
99. Refused

33. Was the **[refrigerator, freezer]** still in working condition when it was picked up (by working condition I mean did the unit turn on and produce cold air)?

1. Yes **[Skip to QError! Reference source not found.]**
2. No
3. It worked but had some problems

98. Don’t know **[Skip to QError! Reference source not found.]**
99. Refused **[Skip to QError! Reference source not found.]**

34. What was wrong with the unit? (If respondent is unsure, ask “would it turn on and produce cold air?”)

1. Wouldn’t turn on
2. Wouldn’t keep food/room cold ENOUGH
3. Wouldn’t keep food/room cold at all
4. Too loud
5. Don’t know, but would produce cold air
6. Don’t know, but would NOT produce cold air
7. Other **[Specify] ____**

98. Don’t know
99. Refused

35. Had you already considered disposing of the **[refrigerator, freezer]** before you heard about **I&M**’s appliance recycling program? By dispose of, I mean getting the appliance out of your home by any means including selling it, giving it away, having someone pick it up, or taking it to the dump or a recycling center yourself.

1. Yes
2. No

98. Don’t know
99. Refused

36. What would you have most likely done with the **[refrigerator, freezer]** had you not disposed of it through **I&M’**s program?

[Read list unless respondent indicates choice without reading the list]

1. Sold it to a private party

2. Sold it to a used appliance dealer
3. Kept it and continued to use it
4. Kept it and stored it unplugged
5. Given it away to a private party, such as a friend or a neighbor
6. Given it away to a charity organization, such as Goodwill Industries or a church
7. Put it on a curb with a "Free" sign on it
8. Had it removed by the dealer you got your new or replacement [refrigerator, freezer] from
9. Taken it to a dump or recycling center
10. Hired someone to take it to a dump or recycling center
11. Gotten rid of it some other way [**Specify**]_____________
98. Don't know
99. Refused

37. What is the MAIN reason you chose to get rid of your **[refrigerator, freezer]** through **I&M**'s program over other methods of disposing of your appliance? **[If multiple are mentioned, ask: "Of those, which is the main reason?" Do not read, accept one answer only.]**

[If respondent says: "I didn't need or want the [refrigerator, freezer]." respond "Yes, but why did you choose to discard it through I&M's program rather than through another method?"]

1. Cash/incentive payment
2. Free pick-up service/others don't pick up/don't have to take it myself
3. Environmentally safe disposal/recycled/good for environment
4. Recommendation of a friend/relative
5. Recommendation of retailer/dealer
6. Utility sponsorship of the program
7. Easy way/convenient
8. Never heard of any others/only one I know of
9. Other **[Specify]**
98. Don't know
99. Refused

38. Would you have participated in the program if the amount of the rebate had been less?

1. Yes
2. No **[Go to QError! Reference source not found.]**
3. Maybe
98. Don't know
99. Refused

39. Would you have participated in the program with no rebate check altogether?

1. Yes
2. No

98. Don't know
99. Refused

SECOND REPLACEMENT UNIT (Skip if QError! Reference source not found. = 2, 98, 99)

"Please think about the [refrigerator, freezer] that *replaced* the one that was removed."

40. Was the replacement [refrigerator, freezer] that replaced the one that was removed one that …

1. You bought New
2. You bought Used
3. You moved from somewhere else in the house
4. You moved from another home, or
5. You received from someone else?

98. Don't know
99. Refused

41. **[IF QError! Reference source not found. = 1, 2, 4, OR 5]** Did you acquire the replacement [refrigerator, freezer] before or after the old [refrigerator, freezer] was picked up? **[RECORD ONLY ONE RESPONSE]**

1. Before
2. After
3. Got it the same day

98. Don't know
99. Refused

42. **[ASK IF QError! Reference source not found. = 1 OR 2]** How long **[BEFORE / AFTER FROM A11]** the old one was picked-up did you get the replacement [refrigerator, freezer]? **[READ RESPONSE LIST; RECORD ONLY ONE RESPONSE]**

1. Within one to two weeks
2. Over two weeks, but less than two months
3. Within two to three months
4. Within four to six months
5. Within seven to twelve months (one year)
6. More than twelve months (one year)
7. Other (Please specify) [DO NOT READ] ______________

98. Don't know [DO NOT READ]
99. Refused [DO NOT READ]

43. **ASK IF (QError! Reference source not found. = 2) OR (QError! Reference source not found. = 1, QError! Reference source not found. = 1**

AND QError! Reference source not found. = 6)] How old is this replacement [refrigerator, freezer]?

\## **[NUMERIC OPEN END; RECORDED IN YEARS]**

1. Less than one year
98. Don't know
99. Refused

44. Please keep thinking about the [refrigerator, freezer] that replaced the [refrigerator, freezer] removed by I&M or JACO. Does this replacement [refrigerator, freezer] have … **[READ LIST FOR SPECIFIC EQUIPMENT TYPE; RECORD ONLY ONE RESPONSE]**

FOR REFRIGERATORS, READ:

1. A single door, with a freezer compartment inside
2. Two doors, side by side, with a freezer on one side
3. Two doors, top and bottom, with a freezer on the top
4. Two doors, top and bottom, with a freezer on the bottom
5. Three doors with a freezer door on the bottom
6. Other-specify ______________
98. Don't know
99. Refused

FOR FREEZERS, READ:

7. A chest freezer
8. An upright freezer
9. Other-specify ______________
98. Don't know
99. Refused

45. Is the replacement [refrigerator, freezer] frost-free or manual defrost? **[DO NOT READ RESPONSE LIST; RECORD ONLY ONE RESPONSE]**

1. Frost free
2. Manual defrost
3. Other-specify ______________
98. Don't know
99. Refused

46. Is your replacement [refrigerator, freezer] larger, smaller or about the same size as the one that the program removed for you? **[DO NOT READ RESPONSE LIST; RECORD ONLY ONE RESPONSE]**

1. Larger
2. Smaller
3. About the Same Size
98. Don't know
99. Refused

PROGRAM SIGN-UP PROCESS

“Now I have some questions about your experience with the program sign-up process.”

47. Once you decided to participate, the first step was signing up for the program. Are you the one that signed up, or did someone else in your household sign up?

1. I signed up
2. Someone else signed up [SKIP TO PROGRAM SATISFACTION SECTION]
98. Don’t know [SKIP TO PROGRAM SATISFACTION SECTION]
99. Refused [SKIP TO PROGRAM SATISFACTION SECTION]

48. **[ASK IF QError! Reference source not found. = 1]** Did you sign up online or on the phone?

1. Telephone
2. Online
3. Other _____________ [SKIP TO PROGRAM SATISFACTION SECTION]
98. Don’t know [SKIP TO PROGRAM SATISFACTION SECTION]
99. Refused [SKIP TO PROGRAM SATISFACTION SECTION]

IF ONLINE SIGNUP (QError! Reference source not found. = 2)

49. Was it easy to find the sign up screen on the I&M website?

1. Yes
2. No
98. Don’t know
99. Refused

50. Did the website answer all your questions about the appliance recycling program?

1. Yes
2. No
3. Not applicable
98. Don’t know
99. Refused

51. Did you receive confirmation that your online sign up had been successful?

1. Yes
2. No
3. Not applicable
98. Don’t know
99. Refused

IF PHONE SIGNUP (Q**Error! Reference source not found.** = 1)

52. Was the representative you spoke to on the telephone polite and courteous?
1. Yes
2. No
3. Not applicable
98. Don't know
99. Refused

53. Did the representative answer all your questions about the program?
1. Yes
2. No [SPECIFY: _______]
3. Not applicable
98. Don't know
99. Refused

54. Did you have to call more than once?
1. Yes
2. No
3. Not applicable
98. Don't know
99. Refused

55. **[ASK IF QError! Reference source not found. = 1]** Why did you need to call more than once?
1. [RECORD OPEN END]
98. Don't know
99. Refused

<u>ALL</u>

56. Were you able to schedule a pick-up date and time that was convenient for you?
1. Yes
2. No
98. Don't know
99. Refused

PROGRAM SATISFACTION

"Now I have some questions about your satisfaction with your participation in the program."

57. How satisfied were you with the rebate amount? Would you say you were: Very Satisfied, Somewhat Satisfied, Neither Satisfied nor Dissatisfied, Somewhat Dissatisfied or Very Dissatisfied??
1. Very satisfied
2. Somewhat satisfied

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

58. From the time you had the appliance(s) picked up, about how many weeks did it take to receive your rebate?**]**
1. Record # of weeks_________
98. Don't know [**Skip to QError! Reference source not found.]**
99. Refused [**Skip to QError! Reference source not found.]**

59. How satisfied were you with how long it took to receive the rebate? Would you say you were Very Satisfied, Somewhat Satisfied, Neither Satisfied nor Dissatisfied, Somewhat Dissatisfied or Very Dissatisfied?
1. Very satisfied
2. Somewhat satisfied
3. Neither satisfied nor dissatisfied
4. Somewhat dissatisfied
5. Very dissatisfied
98. Don't know
99. Refused

60. How satisfied were you with the scheduling of the pick-up of your old appliance(s)?
1. Very satisfied
2. Somewhat satisfied
3. Neither satisfied nor dissatisfied
4. Somewhat dissatisfied
5. Very dissatisfied
98. Don't know
99. Refused

61. How satisfied were you with the actual pick up of your old [refrigerator, freezer]?
1. Very satisfied
2. Somewhat satisfied
3. Neither satisfied nor dissatisfied
4. Somewhat dissatisfied
5. Very dissatisfied
98. Don't know
99. Refused

62. [IF UNSATISFIED FOR QError! Reference source not found. or QError! Reference source not found.] Why were you dissatisfied?

1. Record Verbatim______________________
98. Don't know
99. Refused

63. In the course of participating in **I&M's** program, how often did you contact **I&M** or program staff with questions?

1. Never **[Skip to QError! Reference source not found.]**
2. Once
3. 2 or 3 times
4. 4 times or more
98. Don't know
99. Refused

64. How did you contact them? **[CHECK ALL THAT APPLY]**

1. Phone
2. Email or fax
3. Letter
4. In person
98. Don't know
99. Refused

65. And how satisfied were you with your communications with **I&M** and program staff? Would you say you were Very Satisfied, Somewhat Satisfied, Neither Satisfied nor Dissatisfied, Somewhat Dissatisfied or Very Dissatisfied?

1. Very satisfied **[Skip to QError! Reference source not found.]**
2. Somewhat satisfied **[Skip to QError! Reference source not found.]**
3. Neither satisfied nor dissatisfied **[Skip to QError! Reference source not found.]**
4. Somewhat dissatisfied
5. Very dissatisfied
98. Don't know **[Skip to QError! Reference source not found.]**
99. Refused **[Skip to QError! Reference source not found.]**

66. Why were you dissatisfied?

1. Record Verbatim______________________
98. Don't know
99. Refused

67. Have you noticed any savings on your electric bill since removing your old appliance(s)?

1. Yes
2. No

3. Not sure
98. Don’t know
99. Refused

68. [IF QError! Reference source not found.=1]. How satisfied are you with any savings you noticed on your electric bill since removing your old appliance(s)? Would you say you were: Very Satisfied, Somewhat Satisfied, Neither Satisfied nor Dissatisfied, Somewhat Dissatisfied or Very Dissatisfied??
1. Very satisfied
2. Somewhat satisfied
3. Neither satisfied nor dissatisfied
4. Somewhat dissatisfied
5. Very dissatisfied
98. Don’t know
99. Refused

69. Finally, if you were rating your overall satisfaction with the **I&M** Rebate program, would you say you were Very Satisfied, Somewhat Satisfied, Neither Satisfied nor Dissatisfied, Somewhat Dissatisfied or Very Dissatisfied?
1. Very satisfied
2. Somewhat satisfied
3. Neither satisfied nor dissatisfied
4. Somewhat dissatisfied
5. Very dissatisfied
98. Don’t know
99. Refused

70. Why do you give it that rating?
1. Record Verbatim______________________
98. Don’t know
99. Refused

71. Do you have any suggestions to improve **I&M’s** Appliance Recycling program?
1. Yes, Record Verbatim______________________
2. No
98. Don’t know
99. Refused

DEMOGRAPHICS

“Now I have just a few final questions about your home and energy use.”

72. Which of the following best describes your home/residence?

01. Single-family home, detached construction **[NOT A DUPLEX, TOWNHOME, OR APARTMENT; ATTACHED GARAGE IS OK]**
02. Single family home, factory manufactured/modular
03. Single family, mobile home
04. Row House
05. Two or Three family attached residence—traditional structure
06. Apartment (4 + families)---traditional structure
07. Condominium---traditional structure
08. Other: **[Specify]________________________________**
98. Don't know
99. Refused

73. Do you own or rent this residence?

1. Own
2. Rent
98. Don't know
99. Refused

74. Approximately when was your home constructed? **[DO NOT READ]**

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

75. How many square feet is the above-ground living space (IF NECESSARY, THIS EXCLUDES WALK-OUT BASEMENTS)?

1. Numerical open end [Range 0-99,999]______________
98. Don't know
99. Refused

76. [IF Q**Error! Reference source not found.**=98,99] Would you estimate the above-ground living space is about:

1. Less than 1,000 sqft
2. 1,001-2,000 sqft
3. 2,001-3,000 sqft
4. 3,001-4,000 sqft

5. 4,001-5,000 sqft
6. Greater than 5,000 sqft
98. Don't know
99. Refused

77. How many square feet of conditioned living space is below- ground (IF NECESSARY, THIS INCLUDES WALK-OUT BASEMENTS)?
1. Numerical open end [Range 0-99,999]______________
98. Don't know
99. Refused

78. [IF Q**Error! Reference source not found.**=98,99] Would you estimate the below-ground living space is about:?
1. Less than 1,000 sqft
2. 1,001-2,000 sqft
3. 2,001-3,000 sqft
4. 3,001-4,000 sqft
5. 4,001-5,000 sqft
6. Greater than 5,000 sqft
98. Don't know
99. Refused

This completes the survey. If you have any additional questions regarding this survey or the program please contact I&M at imenergyefficiencyprograms@aep.com. Thank you very much for your time!

Appendix B: Home Energy Reporting Program Participant Survey Instrument

Indiana Michigan Power

Home Energy Reporting 2013

Verification and Net-to-Gross Survey Questionnaire

Interviewer: ______________________ Date of Interview: _____/_____/_____
Respondent: ______________________ Address: __________________________

Hello. My name is _____ and I am calling on behalf of Indiana Michigan Power about the Home Energy Reporting program. Are you the person who is most familiar with the home energy reports that you are receiving in the mail as part of this program?

(IF NOT RIGHT PERSON) *May I please speak to the person who would know the most about your household's participation in this program?*

REPEAT INTRODUCTION AND CONTINUE
(IF RIGHT PERSON) *We are conducting a study to evaluate I&M's Home Energy Reporting program. I&M will use the results of this evaluation to determine the effectiveness of the program and to make improvements. We would like to include your opinions about the program in our evaluation. The interview will take approximately 10 minutes. May I ask you a few questions?*

1. Our records indicate that you are a part of the Indiana Michigan Power Home Energy Reports program and as a result you are receiving reports in the mail that summarize your energy usage at home and provide recommended actions that can be taken to save you energy. Are you familiar with this program?
    a. ( ) Yes *(If checked, go to 2)*
    b. ( ) No *(If checked, thank respondent and terminate interview)*
    c. ( ) Don't know *(If checked, ask to speak with someone in the home who may know)*

2. Do you have electric or gas heating in your home?
    a. ( ) Gas
    b. ( ) Electric
    c. ( ) Other

3. Do you have electric or gas water heating in your home?
    a. ( ) Gas

b. ( ) Electric
c. ( ) Other

4. The reports include recommendations on how to save energy within your home. Have you implemented any of those recommendations?
    a. ( ) Yes *(If yes, Go to Question 4A)*
    b. ( ) No

    4A: What have you implemented? (take down items and quantity of those items)

5. How useful has the report been for helping you understand the amount of energy you use?
    a. ( ) Very Useful
    b. ( ) Somewhat Useful
    c. ( ) Slightly Useful
    d. ( ) Not Useful *(If checked, Why was this information not useful?)*

6. How useful has the report been for helping you understand what you could to do to reduce your consumption?
    a. ( ) Very Useful
    b. ( ) Somewhat Useful
    c. ( ) Slightly Useful
    d. ( ) Not Useful *(If checked, Why was this information not useful?)*

7. The program also has a web based tool that you can access that shows more detailed information about your home's electricity usage. Have you accessed this web based tool?
    a. ( ) Yes *(If yes, Go to Question 7A)*
    b. ( ) No *(If no, Go to Question 7C)*

    7A. The web based tool includes additional recommendations on how to save energy within your home. Have you implemented any of those recommendations?
    a. ( ) Yes (*If Yes, Go to question 7B)*
    b. ( ) No

    7B.Have you installed any of the structural recommendations?*)(If Yes, what?)* (*If Yes, Go to question 8)*

    Have you installed any of these appliance recommendations? *(If Yes, what?)* (*If Yes, Go to question 8)*

Have you adopted any of these lifestyle recommendations? *(If Yes, what?)* (*If Yes, Go to question 8)*

7C. Why haven't you accessed the web based tool?

a. ( ) Was not aware of the tool
b. ( ) Not interested in saving energy right now
c. ( ) Did not know how to access the tool
d. ( ) Did not know how to use the tool
e. ( ) Did not think the tool would provide useful information
f. ( ) Did not have the time to use the tool
g. ( ) Other

8. Did you install these energy efficient measures earlier than you otherwise would have without the program?
   a. ( ) Yes *(If checked, go to 8A)*
   b. ( ) No, program did not affect timing of purchase and installation

8A. When would you otherwise have purchased and installed the above recommended measures?

a. ( ) Less than 6 months later
b. ( ) 6-12 months later
c. ( ) 1-2 years later
d. ( ) 3-5 years later
e. ( ) More than 5 years later
f. () Never

9. Overall how useful did you find the information on the web tool for identifying ways to reduce your home energy use?
   a. ( ) Very Useful
   b. ( ) Somewhat Useful
   c. ( ) Slightly Useful
   d. ( ) Not Useful *(If checked, Why was this information not useful?)*

10. Before being a part of the Indiana Michigan Power Home Energy Reporting program, had you installed any energy efficient measures in your home?
    a. ( ) Yes *(If checked, go to 10A after explanation)* (Please explain):
    ____
    ____
    b. ( ) No

10A. Did you apply for and/or receive a financial incentive for those measures?

a. ( ) Yes
b. ( ) No *(If checked, go to 10B)*

10B. Why didn't you receive a financial incentive for those measures?

a. ( ) Didn't know about financial incentives
b. ( ) Didn't know whether the measures qualified for financial incentives
c. ( ) Financial incentive was insufficient
d. ( ) No financial incentive was offered
e. ( ) Other (please specify): _______________________________________

11. On a scale of 1 to 5, where "5"; is very satisfied and "1" is very dissatisfied, and a "3" is neutral, how would you rate your satisfaction with the following?

Element of program Experience	***Very Satisfied***	***Somewhat Satisfied***	***Neutral***	***Somewhat Dissatisfied***	***Very Dissatisfied***	***Don't Know***
Savings on your monthly bill if recommendation implemented (ASK ONLY IF RECOMMENDATIONS COMPLETED)	5	4	3	2	1	DK
Information provided by Indiana Michigan Power through the reports	5	4	3	2	1	DK
Information provided by Indiana Michigan Power through the web tool (ASK ONLY IF COMPLETED WEB TOOL)	5	4	3	2	1	DK
Performance of installed equipment (ASK ONLY IF RECOMMENDATIONS COMPLETED)	5	4	3	2	1	DK
Overall program experience	5	4	3	2	1	DK

12. *(If any item in Q12 rated 2 or 1)* Why were you dissatisfied with [program Element]? ____
____
____

13. Do you have any other comments that you would like to relay to Indiana Michigan Power about energy efficiency in residences or about this or other programs?

____

This completes the survey. If you have any additional questions regarding this survey or the program please contact I&M at imenergyefficiencyprograms@aep.com. Thank you very much for your time!

Appendix C: Online Energy Check-Up Program Participant Survey Instruments

Indiana Michigan Power

Online Energy Check-Up Program 2013 ELECTRIC W/LED

Verification and Net-to-Gross Survey Questionnaire

Interviewer: ______________________ Date of Interview: _____/_____/_____
Respondent: _____________________ Address: _________________________

Hello. May I please speak with [CONTACT NAME]:___________________________)?

Hello. My name is _____ and I am calling on behalf of Indiana Michigan Power about the Online Energy Check-Up program. Are you the person who is most familiar with your household's participation in this program?

(IF NOT RIGHT PERSON) *May I please speak to the person who would know the most about your household's participation in this program?*

REPEAT INTRODUCTION AND CONTINUE
(IF RIGHT PERSON) *We are conducting a study to evaluate I&M's Online Energy Check-Up program. I&M will use the results of this evaluation to determine the effectiveness of the program and to make improvements. We would like to include your opinions about the program in our evaluation. The interview will take approximately 10 minutes. May I ask you a few questions?*

14. Our records indicate that you participated in I&M's Online Energy Check-Up program by completing an on-line energy check-up and receiving a kit in the mail with low-cost energy efficient measures for installation in your home. Is that correct?
    a. ( ) Yes *(If checked, go to 2)*
    b. ( ) No *(If checked, thank respondent and terminate interview)*
    c. ( ) Don't know *(If checked, ask to speak with someone in the home who may know)*

15. Do you have electric or gas water heating in your home?
    a. ( ) Electric
    b. ( ) Gas
    c. ( ) Other/don't know

3. The energy efficiency kit sent to you contained several measures for you to use in your home. I'd like to ask about the items that you received. *(For each of the items listed below, ask how many they used, how many of those original items are still in use, and how many of those original items they have replaced on their own.)*

Measure Type (Number available in Online Energy Check-Up kit)	***Quantity Used from Online Energy Check-Up Kit***	***Quantity Still in Use from Online Energy Check-Up Kit***	***Additional Quantity Purchased and Installed Since Receiving Online Energy Check-Up Kit***
1-13w CFL			
1-20w CFL			
1-20w CFL (cool white)			
1-23w CFL			
1-LED bulb			
2 low flow shower heads			
2 bathroom aerators			
1 kitchen aerator			
1 refrig/freezer thermometer card			
1 hot water temp card			

(If some items were not used) Why did you choose not to use the remaining measures? (Didn't have time, didn't like a specific item, etc.):

____
____
____

4. In addition to the items you received, did the Online Energy Check-Up program provide you with recommendations for energy savings in your home?
    a. ( ) Yes
    b. ( ) No (Skip to Question 8)
    c. ( ) Don't know (Skip to Question 8)

5. What recommendations did the Online Energy Check-Up program provide to you? (If any of the below recommendations are not mentioned, prompt respondent with "How about [recommendation]?"
    a. ( ) Modifying thermostat or heater settings: If yes, what was the old temperature setting and what was the new recommended temperature setting?

b. ( ) Weatherizing your home: If yes, what type of weatherization measures were recommended?
c. ( ) Replacing refrigerators or freezers
d. ( ) Replacing lighting in your home: If yes, what was the old lighting and what is the new recommended lighting?
e. ( ) Modifying water heater temperature: If yes, what was the temperature before and what was the new recommended temperature setting?
f. ( ) Window replacement
g. ( ) Other: ____

6. Which, if any, of these recommendations did you implement in your home? (if yes, find out quantity of those recommendations (like 4 windows installed, etc.)

____
____
____

7. How useful did you find the recommendations that were provided by the online energy check-up?
   a. ( ) Very useful
   b. ( ) Somewhat useful
   c. ( ) Only slightly useful *(If checked, go to 7A)*
   d. ( ) Not at all useful *(If checked, go to 7A)*
   e. ( ) Don't know

7A. What would have made these recommendations more useful to you?
____
____
______

8. Before you heard of the program, did you have specific plans to purchase these kit measures that were sent to you as part of the program?
   a. ( ) Yes *(Go to question 8A&B)*
   b. ( ) No

8A. What measures did you have planned?

8B. During which of the following time periods did you learn of the Online Energy Check Up program?
   a. ( ) After deciding to replace items in my home with these energy efficient measures but before I had purchased these measures on my own
   b. ( ) After I had purchased these energy efficient measures on my own but before I had installed them

c. ( ) After I had already replaced some of the items in my home with these energy efficient measures
d. ( ) Some other time (please describe): ________

9. How did you learn of I&M's Online Energy Check-Up program? (Select all that apply)
   a. ( ) Approached directly by representative of the Online Energy Check-Up program
   b. ( ) Received an information brochure on the Online Energy Check-Up program
   c. ( ) An I&M representative mentioned it
   d. ( ) The I&M website
   e. ( ) Friends or colleagues
   f. ( ) An energy consultant
   g. ( ) An equipment vendor or building contractor
   h. ( ) Past experience with the program
   i. ( ) Other (please explain): ____________________________________

10. Why did you choose to participate in this program?
   a. ( ) To save money on energy bill(s)
   b. ( ) Environmental reasons
   c. ( ) The measures were provided free of charge
   d. ( ) Other (please specify): ____________________________________

11. How likely is it that you would have purchased all the items in the kit IF YOU HAD NOT participated in the I&M sponsored Online Energy Check Up program?
   a. ( ) Definitely would have purchased all the items in the kit
   b. ( ) Probably would have purchased all the items in the kit
   c. ( ) Probably would not have purchased the items in the kit
   d. ( ) Definitely would not have purchased all the items in the kit

12. Would you have been financially able to install these energy efficient measures without the Online Energy Check Up kit from Indiana Michigan Power?
   a. ( ) Yes
   b. ( ) No

13. Did you install these energy efficient measures earlier than you otherwise would have without the program?
   c. ( ) Yes *(If checked, go to 13A)*
   d. ( ) No, program did not affect timing of purchase and installation

13A. When would you otherwise have purchased and installed the measures?
   e. ( ) Less than 6 months later

f. ( ) 6-12 months later
g. ( ) 1-2 years later
h. ( ) 3-5 years later
i. ( ) More than 5 years later

14. Do you prefer the LED bulb more, less, just the same, compared to the CFL bulbs?

14A. If “more”, what do you like about the LED bulb?

14B. If “less” why do you prefer the CFL bulb?

15. Where did you install the LED bulb?

16. Before you participated in I&M’s Online Energy Check-Up program, had you purchased and used any energy efficient measures in your home?
a. ( ) Yes ***(If checked, go to 16A after explanation)*** (Please explain):
____
____
b. ( ) No

16A. Did you apply for and/or receive a financial incentive for those items?
c. ( ) Yes
d. ( ) No ***(If checked, go to 16B)***

16B. Why didn’t you receive a financial incentive for those items?
f. ( ) Didn’t know about financial incentives
g. ( ) Didn’t know whether the measures qualified for financial incentives
h. ( ) Financial incentive was insufficient
i. ( ) No financial incentive was offered
j. ( ) Other (please specify): ______________________________________

17. Has your experience with I&M’s Online Energy Check-Up program led you to buy any energy efficient equipment or items for which you did not apply for a financial incentive?
a. ( ) Yes ***(If checked, go to 17A)***
b. ( ) No

17A. What energy efficient equipment or items did you buy for which you did not apply for a financial incentive?

____

____

18. Given your experience with I&M's Online Energy Check-Up program, would you buy energy efficient measures in the future, even if financial incentives were not offered?

a. ( ) Yes
b. ( ) No

19. On a scale of 1 to 5, where "5"; is very satisfied and "1" is very dissatisfied, and a "3" is neutral, how would you rate your satisfaction with the following?

Element of program Experience	***Very Satisfied***	***Somewhat Satisfied***	***Neutral***	***Somewhat Dissatisfied***	***Very Dissatisfied***	***Don't Know***
Performance of the measures used	5	4	3	2	1	DK
Savings on your monthly bill	5	4	3	2	1	DK
The effort required for completing the online energy check-up	5	4	3	2	1	DK
Contents of the Online Energy Check-Up kit	5	4	3	2	1	DK
Recommendations provided in in the Online Energy Check-up	*5*	*4*	*3*	*2*	*1*	*DK*
Overall program experience	5	4	3	2	1	DK

20. (If any item in Q18 rated 2 or 1) Why were you dissatisfied with [program Element]? ____
____
____

21. Do you have any other comments that you would like to relay to I&M about energy efficiency in residences or about this or other programs?
____
____
____

This completes the survey. If you have any additional questions regarding this survey or the program please contact I&M at imenergyefficiencyprograms@aep.com. Thank you very much for your time!

Indiana Michigan Power

Online Energy Check-Up Program 2013 GAS W/ LED

Verification and Net-to-Gross Survey Questionnaire

Interviewer: ______________________ Date of Interview: _____/_____/_____
Respondent: _____________________ Address: _________________________

Hello. May I please speak with [CONTACT NAME]:___________________________)?

Hello. My name is _____ and I am calling on behalf of Indiana Michigan Power about the Online Energy Check-Up program. Are you the person who is most familiar with your household's participation in this program?

(IF NOT RIGHT PERSON) *May I please speak to the person who would know the most about your household's participation in this program?*

REPEAT INTRODUCTION AND CONTINUE
(IF RIGHT PERSON) *We are conducting a study to evaluate I&M's Online Energy Check-Up program. I&M will use the results of this evaluation to determine the effectiveness of the program and to make improvements. We would like to include your opinions about the program in our evaluation. The interview will take approximately 10 minutes. May I ask you a few questions?*

16. Our records indicate that you participated in I&M's Online Energy Check-Up program by completing an on-line energy check-up and receiving a kit in the mail with low-cost energy efficient measures for installation in your home. Is that correct?
    a. ( ) Yes *(If checked, go to 2)*
    b. ( ) No *(If checked, thank respondent and terminate interview)*
    c. ( ) Don't know *(If checked, ask to speak with someone in the home who may know)*

17. Do you have electric or gas water heating in your home?
    a. ( ) Electric
    b. ( ) Gas
    c. ( ) Other/don't know

3. The energy efficiency kit sent to you contained several measures for you to use in your home. I'd like to ask about the items that you received. *(For each of the items listed below, ask how many they used, how many of those original items are still in use, and how many of those original items they have replaced on their own.)*

Measure Type (Number available in Online Energy Check-Up kit)	***Quantity Used from Online Energy Check-Up Kit***	***Quantity Still in Use from Online Energy Check-Up Kit***	***Additional Quantity Purchased and Installed Since Receiving Online Energy Check-Up Kit***
1 13w CFL			
1 20w CFL			
1 20w CFL (cool white)			
1 23w CFL			
1-LED bulb			
2 LED Nightlights w/photocell			
1 refrig/freezer thermometer card			

(If some items were not used) Why did you choose not to use the remaining measures? (Didn't have time, didn't like a specific item, etc.):
____
____
____

9. In addition to the items you received, did the Online Energy Check-Up program provide you with recommendations for energy savings in your home?
   a. ( ) Yes
   b. ( ) No (Skip to Question 8)
   c. ( ) Don't know (Skip to Question 8)

10. What recommendations did the Online Energy Check-Up program provide to you? (If any of the below recommendations are not mentioned, prompt respondent with "How about [recommendation]?"
    a. ( ) Modifying thermostat or heater settings: If yes, what was the old temperature setting and what was the new recommended temperature setting?
    b. ( ) Weatherizing your home: If yes, what type of weatherization measures were recommended?
    c. ( ) Replacing refrigerators or freezers
    d. ( ) Replacing lighting in your home: If yes, what was the old lighting and what is the new recommended lighting?
    e. ( ) Modifying water heater temperature: If yes, what was the temperature before and what was the new recommended temperature setting?
    f. ( ) Window replacement
    g. ( ) Other: ____

11. Which, if any, of these recommendations did you implement in your home? (if yes, find out quantity of those recommendations (like 4 windows installed, etc.)

____

____

____

12. How useful did you find the recommendations that were provided by the online energy check-up?
    a. ( ) Very useful
    b. ( ) Somewhat useful
    c. ( ) Only slightly useful *(If checked, go to 7A)*
    d. ( ) Not at all useful *(If checked, go to 7A)*
    e. ( ) Don't know

7A. What would have made these recommendations more useful to you?

____

____

13. Before you heard of the program, did you have specific plans to purchase these kit measures that were sent to you as part of the program?
    c. ( ) Yes *(Go to question 8A&B)*
    d. ( ) No

8A. What measures did you have planned?

8B. During which of the following time periods did you learn of the Online Energy Check Up program?
    e. ( ) After deciding to replace items in my home with these energy efficient measures but before I had purchased these measures on my own
    f. ( ) After I had purchased these energy efficient measures on my own but before I had installed them
    g. ( ) After I had already replaced some of the items in my home with these energy efficient measures
    h. ( ) Some other time (please describe): ________

17. How did you learn of I&M's Online Energy Check-Up program? (Select all that apply)
    j. ( ) Approached directly by representative of the Online Energy Check-Up program
    k. ( ) Received an information brochure on the Online Energy Check-Up program
    l. ( ) An I&M representative mentioned it

m. ( ) The I&M website
n. ( ) Friends or colleagues
o. ( ) An energy consultant
p. ( ) An equipment vendor or building contractor
q. ( ) Past experience with the program
r. ( ) Other (please explain): ____

18. Why did you choose to participate in this program?
   e. ( ) To save money on energy bill(s)
   f. ( ) Environmental reasons
   g. ( ) The measures were provided free of charge
   h. ( ) Other (please specify): ____

19. How likely is it that you would have purchased all the items in the kit IF YOU HAD NOT participated in the I&M sponsored Online Energy Check Up program?
   e. ( ) Definitely would have purchased all the items in the kit
   f. ( ) Probably would have purchased all the items in the kit
   g. ( ) Probably would not have purchased the items in the kit
   h. ( ) Definitely would not have purchased all the items in the kit

20. Would you have been financially able to install these energy efficient measures without the Online Energy Check Up kit from Indiana Michigan Power?
   c. ( ) Yes
   d. ( ) No

21. Did you install these energy efficient measures earlier than you otherwise would have without the program?
   j. ( ) Yes *(If checked, go to 13A)*
   k. ( ) No, program did not affect timing of purchase and installation

13A. When would you otherwise have purchased and installed the measures?
   l. ( ) Less than 6 months later
   m. ( ) 6-12 months later
   n. ( ) 1-2 years later
   o. ( ) 3-5 years later
   p. ( ) More than 5 years later

22. Do you prefer the LED bulb more, less, just the same compared to the CFL bulbs?

14A. If “more”, what do you like about the LED bulb?

14B. If “less” why do you prefer the CFL bulb?

23. Where did you install the LED bulb?

24. Before you participated in I&M’s Online Energy Check-Up program, had you purchased and used any energy efficient measures in your home?
    a. ( ) Yes *(If checked, go to 16A after explanation)* (Please explain):
    ____
    ____
    b. ( ) No

16A. Did you apply for and/or receive a financial incentive for those items?
    e. ( ) Yes
    f. ( ) No *(If checked, go to 16B)*

16B. Why didn’t you receive a financial incentive for those items?
    k. ( ) Didn’t know about financial incentives
    l. ( ) Didn’t know whether the measures qualified for financial incentives
    m. ( ) Financial incentive was insufficient
    n. ( ) No financial incentive was offered
    o. ( ) Other (please specify): ______________________________

25. Has your experience with I&M’s Online Energy Check-Up program led you to buy any energy efficient equipment or items for which you did not apply for a financial incentive?
    c. ( ) Yes *(If checked, go to 17A)*
    d. ( ) No

17A. What energy efficient equipment or items did you buy for which you did not apply for a financial incentive?
____
____

18. Given your experience with I&M’s Online Energy Check-Up program, would you buy energy efficient measures in the future, even if financial incentives were not offered?
    c. ( ) Yes
    d. ( ) No

19.On a scale of 1 to 5, where “5”; is very satisfied and “1” is very dissatisfied, and a “3” is neutral, how would you rate your satisfaction with the following?

Element of program Experience	***Very Satisfied***	***Somewhat Satisfied***	***Neutral***	***Somewhat Dissatisfied***	***Very Dissatisfied***	***Don't Know***
Performance of the	5	4	3	2	1	DK

measures used						
Savings on your monthly bill	5	4	3	2	1	DK
The effort required for completing the online energy check-up	5	4	3	2	1	DK
Contents of the Online Energy Check-Up kit	5	4	3	2	1	DK
Recommendations provided in the Online Energy Check-up	*5*	*4*	*3*	*2*	*1*	*DK*
Overall program experience	5	4	3	2	1	DK

20. (If any item in Q18 rated 2 or 1) Why were you dissatisfied with [program Element]? ____
____
____

21. Do you have any other comments that you would like to relay to I&M about energy efficiency in residences or about this or other programs?
____
____
____

This completes the survey. If you have any additional questions regarding this survey or the program please contact I&M at imenergyefficiencyprograms@aep.com. Thank you very much for your time!

Appendix D: Residential Peak Reduction Program Participant Survey Instrument

Indiana Michigan Power

Residential Peak Reduction Program 2013

Process Questionnaire

Interviewer: ______________________ Date of Interview: _____/_____/_____
Respondent: _____________________ Address: _________________________

Hello. My name is _____ and I am calling on behalf of Indiana Michigan Power about the Peak Reduction program. Are you the person who is most familiar with your household's participation in this program?

(IF NOT RIGHT PERSON) *May I please speak to the person who would know the most about your household's participation in this program?*

REPEAT INTRODUCTION AND CONTINUE
(IF RIGHT PERSON) *We are conducting a study to evaluate Indiana Michigan Power Company's (I&M's) Residential Peak Reduction program. I&M will use the results of this evaluation to determine the effectiveness of the program and to make improvements. We would like to include your opinions about the program in our evaluation. The interview will take approximately 5 minutes. May I ask you a few questions?*

18. Our records indicate that you enrolled in I&M's Residential Peak Reduction program and had a cycling switch installed on your air conditioner to participate in events. Is this correct?
    a. ( ) Yes (If checked, go to Question 2)
    b. ( ) No (If checked, thank respondent and terminate interview)
    c. ( ) Don't know (If checked, ask to speak with someone in the home who may know)

19. I would like to first ask you some questions about how you heard about the Peak Reduction program and why you participated. How did you FIRST learn about the program offered by I&M?
    a. ( ) Utility bill insert
    b. ( ) Utility direct mailing
    c. ( ) Telephone call from I&M operator
    d. ( ) Utility website

e. ( ) Newspaper
f. ( ) Word of mouth
g. ( ) Other

20. How would you prefer to receive information from I&M about programs like this in the future?
    a. ( ) Utility direct mailing such as a letter or postcard
    b. ( ) Telephone call from I&M
    c. ( ) program website
    d. ( ) Email from I&M
    e. ( ) Other

21. Why did you choose to participate in this program? (select all that apply)
    a. ( ) Concerned about saving energy in my home
    b. ( ) To save money on energy bill(s)
    c. ( ) The opportunity to participate in an energy savings program
    d. ( ) program was recommended to me by I&M
    e. ( ) Receiving monthly bill credit
    f. ( ) Not home when AC is cycled
    g. ( ) other (please specify)

22. Of all the things that interested you about the program, what was the most compelling reason you decided to enroll in the program?

23. Did you have concerns about participating in the Peak Reduction program?
    a. ( ) Yes (Go to 6A)
    b. ( ) No
    c. ( ) Don't Know

    6A. What concerns did you have?
    a. ( ) Concerned about being uncomfortable during energy reduction events
    b. ( ) Concerned about the load control device damaging my air conditioning unit
    c. ( ) Concerned about the utility able to shut off my AC
    d. ( ) Other (Please specify)

24. I have some questions regarding the contractor who visited your home to install the switch. On a scale of 1 to 5, where "5"; is very satisfied and "1" is very

dissatisfied, and a “3” is neutral, how would you rate your satisfaction with the following?

Element of program Experience	***Very Satisfied***	***Somewhat Satisfied***	***Neutral***	***Somewhat Dissatisfied***	***Very Dissatisfied***	***Don't Know***
Professionalism of the contractor who installed the cycling switch	5	4	3	2	1	DK
How quickly the contractor installed the cycling switch.	5	4	3	2	1	DK
Quality of work conducted by the contractor	5	4	3	2	1	DK

7A. (If any item in Q2 rated 2 or 1) Why were you dissatisfied with [program Element]?

____

____

____

__

25. How many energy reduction events did you notice during this past summer?

26. Were you at home during any of the energy reduction events?
    a. ( ) Yes (Go to 9A)
    b. ( ) No

9A.How could you tell that I&M’s AC was cycling during an event?
a. ( ) The house got uncomfortably warm
b. ( ) I didn’t hear the air conditioner run as often
c. ( ) I looked at the thermostat and saw that the temperature had increased (Go to 9B)
d. ( ) Other (Please specify)

9B.On average how many degrees did the temperature increase inside the home?
a. ( ) 1 to 3 degrees
b. ( ) 3 to 6 degrees
c. ( ) 6 to 10 degrees
d. ( ) 10 and above degrees

27. Thinking about the events that occurred when you were home, on a scale of 1 to 10, where 1 is very uncomfortable and 10 is very comfortable, how uncomfortable or comfortable were you with the temperature of your home during the energy reduction events?

28. Were you aware that energy reduction events had occurred when you were not home?
    a. ( ) Yes (Go to 11A)
    b. ( ) No

    11A.How did you know that energy reduction events had taken place when you were not home during the event?
    a. ( ) The house was uncomfortably warm when I returned
    b. ( ) The air conditioner was not running when I returned home
    c. ( ) Someone else informed me that an event had occured
    d. ( ) Other (Please specify)

29. Did you expect more or less demand reduction cycling events to take place this summer?
    a. ( ) More
    b. ( ) Less
    c. ( ) No more, no less
    d. ( ) Didn’t know how many to expect

30. Were you happy with the amount of events that took place?
    a. ( ) Yes
    b. ( ) No

31. Did you change your energy use behavior in anticipation of the events?
    a. ( ) Yes (If yes, Go to Question 14A)
    b. ( ) No

    14A.What changes did you make?

32. Did you opt out of any events?
    a. ( ) Yes (Go to 15A)
    b. ( ) No

    15A. Why did you choose to opt out of the event(s)?

    a. ( ) The temperature increase was/would be uncomfortable
    b. ( ) Didn’t want I&M to control my energy use

c. ( ) Afraid it might damage my central air conditioner
d. ( ) Didn’t like the time period when the energy reduction events would happen
e. ( ) Health reasons
f. ( ) Problems with the Peak Reduction program device installation
g. ( ) Other

16. I understand that your household decided not to participate and dropped out of the program. Can you please tell why that is? (select all that apply)

a. ( ) The temperature increase was/would be uncomfortable
b. ( ) Didn’t want I&M to control my energy use
c. ( ) Didn’t understand how the program worked
d. ( ) Didn’t understand the energy reduction events
e. ( ) Didn’t understand what the program was trying to accomplish
f. ( ) Afraid it might damage my central air conditioner
g. ( ) Didn’t like the time period when the energy reduction events would happen
h. ( ) Health reasons
i. ( ) Problems with the Peak Reduction program device installation
j. ( ) Didn’t like the number of days a year when energy reduction events would occur
k. ( )Other

16A.What could have been done differently to encourage you to remain in the program?

a. ( ) Nothing
b. ( ) Better explained the program
c. ( ) Increase the amount of the incentive
d. ( ) Shorter event lengths
e. ( ) Fewer event days
f. ( ) Other (Please specify)

16B. Of all the reasons you mentioned for deciding not to participate in the program, which reason is the most important?

17. Do you plan to participate in the program next year?

a. ( ) Yes
b. ( ) No (If no, Go to Question17A)

17A. If no, are there any specific changes that could be made to the program that would motivate you to participate next year?

18. On a scale of 1 to 5, where "5"; is very satisfied and "1" is very dissatisfied, and a "3" is neutral, how would you rate your satisfaction with the following?

Element of program Experience	***Very Satisfied***	***Somewhat Satisfied***	***Neutral***	***Somewhat Dissatisfied***	***Very Dissatisfied***	***Don't Know***
Understanding the program requirements	5	4	3	2	1	DK
The initial enrollment process for the program	5	4	3	2	1	DK
Interaction with call center staff	5	4	3	2	1	DK
The effort required for the program application process	5	4	3	2	1	DK
Scheduling process for equipment installation	5	4	3	2	1	DK
Date and time of scheduled visit	5	4	3	2	1	DK
Receipt of monthly bill credit	5	4	3	2	1	DK

19. Now I would like to understand how your experience with the Peak Reduction program has affected your satisfaction with I&M as your utility. Did it……?
    a. ( ) Greatly improve your satisfaction
    b. ( ) Somewhat improve your satisfaction
    c. ( ) Make no difference in your satisfaction
    d. ( ) Somewhat decrease your satisfaction (Go to 19A)
    e. ( ) Greatly decrease your satisfaction (Go to 19A)

19A. Will you please tell me why your satisfaction with I&M has decreased?

20. Have you been to the I&M website to review energy saving tips they provide online?
    a. ( ) Yes (Go to 20A)
    b. ( ) No

20A. Please rate the usefulness of the energy efficiency information provided on website using a scale of 1 to 10 where 1 is “not very useful” and 10 is “very useful”.

21. Have you participated in other I&M residential energy efficiency programs?
    a. ( ) Yes (If yes, which programs)
    b. ( ) No

22. Do you have any other comments that you would like to relay to I&M about energy efficiency in residences or about this program or other programs?
    ____
    ____
    ____
    ___

This completes the survey. If you have any additional questions regarding this survey or the program please contact I&M at imenergyefficiencyprograms@aep.com. Thank you very much for your time!

Appendix E: Renewables and Demonstrations Program Participant Survey Instrument

Indiana Michigan Power

Renewables and Demonstrations Participant 2013

Participant Telephone Survey

Interviewer: ______________________ Date of Interview: _____/_____/_____
Respondent: _____________________ Address: _________________________

Hello. May I please speak with [CONTACT NAME]:___________________________)?

Hello. My name is _____ and I am calling on behalf of Indiana Michigan Power about the Renewables and Demonstrationss program. Are you the person who is most familiar with your household's participation in this program?

(IF NOT RIGHT PERSON) *May I please speak to the person who would know the most about your household's participation in this program?*

REPEAT INTRODUCTION AND CONTINUE
(IF RIGHT PERSON) *We are conducting a study to evaluate I&M's Renewables and Demonstrationss program. I&M will use the results of this evaluation to determine the effectiveness of the program and to make improvements. We would like to include your opinions about the program in our evaluation. The interview will take approximately 10 minutes. May I ask you a few questions?*

33. Our records indicate that you participated in I&M's Renewables and Demonstrationss program by having [*Solar Photovoltaic or Ground Source Heat Pump*] installed in your home?
    a. ( ) Yes *(Go to 4)*
    b. ( ) No
    c. ( ) Don't know

34. Is there anyone else in your household who may be familiar with your household's participation in the program?
    a. ( ) Yes
    b. ( ) No *(Thank respondent and terminate interview)*
    c. ( ) Don't know*(Thank respondent and terminate interview)*

35. May I speak with that person?
    a. ( ) Yes *(Return to 1 and begin questions with new respondent)*
    b. ( ) No *(Thank respondent and terminate interview)*

c. ( ) Don't know/No answer *(Thank respondent and terminate interview)*

RESPONDENT BACKGROUND

At this time, I'd like to let you know that your responses to this survey will be kept completely confidential. I'll begin with a few questions about your decision to participate in the program.

36. How did you learn of the Renewables and Demonstrationss program sponsored by I&M? *(Select all that apply)*

s. ( ) Approached directly by representative of the program
t. ( ) Received a letter in the mail about the program
u. ( ) An I&M representative mentioned it
v. ( ) The I&M website
w. ( ) Friends or colleagues
x. ( ) An architect, engineer or energy consultant
y. ( ) An equipment vendor or building contractor
z. ( ) Past experience with the program
aa. ( ) Other *(Specify)*: ___________________________________

37. What is the main reason you decided to participate in the program?

i. ( ) To save money on energy bill(s)
j. ( ) Environmental reasons
k. ( ) I&M paid a portion of the total cost of the measures installed
l. ( ) Other *(Specify)*: ___________________________________
a. ( ) Don't know

MEASURE INSTALLATION

Next, I have some questions about the [*Solar Photovoltaic or Ground Source Heat Pump*] installed that was installed in your home through the program.

38. For the [*Solar Photovoltaic or Ground Source Heat Pump*] installed that was installed in your home, did you have plans to install this measure at your home before participating in the I&M Renewables and Demonstrationss program?

e. ( ) Yes
f. ( ) No

39. For the [*Solar Photovoltaic or Ground Source Heat Pump*] that was installed in your home, would you still have installed this measure at your home if you had not participated in the I&M Renewables and Demonstrationss program?

a. ( ) Yes
b. ( ) No *(If no, go to question 8)*

7A. When did you learn of the Renewables and Demonstrations program?

i. ( ) After deciding to install the [*Solar Photovoltaic or Ground Source Heat Pump*] installed in my home with an energy efficient [*Solar Photovoltaic or Ground Source Heat Pump*] installed but before I had purchased the [*Solar Photovoltaic or Ground Source Heat Pump*] installed on my own
j. ( ) After I had purchased the [*Solar Photovoltaic or Ground Source Heat Pump*] installed on my own but before I had installed it
k. ( ) After I had already replaced the [*Solar Photovoltaic or Ground Source Heat Pump*] installed in my home
l. ( ) Prior to deciding to install the [*Solar Photovoltaic or Ground Source Heat Pump*] in my home
m. ( ) Some other time (please describe): ______________________________
n. ( ) Don't know

40. Did you receive anything else through the program?
   a. ( ) Yes *(Specify)*: ____
   ____
   b. ( ) No
   c. ( ) Don’t know

41. When you are replacing old equipment such as lights or appliances in your home, how likely are you to replace it with energy efficient equipment?
   a. Very likely
   b. Somewhat likely
   c. Somewhat unlikely
   d. Not at all likely
   e. Don’t know

42. Would you have been financially able to install the [*Solar Photovoltaic or Ground Source Heat Pump*] without the Renewables and Demonstrationss program from I&M?
   e. ( ) Yes
   f. ( ) No
   g. ( ) Don't know

43. Did you install this [*Solar Photovoltaic or Ground Source Heat Pump]* earlier than you otherwise would have without the program?
   q. ( ) Yes
   r. ( ) No, program did not affect timing of purchase and installation *(If no, go to question 12)*

11A. When would you otherwise have installed the measures?
   s. ( ) Less than 6 months later
   t. ( ) 6-12 months later
   u. ( ) 1-2 years later
   v. ( ) 3-5 years later
   w. ( ) More than 5 years later

44. Before you participated in the Indiana Michigan Power Renewables and Demonstrationss program, had you purchased and used any energy efficient measures in your home?
    c. ( ) Yes (Please explain):
    ____
    ____
    d. ( ) No *(If no, go to question 13)*

12A. Did you apply for and/or receive a financial incentive for those items?
    g. ( ) Yes *(If yes, go to question 13)*
    h. ( ) No

12B. Why didn't you receive a financial incentive for those items?
    p. ( ) Didn't know about financial incentives
    q. ( ) Didn't know whether the measures qualified for financial incentives
    r. ( ) Financial incentive was insufficient
    s. ( ) Not worth the effort to apply for financial incentive
    t. ( ) No financial incentive was offered
    u. ( ) Other (please specify): ______________________________

45. Has your experience with the Indiana Michigan Power Renewables and Demonstrationss program led you to buy any energy efficient equipment or items for which you did not apply for or receive a financial incentive?
    e. ( ) Yes
    f. ( ) No *(If no, go to question 14)*

13A. What energy efficient equipment or items did you buy for which you did not apply for or receive a financial incentive?
    ____
    ____

46. Given your experience with the Indiana Michigan Power Renewables and Demonstrationss program, would you buy energy efficient measures in the future, even if financial incentives were not offered?
    e. ( ) Yes
    f. ( ) No

PROGRAM SATISFACTION

Now I'd like to ask you about your satisfaction with several aspects of this program.

47. On a scale of 1 to 5, where "5" is very satisfied and "1" is very dissatisfied, and a "3" is neutral, how would you rate your satisfaction with the following?

Element of program Experience	*Very Satisfied*	*Somewhat Satisfied*	*Neutral*	*Somewhat Dissatisfied*	*Very Dissatisfied*	*Don't Know*
Performance of the measures installed	5	4	3	2	1	DK
Savings on your monthly bill	5	4	3	2	1	DK
The effort required for the program application process	5	4	3	2	1	DK
Information provided by I&M	5	4	3	2	1	DK
Quality of work conducted by the contractor	5	4	3	2	1	DK
Overall program experience	5	4	3	2	1	DK

48. *(If any item in 15 rated 2 or 1)* Why were you dissatisfied with [program Element]? ____
____
____

49. Do you have any other comments that you would like to relay to I&M about energy efficiency in residences or about their programs?
____
____
____

DEMOGRAPHICS

Finally, I have a few questions about your household. As a reminder, your responses will remain confidential.

50. Do you rent or own your household?
    a. ( ) Rent
    b. ( ) Own
    c. ( ) Don't know/No answer

51. How many people, including you, live in your household? *("DK" if no response)*_________________

52. How many people in your household are within the following age ranges?
    a. ( ) Under 25
    b. ( ) 25 to 34
    c. ( ) 35 to 44
    d. ( ) 45 to 54
    e. ( ) 55 to 64

f. ( ) 65 or over

53. **Would you be willing to allow the evaluator of the program to visit your home in order to verify the installation of the item from this program? This visit will take a minimum of 15 and no longer than 45 minutes. You will receive between a $25 to $50 dollar gift card to Walmart (depending on amount of time it takes to verify measures) for your participation at the end of the visit.**

    a. **( ) Yes *(Thank you, the evaluator will contact you in the next month to set up a time and day to come by for this short visit)***
    b. **( ) No**

This completes the survey. If you have any additional questions regarding this survey or the program please contact I&M at imenergyefficiencyprograms@aep.com. Thank you very much for your time!

Appendix F: Home Weatherization Program Participant Survey Instrument

Indiana Michigan Power

Home Weatherization Program 2013

Participant Telephone Survey

Interviewer: ______________________ Date of Interview: _____/_____/_____
Respondent: _____________________ Address: _________________________

Hello. May I please speak with [CONTACT NAME]:____________________________)?

Hello. My name is _____ and I am calling on behalf of Indiana Michigan Power about the Home Weatherization program. Are you the person who is most familiar with your household's participation in this program?

(IF NOT RIGHT PERSON) *May I please speak to the person who would know the most about your household's participation in this program?*

REPEAT INTRODUCTION AND CONTINUE
(IF RIGHT PERSON) *We are conducting a study to evaluate I&M's Home Weatherization program. I&M will use the results of this evaluation to determine the effectiveness of the program and to make improvements. We would like to include your opinions about the program in our evaluation. The interview will take approximately 10 minutes. May I ask you a few questions?*

54. Our records indicate that you participated in I&M's Home Weatherization program by completing an energy audit and receiving several energy efficient measures installed in your home. Do you recall participating in this program?
    a. ( ) Yes *(Go to 4)*
    b. ( ) No
    c. ( ) Don't know

55. Is there anyone else in your household who may be familiar with your household's participation in the program?
    a. ( ) Yes
    b. ( ) No *(Thank respondent and terminate interview)*
    c. ( ) Don't know*(Thank respondent and terminate interview)*

56. May I speak with that person?
    a. ( ) Yes *(Return to 1 and begin questions with new respondent)*

b. ( ) No *(Thank respondent and terminate interview)*
c. ( ) Don't know/No answer *(Thank respondent and terminate interview)*

RESPONDENT BACKGROUND

At this time, I'd like to let you know that your responses to this survey will be kept completely confidential. I'll begin with a few questions about your decision to participate in the program.

57. How did you learn of the Home Weatherization program sponsored by I&M? *(Select all that apply)*
bb. ( ) Approached directly by representative of the program
cc. ( ) () Received a letter in the mail about the program
dd. ( ) An I&M representative mentioned it
ee. ( ) The I&M website
ff. ( ) Friends or colleagues
gg. ( ) An architect, engineer or energy consultant
hh. ( ) An equipment vendor or building contractor
ii. ( ) Past experience with the program
jj. ( ) Other *(Specify)*: ____________________________________

58. What is the main reason you decided to participate in the program?
m. ( ) To save money on energy bill(s)
n. ( ) Environmental reasons
o. ( ) I&M paid a portion of the total cost of the measures installed
p. ( ) Other *(Specify)*: ____________________________________
b. ( ) Don't know

MEASURE INSTALLATION

Next, I have some questions about the ______ (insulation and/or air sealing) that was (were) installed in your home through the program.

59. How likely is it that you would have hired a professional contractor to perform a home audit like the Home Weatherization program offers IF YOU HAD NOT participated in the Home Weatherization audit sponsored by I&M?
i. ( ) Definitely would have
j. ( ) Probably would have
k. ( ) Probably would not have
l. ( ) Definitely would not have
m. ( ) Don't know

60. For the _________(insulation and/or air sealing) that was installed in your home, did you have plans to install this measure (or these measures) at your home before participating in the I&M Home Weatherization program? *(here the participants may have had both done and may say yes for one and no for another. Please note)*

g. ( ) Yes
h. ( ) No

61. For the ________(insulation and/or air sealing) that was installed in your home, would you still have installed this measure (or these measures) at your home if you had not participated in the I&M Home Weatherization program? *(here the participants may have had both done and may say yes for one and no for another. Please note)*
    c. ( ) Yes *(If yes, go to question 8A)*
    d. ( ) No

8A. When did you learn of the Home Weatherization program?
    o. ( ) After deciding to replace items in my home with these energy efficient measures but before I had purchased these measures on my own
    p. ( ) After I had purchased these energy efficient measures on my own but before I had installed them
    q. ( ) After I had already replaced some of the items in my home with these energy efficient measures
    r. ( ) Some other time (please describe): ______________________________
    s. ( ) Don't know

62. Did you receive anything else through the program?
    a. ( ) Yes *(Specify)*: ____
    ____
    b. ( ) No
    c. ( ) Don’t know

63. When you are replacing old equipment such as lights or appliances in your home, how likely are you to replace it with energy efficient equipment?
    a. Very likely
    b. Somewhat likely
    c. Somewhat unlikely
    d. Not at all likely
    e. Don’t know

64. Would you have been financially able to install these energy efficient measures without the Home Weatherization program from I&M? *(here the participants may have had both done and may say yes for one and no for another. Please note)*
    h. ( ) Yes
    i. ( ) No
    j. ( ) Don't know

65. Did you install these energy efficient measures earlier than you otherwise would have without the program? *(here the participants may have had both done and may say yes for one and no for another. Please note)*

x. ( ) Yes *(If checked, go to 12A)*
y. ( ) No, program did not affect timing of purchase and installation

12A. When would you otherwise have installed the measures?
z. ( ) Less than 6 months later
aa. ( ) 6-12 months later
bb. ( ) 1-2 years later
cc. ( ) 3-5 years later
dd. ( ) More than 5 years later

66. Before you participated in the Indiana Michigan Power Home Weatherization program, had you purchased and used any energy efficient measures in your home?
e. ( ) Yes *(If checked, go to 13A after explanation)* (Please explain):
____
____
f. ( ) No

13A. Did you apply for and/or receive a financial incentive for those items?
i. ( ) Yes
j. ( ) No *(If checked, go to 13B)*

13B. Why didn't you receive a financial incentive for those items?
v. ( ) Didn't know about financial incentives
w. ( ) Didn't know whether the measures qualified for financial incentives
x. ( ) Financial incentive was insufficient
y. ( ) No financial incentive was offered
z. ( ) Other (please specify): ______________________________

67. Has your experience with the Indiana Michigan Power Home Weatherization program led you to buy any energy efficient equipment or items for which you did not apply for or receive a financial incentive?
g. ( ) Yes *(If checked, go to 14A)*
h. ( ) No

14A. What energy efficient equipment or items did you buy for which you did not apply for or receive a financial incentive?
____
____

68. Given your experience with the Indiana Michigan Power Home Weatherization program, would you buy energy efficient measures in the future, even if financial incentives were not offered?
g. ( ) Yes
h. ( ) No

PROGRAM SATISFACTION

Now I'd like to ask you about your satisfaction with several aspects of this program.

69. On a scale of 1 to 5, where "5" is very satisfied and "1" is very dissatisfied, and a "3" is neutral, how would you rate your satisfaction with the following?

Element of program Experience	*Very Satisfied*	*Somewhat Satisfied*	*Neutral*	*Somewhat Dissatisfied*	*Very Dissatisfied*	*Don't Know*
Performance of the measures installed	5	4	3	2	1	DK
Savings on your monthly bill	5	4	3	2	1	DK
The effort required for the program application process	5	4	3	2	1	DK
Usefulness of the energy audit	5	4	3	2	1	DK
Information provided by I&M	5	4	3	2	1	DK
Quality of work conducted by the contractor	5	4	3	2	1	DK
Overall program experience	5	4	3	2	1	DK

70. *(If any item in 16 rated 2 or 1)* Why were you dissatisfied with [program Element]? ____
____
____

71. Do you have any other comments that you would like to relay to I&M about energy efficiency in residences or about their programs?
____
____
____

DEMOGRAPHICS

Finally, I have a few questions about your household. As a reminder, your responses will remain confidential.

72. Do you rent or own your household?
    i. ( ) Rent

j. ( ) Own
k. ( ) Don’t know/No answer

73. How many people, including you, live in your household? *(“DK” if no response)*________________

74. How many people in your household are within the following age ranges?
    l. ( ) Under 25
    m. ( ) 25 to 34
    n. ( ) 35 to 44
    o. ( ) 45 to 54
    p. ( ) 55 to 64
    q. ( ) 65 or over

75. Would you be willing to allow the evaluator of the program to visit your home in order to verify the installation of items from this program? This visit will not take a min of 15 and no longer than 45 minutes (depending on the amount of measures installed). You will receive between a $25 to $50 dollar gift card to Walmart (depending on amount of time it takes to verify measures) for your participation at the end of the visit, regardless if some of the measures have been removed.

c. ( ) Yes *(Thank you, the evaluator will contact you in the next month to set up a time and day to come by for this short visit)*
d. ( ) No

This completes the survey. If you have any additional questions regarding this survey or the program please contact I&M at imenergyefficiencyprograms@aep.com. Thank you very much for your time!

Appendix G: Renewables and Demonstrations Program Sample Documentation

Inspection Forms

	Solar Inspection Details
Name:	
Address:	
City:	
Pre-Inspection	
Project Type:	
Pre-inspection Date:	
Inspected By:	
Shading:	
Tilt:	
Azimuth:	
Solar Panel Installation Location:	
Pictures Taken:	
Post-Inspection	
Post-inspection Date:	
Inspected By:	
Correct Number of Panels:	
Correct Panel Install Location:	
Correct Panel Mounting:	
Pictures Taken:	
Equipment Nameplate Pictures:	

Geothermal Inspection Details

Pre-Inspection	
Project Type:	
Pre-inspection Date:	
Inspected By:	
Customer Information:	
Pictures Taken:	
Post-Inspection	
Post-inspection Date:	
Inspected By:	
Equipment Model:	
Equipment Serial:	
Equipment Nameplate Pictures:	
Complete System Pictures Taken:	

Program Application

INDIANA MICHIGAN POWER
A unit of American Electric Power

Indiana Michigan Power
Renewables and Demonstrations Pilot Program
Application Form

A. Customer Information

Applicant Name: ______________________________ Utility Acct# ____________

Company Name (if applicable) ______________________________________

Address: ____

City: ______________________________ State: ______ Zip: __________

Contact Person: ____________________________ Title: ________________

Telephone: _________________________ E-mail: ______________________

Applicant Type: Residential ___________ Non-Residential ______________

New Construction ______________ Existing Property _____________________

Existing Heating System ____

B. Project Information

Project Type: Solar Photovoltaic ______ Ground Source Heat Pump _____ Solar Hot Water _____ LED Street Lights ______ and type of existing lights____________

Other ______

Describe ____

____

____

Project Location (if different from above): ______________________________

____

Summary: (Provide a brief summary of project including capacity. Include a copy of itemized project cost estimate and attach schematic/diagram where available.)

____

____

____

SMART Programs – Saving Money And Resources Together®

Estimated Project Completion Date: ______________________________

No equipment may be purchased prior to approval of the incentive. Has the applicant purchased any equipment for which the incentive is requested? Yes _______ No _______

C. **Contractor / Installer**

Company Name: ______________________________

Address: ______________________________

City: ______________________ State: ________ Zip: ________

Contact person: ______________________ Fax: ______________

E. **Terms & Conditions**

As an authorized agent of the Applicant, I hereby submit this Application to Indiana Michigan Power (I&M). I understand that any false statement in this record may subject the Applicant and Signer to forfeit any rebates and or incentives. I understand that additional information may be requested. I also understand that this document in no way constitutes a commitment of an incentive by Indiana Michigan Power for this program.

I hereby represent and certify that the foregoing and attached information, to the best of my knowledge and belief, is true, complete and accurately describes the proposed project for which the financial incentive is being sought. I further agree to inform Indiana Michigan Power of any changes in the foregoing information, which may occur prior to the time the Applicant, and Indiana Michigan Power executes a Renewables and Demonstrations Pilot Program Agreement.

The source of funding for the incentive you may receive might be a factor in the determination of its tax liability. It is the responsibility of the applicant to determine the income tax consequences of accepting incentives through this program. Please consult your tax professional or the Internal Revenue Service (IRS).

The undersigned warrants, certifies and represents that: 1) the Applicant is the Customer of Record for the Indiana Michigan Power Account; and 2) the Applicant realizes that certain information in their application may be subject to the Open Public Records Act. These Terms and Conditions may be subject to change.

______________ ______________ ________ ________

Applicant Signature Printed Name Title Date

The undersigned warrants, certifies and represents that 1) the Installer/Contractor has explained and provided manuals related to the system operation and maintenance to the customer (Applicant); 2) the installation will meet all requirements;

____

Installer Signature Printed Name Title Date

F. **Program Rules and Initial Eligibility Requirements:**

1. Final eligibility is based on unique questions designed to gather specific information regarding technology and custom project details.
2. Depending on technology, alternate system price quotes may be required.
3. Customer is obligated to obtain all permits and approvals for the project.
4. Provide equipment specifications, diagrams or sketches of the proposed installation.
5. For Grid connected Net-metering projects a separate application will need to be completed along with an Interconnection Agreement.
6. Customer must have an active account in the State of Indiana with Indiana Michigan Power; the location where project will be installed must be in the company's service territory.
7. Program funding is limited and available on a first-come first-served basis once project is approved.
8. Only one Renewable and Demonstrations Program application per account will be approved.
9. All projects are subject to pre and post on-site inspection.
10. Pre and post-metering of existing equipment and new equipment may be required.
11. The amount of the incentive will be determined by project type, size, and scope.
12. The recipient of program incentives assumes all responsibilities for any tax consequences resulting from payment.
13. Incentive may not exceed the total cost of the project.
14. Leased equipment is not eligible.
15. All receipts of purchased equipment will be required.
16. Previously installed projects will not be considered.
17. Applicant cannot receive multiple Utility rebates/incentives for the same project.

Name: ________________________________ Signature: ________________________

Title: ________________________________ Date: ________________________

SMART Programs – Saving Money And Resources Together®

Program Website Sample

ELECTRICIDEAS.COM

INDIANA MICHIGAN POWER
A unit of American Electric Power

@HOME @WORK @SCHOOL

PROGRAMS TIPS @HOME TOOLS COMMUNITY

PROGRAMS

- Appliance Recycling
- Home Energy Assessment
- Home Weatherization
- Income Qualified Weatherization
- Lighting
- Online Energy Checkup
- Renewables and Demonstrations
- Residential Peak Reduction
- SMART Shift℠

Testimonials

- Home Energy Assessment

Renewables and Demonstrations Pilot Program

A growing number of Hoosiers are taking advantage of renewable energy and other emerging technologies to reduce overall energy consumption for their home or business.

Indiana Michigan Power's Renewables and Demonstrations Pilot Program makes it easier for residential or business customers to step into the future of energy efficiency.

Examples of projects that may be eligible for funding under this energy efficiency program include, but are not limited to:

- Solar Photovoltaic
- Solar Hot Water
- Ground-source Heat Pumps
- LED parking lot or street lighting

Must be an I&M Indiana customer to participate in this program.

Applications must be submitted with equipment specifications and an itemized cost quote for all technology considered. To have your project considered for program eligibility, please print, complete, and send us your program application, equipment specification, and equipment quote(s) to:

110 E. Wayne St., 25th floor
Fort Wayne, IN 46802
Attn: Energy Efficiency Dept.

Project eligibility is based on technology, specifications contained in the initial project design, and custom project details. Due to limited funding, projects will be reviewed and accepted on a first come, first served basis. No equipment may be purchased prior to approval of the incentive. All projects require pre- and post-inspections.

For more information regarding the Renewables and Demonstrations Pilot Program, please email imenergyefficiencyprograms@aep.com.

Evaluation of Commercial and Industrial Program Portfolio

January 2013 through December 2013

Prepared for:

Indiana Michigan Power

Prepared by:

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M&V Report: April 2014

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Executive Summary

This report provides the results of the impact and process evaluation of the Commercial and Industrial programs, referred to as the Commercial and Industrial Portfolio, that Indiana Michigan Power (I&M) offers to its non-residential customers. This report presents results for activity during program year four (PY4) which occurred from January 1, 2013 through December 31, 2013.

During program year four, the I&M Commercial & Industrial Portfolio achieved program activity in three of the four commercial and industrial (C&I) programs currently offered:

- Commercial and Industrial Incentives Program;
- Commercial and Industrial Audit Program (includes Prescriptive Refrigeration Incentives component);
- Commercial and Industrial Retro-Commissioning Lite Program (RCxL); and
- Commercial and Industrial HVAC Program.

During PY4, projects were completed through the C&I Incentives, C&I Audit, and C&I Retro-Commissioning Lite programs and therefore received both process and impact evaluations. The C&I HVAC Program received a process evaluation.

Evaluation Objectives

The main features of the approach used for the evaluation are as follows:

- Data for the study were collected through review of program materials, on-site inspections, and interviews with I&M staff members, program implementation contractor staff members, and participating customers and installation contractors.
- For programs with completed projects, on-site visits were used to collect data for savings impact calculations, to verify measure installation, and to determine measure operating parameters. Facility staff were interviewed and in many cases, monitoring equipment was deployed to determine the operating hours of the installed measure(s). Equipment was inspected to determine any additional benefits or shortcomings with the installed system(s).
- Customer surveys provided information for the net-to-gross analyses and process evaluations for programs with completed projects in PY4. For the C&I Audit Program, survey data was also used to determine if participants had implemented any recommended measures for which they did not receive incentives. Non-incentivized savings would therefore be attributable to audit program gross savings. Additionally, I&M and implementation contractor staff members were interviewed to provide information for the process evaluation.

Summary of Findings

The PY4 goals and annual kWh energy savings are summarized in Table ES-1 below. Ex ante, audited, verified, ex post, and net annual kWh savings are presented for those programs with program completions during PY4. The ex ante, audited, verified, ex post, and net peak kW demand savings are summarized by program in Table ES-2 below.

Table ES-1. Annual kWh Savings Impact Summary

<table>
<tr><th>Program</th><th>PY4 Annual kWh Program Goals</th><th>Ex Ante Gross kWh Savings</th><th>Gross Audited kWh Savings</th><th>Gross Verified kWh Savings</th><th>Ex Post Gross kWh Savings</th><th>Ex Post Net kWh Savings</th></tr>
<tr><td>C&I Incentives</td><td>25,968,270</td><td>34,832,236</td><td>34,832,236</td><td>34,529,508</td><td>33,664,414</td><td>32,347,279</td></tr>
<tr><td>C&I Audit</td><td rowspan="2">7,203,000</td><td>-</td><td>-</td><td>-</td><td>703,869</td><td>703,504</td></tr>
<tr><td>Prescriptive Refrigeration (Audit)</td><td>3,780,638</td><td>3,780,638</td><td>3,351,291</td><td>3,331,214</td><td>2,671,876</td></tr>
<tr><td>C&I Retro-Commissioning Lite</td><td>38,762,000</td><td>18,571,762</td><td>18,571,762</td><td>18,571,762</td><td>16,290,413</td><td>15,800,267</td></tr>
<tr><td>C&I HVAC</td><td>12,196,887</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
</table>

Table ES-2. Peak Demand Savings Impact Summary

Program	*Ex Post Gross Peak kWh Savings*	*Ex Post Net Peak kW Savings*
C&I Incentives	3,951	3,802
C&I Audit	95	95
Prescriptive Refrigeration (Audit)	461	343
C&I Retro-Commissioning Lite	1,662	1,601
C&I HVAC	-	-

ADM estimated the cost-effectiveness of the PY4 C&I programs and overall portfolio using the Utility Cost Test (UTC), Total Resource Cost Test (TRC), Ratepayer Impact Measure Test (RIM), Societal Cost Test (SCT), and the Participant Cost Test (PCT). The results are provided in Table ES-3 below. The C&I HVAC Program was not evaluated for cost effectiveness due to the absence of program activity during PY4.

Table ES-3. Cost Effectiveness Testing by Program

Program	*UCT*	*TRC*	*RIM*	*SCT*	*PCT*
C&I Incentives	8.43	4.87	0.89	5.69	5.36
C&I Audit	6.14	3.66	0.85	4.29	4.42
C&I Retro-Commissioning Lite	2.62	1.22	0.64	1.37	1.88
C&I HVAC	N/A	N/A	N/A	N/A	N/A

The process evaluation examined program operations and results for each program throughout the program operating year. This portion of the evaluation is designed to identify potential program improvements that may prospectively increase program efficiencies or effectiveness in terms of customer participation and satisfaction levels.

The following presents a selection of key portfolio-level findings from the most recent program year and full program cycle:

- **High Program Satisfaction:** Participants who completed projects in program year four under the active C&I programs expressed a high degree of satisfaction with the program overall.

- **Program Activity:** The C&I Incentives Program exceeded the program goal during PY4. This is, in part, due to a large project that accounted for roughly 40% of PY4 ex ante savings. Participation in this program has increased considerably. The increased activity is likely due to a number of factors, including increased awareness, changes to the qualification criteria (GAP projects), temporary bonus incentives, and establishing a process for exceeding the $20,000 incentive cap.

  C&I Audit and Retro-Commissioning Lite programs fell short of program goals for PY4; however, both programs saw a considerable increase in activity. Additional measures were added to the Prescriptive Refrigeration Incentives component of the C&I Audit Program which led to increased savings. 2013 was the first year projects were completed through the RCxL Program. Although the program launched during the 2012 program year, no projects were completed. This was likely due to the program ramp up period, which is typically long for retro-commissioning programs (longer periods between project initiation and completion).

  The C&I HVAC Program did not achieve any completed projects during its first two years of operation. The program did not see any completions despite an increase in the number of HVAC service providers. Some interviewed contractors expressed optimism that additional activity will occur during summer months. To increase interest in the program, program staff should focus efforts on cross-promoting this program, where possible, to increase awareness. Current incentive levels may need to be revisited.

- **Improve Integration of Programs:** The current set of Core Plus programs are somewhat fragmented in terms of the measures covered and the markets targeted. Customers may have to apply to multiple programs to complete different parts of a project because some measures are covered under one program while others are under another. This design is largely in response to the need to structure the Core Plus programs so that measures do not overlap with Core programs.

  The likely cessation of the statewide Energizing Indiana programs in 2015 creates an opportunity for I&M to revisit the full-portfolio of programs. Restructuring of the portfolio could ensure that program offerings are not as fragmented in terms of measures offered or markets targeted. Ideally, customers would have a single program point of contact while completing energy savings projects for their facility. Greater integration of the program offerings would likely improve the customer experience and increase portfolio savings.

- **Consider Additional Programs or Incentive Offerings:** The I&M C&I portfolio covers a variety of measures and services for reducing energy consumption among its customers. However, one type of incentives not currently offered is new construction. Although I&M has previously been unable to develop a cost effective new construction program, there may be opportunity to offer custom and/or prescriptive incentives for equipment installed in new construction projects through one of its current programs.

- **Consider Other Uses of Audit Funds:** Analysis of the participants in the C&I Audit program who subsequently complete incentive projects through the I&M Core Plus programs suggests that the program is driving little of the activity in the incentive programs. Consequently, I&M may want to consider other, potentially more cost effective, means of generating energy savings.

1. Introduction

This report presents the results of the impact and process evaluations of the Commercial and Industrial (C&I) Program Portfolio that Indiana Michigan (I&M) Power offered its non-residential customers during the period of January 2013 through December 2013. The C&I Program Portfolio is comprised of the C&I Incentives, C&I Audit, C&I Retro-Commissioning Lite, and C&I HVAC programs.

1.1 Commercial and Industrial Incentives Program

The Commercial and Industrial Incentives Program was designed to help businesses identify and implement custom energy saving projects. The program targets commercial, industrial, and institutional accounts and is designed to attract customers and projects with a high potential for savings. Projects must be new improvements in existing facilities and must meet the cost-effectiveness requirements and pass applicable tests.

Incentives are contingent on I&M's review and acceptance of savings claims. Incentives are based on the project expected kWh savings. Incentive rates are detailed below:

- $0.05/kWh for the first 200,000 kWh of energy savings
- $0.025/kWh for the next additional 400,000 kWh

In 2013 several changes were made to the program structure and eligibility requirements. The changes are detailed below.

- In past years, projects with savings less than 100,000 kWh were not eligible from the C&I Incentives Program. Projects with expected savings less than 100,000 kWh are now eligible.
- An oversight board must approve projects that exceed the $20,000 incentive cap.
- Pre inspections are performed for non-lighting projects that exceed an incentive of $2,500 and metering or logging is necessary. Post inspections are required for self-installed projects that exceed an incentive of $5,000. Approximately 10% of all other projects receive post inspections.
- A promotional incentive was offered to customers from June 2013 through November 2013. During this period, the incentive cap was increased from $20,000 to $100,000 and the incentive for lighting projects increased to $0.06 per kWh, while the incentive for non-lighting projects remained $0.05 per kWh. The full incentive was applied to the total project savings rather than applying the standard tiered incentive rate.

There were 111 completed projects in the C&I Incentives program during the period January 2013 through December 2013, which were expected to provide savings of 34,832,236 kWh.

1.2 Commercial and Industrial Audit Program

The Commercial and Industrial Audit Program was designed to inform businesses of energy efficiency opportunities in their existing facilities. It is specifically targeted to food service facilities and grocery stores and supermarkets. The on-site audit is performed by implementer staff to identify viable energy efficiency measures for their facility. Customers receive a comprehensive report listing energy efficiency measures and information regarding recommended utility or state-sponsored incentive programs. The audit results assist customers in determining which measures are appropriate to install based on their individual financial and efficiency goals.

This program also consists of refrigeration improvements and improvements to reduce energy load. The rebates for this portion of the program are prescriptive in nature and are offered for cooler and freezer door retrofits, covers, LED lighting, and control devices that are designed to reduce energy consumption.

Program participation is limited to grocery, restaurant, and (as of PY4) convenience store businesses, which are required to have occupied their current facility for a minimum of three years.

There were 117 completed audits and 81 completed prescriptive refrigeration projects completed during the period January 1, 2013 through December 31, 2013.

1.3 Commercial and Industrial Retro-Commissioning Lite Program

The C&I Retro Commissioning Lite Program is designed to optimize energy performance for customer facilities in three different ways:

- **Compressed Air Optimization**: Compressed air systems account for about 10 percent of total industrial electricity consumption and are found in roughly 70 percent of all manufacturing facilities in the United States, according to the U.S. Department of Energy. Incentives are offered for compressed air projects that optimize system performance and overall efficiency. This program focuses on improving the efficiency of what is currently in place by diagnosing and subsequently installing improvements that produce electricity savings. Qualifying upgrades include leak repair, installation of no-loss drains, and other controls and modifications.

  Customer benefits for this program include lower energy costs, increased capacity, increased equipment reliability, and improved productivity. To be eligible, the upgrades must offer significant savings opportunities over the current system, systems must be functional, and components and controls must not be at the end of their useful life.

- **Building Optimization:** Facility systems require regular tuning and optimization. Incentives are offered for projects that optimize building performance and overall efficiency. This program facilitates the implementation of the latest strategies to reduce energy costs and keep customers’ systems running at peak performance. Qualifying upgrades include the rescheduling of air handlers, free cooling optimization, duct static pressures reset and temperature setback, chiller reset/setback, lighting controls optimization, and other adjustments and modifications.

Customer benefits for this program component include lower energy costs, enhanced building performance, and extended life expectancy of equipment. Customer facilities must exceed 50,000 square feet (of conditioned space), the building must be over 5 years old, energy intensity must be considered higher than normal as determined by the program implementer, a control system must be functional, and mechanical equipment must be functional and not at the end of its useful life.

- **Refrigeration Optimization:** Refrigeration accounts for roughly 60 percent of energy costs for grocery and cold storage. This program helps to reduce customer energy costs and ensures that refrigeration equipment is operating at peak performance. Qualifying upgrades include fixed-head and floating-head pressure controls optimization and floating-suction pressure controls optimization.

  Customer benefits include lower energy costs without major capital expense, extended life of equipment, and the reduction of unanticipated downtime. To be eligible for this program, customer facilities must be greater than 10,000 square feet, the tune up(s) must offer significant savings over the current system(s), the control system must be functional, and the current equipment must not be at the end of its useful life.

Incentives are based on the reduction in energy consumption. Participants receive $0.066 per annual kWh saved. The incentives are capped at the total project cost which includes the cost of pre-implementation monitoring and systems analysis, implementation of measures, and post-implementation monitoring. The maximum incentive a customer can receive is $150,000 per site and up to $300,000 for multiple sites.

During PY4, a 10% bonus incentive was offered to customers, and a $1,000 bonus to service providers, who completed projects by the end of the program year.

To be eligible for the C&I RCxL Program, the customer must not have an existing agreement to complete the project in question and must enter into a commitment to adhere to program recommendations and settings to ensure ongoing energy savings. Pre and post monitoring is completed by an I&M approved RCxL Service Provider in order to estimate energy savings.

There were 28 completed projects in the RCxL program during the period January 2013 through December 2013, which were expected to provide savings of 18,406,093 kWh.

1.4 Commercial and Industrial HVAC Program

The HVAC Rooftop Unit Tune-Up Program seeks to generate kWh savings by improving the operational efficiency of existing HVAC units. The program targets commercial, industrial, and institutional customers that can decrease energy consumption by optimizing the HVAC unit and adding controls to it. This program started based on the premise that many commercial, industrial, and institutional Heating Ventilation and Cooling systems are not operating as planned. To participate in the program, customers must be located in the I&M service territory.

Additional eligibility requirements for the program include:

- The customer cannot have an existing commitment to complete the project;
- HVAC units must be less than 11 years old;
- Projects must be completed by a program approved HVAC RTU Service Provider.

The amount of incentives received depends on the size of the HVAC units and the measure. . The incentives are displayed in Table 1-1.

Table 1-1 HVAC Tune Up Incentives

Measure	*Incentive per Ton of Equipment Serviced*
3 through 4 Ton RTU	
Tune up unit and install new economizer with DCV controls	$79
Tune up unit and install new economizer	$71
5 through 20 Ton RTU	
Tune up unit with existing economizer with thermostat and sensor replacement	$25
Tune up unit with existing economizer with sensor replacement only	$13
Tune up unit and add DCV control to unit with existing economizer	$26
Perform all of the above controls and tune up measures	$38

1.5 Types of Savings Reported

This section describes the methodology for, and definitions of, the different types of energy savings reported for the C&I Incentives Program during PY4.

- Ex Ante savings are the savings that were reported by the program implementer at the conclusion of the program year, prior to evaluation.
- Audited savings are the adjusted savings based on any necessary revisions to program tracking data.
- Verified savings are determined by applying an installation rate to the audited savings. The installation rate is defined as the ratio of units that were installed (verified) to the number of units reported (claimed).
- Ex Post gross savings reflect all adjustments made to the ex ante measure savings that were claimed by the program.
- Net savings reflects the portion of savings that are attributed to the effects of the program. The savings attributable to the program are the savings “net” of free-ridership.

1.6 Organization of Report

This report on the impact and process evaluation of the C&I Program Portfolio for the period January 2013 through December 2013 is organized as follows:

- Chapter 2 presents and discusses the methods used for and the results obtained from estimating gross and net savings and the process evaluation for the Commercial and Industrial Incentives Program.
- Chapter 3 presents and discusses the methods used for and results obtained from estimating gross and net savings and the process evaluation for the Commercial and Industrial Audit Program.
- Chapter 4 presents and discusses the process evaluation for the Commercial and Industrial Retro-Commissioning Lite Program.
- Chapter 5 presents and discusses the process evaluation for the Commercial and Industrial HVAC Program.
- Chapter 6 presents the results of PY4 cost effectiveness testing for each C&I program.
- Appendix A provides project-level measurement and verification reports for each project for which data were collected on-site for the C&I Incentives Program.
- Appendix B provides a copy of the questionnaire used for the survey of decision makers who participated in the C&I Incentives Program.
- Appendix C presents the results from a survey of decision makers that received incentives under the C&I Incentives Program.
- Appendix D provides a copy of the guide used for the C&I Incentives Program trade ally interviews.
- Appendix E presents the results from the C&I Incentives trade ally interviews.
- Appendix F presents the project-level measurement and verification reports for the completed Prescriptive Refrigeration Incentives projects under the C&I Audit Program.
- Appendix G provides a copy of the questionnaire used for the survey of decision makers who received an audit through the C&I Audit Program.
- Appendix H presents the results from a survey of decision makers that received an audit under the C&I Audit Program.
- Appendix I provides a copy of the questionnaire used for the survey of the decision maker who received Prescriptive Refrigeration Incentives under the C&I Audit Program.
- Appendix J presents the results from the survey of the decision maker who received prescriptive refrigeration incentives under the C&I Audit Program.
- Appendix K provides project-level measurement and verification reports for each project for which data were collected on-site for the C&I RCxL Program.
- Appendix L provides a copy of the questionnaire used for the survey of decision makers who received an audit through the C&I RCxL Program.
- Appendix M provides a copy of the guide used for interviews of service providers for the C&I RCxL Program.

- Appendix N provides a copy of the guide used for interviews of service providers for the C&I HVAC Program.

2. Commercial and Industrial Incentives Program

This chapter addresses the methodologies and impact findings of gross and net kWh savings and peak kW reductions resulting from measures installed in facilities of customers that obtained incentives under the C&I Incentives Program during the period January 2013 through December 2013. Appendix A contains specific methodologies for estimating gross savings and savings estimation results for each project.

2.1 Methodology for Estimating Gross Savings

The methodology used for estimating gross savings is described in this section.

2.1.1 Sampling Plan

Data used to estimate the gross savings achieved through the C&I Incentive Program were collected for samples of projects completed during the period January 2013 through December 2013. Data provided by the implementation contractor and utility showed that during the period January 2013 through December 2013, there were 111 projects completed, which were expected to provide savings of 34,832,236 kWh annually.

Inspection of data on kWh savings for individual projects provided by I&M indicated that the distribution of savings was generally positively skewed, with a relatively small number of projects accounting for a high percentage of the estimated savings. Estimation of savings is based on a ratio estimation procedure, which allows precision/confidence requirements to be met with a smaller sample size. ADM selected a sample with a sufficient number of projects to estimate the total achieved savings with 10% precision at 90% confidence. For the sample, the actual precision is ±4.1%.

Sampling for the collection of program M&V data accounted for the M&V effort occurring in real time during program implementation. Completed projects accumulate over time as the program is implemented, and sample selection was thus spread over the entire program year. ADM used a near real-time process whereby a portion of the sample was selected periodically as projects in the program were completed. The timing of sample selection was contingent upon the timing of the completion of projects during the program year.

Table 2-1 shows the strata boundaries, total ex post energy savings, contribution to variance, and the number of sample sites for the sample for each stratum.

Table 2-1. Population Statistics Used for C&I Incentives Sample Design

	Stratum 1	*Stratum 2*	*Stratum 3*	*Stratum 4*	*Stratum 5*	*Totals*
Strata boundaries (kWh)	< 100,000	100,000 – 249,999	250,000 – 399,999	400,000 – 999,999	>1,000,000	
Number of projects	53	29	17	9	3	111
Total kWh savings	2,103,584	4,796,018	5,367,710	5,374,485	17,190,439	34,832,236
Average kWh Savings	39,690	165,380	315,748	597,165	5,730,146	313,804
Std. dev. of kWh savings	26,213	46,400	38,122	128,534	7,044,901	1,324,135
Coefficient of variation	0.66	0.28	0.12	0.22	1.23	4.22
Final design sample	6	6	5	4	3	24

The sampled projects account for approximately 65% of total expected kWh savings. Total and sample ex ante savings are summarized by stratum in Table 2-2.

Table 2-2. Expected Savings Sampled Projects by Stratum

Stratum	*Sample Ex Ante Savings*	*Total Ex Ante Savings*
5	17,190,439	17,190,439
4	2,402,103	5,374,485
3	1,638,176	5,367,710
2	1,205,657	4,796,018
1	275,278	2,103,584
Total	22,711,653	34,832,236

2.1.2 Review of Documentation

I&M's program implementation contractor provided documentation for the sampled energy efficiency projects undertaken at customer facilities. The first step in the evaluation effort was to review this documentation and other program materials that were relevant to the evaluation effort.

For each sampled project, the available documentation (e.g., audit reports, savings calculation work papers, etc.) for each rebated measure was reviewed, with particular attention given to the calculation procedures and documentation for savings estimates. Documentation that was reviewed for all sampled projects included program forms, reports, billing system data, weather data, and any other potentially useful data. Each application was reviewed to determine whether the following types of information had been provided:

- Documentation for the equipment changed, including (1) descriptions, (2) schematics, (3) performance data, and (4) other supporting information

- Documentation for the new equipment installed, including (1) descriptions, (2) schematics, (3) performance data, and (4) other supporting information
- Information about the savings calculation methodology, including (1) what methodology was used, (2) specifications of assumptions and sources for these specifications, and (3) correctness of calculations.

2.1.3 On-Site Data Collection Procedures

On-site visits were used to collect data that were used in calculating savings impacts. The visits to the sites of each sampled project were used to collect primary data on the facilities participating in the program. I&M Energy Efficiency staff were notified prior to ADM initiating customer contact.

During an on-site visit, the engineering staff accomplished three major tasks:

- First, they verified the implementation status of all measures for which customers received incentives. They verified that the energy efficiency measures were indeed installed, that they were installed correctly and that they still functioned properly.
- Second, they collected the physical data, when necessary, needed to analyze the energy savings that have been realized from the installed improvements and measures. Data were collected using a form that was prepared specifically for the project in question after an in-house review of the project file.
- Third, they interviewed the contact personnel at a facility to obtain additional information on the installed system to complement the data collected from other sources.

2.1.4 Procedures for Estimating Savings from Measures Installed through C&I Incentives Program

This section presents the M&V methodologies employed to calculate savings for the sampled projects. The method ADM employed to determine gross savings impacts depends on the types of measures being analyzed. Categories of measures include the following:

- Lighting
- Motors and VFDs
- HVAC

ADM uses a specific set of methods to determine gross savings for projects that depend on the type of measure being analyzed. These typical methods are summarized in Table 2-3. Project-specific information on savings calculation is contained in Appendix A, which describes analytical strategies for projects for which the following strategies are not appropriate.

Table 2-3. Typical Methods to Determine Savings

Type of Measure	*Method to Determine Savings*
Lighting	Custom-designed lighting evaluation model, which uses data on wattages before and after installation of measures and hours-of-use data from field monitoring
Compressed Air	Engineering analysis with monitored data on load factor and schedule of operation
HVAC (including packaged units, chillers, cooling towers, controls/EMS)	eQuest simulations using DOE-2.2 as its analytical engine for estimating HVAC loads and facility energy consumption

The activities specified in Table 2-3 produced two estimates of gross savings for each project: an expected gross savings estimate and a verified gross savings estimate. The savings realization rate for a project is calculated as the ratio of the verified, or ex post, savings for the project (as measured and verified through the M&V effort) to the expected, or ex ante, savings (as determined through the project application procedure and recorded in the tracking system for the program).

Energy savings realization rates were calculated for each project for which on-site data collection and engineering analysis/building simulations were conducted. Sites with relatively high or low realization rates were further analyzed to determine the reasons for the discrepancy between ex ante and ex post energy savings. The following discussion describes the basic procedures used for estimating savings from lighting measures. Project-specific information regarding savings calculations are contained in Appendix A.

Plan for Analyzing Savings from Lighting Measures: Lighting measures examined include retrofits of existing fixtures, lamps and/or ballasts with energy efficient fixtures, lamps and/or ballasts. These types of measures reduce demand, while not affecting operating hours. Any proposed lighting control strategies are examined that might include the addition of energy conserving control technologies such as motion sensors or daylighting controls. These measures typically involve a reduction in hours of operation and/or lower current passing through the fixtures.

Analyzing the savings from such lighting measures requires data for retrofitted fixtures on (1) wattages before and after retrofit and (2) hours of operation before and after the retrofit. Fixture wattages are taken from a table of standard wattages, with corrections made for non-operating fixtures. Hours of operation are determined from metered data collected after measure installation for a sample of fixtures.

To determine baseline and post-retrofit demand values for the lighting efficiency measures, ADM uses in-house data on standard wattages of lighting fixtures and ballasts to determine demand values for lighting fixtures. These data provide information on wattages for common lamp and ballast combinations.

As noted, ADM collects data with which to determine average operating hours for retrofitted fixtures by using Time-of-Use (TOU) data loggers to monitor a sample of “last points of control” for unique usage areas in the sites where lighting efficiency measures have been installed. Usage areas are defined to be those areas within a facility that are expected to have comparable average operating hours. For industrial customers, expected usage areas include fabrication areas, clean rooms, office space, hallways/stairways, and storage areas. Typical usage areas are designated in the forms used for data collection.

ADM uses per-fixture baseline demand, retrofit demand, and appropriate post-retrofit operating hours to calculate peak capacity savings and annual energy savings for sampled fixtures of each usage type.

The on-off profile and the fixture wattages are used to calculate post-retrofit kWh usage. Peak demand savings are calculated by taking the average of the difference between baseline demand and post-installation demand over I&M’s peak period, which is defined as 7:00 AM to 9:00 PM, Monday through Friday. Peak period demand savings are calculated per the following formula:

$$\text{Peak Demand Savings} = \sum (kW_{before} - kW_{after} / 14$$

The baseline and post-installation average demands are calculated by dividing the total kWh usage during the peak period by the number of hours in the peak period.

ADM calculates annual energy savings for each sampled fixture per the following formula:

$$\text{Annual Energy Savings} = kWh_{\ before} - kWh_{\ after}$$

The values for insertion in this formula are determined through the following steps:

Results from the monitored sample are used to calculate the average operating hours of the metered lights in each costing period for every unique building type/usage area.

These average operating hours are then applied to the baseline and post-installation average demand for each usage area to calculate the respective energy usage and peak period demand for each usage area.

The annual baseline energy usage is the sum of the baseline kWh for each costing period for all of the usage areas. The post-retrofit energy usage is calculated similarly. The energy savings are calculated as the difference between baseline and post-installation energy usage.

Savings from lighting measures in conditioned spaces are factored by the region-specific, building type-specific heating cooling interaction factors in order to calculate total savings attributable to lighting measures, inclusive of impacts on HVAC operation

Plan for Analyzing Savings from Compressed Air Measures: Measures to improve the efficiency of a compressed air system include the reduction of air leaks, resizing of compressors, installing more efficient compressors, improved controls, or a complete system redesign. Savings from such measures are evaluated through engineering analysis of compressor performance curves, supported by data collected through short-term metering.

ADM field staff obtain nameplate information for the pre-retrofit equipment either from the project file or during the on-site survey. Performance curve data is obtained from the Compressed Air Gas Institute (CAGI). Engineering staff then conduct an engineering analysis of the performance characteristics of the pre-retrofit equipment. During the on-site survey, field staff inspect the as-built system equipment, take pressure and load readings, and interview the system operator to identify seasonal variations in load. Potential interactions with other compressors are assessed and it is verified that the rebated compressor is being operated as intended.

When appropriate, short-term measurements are performed to reduce the uncertainty in defining the load on the as-built system. These measurements may be taken either with a multi-channel logger, which can record true power for several compressors, with current loggers, which can provide average amperage values, or with motor loggers to record operating hours. The appropriate metering equipment is selected by taking into account variability in load and the cost of conducting the monitoring.

ADM used engineering calculations to calculate the annual energy savings due to the compressed air measures. This is facilitated through the use of CAGI efficiency curves allowing for the calculation of the CFM output of a given compressor based on monitoring data. Using the assumption that the CFM demand of the facility will remain the same for the baseline and as-built compressors, CAGI curves can then be used to determine the kW demand of the preexisting compressor. This data is then extrapolated to entire year and normalized to production data when appropriate. Project energy savings were calculated by subtracting the as-built from the baseline energy consumption.

Plan for Analyzing Savings from HVAC Measures: Savings estimates for HVAC measures installed at a facility are derived by using the energy use estimates developed through eQuest simulations and engineering calculations. The HVAC simulations also allow calculation of the primary and secondary effects of lighting measures on energy use. Each simulation produces estimates of HVAC energy and demand usage to be expected under different assumptions about equipment and/or construction conditions. There may be cases in which eQuest simulations are inappropriate because data are not available to properly calibrate a simulation model, and engineering analysis provides more accurate M&V results.

For the analysis of HVAC measures, the data collected through on-site visits and monitoring are utilized. Using these data, ADM prepares estimates of the energy savings for the energy efficient equipment and measures installed in each of the participant facilities. Engineering staff develop independent estimates of the savings through engineering calculations or through simulations with energy analysis models. By using energy simulations for the analysis, the energy use associated with the end use affected by the measure(s) being analyzed can be quantified. With these quantities in hand, it is a simple matter to determine what the energy use would have been without the measure(s).

Before making the analytical runs for each site with sampled project HVAC measures, engineering staff prepare a model calibration run. This is a base case simulation to ensure that the energy use estimates from the simulations have been reconciled against actual data on the building's energy use. This run is based on the information collected in an on-site visit pertaining to types of equipment, their efficiencies and capacities, and their operating profiles. Current operating schedules are used for this simulation, as are local (TMY) weather data covering the study period. The model calibration run is made using actual weather data for a time period corresponding to the available billing data for the site.

The goal of the model calibration effort is to have the results of the eQuest simulation come within approximately 10% of the patterns and magnitude of the energy use observed in the billing data history. In some cases, it may not be possible to achieve this calibration goal because of idiosyncrasies of particular facilities (e.g., multiple buildings, discontinuous occupancy patterns, etc.).

Once the analysis model has been calibrated for a particular facility, ADM performs three steps in calculating estimates of energy savings for HVAC measures installed or to be installed at the facility.

First, an analysis of energy use at a facility under the assumption that the energy efficiency measures are not installed is performed.

Second, energy use at the facility with all conditions the same but with the energy efficiency measures now installed is analyzed.

Third, the results of the analyses from the preceding steps are compared to determine the energy savings attributable to the energy efficiency measure.

2.2 Results of Gross Savings Estimation

To estimate gross kWh savings and peak kW reductions for the program, data were collected and analyzed for a sample of 24 projects completed during the program year. The results of the analysis are reported in this section.

2.2.1 Gross kWh Savings

The gross kWh savings of the C&I Incentives Program during the period January 2013 through December 2013 are summarized in Table 2-4. The achieved gross savings of 33,664,414 kWh are equal to 97% of the ex ante savings.

Table 2-4. Gross kWh Savings for C&I Incentives Program

Ex Ante Gross kWh Savings	*Gross Audited kWh Savings*	*Gross Verified kWh Savings*	*Ex Post Gross kWh Savings*	*Gross Realization Rate*
34,832,236	34,832,236	34,529,508	33,664,414	97%

Gross kWh savings are summarized by sampling stratum in Table 2-5. For PY4, audited savings were equal to ex ante savings. Ex ante, verified and ex post kWh savings are shown in Table 2-6 for each project sampled in PY4.

Table 2-5. Gross kWh Savings by Sample Stratum

Stratum	*Ex Ante kWh Savings*	*Verified kWh Savings*	*Ex Post kWh Savings*	*Gross Realization Rate*
5	17,190,439	17,190,439	16,583,086	96%
4	5,374,485	5,374,485	5,670,245	106%
3	5,367,710	5,307,310	5,136,730	96%
2	4,796,018	4,795,712	4,441,039	93%
1	2,103,584	1,861,562	1,833,313	87%
Total	34,832,236	34,529,508	33,664,414	97%

Table 2-6. Gross kWh Savings for C&I Incentives Program by Sampled Project

Project ID	*Ex Ante kWh Savings*	*Verified kWh Savings*	*Ex Post kWh Savings*	*Project Gross Realization Rate*
AEPIM-13-00012	141,401	13,855,069	118,672	84%
AEPIM-13-00019	790,071	2,013,886	1,018,274	129%
AEPIM-13-00027	249,718	1,321,484	255,314	102%
AEPIM-13-00033	138,954	790,071	95,575	69%
AEPIM-13-00036	497,871	622,207	465,191	93%
AEPIM-13-00057	491,954	497,871	469,493	95%
AEPIM-13-00059	292,667	491,954	297,324	102%
AEPIM-13-00062	13,855,069	366,706	13,369,158	96%
AEPIM-13-00070	364,335	364,335	341,190	94%
AEPIM-13-00075	218,066	316,207	203,739	93%
AEPIM-13-00076	378,759	292,667	363,277	96%
AEPIM-13-00077	90,098	279,827	90,099	100%
AEPIM-13-00087	245,621	249,718	245,624	100%
AEPIM-13-00088	622,207	245,621	581,334	93%
AEPIM-13-00092	30,831	218,066	30,831	100%
AEPIM-13-00106	2,013,886	211,897	1,942,768	96%
AEPIM-13-00110	211,897	141,324	197,496	93%
AEPIM-13-00113	286,208	138,954	271,370	95%
AEPIM-13-00124	82,927	90,098	70,447	85%
AEPIM-13-00135	22,180	82,927	22,180	100%
AEPIM-13-00151	1,321,484	12,462	1,271,160	96%
AEPIM-12-00157	316,207	30,831	294,522	93%
AEPIM-12-00158	6,502	22,180	9,239	142%
AEPIM-12-00189	42,740	5,109	17,114	40%
All Non-Sample Projects	12,120,583	11,868,037	11,623,023	96%
Total	34,832,236	34,529,508	33,664,414	97%

2.2.2 Gross Peak kW Savings

The gross peak kW reductions of the C&I Incentives Program during the period January 2013 through December 2013 are summarized in Table 2-11. The achieved gross peak demand kW savings were 3,951 kW for PY4.

2.3 Methodology for Estimating Net Savings

To estimate net impacts for the program, data were collected and analyzed for all four customer decision makers who completed projects over the current program year. The results of the analysis are reported in this section. Appendix B contains the survey used to collect data for the C&I Incentives Program, while Appendix C contains the decision maker survey results.

2.3.1 Procedures Used to Estimate Net Savings

The net savings analysis determines the portion of gross energy impacts achieved by program participants that are attributable to the effects of the program. The savings induced by the program are the “net” savings that are attributable to the program. The savings attributable to the program are the savings “net” of the total gross savings associated with the project.

Net savings may be less than gross savings because of free ridership impacts, which arise to the extent that participants in a program would have adopted energy efficiency measures and achieved the observed energy changes even in the absence of the program. Free riders for a program are defined as those participants that would have installed the same energy efficiency measures without the program.

The goal of the net-to-gross analysis is to estimate the impacts of energy efficiency measures attributable to the program that are net of free ridership. That is, because the energy savings realized by free riders are not induced by the program, these savings should not be included in the estimates of the program's actual impacts. Without adjustment for free ridership, some savings that would have occurred naturally would be attributed to the program. The measurement of the net impact of the program requires estimation of the marginal effect of the program over and above the "naturally occurring" patterns for installation and use of energy efficient equipment.

Information collected from program participants through a customer survey was used for the net-to-gross analysis. Appendix B provides a copy of the survey instrument, and Appendix C presents tabulated responses for each survey question.

Based on review of this information, the preponderance of evidence regarding free ridership inclinations was used to attribute a customer’s savings to free ridership.

Several criteria were used for determining what portion of a customer’s savings for a particular project should be attributed to free ridership. The first criterion was based on the response to the question: “Would you have been financially able to install the equipment or measures without the financial incentive from the C&I Incentives Program?” If a customer answered “No” to this question, a free ridership score of 0 was assigned to the project. That is, if a customer required financial assistance from the C&I Incentives Program to undertake a project, then that customer was not deemed a free rider.

For decision makers that indicated that they were able to undertake energy efficiency projects without financial assistance from the program, three factors were analyzed to determine what percentage of savings may be attributed to free ridership. The three factors are:

- Plans and intentions of firm to install a measure even without support from the program
- Influence that the program had on the decision to install a measure
- A firm's previous experience with a measure installed under the program

For each of these factors, rules were applied to develop binary variables indicating whether or not a participant's behavior showed free ridership. These rules made use of answers to questions on the decision maker survey questionnaire. (A copy of the questionnaire is provided as Appendix B.)

The first factor required determining if a participant stated that his or her intention was to install an energy efficiency measure even without the program. The answers to a combination of several questions were used with a set of rules to determine whether a participant's behavior indicates likely free ridership. Two binary variables were constructed to account for customer plans and intentions: one, based on a more restrictive set of criteria that may describe a high likelihood of free ridership, and a second, based on a less restrictive set of criteria that may describe a relatively lower likelihood of free ridership.

The first, more restrictive criteria indicating customer plans and intentions that likely signify free ridership are as follows:

- The respondent answered "yes" to the following two questions: "Did you have plans to install the measure before participating in the program?" and "Would you have gone ahead with this planned installation of the measure even if you had not participated in the C&I Incentives Program?"
- The respondent answered "definitely would have installed" to the following question: "If the financial incentive from the C&I Incentives Program had not been available, how likely is it that you would have installed [Equipment/Measure] anyway?"
- The respondent answered "did not affect timing of purchase and installation" to the following question: "How did the availability of information and financial incentives through the C&I Incentives Program affect the timing of your purchase and installation of [Equipment/Measure]?"
- The respondent answered "no, the program did not affect level of efficiency that we chose for equipment" in response to the following question: "How did the availability of information and financial incentives through the C&I Incentives Program affect the level of energy efficiency you chose for [Equipment/Measure]?
- The respondent answered "no, the program did not affect quantity purchased and installed" in response to the following question: "How did the availability of information and financial

incentives through the C&I Incentive Program affect the quantity (or number of units) of energy efficient [Measure/Equipment Type] that you purchased and installed?"

The second, less restrictive criteria indicating customer plans and intentions that likely signify free ridership are as follows:

- The respondent answered "yes" to the following two questions: "Did you have plans to install the measure before participating in the program?" and "Would you have gone ahead with this planned installation of the measure even if you had not participated in the C&I Incentives Program?"
- Either the respondent answered "definitely would have installed" or "probably would have installed" to the following question: "If the financial incentive from the C&I Incentives Program had not been available, how likely is it that you would have installed [Equipment/Measure] anyway?"
- Either the respondent answered "did not affect timing of purchase and installation" to the following question: "How did the availability of information and financial incentives through the C&I Incentives Program affect the timing of your purchase and installation of [Equipment/Measure]?" or the respondent indicated that that while program information and financial incentives did affect the timing of equipment purchase and installation, in the absence of the program they would have purchased and installed the equipment within the next two years.
- The respondent answered "no, the program did not affect level of efficiency that we chose for equipment" in response to the following question: "How did the availability of information and financial incentives through the C&I Incentives Program affect the level of energy efficiency you chose for [Equipment/Measure]?
- The respondent answered "no, the program did not affect quantity purchased and installed" in response to the following question: "How did the availability of information and financial incentives through the C&I Incentive Program affect the quantity (or number of units) of energy efficient [Measure/Equipment Type] that you purchased and installed?"

The second factor required determining if a customer reported that a recommendation from a C&I Incentives Program representative or past experience with the program was influential in the decision to install a particular piece of equipment or measure.

The criterion indicating that program influence may signify a lower likelihood of free ridership is that either of the following conditions is true:

- The respondent answered "very important" to the following question: "How important was previous experience with the C&I Incentives Program in making your decision to install [Equipment/Measure]?
- The respondent answered "yes" to the following question: "Did a representative of the C&I Incentives Program recommend that you install [Equipment/Measure]?" and "probably would not have" or "definitely would not have" to the question: "If the C&I Incentive

Program representative had not recommended installing the equipment, how likely is it that you would have installed it anyway?"

The third factor required determining if a participant in the program indicated that he or she had previously installed an energy efficiency measure similar to one that they installed under the program without an energy efficiency program incentive during the last three years. A participant indicating that he or she had installed a similar measure is considered to have a likelihood of free ridership.

The criteria indicating that previous experience may signify a higher likelihood of free ridership are as follows:

- The respondent answered "yes" to the following question: "Before participating in the C&I Incentives Program, had you installed any equipment or measure similar to [Rebated Equipment/Measure] at your facility?"
- The respondent answered "yes, purchased energy efficient equipment but did not apply for financial incentive." to the following question: "Has your organization purchased any energy efficient equipment in the last three years for which you did not apply for a financial incentive through the C&I Incentives Program?"

The four sets of rules just described were used to construct four different indicator variables that address free ridership behavior. For each customer, a free ridership value was assigned based on the combination of variables. With the four indicator variables, there were 11 applicable combinations for assigning free ridership scores for each respondent, depending on the combination of answers to the questions creating the indicator variables. Table 2-7 displays each possible combination along with corresponding free ridership values.

Table 2-7. Free Ridership Scores for Combinations of Indicator Variable Responses

Indicator Variables				*Free Ridership Score*
Had Plans and Intentions to Install Measure without C&I Program? (Definition 1)	*Had Plans and Intentions to Install Measure without C&I Program? (Definition 2)*	*C&I Program had influence on Decision to Install Measure?*	*Had Previous Experience with Measure?*	
Y	N/A	Y	Y	100%
Y	N/A	N	N	100%
Y	N/A	N	Y	100%
Y	N/A	Y	N	67%
N	Y	N	Y	67%
N	N	N	Y	33%
N	Y	N	N	33%
N	Y	Y	Y	33%
N	Y	Y	N	0%
N	N	N	N	0%
N	N	Y	N	0%
N	N	Y	Y	0%

2.4 Results of Net Savings Estimation

The procedures described in the preceding section were used to estimate free ridership rates and net-to-gross ratios for the C&I Incentives Program the period January 2013 through December 2013.

2.4.1 Ex Post Net kWh Savings

The data used to assign free ridership scores were collected through a customer survey of all four customer decision makers for projects completed during the period January 2013 through December 2013.

As discussed in Section 2.3, the first criteria in determining what proportion of energy savings from a project should be assigned to free ridership was whether a participant was financially able to undertake the project without financial assistance from the C&I Program. If a decision maker respondent answered “No” to the question of “Would you have been financially able to install the equipment or measures without the financial incentive from the C&I Incentives Program?” a free ridership score of 0 was assigned to the project. That is, if a participant required financial assistance from the C&I Incentives Program to undertake a project, then that participant was judged to not be a free rider.

Under this criterion, the other free ridership scoring criteria were applied only to projects for participants who answered “Yes” to the question: “Would you have been financially able to install the equipment or measures without the financial incentive from the C&I Incentives Program?” However, respondents who answered “No” to this question would be judged to have zero free ridership even if the other free ridership criteria were applied, due to the nature of their specific survey responses.

Table 2-8 shows the percentage of survey respondents who relayed the following: They had plans and intentions to install the measures without any program incentive (under two alternative definitions as described in the preceding section), that the program influenced their decision to install the measure, or that they previously installed a similar energy efficiency measure without an energy efficiency program incentive during the last three years. Percentages reported are averages weighted by project gross realized (ex post) savings.

Table 2-8. Weighted Average Indicator Variable Values

Had Financial Ability	*Had Plans and Intentions to Install Measure without C&I Program (Definition 1)*	*Had Plans and Intentions to Install Measure without C&I Program (Definition 2)*	*C&I Program had influence on Decision to Install Measure*	*Had Previous Experience with Measure*
31%	0%	1%	2%	12%

Table 2-9 shows percentages of total ex post gross custom incentive energy savings that are associated with different combinations of free ridership indicator variable values. Thirty-one percent of the savings is associated with respondents who indicated that they were financially unable to implement the project in the absence of the program incentive. None of the customer decision makers met the criteria for having plans prior to participating.

Table 2-9. Estimated Free-ridership for kWh Savings from C&I Incentive Program

Had Plans and Intentions to Install Measure without C&I Program? (Definition 1)	*Had Plans and Intentions to Install Measure without C&I Program? (Definition 2)*	*C&I Program had influence on Decision to Install Measure?*	*Had Previous Experience with Measure?*	*Percentage of Total Ex Post Gross kWh Savings*	*Free Ridership Score*
N	N	N	N	19.8%	0.0%
N	N	N	Y	9.9%	33.3%
Y	Y	N	Y	0.3%	100.0%
N	Y	N	Y	0.2%	66.7%
N	Y	N	N	0.2%	33.3%
Y	Y	N	N	0.1%	100.0%
Required program incentive to implement measures.				69.4%	0.0%
Total				100.0%	3.9%

One participant in the program indicated that additional spillover measures were installed as a result of participating in the program. The project implemented by this participant resulted in an additional 2,551 kWh and 0.46 peak kW attributable to the program. The total kWh and peak kW spillover identified by survey respondents equaled 0.01% of the ex post gross kWh and 0.02% of the ex post gross peak kW associated with survey respondent projects.

The ex post energy savings of the C&I Incentives Program during the period January 2013 through December 2013 are summarized in Table 2-10. During this period, ex post net energy savings for the program totaled 32,347,279 kWh. The net-to-gross ratio for the C&I Incentives Program is 96%.

Table 2-10. Summary of kWh Savings from C&I Incentive Program

Ex Ante kWh Savings	*Ex Post Gross kWh Savings*	*Free Ridership*	*Spillover*	*Ex Post Net kWh Savings*	*Net to Gross Ratio*
34,832,236	33,664,414	1,321,019	3,884	32,347,279	96%

2.4.2 Ex Post Net Peak kW Savings

The ex post net peak kW reductions of the C&I Incentives Program during the period January 2013 through December 2013 are summarized in Table 2-11. The achieved net peak demand savings for the program are 3,802 kW.

Table 2-11. Summary of Peak kW Savings from C&I Incentive Program

Ex Post Gross Peak kW Savings	*Free Ridership*	*Spillover*	*Ex Post Net Peak kW Savings*	*Net to Gross Ratio*
3,950.71	149.34	0.74	3,802.10	96%

2.5 Process Evaluation

This section presents the results of the process evaluation for Indiana Michigan Power's (I&M) C&I Incentives Program during program year 4. The purpose of the process evaluation is to assess qualitative aspects of the program design, delivery, and impact to determine how effectively it is achieving its intended outcomes. Process evaluation activities include a review of all program documentation, a survey of program participants, and interviews with program staff and trade allies. Key findings from those data collection activities are synthesized into overarching, program level conclusions. These conclusions can then provide insight into the driving forces behind customer satisfaction and decision making, as well as program effectiveness, efficiency, and most important, performance.

The chapter begins with an overview of evaluation objectives and data collection procedures, followed by a summary of key conclusions and recommendations. The results from each data collection activity are summarized in sub-sections of this chapter. Section 2.5.5 presents the results of the participant survey; section **Error! Reference source not found.**2.5.6 focuses on the trade ally interviews; and section 2.5.7 discusses findings from program staff interviews.

2.5.1 Evaluation Objectives

The process evaluation was designed to answer several key research questions. These questions provided the foundation for data collection instruments and were kept in mind when synthesizing research conclusions and recommendations.

Key research questions to be addressed by this evaluation of PY4 activity include:

Did the C&I Incentives Program reach its goal?

Was the C&I Incentives Program delivery effective and efficient?

Is the C&I Incentives Program well designed to reduce barriers to increased energy efficiency project implementation?

Were participants satisfied with the program and the equipment they installed?

During the evaluation, data and information from numerous sources are analyzed to achieve the stated research objectives. Insight into the customer experience with the C&I Incentives Program is developed from a telephone survey of program participants. The industry perspective is developed through interviews with trade allies who market the program to their customers, work with participants to prepare incentive applications, and assist with project implementation. Lastly, the internal organization and operational efficiency of program delivery is examined through analysis of interviews conducted with I&M program managers and program implementation contractor staff.

2.5.2 Summary of Primary Data Collection

- **Participant Surveys:** Participant surveys are the primary data source for several components of this process evaluation, and serve as the foundation for understanding the customer perspective. The participant surveys provide customer feedback and insight regarding customer experiences with the C&I Incentives Program. Respondents report on their satisfaction with the program, detail their motivations and the factors affecting their decision making process, and provide recommendations related to improving the program.

- **Trade Ally Interviews:** Interviews with trade allies provide information about the program from an industry perspective. The objective of the interviews is to gain insight into the application and project implementation process and to develop a sense of program satisfaction levels. Trade allies report on their experiences with program operations, program marketing strategies, customer feedback, and provide opinions of how the program could be improved.

- **Interviews with I&M Staff Members:** Interviews with I&M staff members provide insight into various aspects of the program and its organization. I&M staff members also provide information regarding recent organizational and procedural improvements that have been implemented in order to enhance program efficiency and effectiveness.

- **Interview with DNV GL Staff:** Interviews with DNV GL[1] program implementation staff provide information regarding program progress and observations regarding trade allies and customers. DNV GL staff report on recent program changes and future plans to improve program operational efficiency.

2.5.3 Summary of Conclusions and Recommendations

The following key conclusions provide readers with an idea of the common themes that surfaced throughout the evaluation. The recommendations that follow the conclusions were developed to help improve the program delivery structure and increase the energy savings impacts.

- **C&I Incentives Program Exceeded its Energy Savings Goals.** The program experienced an increase in activity in 2013 and exceeded its energy savings goal by 2,637,253 kWh.[2] Outreach efforts to increase awareness of the program among customers and trade allies, and a bonus incentive for lighting projects were the major factors that increased program activity. The promotional incentive offered June 2013 through November 2013 increased the incentive cap from $20,000 to $100,000. In addition, lighting projects received an incentive of $0.06 per kWh saved instead of $0.05 per kWh saved. Finally, the program implementation contractor increased its promotional and marketing activities by hiring a new staff member who focused primarily on trade ally communication and support. All of these actions helped to increase program activity and energy savings.

- **High Levels of Satisfaction with Most Program Areas.** Participant survey respondents indicated that the majority of projects went smoothly and either met or exceeded expectations. Participants were most satisfied with the performance of the equipment and quality of work provided by the trade ally. Trade Allies generally thought that program staff members were knowledgeable and responsive. Every trade ally that received support from the implementation contractor said their interactions were positive and they received the support they needed in a timely manner. Additionally, trade allies indicated that program staff members were extremely knowledgeable about the eligible measures and the technical aspects of energy savings calculations.

  Participants were least satisfied with the application materials and information provided by program staff members. Some participants indicated that the application was too complex and that there was not enough communication from program staff. Trade allies also indicated that there is room for improvement with the application process. Approximately half of the trade allies interviewed suggested that the application process could be more efficient and straight forward. Several suggested upgrading the online

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[1] DNG GL is formerly known as DNV KEMA or KEMA, prior to the recent merger. ADM referred to the implementation contractor as "KEMA" during the survey administration phase, as this name is commonly recognized by customers.

[2] Verified Net Savings (32,347,279 kWh) – Savings Goal (29,710,026 kWh) = 2,637,253 kWh

tools, such as the website and online application forms. More interactive forms could assist with energy savings calculations and reduce manual data entry.

- **Trade Allies are Critical to Program Success.** The research completed for the evaluation of the C&I Incentives Program indicates that trade allies are the primary source of information for energy efficiency improvements and utility incentive programs. Additionally, trade allies that actively promote the program and who have an existing customer base in the utility service territory, generate the most program activity. The C&I Incentives Program is supported by trade allies that are part of the Trade Ally network maintained by the Indiana Michigan's Core Programs. Registered Trade Allies are primarily small to medium sized companies that have between ten and one hundred employees and identify themselves as electrical contractors, energy service companies (ESCO's), distributors, or engineering firms.

- **The C&I Incentives Program has Expanded the Scope and Accelerated the Timing of Energy Efficiency Projects in Indiana Michigan's Service Territory**. Decision maker survey responses indicate that the program influenced customers to purchase more equipment with higher levels of efficiency, than they otherwise would have without the program. The program had the greatest effect on the timing of projects; the majority of customers indicated that they completed projects that would have otherwise taken five or more years to finish.

- **Demand for LED Lighting and New Construction Incentives.** Trade allies indicated that LED lighting is trending in the consumer market. Trade allies have said that LEDs are superior technology, have a longer useful life, and will ultimately provide the most energy savings as compared to other lighting solutions. Trade allies have also indicated that there is interest in new construction incentives. Some trade allies have worked on projects where customers installed inefficient equipment because it was less expensive. They believe there are significant energy savings that a new construction program component could capture.

- **Several Changes made to the C&I Incentives Program in 2013.** The program has instituted a process for approving projects that exceed the $20,000 incentive cap. In 2013, it was decided that project request incentives over $20,000 would be eligible but an oversight board would need to first review the project and approve the incentive amount prior to the reservation of funds. The program implementation contractor submits project summaries to request an exemption from the incentive caps. This summary includes information on the project cost, incentive request, and payback period. The oversight board approved all submitted projects in 2013.

  In prior program years, participation in the program required pre and post-inspections for all projects. The program now only performs a random pre-inspection of 10% of projects with less than 200,000 kWh. This change reduces the program's administrative cost, improve the participant experience, and allow for program to focus its resources on those projects with greatest energy savings impacts, thereby reducing the evaluation risk associated.

- **Changes to Program Goals and Budget.** The savings goal for the 2013 program year was initially set at 25.6 GWh. However, to compensate for other programs in the portfolio not meeting their savings target, the utility increased savings goals for 2013 to 31 GWh. The program goal for 2014 also increased, although the budget will be smaller. These changes were based on recommendations provided in an updated market potential study. The increased goals and smaller program budget will create some challenges for the administration and implementation of the program in 2014. Utility staff noted that to ensure that customers with delayed projects do not tie up funds to other projects that would be completed during the program year, additional monitoring of delayed projects will be necessary. As of the end of February, the program has about 8 GWh of savings associated with projects that have currently submitted final applications.

- **Program Awareness is Generally High but Additional Efforts are needed to Clarify Program Offerings.** The majority of trade allies said that 50%-90% of their customers knew about the C&I Incentives Program prior to being told about it. However, they were not clear about how it differed from the prescriptive Energizing Indiana statewide program. The confusion between the custom I&M program and the statewide prescriptive program and the respective program incentives and requirements has been a challenge for program staff during the custom.

Continuous improvement is the underlying goal of the following EM&V report. Therefore, these results have lent themselves to program recommendations for future program years.

- **Consider Re-evaluating the $20,000 Incentive Cap.** Large projects are often the most cost effective and efficient to manage from an implementation perspective. Although this cap can be exceeded, some staff members believe that it may be discouraging larger customers from participating.

- **Consider Changes to the Application Materials:** Approximately half of the trade allies interviewed suggested that the application process could be more efficient and straight forward. Several suggested upgrading the online tools, such as the website and online application forms. More interactive forms could assist with energy savings calculations and reduce manual data entry.

- **Consider Incentives for New Construction Projects.** The C&I Incentives Program is only available to customers with existing building projects. Program staff should consider revising the eligibility requirements to include new construction equipment purchases that go beyond code. Adding a new construction component to the existing C&I Incentives Program could capture additional energy savings without having to develop a completely separate program.

- **Continue to Improve Trade Ally Outreach.** Consider expanding the number and scope of the events offered through the program.

- **Emphasize Program Differentiation with Trade Allies and Customers.** Consider investing in additional methods to clarify better the difference between Energizing Indiana and the C&I Incentives Program.

2.5.4 C&I Incentives Program Customer Profile

As shown in Table 2-12, 111 C&I Incentives projects were completed during the 2013 program year. These projects were associated with ex post savings ranging from 4,583 kWh to 13,369,158 kWh. Most of the projects and ex post program savings came from lighting projects. Specifically, 91% of realized savings were from lighting projects.

Table 2-12 C&I Incentive Program Project Characteristics

Project Type	*Number of Projects*	*Average Realized kWh Savings*	*Average Incentives Paid*	*Total Realized kWh Savings*	*Total Incentives Paid*
Lighting	100	308,008	$13,212	30,800,783	$1,321,175
Non-Lighting	11	260,330	$10,473	2,863,630	$115,201
Total	111	303,283	$20,000	33,664,414	$1,436,376

Heavy and light industrial businesses accounted for most of the program savings during the 2013 program year. As shown in Table 2-13, these business types accounted for approximately two-thirds of ex post savings. Retail businesses and colleges and universities also accounted for sizable shares of program savings.

Table 2-13 Project Savings by Business Type

Business Type	*Ex Post kWh Savings*	*Percent of Savings*
Heavy Industry	19,812,616	59%
Light Industry	5,110,162	15%
Retail/Service	2,670,765	8%
College/University	2,035,979	6%
School	1,132,078	3%
Warehouse	924,426	3%
Hotel/Motel	570,035	2%
Government/Municipal	429,448	1%
Grocery	399,111	1%
Medical	322,681	1%
Office	5,734	<1%
Other	251,378	1%
Total	33,664,414	100%

The C&I Incentives program offered a promotional incentive beginning in June that increased the incentive cap to $100,000, increased lighting incentives to $0.06 per kWh reduced, and eliminated the tiered incentive structure so that projects received the higher incentive rate for the full project savings. To qualify for the promotional incentives, projects had to submit their final application by November 15th. Figure 2-1 displays the cumulative and monthly ex post savings associated with application submission dates. One project, for which the application was submitted in October 2013, accounted for approximately 40% of project savings. The figure shows that monthly savings associated with initial applications were generally higher in the period around May through September, suggesting that the promotional incentive offered during this period generated additional activity. Further evidence of the effect of the promotional period is shown in Figure 2-2, which displays the monthly and cumulative savings by final application submission date. The savings shown below do not include the savings associated with the large project that was completed in December in order to more clearly assess whether the promotional incentive increased program activity. The figure shows an increase in savings in November followed by a decrease in December.

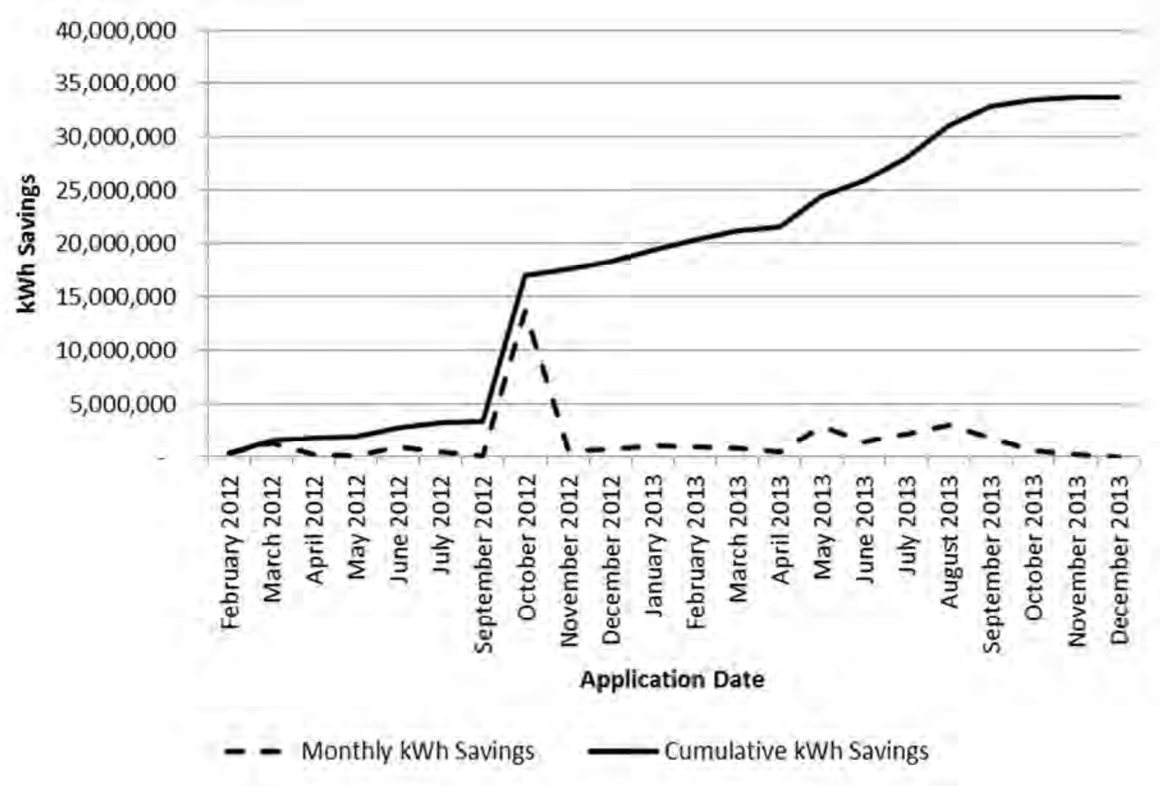


Figure 2-1 Monthly and Cumulative Ex Post Savings by Application Submission Date

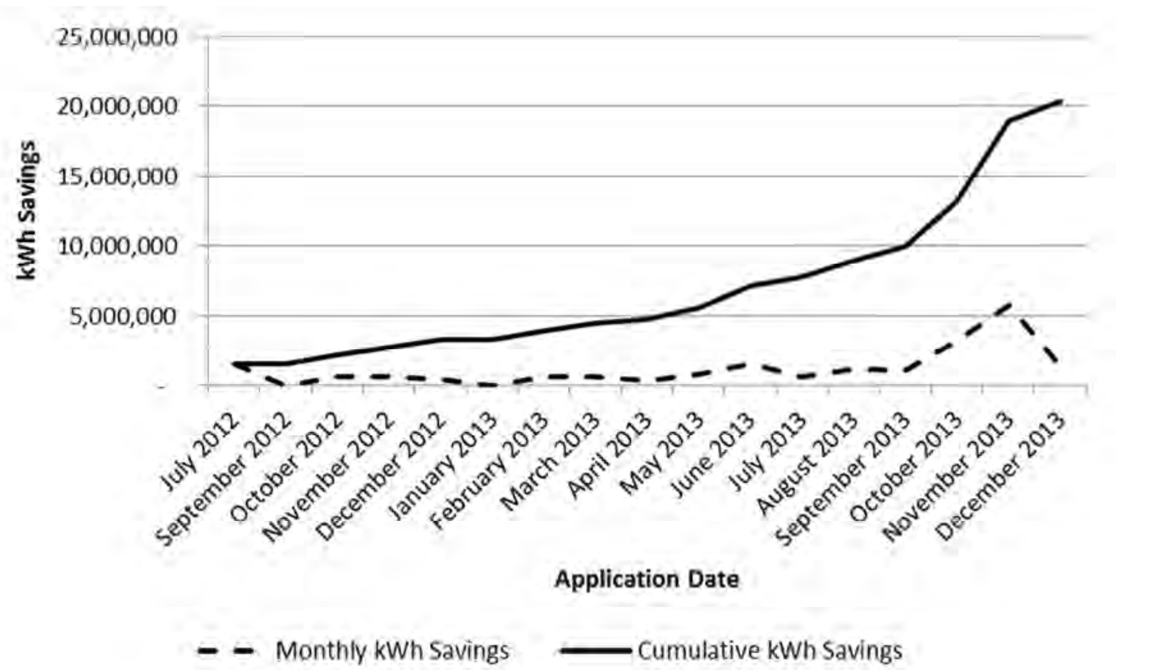


Figure 2-2 Monthly and Cumulative Ex Post Savings by Application Submission Date

Unlike in prior years, the program began offering incentives to projects of less than 100,000 kWh. Table 2-14 shows the number of projects and the total expected savings, for projects below and above this threshold. As shown, a sizable number of projects below the threshold were completed. However, the savings associated with larger projects were considerably larger and consequently the smaller projects only accounted for a small share of expected savings.

Table 2-14 Program Activity by Project Size

Project Size	*Count*	*Ex Ante kWh Savings*
<100,000 kWh	53	2,103,584
>100,000 kWh	58	32,728,652
Total	111	34,832,236

In addition to the promotional period when the incentive caps were raised, projects exceeding the $20,000 incentive cap can be approved on a case-by-case basis. The data shown in Table 2-15 suggest that the majority of project savings were associated with projects that exceed the incentive cap. Additionally, these savings came at a slightly lower incentive cost, averaging $0.04 per realized kWh saved.

Table 2-15 Program Activity by Incentive Size

Incentive Amount	*Count*	*Total Incentives Paid*	*Total Ex Post kWh Savings*	*Amount Paid per kWh Saved*
< =$20,000	98	$646,538	11,964,838	$0.05
>$20,000	13	$789,838	21,699,575	$0.04
Total	111	$1,436,376	33,664,414	$0.04

2.5.5 Customer Outcomes

Telephone surveys collected data about customer decision-making, preferences, and opinions of the C&I Incentives Program. In total, all forty-one out of eighty-four customers responded to the survey, which represents a 48% response rate.

2.5.5.1. Customer Profiles and Sources of Information about Energy Efficiency

Customers were asked to respond to several questions about the size and scope of their organizations, as well as what sources they rely on for information about energy efficiency. Thirty-nine percent of respondents indicated that their organization has 50-250 employees, 34% claimed 10-50 employees, while 22% percent stated that they have over 250 employees. The participating organizations are fairly evenly distributed between large and medium size companies. Only two respondents indicated that their organizations have less than ten employees. Of the customers that responded to the survey, the manufacturing industry was most active. Forty percent of respondents indicated that they are in manufacturing, followed by other services (17%), and Educational Services (10%).

C&I Incentives Program participants were asked about their primary sources of information about energy efficiency and how they first learned about the program. Twenty-eight respondents indicated that they rely on equipment vendors or building contractors, followed by trade journals or magazines, the Indiana Michigan website, Indiana Michigan customer service representatives, or friends and colleagues. Several did indicate that they rely on consultants, trade associations, or advertisements. When asked about how they learned about the program, thirty-one respondents indicated that an equipment vendor or building contractor referred them to the program; eight said that they first heard about the program through an Indiana Michigan customer service representative. Other sources of information included the utility website, friends or colleagues, and a utility bill insert.

Figure 2-3, below, displays the results of these two questions. By far, equipment vendors and building contractors are not only who most customers go to for information about energy efficiency, but they are also the most common way customers learn about the program. This is a common finding when evaluating commercial and industrial incentive programs because trade allies are key drivers of program activity. The second most common source of energy efficiency information for customers is trade journals or magazines. However, none of the participants indicated that they learned about their utility's program through a trade journal or magazine. Trade journals and magazines may represent a desirable marketing channel that has yet to be explored.

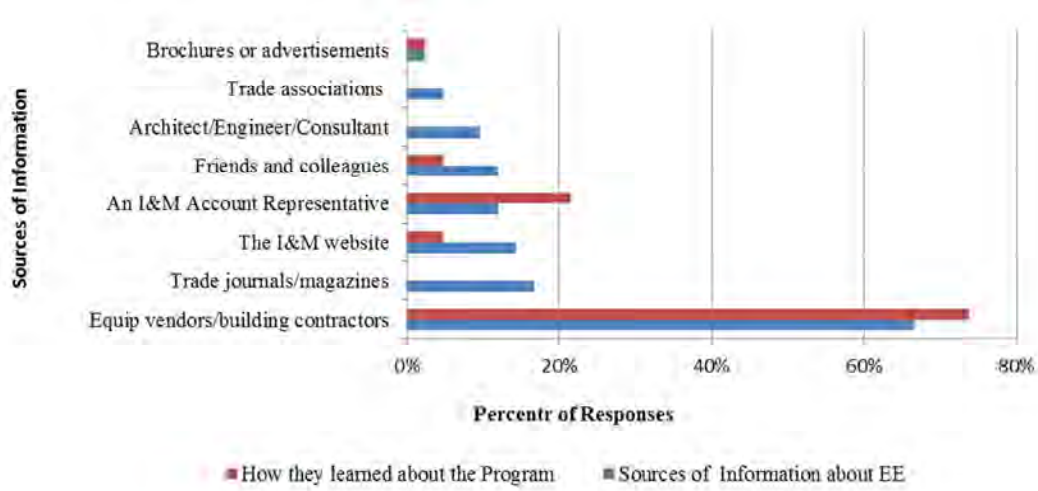


Figure 2-3: Sources of Information Customers Rely on for Information

2.5.5.2. Customers' Internal Policies for Making Energy Efficiency Decisions

C&I Incentives Program participants were asked about their organizations' internal energy efficiency policies and procedures, and who their energy efficiency decision makers are. Seventeen respondents indicated that their organizations have corporate policies that integrate energy efficiency into operations and procurement. Fourteen respondents indicated that their organizations have an energy management plan. Fourteen respondents also indicated that their organizations do not have a policy in place regarding energy efficiency improvements. Ten respondents stated that their organizations have quantitative goals for energy cost reduction, while another eight indicated that their organizations have quantitative goals for energy savings.

Twenty-two respondents (52%), indicated that the decision to make energy efficiency improvement are made by one or two key people, while ten respondents (24%) stated that decisions are based on staff recommendations to a decision maker. The other ten survey respondents (24%) indicated that primarily a group or committee makes energy efficiency decisions. The results indicate that one or two key people in an organization make the majority of decisions about energy efficiency. Accessing these decision makers will be critical to program adoption as the C&I Incentives Program continues to engage customers and locate projects with deeper energy savings potential.

C&I Incentives Program participants were asked which financial method their organization typically uses to evaluate energy efficiency improvements. The results are displayed in Figure 2-4, below. The primary method identified by customers was simple payback, followed by internal rate of return, initial cost, and finally the life cycle cost of the equipment.

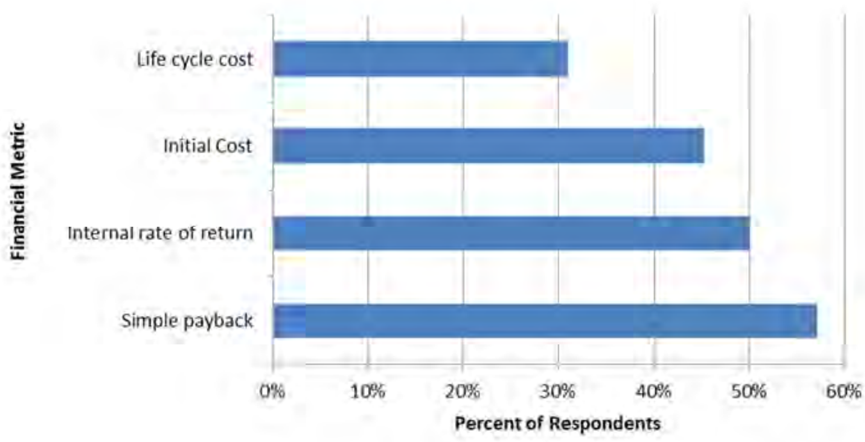


Figure 2-4: Financial Methods used to Evaluate Energy Efficiency Improvements

The following questions are designed to provide insight into what influences organizations to make energy efficiency improvements. Customers were asked to rate the importance of the following factors: Past experience with energy efficiency, advice from I&M, incentive payments, advice from KEMA, advice from equipment vendors, and their organization's policies. The results are displayed below in Figure 2-5

Several trends surfaced from these questions. Incentive payments and their previous experience with energy efficiency improvements were most influential to energy efficiency customers. Respondents stated that they are equally influenced by advice from I&M staff and equipment vendors, although to a lesser degree than by incentives and their previous experience. Internal energy efficiency policies reportedly had little influence on energy efficiency customers' decisions.

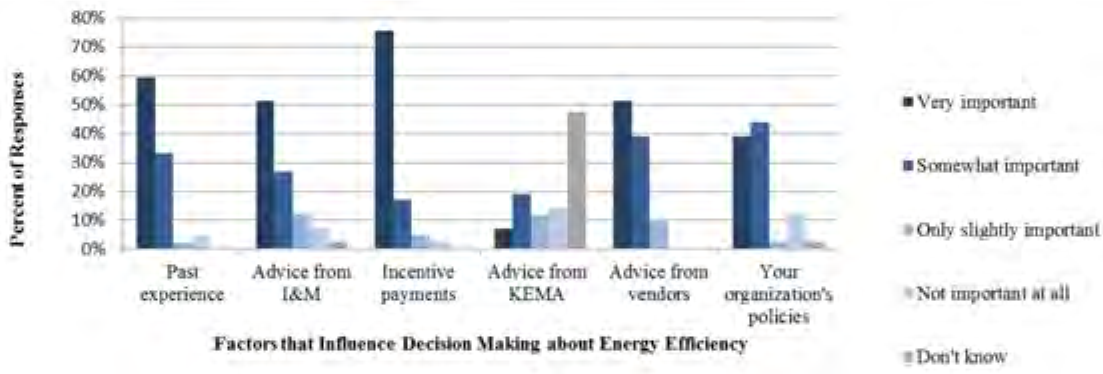


Figure 2-5: Factors that Influence Decision Making about Energy Efficiency

2.5.5.3. Customers' Experiences with Vendors

Participants answered a series of questions about the vendors that completed the work. The questions allow for better understanding of how customers choose vendors and if the vendor met their expectations.

First customers answered how they went about choosing a vendor. Forty-five percent of customers indicated that they used an open bidding process, 26% said they offered the project to only one vendor, and 24% indicated that they did not use a vendor and self-installed. If a vendor was used, the participants were then asked if they selected a vendor that promoted the program. Eighty percent said yes, they did use a vendor that promoted the program, while 17% said no.

When asked if they had worked with that vendor before, 60% indicated that they had worked with that vendor before and forty percent said they had not. In summary, approximately 70% of the customers surveyed indicated that they worked with a vendor and customers tend to choose vendors who promote the program and vendors with whom they have previously worked. Therefore, vendors who are registered trade allies that actively promote the program and who have an existing customer base in Indiana Michigan's, Indiana service territory, are generating the most projects.

Participants next specified if the implementation went smoothly; 93% of respondents said yes. One respondent said for the most part it went smoothly and two respondents said it did not go smoothly. Next, participants indicated if the energy efficiency measures met their expectations. The majority of respondents (52%) said the measures met their expectations, while 21% stated that the measures exceeded their expectations. Only two respondents indicated that the measures only mostly met their expectations. Customer responses indicate the majority of projects went smoothly and either met or exceeded their expectations.

2.5.5.4. Pre and Post Inspections and Paperwork

Participants disclosed if anyone from I&M or KEMA conducted a pre-inspection. Forty-five percent of respondents said yes and 24% or respondents said no. Thirty-one percent were unable to comment. Of those that indicated they had received a pre-inspection visit at their facility, only one person indicated that something changed in the project design as a result of the pre-inspection. Survey participants also indicated if they received a post-inspection. This time 60% indicated that a post-inspection was conducted as opposed to 7% that said no. Thirty-three percent were unable to respond to the question. Of those that indicated that their facility received a post-inspection, three participants indicated that their incentive amount changed as a result. Some participants provided an explanation of what occurred during the site visits. These participants noted that their site visits included verification of installed equipment and drop off or collection of lighting loggers. Generally, more survey respondent projects receive post-inspections than pre-inspections.

Respondents answered questions about the process for obtaining the incentive check. Twenty-five percent of respondents said they had an issue with the process and 60% said they did not. Fifteen percent were unable to comment on the question. Specific feedback on the incentive process included complaints about the complexity of the documentation and data required. A few participants indicated that much of the data collection was repetitive. Four participants voiced strong opinions about the length of time it takes to process an incentive check, emphasizing the time lapse is too long.

2.5.5.5. Program Influence non-incentivized measures

ADM designed the next series of questions to understand how the program experience influences participants' future energy efficiency decisions. First, participants specified if they have bought, or are likely to buy energy efficient equipment without applying for an incentive. Sixty-four respondents said they would not buy energy efficient equipment without an incentive, while 10% said they would, and 26% were unable to comment on the question. The four participants (10%) that indicated that they have bought or are likely to buy energy efficient equipment without an incentive, were asked two follow up questions to clarify their responses. They were asked how important their experience with the C&I Incentives Program or any other program offered by I&M was to their decision to implement the additional energy efficiency measures. Three respondents indicated that their experience with the C&I Incentives Program was somewhat important, while one participant said it was not at all important. Two respondents indicated that experience with other I&M Programs was somewhat important, one person said it was only slightly important, and one person indicated that it was not at all important.

2.5.5.6. Program Influence on Customers' Knowledge of Energy Efficiency

Surveyed participants responded to whether their knowledge of energy efficient equipment and practices is greater after participating in the C&I Incentives Program. Sixty-four percent of respondents indicated that their knowledge is now greater, while 36% indicated that it is the same as before. Additionally, 64% of survey participants said they would recommend the program and 57% said they would recommend the energy efficient equipment they installed through the program.

2.5.5.7. Customer Satisfaction with the Program

Respondents were asked to rate how satisfied they were with different components of the program and the program overall. The responses are displayed below in Table 2-16. Surveyed participants were mostly satisfied with the program overall. Results indicated that they were most satisfied with the performance of the equipment and the quality of work provided by the vendor. Participants were less enthusiastic about the application process and the information provided by I&M account representatives. Approximately half of the surveyed participants indicated that were unable to comment on the cost savings on their monthly utility bills.

Table 2-16 Participant Satisfaction with Program

Element of Program Experience	*Very Satisfied*	*Satisfied*	*Neither Satisfied nor dissatisfied*	*Dissatisfied*	*Very dissatisfied*	*Don't Know*
The performance of the equipment installed	81%	19%	0%	0%	0%	0%
The savings on your monthly bill	29%	5%	12%	0%	0%	55%
The incentive amount	40%	38%	17%	0%	0%	5%
The application process	24%	29%	21%	10%	5%	12%
The information from I&M	29%	26%	14%	5%	5%	21%
The quality of your contractors work	81%	17%	0%	0%	0%	2%
The timing of the incentive	36%	24%	12%	5%	5%	19%
the overall program experience	52%	24%	19%	0%	2%	2%

2.5.5.8. Summary of Participant Survey

The C&I Incentives Program increased participation during the third year of program activity from January 2013 through December 2013. Key insights from those participants are provided below:

- **Equipment Vendors and Building Contractors are the Primary Path to Program Participation.** Equipment vendors and building contractors are not only the people most customers go to for information about energy efficiency, but they also are from whom customers learned about the program. This is a common finding when evaluating commercial and industrial incentive programs because marketing for these programs, typically, relies heavily on promotional efforts of equipment vendors and contractors. Additionally, the research shows that the second most common source of information for customers is trade journals or magazines; however, no program participants indicated that they learned about their utility's program through a trade journal or magazine. This could potentially represent a valuable but unexplored marketing channel.

- **Majority of Decisions Made by One or Two Key People.** Accessing these decision makers will be critical for program adoption as the C&I Incentives Program continues to engage customers and locate projects with deeper energy savings potential.

- **Registered Trade Allies Produce Most Program Activity.** Vendors and contractors who are registered trade allies that actively promote the program and that have an existing customer base in Indiana Michigan's service territory generated the most projects. Seventy percent of the customers surveyed indicated that they worked with a vendor or contractor, and customers tend to choose those that promote the program and who they have worked with previously.

- **Majority of Projects went smoothly and Expectations were wither Met or Exceeded.** Survey participants were mostly satisfied with the program overall. Results indicated that they were most satisfied with the performance of the equipment and the quality of work provided by the vendor. Participants were less enthusiastic about the application process and the information provided by I&M account representatives.

2.5.6 Trade Ally Perspectives

Telephone interviews were conducted with twenty-five trade allies who participated in the C&I Incentives Program. Additionally, efforts were focused on obtaining detailed response from the most active trade allies.

Participating trade allies were asked about their experiences with the program, as well as their preferences, opinions, and recommendations regarding the organization and design of the program

2.5.6.1. Trade Ally Profiles

Trade allies answered questions about the size of their firms, and the types of products and services they offer. Figure 2-6 below displays the responses. The majority of trade ally activity is split between small and medium size firms that have 5-20 employees or 25-100 employees.

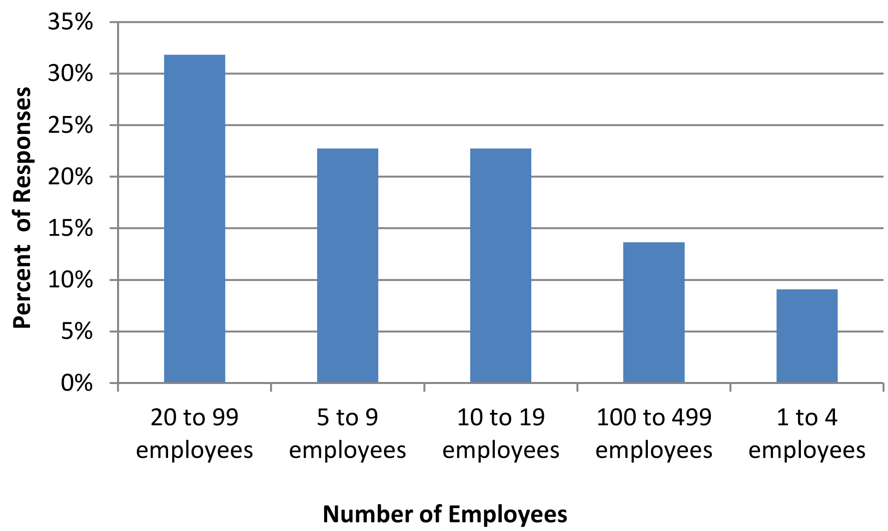


Figure 2-6: Trade Ally Firm Size

Most trade allies identified themselves as electrical contractors, energy service companies (ECSOs), distributors, or engineering firms that offer lighting, energy analysis, HVAC, building design, compressed air systems, motors and drives, lighting controls, and windows.

2.5.6.2. Trade Ally Views of the Application Process

Trade allies discussed their views of the C&I Incentives Program application process. Of the twenty-five interviewed trade allies, seventeen (77%) said that they were directly involved with the application process; of those seventeen, six said that there were aspects of the application process that should be modified. Below are a few of those responses:

> *"It [is] a little cumbersome. I called an[d] talked to a rep to make sure we had the information we needed. There was a little bit of frustration because we put it together and sent it in and some things were still not right."*
>
> *"It would be nice if the energy savings were calculated. There is lots of manual entry. Need to have an online format, instead of PDF. More interactive and logical. The Good Sense one for Georgia power is a great format."*
>
> *"The easier the better. Keep i[t] simple."*
>
> *"Final confirmation took a while."*

However, most of the interviewees were satisfied with the application process and few had recommendations for improvements. It should be noted that since these data were collected from trade allies, I&M has launched a new program website with online application tools.

2.5.6.3. Staff support

Trade allies were asked if they received any assistance from program staff for incentive projects they were working on; 59% of respondents said yes. Common areas of inquiry were eligibility of equipment, application instructions, assistance with energy savings calculations, and status updates. All of the trade allies that needed assistance said that program staff answered their questions. These responses indicate that the implementation contractor is responsive to the needs of participating trade allies.

2.5.6.4. Trade Ally Views of Program Incentives and Market Trends

Trade allies discussed how the program incentives affect their businesses. All of the trade allies interviewed, but one, indicated that the program definitely helps them sell their products or services. Incentives reduce payback periods and increase the ROI for proposed projects, which are two factors that greatly influence financial decision-making in the commercial and industrial sectors. Several trade allies also indicated that program incentives affect the timing of projects by speeding up the decision making process and influencing customers to take advantage of the incentives before they are gone.

Next, trade allies indicated if their involvement in the C&I Incentives Program affected the types of equipment or services that they provide. Five respondents (24%) said that C&I Incentives Program do affect the types of equipment or services they provide. The most common response was that trade allies have expanded their equipment offerings, they focus more on project energy savings, and they stock more energy efficient equipment in house. These responses indicate that the program is encouraging some businesses to expand their product offerings to increase the amount of energy efficiency products and services they offer.

When asked about the adequacy of incentive levels, thirteen respondents (59%) said the incentive levels could be higher for certain equipment. The most common response was LED lamps, interior/exterior fixtures, and controls. Two trade allies mentioned ceramic halides and variable speed drives (VSDs). Several trade allies suggested that the incentive levels increase to between $.06 and $.10 per kWh. It should be noted that incentives in this range would be toward the high end of what is typically offered by utilities for this type of program.

LED’s were the most popular energy efficiency product when trade allies described their product choices and trends in the market. Eleven respondents indicated that LED’s and other lighting solutions are the biggest market trends for customers pursuing energy efficiency projects. Two other equipment trends mentioned were VSDs and induction lighting.

2.5.6.5. Program Marketing

The interviewees were asked if there are ways that I&M could market the program more effectively. Thirteen respondents (62%) said yes. Several of those responses are quoted below:

> *“Yes, have a separate website dedicated directly to the Program. It[‘]s like an Easter egg hunt. There should be a link on their homepage to a separate program website.”*
>
> *“Email is usually the best, and I really don't get much. Newsletters and more communication via email.”*
>
> *“Offer more co-branding marketing material to TA's, brochures, flyers.”*

Trade allies indicated that their customers were generally aware that incentives were available for energy efficiency projects. Most said that 50%-90% of customers were already aware of the incentives. Five trade allies indicated that less than 20% of their customers know about the program incentives. These results show that program awareness is generally high, but there is still a need for additional program outreach and awareness.

Trade allies indicated that awareness was highest in industrial, manufacturing and large corporations, while awareness is lowest in the retail, small business, public, and residential sectors. The lower levels of awareness in these sectors may be due the requirement in prior years of program operations that incentive projects result in at least 100,000 kWh of annual electric savings. These sectors are less likely to generate projects of this size. Respondents offered suggestions on how awareness could be improved in these sectors. Most suggested various forms of advertising, which include brochures, mailers, television commercials, and promotion by contractors. One trade ally suggested that the program should create case studies that share success stories so customers can better understand the costs and benefits associated with investing in energy efficiency improvements.

Trade allies were asked if they actively market the program. Eighteen respondents (82%) indicated that they always include the program incentives in their project proposals or mention it during the sales process. One trade ally said that their job is to manage the project and add value in any way possible.

However, despite the incentives available, customers still decline to complete incentive projects through the C&I Incentives Program. Five of the twenty-five trade allies interviewed said that they had customers decline for financial reasons. The upfront capital expense required for energy efficiency improvements remains the primary barrier to participation according to the group of trade allies that provided feedback on this question.

2.5.6.6. Trade Ally Satisfaction and Recommendations for the Program

Interviewees answered how satisfied they are with their experiences in working the C&I Incentives Program. Approximately half of trade allies interviewed said they were very satisfied with their experience and the other half said they were somewhat satisfied; only one trade ally indicated that they were neither satisfied nor dissatisfied. Respondents generally made positive comments about program staff and the support they received. Trade allies were also grateful for the incentive program. One trade ally commented on the 2013 program changes, stating that allowing gap projects (those with expected savings less than 200,000 kWh) and omitting the incentive cap was beneficial to the contractors and has allowed more small and large projects to qualify.

Several trade allies offered suggestions on how the program could be improved. While most interviewees were happy with the staff support they received, three trade allies said more communication would improve their program experience. There were times when the trade ally and customer thought things were in place and moving along, only to call staff and find out that there were outstanding requirements.

While the incentives are appreciated and have helped encourage energy efficiency improvements, some trade allies believe that the incentive levels are not high enough, especially for LED lighting. Trade allies recommended that I&M increase their incentives to $.06 to $.10 per kWh. Trade allies also indicated that the promotional period was beneficial and encouraged some customers to move forward who were previously undecided. Therefore, promotional incentive periods are valued and trade allies would like to see them continue in the future.

Additionally, several trade allies suggested that I&M consider adding a new construction program component. Interviewees indicated that there is not a program for new construction projects and they have worked on buildings where customers are putting in outdated equipment. They believe there is significant energy savings that the program could capture.

2.5.6.7. Summary of Trade Ally Interview Findings

Key trends and issues addressed by trade allies include:

- **Small to Medium Size Companies Make up the Trade Ally Network:** Most of the trade allies interviewed have between ten and 100 employees and identify themselves as electrical contractors, energy service companies (ESCO's), distributors, or engineering firms.

- **Room for Improvement with the Application Process:** Approximately half of the trade allies interviewed suggested that the application process could be more efficient and straight forward. Several suggested upgrading the online tools, such as the website and online application forms. More interactive forms could assist with energy savings calculations and reduce manual data entry.

- **Program Staff is Knowledgeable and Responsive:** Every trade ally that received support from the implementation contractor said their interactions were positive and they received the support they needed in a timely manner. Additionally trade allies said that program staff members were extremely knowledgeable about the eligible measures and the technical aspects of energy savings calculation.

- **Incentives Improve Financial Position of Projects:** The general feeling was that incentives definitely improve two of the key financial metrics that guide decision making for commercial and industrial customers, which are payback period and ROI. Some trade allies went as far as to suggest new incentive levels; suggested amounts were between $.06 and $.10 per kWh. Trade allies mentioned that program staff should consider increasing incentives for LED lighting.

- **Program Awareness is Generally High but Additional Efforts are needed to Clarify Program Offerings:** The majority of trade allies said that 50%-90% of their customers knew about the C&I Incentives Program prior to being told about it. However, they were not clear about how it differentiated from the prescriptive component called Energizing Indiana. All trade allies indicated that they actively market the program, trade allies consider it including the program incentives a value-added service.

- **High Demand for LED Lighting:** Trade allies indicated that LED lighting is trending in the consumer market and is the technology most asked about from customers. Additionally, trade allies have said that LEDs are superior technology, they have a longer useful life, and they will ultimately provide the most energy savings as compared to other lighting solutions.

- **Interest in New Construction Incentives:** Interviewees indicated that there is not a program for new construction projects. However, they have worked on buildings where customers are putting in outdated equipment. They believe there is significant energy savings that the program could capture.

2.5.7 Program Operations Perspective

This section summarizes the core findings from interviews conducted with two KEMA program staff and one senior I&M program staff member. These interviews focused on program operations, the overall effectiveness of the program process, and the identification of areas for future program improvement.

Respondents shared their perspective regarding how the program has developed since the prior program year. Interview questions related the respondents' individual roles in administering the programs as well as their perceptions of overall program strengths, weaknesses, and opportunities for the future. Changes that have occurred since the first program year were also discussed.

- **Program Implementation Staffing**: Currently, four full-time employees and one part-time staff member support the C&I Incentives Program. The Senior Program and Operations Manager is responsible for most of the initial customer outreach and communication. He also conducts presentations at program events and collaborates with the utility staff and other implementers around the state of Indiana. The Lead Engineer primarily focuses on project level analysis and works with customers to find identify all cost effective energy savings opportunities in their buildings. The Outreach Coordinator was hired in August of 2013, and is responsible for customer communication and project management. He also conducts inspections and installs lighting loggers for some of the smaller projects. The Program Administrator is responsible for processing the applications, collecting and verifying supporting documentation, coordinating engineering analyses, and data entry. She knows the program well and works with customers to identify additional energy savings, when necessary.

  Interviewees indicated that the staffing resources are sufficient at this time. KEMA has engineering staff that work around the country and able to utilize those resources when necessary. For example, at the end of the 2013 program year, there was a surge of engineering activity and staff resources were strained. KEMA brought in a part-time staff member to support the increased work demand between September and December.

- **Participation Process:** When an application is received, staff verifies the customer and measure qualify for the program. A project will often have measures that span over multiple programs, so staff must be able to direct customers to the appropriate programs where the suggested measures are eligible. Program staff will review the application for completeness and conduct an initial engineering review to understand the scope of the project and ensure savings calculations are accurate. The application paperwork is the same for all projects. However, the preapproval process is different for projects that exceed 200,000 kWh in expected savings. If the project is under 200,000 kWh and the engineer approves the project and a reservation letter is sent out to the customer that sets the project timeline and the expected incentive amount. KEMA staff conducts pre- and post-installation visits for only 10% of those projects, depending on the degree of savings uncertainty. For all projects that exceed 200,000 kWh, a pre-inspection is completed, and then the reservation letter is sent to the customer. These projects will receive a post installation visit, as well.

KEMA staff follows up with all active projects to inquire about the timing and progress of the project. If there were delays in the project, staff will extend the reservation. Customers have sixty days from completion to submit the final paperwork and request payment. According to program staff, no one missed the deadline in 2013.

- **Program Marketing and Promotions:** The two most significant program changes in 2013 were 1) new full-time staff to focus on outreach and 2) a promotional incentive that occurred from June 1, 2013 through November 15, 2013. The details of the promotional incentive are below.

  - Increased the incentive cap to $100,000. Previously, the incentive level was set at $20,000.

  - Increased the lighting incentive to $0.06/kWh, previously, the incentive was $0.05.

  - Removed tiered incentive structure, so the full incentive rate ($0.05/kWh for non-lighting and $0.06 for lighting) was paid up to the $100,000 cap.

Figure 2-7 below demonstrates the increase in application submittals that occurred during the promotional period. Prior to June, the program was averaging 5 applications per month. Once the promotional period began, the average applications submitted per month doubled to 10.

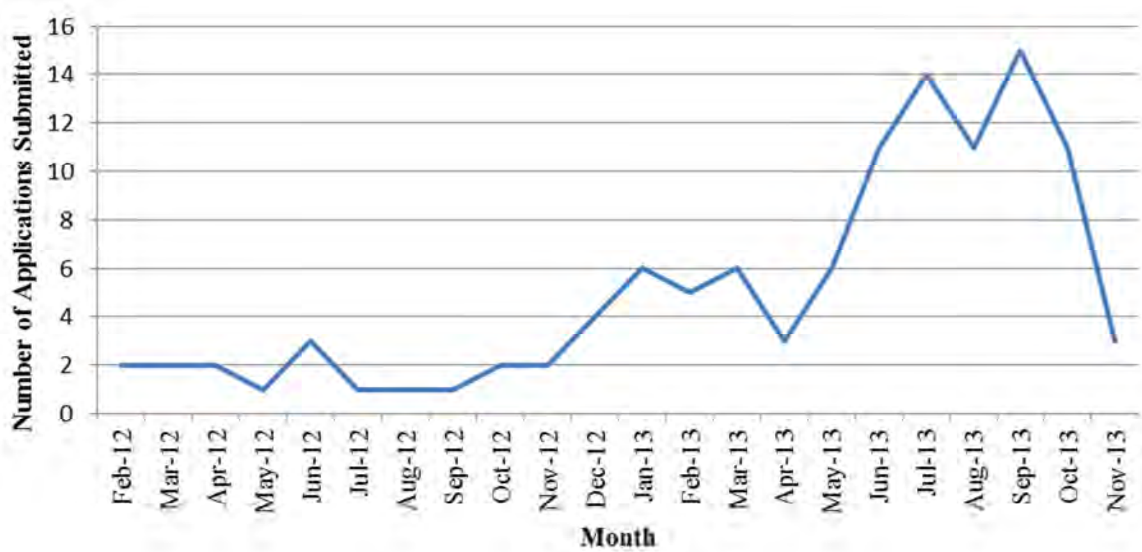


Figure 2-7 Number of Applications Submitted per Month

Staff indicated that this promotional period was successful at increasing program activity during the second half of 2013. Additionally, staff commented that the increased incentive cap was particularly helpful and that $20,000 is too low to incentivize some of the larger customers to participate. Although the cap can be exceeded with approval from the oversight board, one staff member said that it still might be dissuading large customers from applying.

In addition to the incentive changes, the program implementation contractor increased its promotion and marketing of the program. These changes included more contacts with vendors and contractors, and more distribution of fliers endorsing the promotional incentives. Additionally, the implementation contractor hired a new staff member to promote the program to I&M customers and trade ally firms. The new hire focuses on trade ally communication and support, but is also technically minded and can support other project review functions.

- **Customer Feedback on Incentive Programs**: Program staff members gave their impressions on customer satisfaction and the feedback they receive. Staff noted the confusion caused by the program structure that splits incentives between the prescriptive Energizing Indiana program component, implemented by GoodCents, and the custom program component, administered by KEMA, was confusing to customers. One point of confusion noted by program staff was the need for pre-installation monitoring. Prescriptive measures that fall under the Energizing Indiana Program do not require pre-installation monitoring, while custom measures that exceed 200,000 kWh in expected savings do require pre-installation monitoring. Therefore, if a project is underway and it is expected to generate savings exceeds the 200,000 kWh threshold, the project will not qualify for incentives under the custom program component. From a program design perspective, this guideline reduces evaluation risk associated with the uncertainties of realized energy savings for large projects. Pre-installation monitoring reduces this risk by capturing baseline operating conditions, which allows for a more accurate calculation of expected savings. However, from a participation perspective, pre-installation monitoring is time consuming, can create project delays, and can be frustrating to customers.

  This issue highlights the critical role of the trade ally. Approximately 17% of the project did not have a contractor during the 2013 program year. Program staff said that trade allies have a much better understanding of the program and tend to navigate the multiple program structure more effectively. Trade allies also tend to understand the importance of pre- and post-installation monitoring and can be the most effective bridge between customers and the program.

- **Program Goals and Budget:** The savings goal for the 2013 program year was initially set at 25.6 GWh. However, to compensate for other programs in the portfolio not meeting their savings target, the savings goals for 2013 increased to 31 GWh. According the I&M staff, in 2013 there was minimal concern with exceeding the program budget. However, several large projects are already proposed for the 2014 program year and there are greater concerns about adhering to the program budget.

- **Communications between I&M and KEMA:** I&M program staff indicated that there is regular communication with KEMA staff. KEMA provides I&M with weekly status reports that color codes projects depending on their status; highlighting new projects and projects that are close to completion. Overall, I&M was pleased with KEMA staff and felt that they do a good job representing I&M and implementing the program.

- **Large Project Review Process:** This group is external to the utility commission and is responsible for approving projects that exceed the $20,000 incentive cap. The oversight board is made of members of the utilities council, citizen's action coalition, industrial group, and representatives from the City of Ft. Wayne. The new project review process was introduced at the beginning of the 2013 program year in an effort to encourage customers with larger projects to apply and ultimately increase the program impacts. In 2013, 10 projects exceeded the $20,000 incentive cap, all of which were approved.

3. Commercial and Industrial Audit Program

This chapter addresses the methodologies and impact findings of gross and net kWh savings and peak kW reductions resulting from measures installed in facilities of customers that received audits under the C&I Audit Program during the period January 2013 through December 2013. This chapter also includes savings generated as a result of the Prescriptive Refrigeration Incentives component of the Audit Program.

The C&I Audit Program is designed to generate kWh savings through an on-site audits and prescriptive refrigeration measures. The program targets grocery, restaurant, and convenient store customers. Appendix F contains the specific methodologies for estimating gross savings and savings estimation results for the completed prescriptive refrigeration projects under this program.

3.1 Methodology for Estimating Gross Savings

This section outlines the methodology and results of the C&I Audit Program, including the Prescriptive Refrigeration Incentives component of the program.

3.1.1 Follow-Up Participant Surveys

In order to estimate savings for the C&I Audit Program, ADM attempted to survey all program year four participants. During program year four, there were 34 decision makers for the audit program and 24 decision makers who received prescriptive refrigeration incentives. Eight of these participating decision makers received both an audit and prescriptive incentives. The audit survey was administered to the eight decision makers who participated in both components of the program. The survey administered to audit participants was designed to gather information from participants about any energy efficiency actions they have taken after receiving the program audit. Two of the surveyed participants, who received audits only, identified energy efficiency improvements that would qualify for program savings.

In total, 12 decision makers responded to the survey for the audit component, three of whom also received prescriptive refrigeration incentives, and four responded to the survey for the prescriptive incentive component. These responses accounted for 34% of the savings associated with recommendations of the program and 55% of the expected savings associated with prescriptive incentive projects.

3.1.2 Cross-Verification of Participant Activity

ADM performed cross-verification checks of audit recipient activity in order to determine whether any audit participants had proceeded to implement energy efficiency improvements through other I&M programs. It was determined that eight customers received audits and also received measures through the prescriptive refrigeration component of the program. In these eight cases, customers received the audit survey.

3.1.3 Methodology for Audit Recipients

Savings resulting from projects attributable to audits were determined using participant surveying and follow-up interviews with customer facility staff. During the telephone survey, audit customers were asked whether or not they implemented any of the recommended energy saving projects. Customers who reported completing projects were asked if they had applied for or received an incentive through an Energizing Indiana or I&M program for the project. Customers who reported that they had received or applied for an incentive for all of the implemented recommendations were not asked any further questions about the project as these savings are not attributable to the C&I Audit Program

Customers who reported implementing recommended measures without applying for or receiving an incentive were categorized as eligible for gross savings. These customers were asked a series of follow-up questions requesting measure-specific details in order to inform the savings quantification desk review. Procedures for calculating measure-specific savings is described in section 3.1.5 below.

After the desk reviews were completed for PY4 audit-recommended projects, the calculated savings were then extrapolated to the program population. Sample projects represent facilities for which the evaluators were able to confirm zero savings or potential savings with certainty. The total program population is then divided by the sample figure. This ratio is then multiplied by the total ex post gross savings that was determined at the project level. This procedure was applied to extrapolate kWh and peak kW savings to the program level, respectively.

$$\textit{Program Savings} = \textit{Total Project Savings} * (\textit{Population of Projects}/\textit{Sample of Projects})$$

Equation 3-1

3.1.4 Methodology for Prescriptive Refrigeration Incentive Recipients

The methodology used to calculate savings for the Prescriptive Refrigeration component of the Audit Program is detailed in the sub sections below.

3.1.4.1. Sampling Plan

Data used to estimate the gross savings achieved through the Prescriptive Refrigeration Incentives component of the program were collected for samples of projects completed during the period January 2013 through December 2013. Data provided by the implementation contractor and utility showed that during the period January 2013 through December 2013, there were 81 projects completed, which were expected to provide savings of 3,780,638 kWh annually.

Inspection of data on kWh savings for individual projects provided by I&M and the implementation contractor indicated that the distribution of savings was generally positively skewed, with a relatively small number of projects accounting for a high percentage of the estimated savings. Estimation of savings is based on a ratio estimation procedure, which allows precision/confidence requirements to be met with a smaller sample size. ADM selected a sample with a sufficient number of projects to estimate the total achieved savings with 10% precision at 90% confidence. For the sample, the actual precision is ±9.0%.

Sampling for the collection of program M&V data accounted for the M&V effort occurring in real time during program implementation. Completed projects accumulate over time as the program is implemented, and sample selection was thus spread over the entire program year. ADM used a near real-time process whereby a portion of the sample was selected periodically as projects in the program were completed. The timing of sample selection was contingent upon the timing of the completion of projects during the program year.

Table 3-1 shows the strata boundaries, total ex post energy savings, contribution to variance, and the number of sample sites for the sample for each stratum.

Table 3-1. Population Statistics Used for Prescriptive Refrigeration Sample Design

	Stratum 1	*Stratum 2*	*Stratum 3*	*Stratum 4*	*Totals*
Strata boundaries (kWh)	< 25,000	25,000 – 74,999	75,000 – 199,999	> 200,000	
Number of projects	37	32	11	1	81
Total kWh savings	488,640	1,349,625	1,085,281	857,092	3,780,638
Average kWh Savings	13,206	42,176	98,662	857,092	46,675
Std. dev. of kWh savings	5,722	11,070	24,967	-	96,164
Coefficient of variation	0.43	0.26	0.25	-	2.06
Final design sample	4	5	4	1	14

The sample projects account for approximately 43% of total expected kWh savings. Total and sample ex ante savings for the prescriptive refrigeration component of the audit program are summarized by stratum in Table 3-2***Error! Reference source not found.***.

Table 3-2. Ex Ante Savings Sampled Projects by Stratum

Stratum	*Sample Ex Ante Savings*	*Total Ex Ante Savings*
4	857,092	857,092
3	465,717	1,085,281
2	258,792	1,349,625
1	55,650	488,640
Total	1,637,251	3,780,638

3.1.4.2. Review of Documentation

Indiana Michigan Power’s program implementation contractor provided documentation for the completed audits and completed prescriptive refrigeration measures during program year four. The first step in the evaluation effort was to review this documentation and other program materials that were relevant to the evaluation effort.

For each sampled prescriptive refrigeration project, the available documentation (e.g., audit reports, savings calculation work papers, etc.) for each rebated measure was reviewed, with particular attention given to the calculation procedures and documentation for savings estimates. For completed audits, reviews were conducted for measures for which participants did not receive an incentive.

Documentation that was reviewed for all sampled prescriptive refrigeration projects included program forms, reports, billing system data, weather data, and any other potentially useful data. Each application was reviewed to determine whether the following types of information had been provided:

- Documentation for the equipment changed, including (1) descriptions, (2) schematics, (3) performance data, and (4) other supporting information
- Documentation for the new equipment installed, including (1) descriptions, (2) schematics, (3) performance data, and (4) other supporting information
- Information about the savings calculation methodology, including (1) what methodology was used, (2) specifications of assumptions and sources for these specifications, and (3) correctness of calculations.

3.1.4.3. On-Site Data Collection Procedures

On-site visits were used to collect data that were used in calculating savings impacts for the Prescriptive Refrigeration Incentive component of the C&I Audit program. The visits to the sites of the completed projects were used to collect primary data on the facilities and the incentivized measures. I&M Energy Efficiency staff were notified prior to ADM initiating customer contact.

During the on-site visit, the engineering staff accomplished three major tasks:

- First, they verified the implementation status of all measures for which the customer received incentives. They verified that the energy efficiency measures were indeed installed, that they were installed correctly and that they still functioned properly.
- Second, they collected the physical data, when necessary, needed to analyze the energy savings that have been realized from the installed improvements and measures. Data were collected using a form that was prepared specifically for the project in question after an in-house review of the project file.
- Third, they interviewed the contact personnel at the facility to obtain additional information on the installed system to complement the data collected from other sources.

3.1.5 Procedures for Identifying C&I Audit Projects Attributable to the Audit Component of the Program

Decision makers whose facilities received an audit were interviewed using the survey instrument in Appendix G to identify energy saving projects attributable to the audit component of the program. Interviewed decision makers were asked a battery of questions related to each of the recommendations that they received. These questions were developed to accomplish the following objectives:

- Identify any projects that were implemented based on audit recommendations
- Determine whether or not the participant received an incentive through an Energizing Indiana or another I&M incentive program.
- Assess the level of influence the audit recommendations had on the project.
- Collect project specific information to calculate energy saving impacts.

Projects that did not receive an incentive through another program and that were influenced by the audit recommendations were reviewed to estimate savings. This review was informed by survey responses, documentation provided in the audit report, and follow up interviews, as needed.

3.1.6 Procedures for Estimating Savings from Measures Installed through C&I Audit and Prescriptive Refrigeration Projects

This section presents the M&V methodologies employed to calculate savings for projects resulting from audit recommendations and prescriptive refrigeration projects. The method ADM employed to determine gross savings impacts depends on the types of measures being analyzed. Categories of measures include the following:

- Refrigeration and Controls
- Lighting

ADM uses a specific set of methods to determine gross savings for projects that depend on the type of measure being analyzed. These typical methods are summarized in Table 3-3. For program year four, the majority of the savings for the C&I Audit Program fell under the Prescriptive Refrigeration Incentives component of the program. Typical methods for savings calculation is contained in Appendix F, which describes analytical strategies for project for each specific project.

Table 3-3. Typical Methods to Determine Savings

Type of Measure	*Method to Determine Savings*
Refrigeration	Simulations with EQuest engineering analysis model, with monitored data
Lighting	Custom-designed lighting evaluation model, which uses data on wattages before and after installation of measures and hours-of-use data from field monitoring

The activities specified in Table 3-3 produced two estimates of gross savings for each project: an expected gross savings estimate and a verified gross savings estimate. The savings realization rate for a project is calculated as the ratio of the verified, or ex post, savings for the project (as measured and verified through the M&V effort) to the expected, or ex ante, savings (as determined through the project application procedure and recorded in the tracking system for the program).

Energy savings realization rates were calculated for each project for which on-site data collection and engineering analysis/building simulations were conducted. The following discussion describes the basic procedures used for estimating savings from refrigeration measures. Project-specific information regarding savings calculation is contained in Appendix E.

Plan for Analyzing Savings from Refrigeration Measures: During the current program year, ADM analyzed savings resulting from Anti-Sweat Heater (ASH) controls. To estimate savings for this measure, ADM uses monitoring data and outdoor and indoor air temperature readings as inputs into regression models. Consumption of the ASH controls are extrapolated over one year using TMY3 weather data for the region.

The annual consumption is the total demand of all ASH controls multiplied by 8,760 hours. The annual savings due to the installation of ASH controls is the difference between the baseline yearly energy consumption and the as-built yearly energy consumption.

Plan for Analyzing Savings from Lighting Measures: Lighting measures examined include refrigeration case lighting and exterior LED lighting. These types of measures reduce demand, while not affecting operating hours. Lighting control strategies are examined that might include the addition of energy conserving control technologies such as motion sensors. These measures typically involve a reduction in hours of operation and/or lower current passing through the fixtures.

Analyzing the savings from such lighting measures requires data for retrofitted fixtures on (1) wattages before and after retrofit and (2) hours of operation before and after the retrofit. Fixture wattages are taken from a table of standard wattages, with corrections made for non-operating fixtures.

To determine baseline and post-retrofit demand values for the lighting efficiency measures, ADM uses in-house data on standard wattages of lighting fixtures and ballasts to determine demand values for lighting fixtures. These data provide information on wattages for common lamp and ballast combinations.

ADM uses per-fixture baseline demand, retrofit demand, and appropriate post-retrofit operating hours to calculate peak capacity savings and annual energy savings for sampled fixtures of each usage type.

The on-off profile and the fixture wattages are used to calculate post-retrofit kWh usage. Peak demand savings are calculated by taking the average of the difference between baseline demand and post-installation demand over I&M's peak period. Peak period demand savings are calculated per the following formula:

$$\text{Peak Demand Savings} = \sum (kW_{\text{before}} - kW_{\text{after}} / 14$$

The baseline and post-installation average demands are calculated by dividing the total kWh usage during the Peak Period by the number of hours in the Peak Period.

ADM calculates annual energy savings for each sampled fixture per the following formula:

$$\text{Annual Energy Savings} = kWh_{\text{before}} - kWh_{\text{after}}$$

The values for insertion in this formula are determined through the following steps:

Results from the monitored sample are used to calculate the average operating hours of the metered lights in each costing period for every unique building type/usage area.

These average operating hours are then applied to the baseline and post-installation average demand for each usage area to calculate the respective energy usage and peak period demand for each usage area.

The annual baseline energy usage is the sum of the baseline kWh for each costing period for all of the usage areas. The post-retrofit energy usage is calculated similarly. The energy savings are calculated as the difference between baseline and post-installation energy usage.

Savings from lighting measures are factored by the region-specific, building type-specific heating cooling interaction factors in order to calculate total savings attributable to lighting measures, inclusive of impacts on, in this case, cooling operation.

3.2 Results of Gross Savings Estimation

To estimate gross kWh savings and peak kW reductions for the Audit Program and Prescriptive Refrigeration Incentives component of the program, data were collected and analyzed for projects completed during the program year. The results of the analyses are reported in this section.

3.2.1 Ex Post Gross Annual kWh and Peak kW Savings Resulting from Measures Recommended by C&I Audits

The gross kWh savings and peak kW reductions resulting from measures installed as a result of audit recommendations during the period January 2013 through December 2013 are summarized in the sub sections below.

3.2.1.1. Gross kWh Savings

The ex post gross sample kWh savings resulting from measures recommended through PY4 audits is summarized in Table 3-4 below. Because only program-level ex ante estimates are determined for this program, only ex post savings are provided by project. Audits 194A through 203A were completed at multiple locations by the same customer and were therefore combined into one analysis.

Table 3-4. Sample Ex Ante and Ex Post kWh Savings for C&I Audits

Project ID	*Ex Post Gross kWh Savings*
AEPIM-13-00194A through 000203A	238,919
AEPIM-13-00335A	372
Total	239,290

The two desk reviews were extrapolated to the program population to determine ex post savings for PY4 audit projects. The total gross kWh savings resulting from measures recommended through PY4 audits is 703,869 kWh.

3.2.1.2. Gross Peak kW Savings

The achieved ex post gross peak kW reductions of the C&I Audit Program during the period January 2013 through December 2013 are 32.3 kW.

3.2.2 Ex Post Gross Annual kWh and Peak kW Savings Resulting from Prescriptive Refrigeration Incentives

The gross kWh savings and peak kW reductions resulting from measures installed as a result of audit recommendations during the period January 2013 through December 2013 are summarized in the sub sections below.

3.2.2.1. Gross kWh Savings

The gross kWh savings of the Prescriptive Refrigeration Incentives component C&I Audit Program are summarized in Table 3-5. The achieved gross savings of 3,331,214 kWh are equal to 88% of the ex ante savings.

Table 3-5. Gross kWh Savings for Prescriptive Refrigeration Incentives

Ex Ante Gross kWh Savings	*Gross Audited kWh Savings*	*Gross Verified kWh Savings*	*Ex Post Gross kWh Savings*	*Gross Realization Rate*
3,780,638	3,780,638	3,351,291	3,331,214	88%

Gross kWh savings are summarized by sampling stratum in Table 3-6. For PY4, audited savings were equal to ex ante savings. Ex ante, verified and ex post kWh savings are shown in Table 3-7 for each project sampled in PY4.

Table 3-6. Gross kWh Savings by Sample Stratum

Stratum	*Ex Ante kWh Savings*	*Verified kWh Savings*	*Ex Post kWh Savings*	*Gross Realization Rate*
4	857,092	857,092	1,408,393	164%
3	1,085,281	1,085,281	1,053,793	97%
2	1,349,625	984,622	668,189	50%
1	488,640	424,296	200,839	41%
Total	3,780,638	3,351,291	3,331,214	88%

Table 3-7. Gross kWh Savings for C&I Incentive Program by Sampled Project

Project ID	*Ex Ante kWh Savings*	*Verified kWh Savings*	*Ex Post kWh Savings*	*Project Gross Realization Rate*
AEPIM-13-0000214-S	61,050	0	0	0%
AEPIM-13-0000215-S	83,130	83,130	118,260	142%
AEPIM-13-0000228-S	93,134	93,134	83,320	89%
AEPIM-13-0000253-S	5,550	5,550	1,390	25%
AEPIM-13-0000264-S	152,056	152,056	103,520	68%
AEPIM-13-0000276-S	857,092	857,092	1,408,393	164%
AEPIM-13-0000288-S	73,618	73,618	53,118	72%
AEPIM-13-0000295-S	38,462	33,992	12,538	33%
AEPIM-13-0000303-S	38,462	33,992	17,970	47%
AEPIM-13-0000380-S	16,700	16,700	8,500	51%
AEPIM-13-0000382-S	16,700	9,372	5,378	32%
AEPIM-13-0000384-S	16,700	16,700	7,605	46%
AEPIM-13-0000420-S	137,397	137,397	147,105	107%
AEPIM-13-0000487-S	47,200	47,200	44,500	94%
All Non-Sample Projects	2,143,387	1,791,358	1,319,617	62%
Total	3,780,638	3,351,291	3,331,214	88%

3.2.3 Gross Peak kW Savings

The achieved ex post gross peak kW reductions resulting from prescriptive refrigeration projects during PY4 are 460.6 kW.

3.3 Methodology for Estimating Net Savings

The net savings analysis determines the portion of gross energy impacts achieved by program participants that are attributable to the effects of the program. The savings induced by the program are the “net” savings that are attributable to the program. The savings attributable to the program are the savings “net” of the total gross savings associated with the project.

Net savings may be less than gross savings because of free ridership impacts, which arise to the extent that participants in a program would have adopted energy efficiency measures and achieved the observed energy changes even in the absence of the program. Free riders for a program are defined as those participants that would have installed the same energy efficiency measures without the program.

The goal of the net-to-gross analysis is to estimate the impacts of energy efficiency measures attributable to the program that are net of free ridership. That is, because the energy savings realized by free riders are not induced by the program, these savings should not be included in the estimates of the program's actual impacts. Without adjustment for free ridership, some savings that would have occurred naturally would be attributed to the program. The measurement of the net impact of the program requires estimation of the marginal effect of the program over and above the "naturally occurring" patterns for installation and use of energy efficient equipment.

Information collected from program participants through a customer survey was used for the net-to-gross analysis. Appendix F provides a copy of the survey instrument for participants who received audits and Appendix H provides a copy of the instrument for the refrigeration incentive recipients, and Appendix G and Appendix I present the tabulated responses for each survey question, for the audit and refrigeration incentive recipients, respectively.

Based on a review of this information, the preponderance of evidence regarding free ridership inclinations was used to attribute a customer’s savings to free ridership.

3.3.1 Procedures Used for Audit Recipients

Audit customers were asked whether or not they implemented any of the recommended energy saving projects. Customers who reported completing projects were asked if they had applied for or received an incentive through an Energizing Indiana or I&M program for the project. Customers who reported that they had received or applied for an incentive for all of the implemented recommendations were not asked any further questions about the project as these savings are not attributable to the C&I Audit Program

For customers who reported implementing recommendations for which they did not apply for or receive an incentive, several criteria were used to determine the portion of the customer’s savings for a particular project should be attributable to the audit component of the program. The three factors used to determine the portion of the projects savings attributable to the program are:

- Plans and intentions of firm to install a measure even without the support provided through the audit component of the program
- Influence that the audit had on the decision to install a measure
- A firm’s previous experience with a measure installed under the program

For each of these factors, rules were applied to develop binary variables indicating whether or not a participant’s behavior showed free ridership. These rules made use of answers to questions on the decision maker survey questionnaires.

The first factor required determining if a participant stated that his or her intention was to install an energy efficiency measure even without the program. Two binary variables were constructed to account for customer plans and intentions: one, based on a more restrictive set of criteria that may describe a high likelihood of free ridership, and a second, based on a less restrictive set of criteria that may describe a relatively lower likelihood of free ridership.

The first, more restrictive criteria indicating customer plans and intentions that likely signify free ridership are as follows:

- The respondent answered "yes" to the question: "Did you have plans to install the measure before participating in the program?" and "Would you have gone ahead with this planned installation of the measure even if you had not received the audit?"

The second, less restrictive criteria indicating customer plans and intentions that likely signify free ridership are as follows:

- The respondent answered "yes" to the question: "Did you have plans to install the measure before participating in the program?" and "No" or "Don't know" to the question "Would you have gone ahead with this planned installation of the measure even if you had not received the audit?"

The second factor required determining if a customer reported that the information provided in the audit was influential to his or her decision to complete the energy saving project. The criterion indicating that program influence may signify a lower likelihood of free ridership is that either the respondent answered "very important" or "somewhat important" to the question "How important was the information provided to you in the audit to decision to install the recommended measure?"

The third factor required determining if a participant in the program indicated that he or she had previously installed an energy efficiency measure similar to one that was recommended to them in the audit report. The criteria indicated that previous experience may signify a higher likelihood of free rider ship is the respondent answered "yes" to the question "Before you received the audit, had you implemented energy saving equipment similar to the recommended measure that you installed?"

The four sets of rules just described were used to construct four different indicator variables that address free ridership behavior. For each customer, a free ridership value was assigned based on the combination of variables. With the four indicator variables, there were 11 applicable combinations for assigning free ridership scores for each respondent, depending on the combination of answers to the questions creating the indicator variables. Table 3-8 displays each possible combination along with corresponding free ridership values.

Table 3-8 Free Ridership Scores for Combinations of Indicator Variable Responses

Indicator Variables				*Free Ridership Score*
Had Plans and Intentions to Install Measure without Program? (Definition 1)	*Had Plans and Intentions to Install Measure without Program? (Definition 2)*	*Influence of Audit Recommendation on Decision to Install Measure?*	*Had Previous Experience with Measure?*	
Y	N/A	N	N	100%
Y	N/A	N	Y	100%
Y	N/A	Y	N	67%
N	Y	N	Y	67%
N	Y	N	N	33%
N	Y	Y	N	0%
N	Y	Y	Y	33%
N	N	N	Y	33%
N	N	N	N	0%
N	N	Y	N	0%
N	N	Y	Y	0%

3.3.2 Procedures Used for Prescriptive Refrigeration Incentive Recipients

Several criteria were used for determining what portion of a customer’s savings for a particular project should be attributed to free ridership. The first criterion was based on the response to the question: “Would you have been financially able to install the equipment or measures without the financial incentive from the Prescriptive Refrigeration Incentives Program?” If a customer answered “No” to this question, a free ridership score of 0 was assigned to the project. That is, if a customer required financial assistance from the Prescriptive Refrigeration Incentives Program to undertake a project, then that customer was not deemed a free rider.

For decision makers that indicated that they were able to undertake energy efficiency projects without financial assistance from the program, three factors were analyzed to determine what percentage of savings may be attributed to free ridership. The three factors are:

- Plans and intentions of firm to install a measure even without support from the program
- Influence that the program had on the decision to install a measure
- A firm’s previous experience with a measure installed under the program

For each of these factors, rules were applied to develop binary variables indicating whether or not a participant’s behavior showed free ridership. These rules made use of answers to questions on the decision maker survey questionnaires.

The first factor required determining if a participant stated that his or her intention was to install an energy efficiency measure even without the program. The answers to a combination of several questions were used with a set of rules to determine whether a participant’s behavior indicates likely free ridership. Two binary variables were constructed to account for customer plans and intentions: one, based on a more restrictive set of criteria that may describe a high likelihood of free ridership, and a second, based on a less restrictive set of criteria that may describe a relatively lower likelihood of free ridership.

The first, more restrictive criteria indicating customer plans and intentions that likely signify free ridership are as follows:

- The respondent answered “yes” to the following two questions: “Did you have plans to install the measure before participating in the program?” and “Would you have gone ahead with this planned installation of the measure even if you had not participated in the Prescriptive Refrigeration Incentives Program?”
- The respondent answered “definitely would have installed” to the following question: “If the financial incentive from the Prescriptive Refrigeration Incentives Program had not been available, how likely is it that you would have installed the refrigeration equipment anyway?”
- The respondent answered “did not affect timing of purchase and installation” to the following question: “How did the availability of information and financial incentives through the Prescriptive Refrigeration Incentives Program affect the timing of your purchase and installation of refrigeration equipment?”
- The respondent answered “no, the program did not affect level of efficiency that we chose for equipment” in response to the following question: “How did the availability of information and financial incentives through the Prescriptive Refrigeration Incentives Program affect the level of energy efficiency you chose for refrigeration equipment?”
- The respondent answered “no, the program did not affect quantity purchased and installed” in response to the following question: “How did the availability of information and financial incentives through the Prescriptive Refrigeration Incentives Program affect the quantity (or number of units) of energy efficient refrigeration equipment that you purchased and installed?”

The second, less restrictive criteria indicating customer plans and intentions that likely signify free ridership are as follows:

- The respondent answered “yes” to the following two questions: “Did you have plans to install the measure before participating in the program?” and “Would you have gone ahead with this planned installation of the measure even if you had not participated in the Prescriptive Refrigeration Incentives Program?”
- Either the respondent answered “definitely would have installed” or “probably would have installed” to the following question: “If the financial incentive from the Prescriptive Refrigeration Incentives Program had not been available, how likely is it that you would have installed refrigeration equipment anyway?”
- Either the respondent answered “did not affect timing of purchase and installation” to the following question: “How did the availability of information and financial incentives through the Prescriptive Refrigeration Incentives Program affect the timing of your purchase and

installation of the refrigeration equipment?" or the respondent indicated that that while program information and financial incentives did affect the timing of equipment purchase and installation, in the absence of the program they would have purchased and installed the equipment within the next two years.

- The respondent answered "no, the program did not affect level of efficiency that we chose for equipment" in response to the following question: "How did the availability of information and financial incentives through the Prescriptive Refrigeration Incentives Program affect the level of energy efficiency you chose for the refrigeration equipment?"
- The respondent answered "no, the program did not affect quantity purchased and installed" in response to the following question: "How did the availability of information and financial incentives through the Prescriptive Refrigeration Incentives Program affect the quantity (or number of units) of energy efficient refrigeration equipment that you purchased and installed?"

The second factor required determining if a customer reported that a recommendation from a Prescriptive Refrigeration Incentives Program representative or past experience with the program was influential in the decision to install a particular piece of equipment or measure.

The criterion indicating that program influence may signify a lower likelihood of free ridership is that either of the following conditions are true:

- The respondent answered "very important" to the following question: "How important was previous experience with the Prescriptive Refrigeration Incentives Program in making your decision to install energy efficient refrigeration equipment?"
- The respondent answered "yes" to the following question: "Did a representative of the Prescriptive Refrigeration Incentives Program recommend that you install the refrigeration equipment?"

The third factor required determining if a participant in the program indicated that he or she had previously installed an energy efficiency measure similar to one that they installed under the program without an energy efficiency program incentive during the last three years. A participant indicating that he or she had installed a similar measure is considered to have a likelihood of free ridership.

The criteria indicating that previous experience may signify a higher likelihood of free ridership are as follows:

- The respondent answered "yes" to the following question: "Before participating in the Prescriptive Refrigeration Incentives Program, had you installed any equipment similar to the energy efficient equipment installed through the program at your facility?"
- The respondent answered "yes, purchased energy efficient equipment but did not apply for financial incentive." to the following question: "Has your organization purchased any energy efficient equipment in the last three years for which you did not apply for a financial incentive through the Prescriptive Refrigeration Incentives Program?"

The four sets of rules just described were used to construct four different indicator variables that address free ridership behavior. For each customer, a free ridership value was assigned based on the combination of variables. With the four indicator variables, there were 11 applicable combinations for assigning free ridership scores for each respondent, depending on the combination of answers to the questions creating the indicator variables. Table 3-9 displays each possible combination along with corresponding free ridership values.

Table 3-9. Free Ridership Scores for Combinations of Indicator Variable Responses

Indicator Variables				*Free Ridership Score*
Had Plans and Intentions to Install Measure without the Program? (Definition 1)	*Had Plans and Intentions to Install Measure without the Program? (Definition 2)*	*Program had influence on Decision to Install Measure?*	*Had Previous Experience with Measure?*	
Y	N/A	Y	Y	100%
Y	N/A	N	N	100%
Y	N/A	N	Y	100%
Y	N/A	Y	N	67%
N	Y	N	Y	67%
N	N	N	Y	33%
N	Y	N	N	33%
N	Y	Y	N	0%
N	N	N	N	0%
N	N	Y	N	0%
N	N	Y	Y	0%

3.4 Results of Net Savings Estimation

The procedures described in the preceding section were used to estimate free ridership rates and net-to-gross ratios for the Prescriptive Refrigeration Incentives component of the C&I Audit Program for the period January 2013 through December 2013.

3.4.1 Ex Post Net Annual kWh Savings and Peak kW Savings Resulting from Measures Recommended by C&I Audits

The data used to assign free ridership scores were collected through a customer survey of all four customer decision makers for projects completed during the period January 2013 through December 2013.

3.4.1.1. Ex Post Net Annual kWh Savings

The realized, or ex post, energy savings for the Audit Component of the C&I Audits Program during the period January 2013 through December 2013 are summarized in Table 3-10. During this period, ex post net energy savings for the program totaled 703,504 kWh. The net-to-gross ratio for the Prescriptive Refrigeration Incentives is 99.9%.

Table 3-10 Summary of kWh Savings from Audit Component

Ex Post Gross kWh Savings	*Free Ridership*	*Spillover*	*Ex Post Net kWh Savings*	*Net to Gross Ratio*
703,869	365	0	703,504	99.9%

3.4.1.2. Ex Post Net Peak kW Savings

The ex post net peak kW reductions of the Prescriptive Refrigeration Incentives Program during the period January 2013 through December 2013 are summarized in Table 3-11. The achieved net peak demand savings for the program are 94.78 kW.

Table 3-11. Summary of Peak kW Savings from Prescriptive Refrigeration Incentives

Ex Post Gross Peak kW Savings	*Free Ridership*	*Spillovers*	*Ex Post Net Peak kW Savings*	*Net to Gross Ratio*
95.1	0.3171	0	94.78	99.7%

3.4.2 Ex Post Net Annual kWh Savings and Peak kW Savings Resulting from Prescriptive Refrigeration Incentive Measures

The data used to assign free ridership scores were collected through a customer survey of all four customer decision makers for projects completed during the period January 2013 through December 2013.

3.4.2.1. Ex Post Net Annual kWh Savings

As discussed in Section 3.3, the first criteria in determining what proportion of energy savings from a project should be assigned to free ridership was whether a participant was financially able to undertake the project without financial assistance from the Prescriptive Refrigeration Incentive Program. If a decision maker respondent answered “No” to the question of “Would you have been financially able to install the equipment or measures without the financial incentive from the Prescriptive Refrigeration Incentive Program?” a free ridership score of 0 was assigned to the project. That is, if a participant required financial assistance from the Prescriptive Refrigeration Incentive Program to undertake a project, then that participant was judged to not be a free rider. This was not the case for the program participant and instead the other free ridership scoring criteria were applied to this project.

Table 3-12 shows whether the decision makers responses met the criteria for whether they had plans and intentions to install the measures without any program incentive (under two alternative definitions as described in the preceding section), that the program influenced their decision to install the measure, or that they previously installed a similar energy efficiency measure without an energy efficiency program incentive during the last three years. The respondent did not meet the criteria for any of the indicator variables. The free ridership score associated with these responses is 0.0%.

Table 3-12. Weighted Responses for Indicator Values

Had Financial Ability	*Had Plans and Intentions to Install Measure without Program (Definition 1)*	*Had Plans and Intentions to Install Measure without Program (Definition 2)*	*Program had influence on Decision to Install Measure*	*Had Previous Experienc e with Measure*
98%	30%	30%	91%	0%

Table 3-13 shows percentages of total ex post gross custom incentive energy savings that are associated with different combinations of free ridership indicator variable values. Ninety-eight percent of the savings is associated with respondents who indicated that they were financially unable to implement the project in the absence of the program incentive.

Table 3-13 Estimated Free Ridership from Prescriptive Refrigeration Projects

Had Plans and Intentions to Install Measure without Program? (Definition 1)	*Had Plans and Intentions to Install Measure without Program? (Definition 2)*	*Program had influence on Decision to Install Measure?*	*Had Previous Experience with Measure?*	*Percentage of Total Ex Post Gross kWh Savings*	*Free Ridership Score*
N	Y	N	Y	0.0%	66.7%
N	N	N	N	7.3%	0.0%
N	Y	N	N	0.0%	33.3%
N	N	N	Y	0.0%	33.3%
N	N	Y	N	61.1%	0.0%
N	N	Y	Y	0.0%	0.0%
N	Y	Y	N	0.0%	0.0%
N	Y	Y	Y	0.0%	33.3%
Y	Y	N	N	0.0%	100.0%
Y	Y	N	Y	0.0%	100.0%
Y	Y	Y	N	29.5%	66.7%
Y	Y	Y	Y	0.0%	100.0%
Required program incentive to implement measures.				2.0%	0.0%
Total				100.0%	19.8%

The net energy savings for the Prescriptive Refrigeration Incentives during the period January 2013 through January 2013 are summarized in Table 3-14. During this period, ex post net energy savings for the program totaled 2,671,876 kWh. The net-to-gross ratio for the Prescriptive Refrigeration Incentives is 80%.

Table 3-14 Summary of kWh Savings from Prescriptive Refrigeration Incentives

Ex Ante kWh Savings	*Ex Post Gross kWh Savings*	*Free Ridership*	*Spillover*	*Ex Post Net kWh Savings*	*Net to Gross Ratio*
3,780,638	3,331,214	659,338	0	2,671,876	80%

3.4.2.2. Ex Post Net Peak kW Savings

The ex post net peak kW reductions of the Prescriptive Refrigeration Incentives Program during the period January 2013 through December 2013 are summarized in Table 3-15. The achieved net peak demand savings for the program are 343 kW.

Table 3-15. Summary of Peak kW Savings from Prescriptive Refrigeration Incentives

Ex Post Gross Peak kW Savings	*Free Ridership*	*Spillovers*	*Ex Post Net Peak kW Savings*	*Net to Gross Ratio*
461	118	0	343	74%

3.5 Process Evaluation

This section presents the results of the process evaluation for Indiana Michigan Power's (I&M) C&I Audit Program during its second year of program operations. The process evaluation focuses on the effectiveness of program policies and organization, as well as the program delivery framework. The purpose of the process evaluation is to assess the design and recent results of the program to determine how effectively it is achieving its intended outcomes. This evaluation is based upon analysis of program structure and interviews, and surveys of participating I&M customers, trade allies, I&M energy efficiency staff, program implementation contractor staff, and program tracking data and documentation.

The chapter begins with a discussion of the overall progress of the program. This is followed by an examination of certain issues that are critical to the future success of the program. This chapter also presents strategic planning and process recommendations, and highlights key findings from the interviews of participants, trade allies, and program operations staff.

3.5.1 Evaluation Objectives

The purpose of the process evaluation is to examine program operations and results throughout the program operating year, and to identify potential program improvements that may prospectively increase program efficiency or effectiveness in terms of customer participation and satisfaction levels. This process evaluation was designed to document the operations and delivery of the C&I Audit Program during the 2013 program year.

Key research questions to be addressed by the evaluation of PY4 activity include:

Has the program implementation contractor made progress in developing the C&I Audit Program infrastructure?

Was the C&I Audit Program delivery effective and successful?

Is C&I Audit Program well designed to reduce barriers to increased energy efficiency project implementation?

Were participants satisfied with the program and the equipment they installed?

Insight into the customer experience with the C&I Audit Program is developed from a telephone survey of program participants. Analysis of interviews conducted with I&M program managers and program implementation contractor staff examine the internal organization and operational efficiency of program delivery

3.5.2 Summary of Primary Data Collection

- **Participant Surveys:** Participant surveys are the primary data source for several components of this process evaluation, and serve as the foundation for understanding the customer perspective. The participant surveys provide customer feedback and insight regarding customer experiences with the C&I Audit Program. Respondents report on their satisfaction with the program, detail their motivations and the factors affecting their decision making process, and provide recommendations related to improving the program.

- **Interviews with I&M Staff Members:** Interviews with I&M staff members provide insight into various aspects of the program and its organization. I&M staff members also provide information regarding recent organizational and procedural improvements that have been implemented to enhance program efficiency and effectiveness.

- **Interviews with Lockheed Martin Staff Members:** Interviews with Lockheed Martin program implementation staff members provide information regarding program progress and observations regarding trade allies and customers. Lockheed Martin staff members report on recent program changes and future plans to improve program operational efficiency.

3.5.3 Summary of Conclusions and Recommendations

This report evaluates the first year of program activity for the C&I Audit Program. The goals for the program year were to complete 116 audits for savings of 6,501,040 kWh. During the program year, 117 sites were audited. Gross savings for the Audit and Prescriptive Refrigeration Incentives Components totaled 4,035,083 kWh. Most of the program savings came from the prescriptive incentives. During PY4, only two of the surveyed participants reported that they implemented any of the recommendations from the audits. The implementation of these recommendations resulted in ex post electric savings of 703,504 kWh.

The following presents a selection of key conclusions from the most recent program year:

- **Increased Activity in Audit and Prescriptive Refrigeration Components of Program:** The number of sites audited more than doubled from the prior year. Additionally, there was a large increase in the number of sites that completed prescriptive refrigeration incentive projects. During the 2012 program year, one project was completed, whereas, during the 2013 program year 81 projects were completed. These projects were estimated to produce expected savings of 3,780,638 kWh.

- **Program Expanded to Include Convenience Stores:** The C&I Audit Program expanded the types of qualifying businesses to include convenience stores. Additionally, the program saw some activity from cafeterias located in other types of facilities such as museums and schools.

- **Changes to Prescriptive Refrigeration Incentive Offerings:** Incentives were offered for two new types of energy saving equipment—exterior LED lighting and LED lighting within a refrigerated space. Any business can apply for and receive incentives for LED lighting in a refrigerated space; however, only restaurants, groceries, and convenience stores can receive the prescriptive incentives for exterior LED lighting. These two measures accounted for more than one-half of the expected program savings.

- **Participants Satisfied with Program:** Participants in both the Audit Component and the Prescriptive Refrigeration Component of the C&I Audit Program reported that they were generally satisfied with the programs. Additionally, participants in both components noted few issues with the application process and all reported knowing whom to contact to get clarification.

- **Audit Program Feeds few Participants into Prescriptive Refrigeration and Custom Incentives Programs:** None of the 2012 and 2013 audit recipients participated in the C&I Custom Incentives program and a small share of the prescriptive incentive program incentive projects stemmed from customers who received an audit prior to applying for the incentives. These findings suggest that the program may not be effectively channeling participants into the other incentive programs offered by I&M. However, it is unclear how many audit participants are receiving incentives through the Core Programs.

The following recommendations are offered based on the analysis of the program:

- **Consider Adding Project Payback to Audit Report:** A large share of the Audit Program Component survey respondents (82%) indicated that they use the payback period to evaluate energy efficiency purchases. However, the audit reports do not currently provide this information to customers. Including payback period may help encourage some customers to proceed with implementing the energy saving recommendations.

- **Establish Procedures to Share Audit Participant Information with Implementers for Other Programs:** Program staff members report that currently there is no formal process for sharing the recommendations made to audit participants and the participants' contact information with the implementers of other applicable incentive programs. Formally sharing this information so these implementers can follow up with the audit participants and offer assistance in completing incentive applications may generate additional savings.

3.5.4 C&I Audit Program Customer Profile

The C&I Audit Program audited 117 facilities. The savings estimated savings associated with the audit recommendations totaled 7,828,944 kWh. Thirty of the sites were classified as groceries while the remaining 87 locations were restaurants. Nine of the restaurant sites were cafeterias or kitchens located with schools, healthcare facilities, and a museum. Although the program now provides audits for convenience stores, they were not identified as such in the program tracking data. Many of the facilities were chain stores. In total, there were 34 decision makers.

Table 3-16 displays the number of audit recommendations and the associated kWh savings by measure type. Refrigeration equipment recommendations were associated with the largest estimated savings followed by exterior LED retrofits, T5 or T8 lighting retrofits, and kitchen equipment. Relatively little savings potential was found for lighting and vending machine controls.

Table 3-16 Audit Recommendations and Associated kWh Savings and Incentives

Recommended Measure	*Number of Sites Receiving Recommendation*	*Estimated kWh Savings*	*Estimated I&M Incentives*
Refrigeration Equipment	114	3,542,795	$165,515
LED retrofits	49	1,369,534	$47,924
T5/T8 retrofits	113	1,244,345	$86,337
Kitchen Equipment	107	1,204,902	$99,670
Incandescent and CFL retrofits	41	221,871	$2,920
Maintenance and repair	8	117,415	$7,848
Variable Frequency Drives	2	106,172	$5,200
Vending Machine Controls	6	21,911	$0
Occupancy and Daylight sensors	70	-	$6,347
Total	117	7,828,944	$421,761

The monthly and cumulative savings associated with audit completion dates are shown in Figure 3-1. More savings associated with audit recommendations occurred during the beginning and end of the program year. The higher level of activity during these periods was largely due to the number of audits completed rather than the scope of the audit projects.

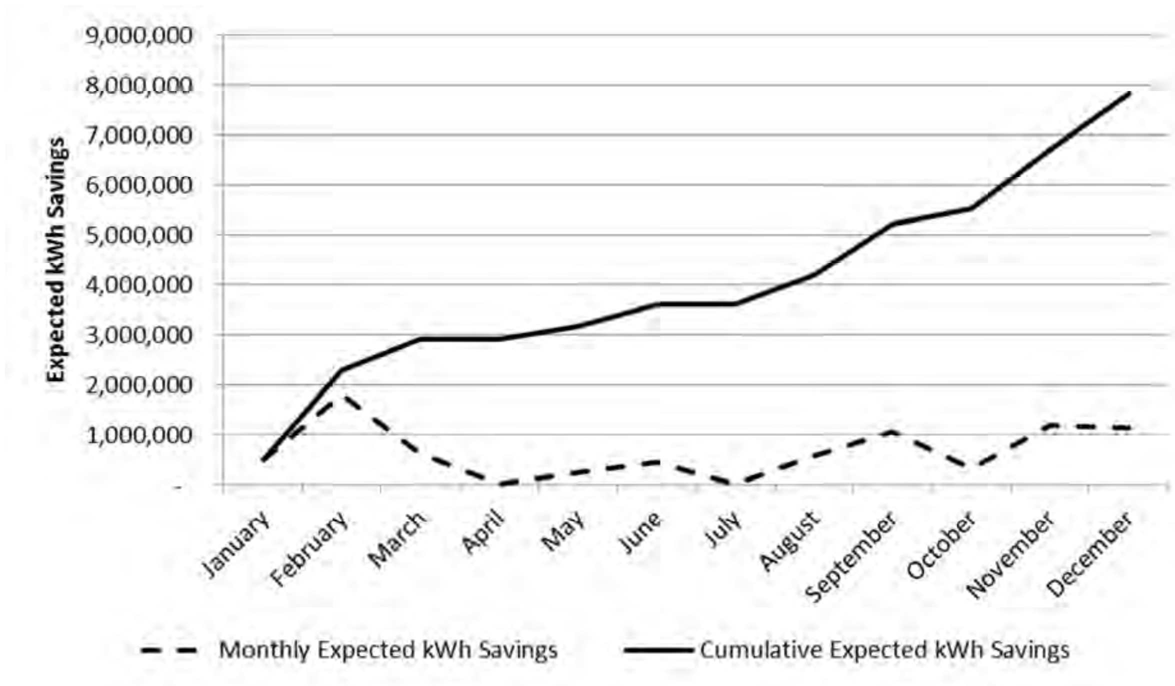


Figure 3-1 Incentives Associated with Audits Completed during Program Year Four

Table 3-17 displays the savings characteristics of the audit recommendations for the audited sites. On average, audits contained four recommendations. The site-level energy savings associated with these recommendations were quite variable, ranging from 10,773 kWh to 447,753 kWh. Similarly, the cost savings ranged from less than $882 to over $30,000.

Table 3-17 Savings Characteristics of Audit Recommendations for Sites

	Average	*Median*	*Range*
Number of Recommendations	4	5	2-12
Estimated kWh Savings	66,914	37,559	10,773 - 447,753
Estimated Cost Savings	$4,552	$2,724	$882 - $30,558

3.5.5 Prescriptive Incentive Participant Profile

Table 3-18 displays the savings and incentives associated with the paid incentive measures during the 2013 program year. The largest share of expected savings is attributable to LED case lighting. During program year four, 135 LED case lighting projects were completed for an expected savings of 1,927,065.

Table 3-18 Number of Projects and Expected Savings for Prescriptive Measures

Prescriptive Measure	*Number of Projects*	*Average Expected kWh Savings*	*Average Incentives Paid*	*Total Expected kWh Savings*	*Total Incentives Paid*
LED Case Lighting	135	14,275	$634	1,927,065	$85,624
Anti-Sweat Heater Controls	33	10,985	$501	362,508	$16,542
Motion Sensors on LED Cases	4	7,671	$325	30,682	$1,301
Auto Door Closers	2	1,735	$78	3,469	$155
Refrigeration Case Door Retrofits	22	21,554	$971	474,192	$21,360
Floating Head Pressure Controls	2	257,600	$11,396	515,200	$22,792
Floating Suction Pressure Controls	1	262,000	$12,000	262,000	$12,000
Evaporator Fan Controls	1	127,092	$5,607	127,092	$5,607
LED Exterior Lighting	3	26,143	$1,178	78,430	$3,534
Total	203	3,591	$18,624	3,780,638	$168,915

Figure 3-2 displays the ex post savings associated with prescriptive incentive project start dates. Although there was some monthly variability in the program activity, the realized savings increased throughout the year.

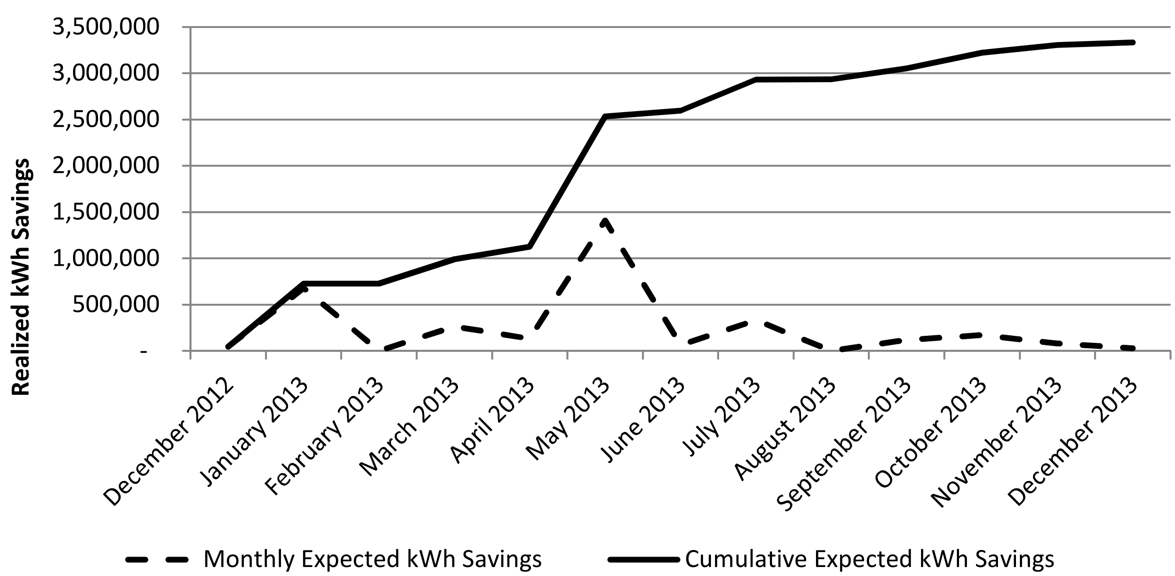


Figure 3-2 Monthly and Cumulative Ex Post Prescriptive Incentive Savings

3.5.6 Audit Recipients Participation in Incentive Programs

Table 3-19 compares expected kWh savings associated with audit recommendations and incentive projects completed through the prescriptive incentives component to assess the role that audits may play in encouraging customers to complete prescriptive incentives projects. It should be noted that the ex post savings presented in the table only include incentive projects with start dates after the date the audit was performed. As shown, none of the 2012 audit participants implemented 2013 incentive projects, however, a few of the 2013 audit participants completed incentive projects through the prescriptive refrigeration incentive component. The realized incentive projects savings associated with audits accounted for 1% of the exterior LED savings identified in the audits and 7% of the refrigeration equipment savings identified in the audits. However, some audit participants completed incentive projects before the date the audit occurred. These participants completed projects associated with 3% of the recommended savings associated with LED retrofits and 1% of the savings associated with recommended refrigeration equipment. Consequently, the total incentive project savings associated with audit participants exceeded the amounts shown in Table 3-19.

None of the 2012 or 2013 audit participants completed C&I Incentive projects during 2013.

Table 3-19 Audit Recipient Participation in Prescriptive Incentives Component

Incentive Type	*2012 Audit Participants*		*2013 Audit Participants*	
	Audit Recommended kWh	*2013 Prescriptive Incentives Expected kWh*	*Audit Recommended kWh*	*2013 Prescriptive Incentives Expected kWh*
LED retrofits	-	-	1,369,534	17,710
Refrigeration Equipment	2,143,338	-	3,542,795	252,686

3.5.7 C&I Audit Program Customer Outcomes – Audit Component

A telephone survey was conducted to collect data about customer decision-making, preferences, and opinions of the C&I Audit Program. Repeated efforts were made to complete telephone surveys with all decision makers. In total, twelve customers who received an audit through the program responded to the survey. These customers represented 34% of the program estimated savings associated with the recommendations for the 2013 year.

3.5.7.1. How Customers Learn About the Program

Table 3-20 describes how customers first learned about the C&I Audit Program. The two most frequently mentioned sources were C&I Audit Program representatives and I&M customer service representatives, each mentioned by 42% of respondents. Additionally, two customers heard about the program from another source, one of whom elaborated that they heard of the program from their corporate office.

Table 3-20 How Customers Learned About the Program

	Response	*Percent of Respondents (n=12)*
How did you learn of the C&I Audit Program?	Approached directly by representative of the C&I Audit Program	42%
	An I&M customer service representative mentioned it	42%
	Friends or colleagues	8%
	Received an information brochure on the C&I Audit Program	-
	Received information from a Lockheed Martin staff member	-
	I&M website	-
	An architect, engineer or energy consultant	-
	An equipment vendor or building contractor	-
	A utility bill insert	-
	An email from I&M	-
	Other	17%

At this stage of the program development, the program remains highly dependent on promotion by program staff. As the program becomes more established, other sources of information such as word of mouth communications may have a greater importance for program awareness.

3.5.7.2. Energy Efficiency Attitudes, Behaviors, and Decision Making

Surveyed participants were asked about the policies and procedures their organizations have in place regarding energy efficiency improvements at their facilities. Their responses are shown in Table 3-21. One-quarter of survey respondents reported that they did not have any policies regarding energy efficiency. Among the remaining respondents, corporate policies that incorporate energy efficiency in operations and procurement were the most commonly mentioned, followed by active training of staff. Energy management plans, numeric goals for energy savings, and numeric goals for energy cost reductions.

Table 3-21 Energy Efficiency Policies and Procedures

	Response	*Percent of Respondents (n=12)*
Which of the following policies or procedures, if any, does your organization have in place regarding energy efficiency?	Corporate policies that incorporate energy efficiency in operations and procurement	50%
	Active training of staff.	42%
	An energy management plan	33%
	A numeric goal for energy savings	33%
	A numeric goal for energy cost reduction	25%
	None	25%
	Other	-

Two-thirds of participants reported that one or two key people made decisions regarding energy efficiency improvements, while 25% of respondents stated that they base these decisions on recommendations made by staff to a decision maker, and one respondent stated that a group or committee made them. The large share of respondents who noted that one or two key people likely make energy efficiency decisions reflects this program's focus on local businesses. It is likely that these key people are the owners of the establishments.

Survey respondents were asked about the financial methods they may use to evaluate energy efficiency improvements. The most common response was simple pay back, mentioned by 82% of respondents. Four of the customers, who evaluated energy efficiency improvements by simple pay back, provided an estimated payback period that they are looking for from an energy efficiency project. Three of the four stated that they are looking for a payback period of around 5 years or less, while the remaining participant indicated that they were looking for a very short payback of six months.

The initial cost of the project and the internal rate of return were also popular responses. Each of these methods is used by 55% of the survey respondents.

Table 3-22 Financial Methods Used to Evaluate Efficiency Improvements

	Response	*Percent of Respondents (n=11)*
Which financial methods, if any, does your organization typically use to evaluate energy efficiency improvements for [LOCATION]?	Simple payback (provide numeric payback time if possible)	82%
	Initial Cost	55%
	Internal rate of return (provide numeric rate of return if possible)	55%
	Life cycle cost	27%
	None of these	18%

3.5.7.3. Where Decision Makers Get Their Information

Customers reported that they rely on a variety of sources for information about energy efficient equipment materials and design features. These responses are shown below in Table 3-23. I&M account representatives were most frequently mentioned followed by the I&M website. Other sources mentioned included I&M Energy Specialists, trade associations and business groups, journals and magazines, friends and colleagues, and building and trade professionals.

Two respondents indicated other sources of information, one of whom wrote in the name of a firm that specializes in energy conservation and another indicated that they review their energy consumption monthly.

Table 3-23 Sources for Information on Saving Energy

	Response	*Percent of Respondents (n=11)*
What sources, if any, does your organization rely on for information about ways to save energy?	An I&M Account Representative	45%
	The I&M website	18%
	An I&M Energy Specialist	9%
	Trade associations or business groups you belong to	9%
	Trade journals or magazines	9%
	Friends and colleagues	9%
	An architect, engineer or energy consultant	9%
	Equipment vendors or building contractors	9%
	Brochures or advertisements	-
	Other	18%

3.5.7.4. The Application Process

Survey respondents indicated whether they worked on completing the application for the program. Fifty-eight percent, or seven, of the survey respondents indicated that they had worked on the application. These customers answered a series of follow-up questions on their views of the application process.

Table 3-24 displays respondents' views of the clarity of information on how to complete the application. None of the customers reported that the information was unclear and most reported that it was either mostly or completely clear.

Table 3-24 Customer Views on the Clarity of Application Instructions

	Response	*Percent of Respondents (n=7)*
Thinking back to the application process, please rate the clarity of information on how to complete the application. Would you say…	Not at all clear	-
	Somewhat clear	-
	Mostly clear	57%
	Completely clear	14%
	Don't know	29%

Table 3-25 displays responses about the application process. Most customers reported that the ease of finding how to apply for the audit program on I&M's website and the ease of using the application forms were completely acceptable. Customers' views of the time it took to have the application approved were slightly less favorable because one customer reported that the amount of time was unacceptable. However, all customers rated the overall application process as somewhat or completely acceptable.

Table 3-25 Customer Views of the Application Process

	Completely unacceptable	*Somewhat unacceptable*	*Somewhat acceptable*	*Completely acceptable*	*Don't know*
Ease of finding how to apply for the audit program on I&M's website (n=7)	-	-	14%	71%	14%
Ease of using the application forms (n=7)	-	-	14%	71%	14%
Time it took to have the application approved (n=7)	14%	-	14%	57%	14%
Overall application process (n=7)	-	-	43%	57%	-

All of the survey respondents indicated that they knew whom to contact, to get assistance with the application process.

3.5.7.1. The Audit Process and Audit Report

Surveyed Audit Component participants answered several questions about their perceptions of the audit process and the recommendations made in it. Their responses are discussed below.

Customers commented on whether they agreed that the auditor was courteous, efficient, and minimized disruption to their businesses. The responses they provided are displayed in Table 3-26. None of the respondents indicated that the auditor was discourteous, inefficient, or overly disruptive to their business. These responses suggest that the audits are being performed in a professional and efficient manner.

Table 3-26 Views of the Onsite Audit

	Completely disagree	*Somewhat disagree*	*Neither disagree nor agree*	*Somewhat agree*	*Completely agree*	*Don't know*
The auditor was courteous. (n=12)	-	-	-	25%	75%	-
The auditor was efficient. (n=12)	-	-	8%	42%	50%	-
The auditor minimized disruption to our business. (n=12)	-	-	8%	25%	67%	-

All but one of the respondents reported that they had reviewed the audit report; the remaining respondent was not sure whether he or she had reviewed it. The 11 respondents who had reviewed the report further specified their assessments of the information provided. As shown in Table 3-27, the largest share of respondents, 45%, thought that the audit report was easy to understand followed by 36% who thought it was somewhat easy to understand. One respondent indicated that the report was somewhat difficult to understand. However, this respondent did not have any suggestions for how to make the report easier to understand.

Table 3-27 Ease of Understanding Audit Report

	Response	*Percent of Respondents (n=11)*
How easy or difficult was the audit report to understand? Would you say…	Very easy to understand	45%
	Somewhat easy to understand	36%
	Somewhat difficult to understand	18%
	Very difficult to understand	-
	Don't know	-

As shown in Table 3-28, all of the survey respondents reported that the audit report provided sufficient information to make decisions about whether or not to implement the recommendations.

Table 3-28 Sufficiency of Information for Decision Making

	Response	*Percent of Respondents (n=11)*
Did the audit report present sufficient information for you to make a decision about whether or not to implement the recommendations? Would you say...	Yes	100%
	For the most part	-
	No	-
	Don't know	-

Fifty-five percent of survey respondents indicated that the information on how to apply for financial incentives for projects was very clear and another 18% reported that it was somewhat clear. More than a quarter of respondents indicated that they did not know, suggesting that perhaps they had not considered completing any incentive project.

Table 3-29 Clarity of Information on Incentives

	Response	*Percent of Respondents (n=11)*
After reviewing the report, was it clear to you how to apply for financial incentives for the recommended energy saving improvements? Would you say…	Very clear	55%
	Somewhat clear	18%
	Somewhat unclear	-
	Very unclear	-
	Don't know	27%

3.5.7.2. Customer Satisfaction with the Program

Participants in the Audit Component of the program reported that they were generally satisfied with the program. Participants were most satisfied with the professionalism of the person performing the audit. However, three customers noted dissatisfaction with one or more elements of the program. The reasons for dissatisfaction reported varied; customers were dissatisfied because the recommendations did not seem relevant, a customer started a project but later was told they would not get an incentive, and that the recommendations did not amount to significant savings.

Table 3-30 Customer Satisfaction with the Audit Program

Element of Program Experience	*Very dissatisfied*	*Dissatisfied*	*Neither satisfied nor dissatisfied*	*Satisfied*	*Very satisfied*
Professionalism of the person performing the audit. (n=12)	-	-	-	8%	92%
The report recommendations. (n=12)	-	-	42%	17%	42%
The usefulness of the audit report. (n=12)	8%	17%	-	33%	25%
The effort required for the application process. (n=12)	8%	-	25%	42%	25%
Information provided by an I&M Account representative. (n=12)	-	8%	33%	25%	33%
Savings on your monthly bill. (n=11)	9%	-	82%	9%	-
Overall program experience. (n=11)	9%	-	9%	36%	45%

Survey respondents were also asked to make any additional comments that they might have about I&M's programs. These comments are summarized below:

- Two customers suggested that the program should be expanded to include other businesses.
- Two customers expressed appreciation for the audit.
- One customer indicated that even with incentives, they could not afford to implement the recommendations.

- One customer suggested adding more LED incentives.
- One customer was dissatisfied with the program.

3.5.7.3. Summary of Participant Survey

Customers were generally satisfied with the C&I Audit program. Overall, few customers reported issues with the application process or the audit process.

3.5.8 C&I Audit Program Customer Outcomes – Prescriptive Refrigeration Incentives Component

A telephone survey was conducted to collect data about customer decision-making, preferences, and opinions of the C&I Audit Program. Despite efforts to survey all of the participating customers, in total, four customers who received an audit through the program responded to the survey. An additional two customers who received an audit were interviewed using the survey developed for that program component. Their responses are included in the previous discussion. In total, the surveyed customers represented 55% of the program expected savings for the 2013 year.

3.5.8.1. How Customers Learn About the Program

Table 3-31 describes how customers learned about the program. The most frequently mentioned source of awareness of the program was from I&M customer service representatives. Other respondents also mentioned the website and an architect, engineer, or energy consultant.

Table 3-31 How Customers Learned About the Program

	Response	*Percent of Respondents (n=4)*
How did you learn of the Prescriptive Refrigeration Incentives Program?	An I&M customer service representative mentioned it	50%
	I&M website	25%
	An architect, engineer or energy consultant	25%
	Approached directly by representative of the program	-
	Received an information brochure on the program	-
	Friends or colleagues	-
	An equipment vendor or building contractor	-
	A utility bill insert	-
	An email from I&M	-
	Other	25%

3.5.8.2. Energy Efficiency Attitudes, Behaviors, and Decision Making

Surveyed participants specified the policies and procedures their organizations have in place regarding energy efficiency improvements at their facilities. Their responses are shown in Table

3-32. All of the respondents indicated that they had policies or procedures in place regarding energy efficiency. The most commonly mentioned policy or procedure was an energy management plan, which all of the survey respondents indicated they had in place. Additionally, three of the four respondents indicated that they had corporate policies in place that incorporate energy efficiency into purchases and operations. Seventy-five percent of respondents also indicated that they had a numeric goal for energy savings and a goal for energy cost reduction.

Table 3-32 Energy Efficiency Policies and Procedures

	Response	*Percent of Respondents (n=4)*
Which of the following policies or procedures, if any, does your organization have in place regarding energy efficiency?	An energy management plan	100%
	Corporate policies that incorporate energy efficiency in operations and procurement	75%
	A numeric goal for energy savings	75%
	A numeric goal for energy cost reduction	50%
	Active training of staff on saving energy	-
	Other	-
	None	-

One-half of the survey respondents stated that staff recommendations to a decision-maker led to energy efficiency decisions while the other half stated that a group or committee made decisions regarding energy efficiency.

Survey respondents described the financial methods they may use to evaluate energy efficiency improvements. All respondents indicated that they use one or more financial methods. The most common responses were simple pay back and internal rate of return, each mentioned by 75% of the respondents. One of these respondents indicated that they look for a three-year payback while another indicated that it depends on the size of the project. One-half of the respondents also mentioned the initial cost of the project and the life cycle cost.

Table 3-33 Financial Methods Used to Evaluate Efficiency Improvements

	Response	*Percent of Respondents (n=4)*
Which financial methods, if any, does your organization typically use to evaluate energy efficiency improvements for [LOCATION]?	Simple payback (provide numeric payback time if possible)	75%
	Internal rate of return (provide numeric rate of return if possible)	75%
	Initial Cost	50%
	Life cycle cost	50%
	None of these	-

3.5.8.3. Where Decision Makers Get Their Information

Customers reported that they rely on a variety of sources for information about energy efficient equipment materials and design features. These responses are shown below in Table 3-34. Half of the respondents rely on I&M account representatives and another half rely on vendors and contractors for energy saving information. One respondent relies on a national committee for information on energy savings.

Table 3-34 Sources for Information on Saving Energy

	Response	*Percent of Respondents (n=4)*
What sources, if any, does your organization rely on for information about ways to save energy?	An I&M Account Representative	50%
	Equipment vendors or building contractors	50%
	An I&M Energy Specialist	-
	The I&M website	-
	Brochures or advertisements	-
	Trade associations or business groups you belong to	-
	Trade journals or magazines	-
	Friends and colleagues	-
	An architect, engineer or energy consultant	-
	Other	25%

3.5.8.4. The Application Process

Survey respondents specified whether they worked on completing the program application. Seventy-five percent, or three of the survey respondents, indicated that they had worked on the application. These customers answered a series of follow-up questions on their views of the application process.

Customers' views of the clarity of information on how to complete the application are below in Table 3-35. None of the customers reported that the information was unclear. Two of three respondents stated that it was mostly clear and one stated that it was somewhat clear.

Table 3-35 Customer Views on the Clarity of Application Instructions

	Response	*Percent of Respondents (n=3)*
Thinking back to the application process, please rate the clarity of information on how to complete the application. Would you say…	Not at all clear	-
	Somewhat clear	33%
	Mostly clear	67%
	Completely clear	-
	Don't know	-

Table 3-36 displays responses to questions about the application process. At least one survey respondent reported that the each aspect of the process was somewhat unacceptable.

Table 3-36 Customer Views of the Application Process

Element of Application Process	*Completely unacceptable*	*Somewhat unacceptable*	*Somewhat acceptable*	*Completely acceptable*	*Don't know*
Ease of finding how to apply for the program on I&M's website (n=3)	-	33%	33%	33%	-
Ease of using the application forms (n=3)	-	33%	-	67%	-
Time it took to have the application approved (n=3)	-	33%	-	67%	-
Overall application process (n=3)	-	33%	33%	33%	-

All of the survey respondents indicated that they knew whom to contact, to get assistance with the application process.

3.5.8.5. Customer Satisfaction with the Program

Participants in the Prescriptive Refrigeration Component of the Program were generally satisfied with the program. Most respondents indicated that they were very satisfied with each element of the program, except for the time it took to receive the incentive and the savings on their monthly bill. These are typically the area of least satisfaction for participants. Customers generally place a high priority on receiving the incentive quickly and energy savings may be difficult for customers to notice on their monthly bill. Not all customers closely track their monthly spending and changes unrelated to the efficient equipment can cause month-to-month variation that obscures the energy savings resulting from the project. None of the customers indicated dissatisfaction with any element of the program or the program overall.

Table 3-37 Customer Satisfaction with the Audit Program

Element of Program Experience	*Very dissatisfied*	*Dissatisfied*	*Neither satisfied nor dissatisfied*	*Satisfied*	*Very satisfied*
The effort required for the application process (n=4)	-	-	-	-	100%
Information provided by an I&M Account Representative (n=4)	-	-	-	25%	75%
Performance of the equipment installed (n=4)	-	-	-	-	100%
The elapsed time to receive the incentive (n=4)	-	-	25%	25%	50%
The savings on your monthly bill (n=4)	-	-	75%	-	25%
The incentive amount (n=4)	-	-	-	25%	75%
The quality of work performed by your contractor (n=4)	-	-	-	25%	75%

Survey respondents were also asked to make any additional comments that they might have about I&M's programs. Only one survey respondent replied. This customer indicated that he or she was grateful for the program.

3.5.8.6. Summary of Participant Survey

Customers were generally satisfied with the C&I Audit program. Overall, few customers reported issues with the application process or the audit process.

3.5.9 Program Operations Perspective

This section summarizes the core findings of interviews conducted with program staff of I&M and Lockheed Martin for the purposes of developing market environment and internal program management perspectives.

To gain insight into the C&I Audit Program's operation and delivery, interviews were conducted with key members of the utility and implementer program staff. These interviews focused on program operations, the overall effectiveness of the program process, and the identification of areas for future program improvement.

Respondents shared their perspectives on program development and on how the launch has proceeded. Interview questions related to the respondents' individual roles in administering the programs as well as their perceptions of overall program strengths, weaknesses, and opportunities for the future.

3.5.9.1. Summary of Interview Findings

Key trends and issues addressed by respondents include:

- **New Measures Offered During Program Year:** Prescriptive incentives were offered during the program year for two new measure types, exterior LED retrofits and LED lighting within a refrigerated space. The goal of these measures was to generate additional savings through the program. Although the program can provide incentives for refrigerated case lighting at a variety of facility types, the incentives for exterior LED lighting can only be completed at restaurants, groceries, and convenience stores. Customers seeking incentives for exterior LED lighting at other types of facilities should complete the project through the custom incentives program.

- **Expansion of Facility Types:** The types of facilities that qualify for the audit program expanded during the year. The program now provides audits to convenience stores, which are reportedly commonplace in the service territory. Additionally, the program allowed audits in cafeterias and kitchen areas of other facility types such as hospitals, schools, and museums. However, these facility types cannot receive incentives for exterior LED lighting.

- **Different Strategies Taken to Promote Audits and Prescriptive Incentives:** The restaurants, groceries, and convenience stores targeted for audits tend to be local stores, local chains, or locally franchised chain locations. Because of the local ownership of these facilities, the program is generally marketed to local decision makers. In contrast, the prescriptive incentives are generally marketed to chains stores and the incentives are promoted with corporate decision makers.

- **No Formal Process for Sharing Audit Reports with Program Implementers:** I&M programs are implemented with multiple program implantation firms. Currently, there is not a developed process for sharing audit reports with other program implementers. Although Lockheed-Martin reportedly follows-up with participants to encourage them to implement the recommendations for the prescriptive incentives covered by the program, there may not be similar follow-up efforts for recommendations that would receive incentives through another program. Consequently, the program may not be realizing its full potential for generating incentive projects. However, utility and implementation staff both noted that implementers work together to share information about participants interested in savings projects that may fall under one of the other programs.

4. Commercial and Industrial Retro-Commissioning Lite Program

This chapter addresses the methodologies and impact findings of gross and net kWh savings and peak kW reductions resulting from measures installed through Indiana Michigan Power's (I&M) Retro-Commissioning Lite (RCxL) Program during the period January 2013 through December 2013. Appendix K contains specific methodologies for estimating gross savings and savings estimation results for each project.

4.1 Methodology for Estimating Gross Savings

The methodology used for estimating gross savings is described in this section.

4.1.1 Sampling Plan

Data used to estimate the gross savings achieved through the C&I RCxL Program were collected for samples of projects completed during the period January 2013 through December 2013. Data provided by the implementation contractor showed that during the period January 2013 through December 2013, there were 30 projects completed, which were expected to provide savings of 18,571,762 kWh annually.

Inspection of data on kWh savings for individual projects provided by the program implementer indicated that the distribution of savings was generally positively skewed, with a relatively small number of projects accounting for a high percentage of the estimated savings. Estimation of savings is based on a ratio estimation procedure, which allows precision/confidence requirements to be met with a smaller sample size. ADM selected a sample with a sufficient number of projects to estimate the total achieved savings with 10% precision at 90% confidence. For the sample, the actual precision is ±9.6%.

Sampling for the collection of program M&V data accounted for the M&V effort occurring in real time during program implementation. Completed projects accumulate over time as the program is implemented, and sample selection was thus spread over the entire program year. ADM used a near real-time process whereby a portion of the sample was selected periodically as projects in the program were completed. The timing of sample selection was contingent upon the timing of the completion of projects during the program year.

Table 2-1 shows the strata boundaries, total ex post energy savings, contribution to variance, and the number of sample sites for the sample for each stratum.

Table 4-1. Population Statistics Used for RCxL Sample Design

	Stratum 1	*Stratum 2*	*Stratum 3*	*Stratum 4*	*Totals*
Strata boundaries (kWh)	<300,000	300,000–899,999	900,000–1,999,999	>2,000,000	
Number of projects	16	6	6	2	30
Total kWh savings	2,200,522	3,574,236	7,612,072	5,184,932	18,571,762
Average kWh Savings	137,533	595,706	1,268,679	2,592,466	619,059
Std. dev. of kWh savings	92,519	184,457	250,933	343,791	713,549
Coefficient of variation	0.67	0.31	0.20	0.13	1.15
Final design sample	3	3	3	2	11

The sampled projects account for approximately 59% of total expected kWh savings. Total and sample ex ante savings are summarized by stratum in Table 4-2.

Table 4-2. Expected Savings Sampled Projects by Stratum

Stratum	*Sample Ex Ante Savings*	*Total Ex Ante Savings*
4	5,184,932	5,184,932
3	3,560,382	7,612,072
2	1,881,103	3,574,236
1	423,352	2,200,522
Total	11,049,769	18,571,762

4.1.2 Review of Documentation

I&M’s program implementation contractor provided documentation for the sampled energy efficiency projects undertaken at customer facilities. The first step in the evaluation effort was to review this documentation and other program materials that were relevant to the evaluation effort.

For each sampled project, the available documentation (e.g., audit reports, savings calculation work papers, etc.) for each rebated measure was reviewed, with particular attention given to the calculation procedures and documentation for savings estimates. Documentation that was reviewed for all sampled projects included program forms, reports, billing system data, weather data, and any other potentially useful data. Each application was reviewed to determine whether the following types of information had been provided:

- Documentation for the equipment changed, including (1) descriptions, (2) schematics, (3) performance data, and (4) other supporting information
- Documentation for the new equipment installed, including (1) descriptions, (2) schematics, (3) performance data, and (4) other supporting information

- Information about the savings calculation methodology, including (1) what methodology was used, (2) specifications of assumptions and sources for these specifications, and (3) correctness of calculations.

4.1.3 On-Site Data Collection Procedures

On-site visits were used to collect data that were used in calculating savings impacts. The visits to the sites of each sampled project were used to collect primary data on the facilities participating in the program. I&M Energy Efficiency staff were notified prior to ADM initiating customer contact.

During an on-site visit, the engineering staff accomplished three major tasks:

- First, they verified the implementation status of all measures for which customers received incentives. They verified that the energy efficiency measures were indeed installed, that they were installed correctly and that they still functioned properly.
- Second, they collected the physical data, when necessary, needed to analyze the energy savings that have been realized from the installed improvements and measures. Data were collected using a form that was prepared specifically for the project in question after an in-house review of the project file.
- Third, they interviewed the contact personnel at a facility to obtain additional information on the installed system to complement the data collected from other sources.

4.1.4 Procedures for Estimating Savings from Measures Installed through C&I Incentives Program

This section presents the M&V methodologies employed to calculate savings for the sampled projects. The method ADM employed to determine gross savings impacts depends on the types of measures being analyzed. Categories of measures include the following:

- Compressed Air
- Process Improvements

ADM uses a specific set of methods to determine gross savings for projects that depend on the type of measure being analyzed. These typical methods are summarized in Table 4-3. Project-specific information on savings calculation is contained in Appendix A, which describes analytical strategies for projects for which the following strategies are not appropriate.

Table 4-3. Typical Methods to Determine Savings

Type of Measure	*Method to Determine Savings*
Compressed Air	Engineering analysis with monitored data on load factor and schedule of operation
Process Improvements	Engineering analysis with monitored data on load factor and schedule of operation

The activities specified in Table 2-3 produced two estimates of gross savings for each project: an expected gross savings estimate and a verified gross savings estimate. The savings realization rate for a project is calculated as the ratio of the verified, or ex post, savings for the project (as measured and verified through the M&V effort) to the expected, or ex ante, savings (as determined through the project application procedure and recorded in the tracking system for the program).

Energy savings realization rates were calculated for each project for which on-site data collection and engineering analysis/building simulations were conducted. Sites with relatively high or low realization rates were further analyzed to determine the reasons for the discrepancy between ex ante and ex post energy savings. The following discussion describes the basic procedures used for estimating savings from lighting measures. Project-specific information regarding savings calculations are contained in Appendix A.

Plan for Analyzing Savings from Compressed Air Measures: Measures to improve the efficiency of a compressed air system include the reduction of air leaks, resizing of compressors, installing more efficient compressors, improved controls, or a complete system redesign. Savings from such measures are evaluated through engineering analysis of compressor performance curves, supported by data collected through short-term metering.

ADM field staff obtain nameplate information for the pre-retrofit equipment either from the project file or during the on-site survey. Performance curve data is obtained from the Compressed Air Gas Institute (CAGI). Engineering staff then conduct an engineering analysis of the performance characteristics of the pre-retrofit equipment. During the on-site survey, field staff inspect the as-built system equipment, take pressure and load readings, and interview the system operator to identify seasonal variations in load. Potential interactions with other compressors are assessed and it is verified that the rebated compressor is being operated as intended.

When appropriate, short-term measurements are performed to reduce the uncertainty in defining the load on the as-built system. These measurements may be taken either with a multi-channel logger, which can record true power for several compressors, with current loggers, which can provide average amperage values, or with motor loggers to record operating hours. The appropriate metering equipment is selected by taking into account variability in load and the cost of conducting the monitoring.

ADM used engineering calculations to calculate the annual energy savings due to the compressed air measures. This is facilitated through the use of CAGI efficiency curves allowing for the calculation of the CFM output of a given compressor based on monitoring data. Using the assumption that the CFM demand of the facility will remain the same for the baseline and as-built compressors, CAGI curves can then be used to determine the kW demand of the preexisting compressor. This data is then extrapolated to entire year and normalized to production data when appropriate. Project energy savings were calculated by subtracting the as-built from the baseline energy consumption

Plan for Analyzing Savings from Process Improvements: Analysis of savings from refrigeration and process improvements is inherently project-specific. Where appropriate, DEER eQuest refrigeration models were utilized to develop savings estimates.

Major factors in ADM's engineering analysis of process savings are operating schedules and load factors. Information on these factors is developed through short-term monitoring of the affected equipment (pumps, heaters, compressors, etc). The monitoring is completed after the process change. The data collected on operating hours and load factors are used in the engineering analysis to define "before" conditions for the analysis of savings.

4.2 Results of Gross Savings Estimation

To estimate gross kWh savings and peak kW reductions for the program, data were collected and analyzed for a sample of 24 projects completed during the program year. The results of the analysis are reported in this section.

4.2.1 Gross kWh Savings

The gross kWh savings of the C&I Incentives Program during the period January 2013 through December 2013 are summarized in Table 4-4. The achieved gross savings of 16,290,413 kWh are equal to 88% of the ex ante savings.

Table 4-4. Gross kWh Savings for RCxL Program

Ex Ante Gross kWh Savings	*Gross Audited kWh Savings*	*Gross Verified kWh Savings*	*Ex Post Gross kWh Savings*	*Gross Realization Rate*
18,571,762	18,571,762	18,571,762	16,290,413	88%

Gross kWh savings are summarized by sampling stratum in Table 4-5. For PY4, audited savings were equal to ex ante savings. Ex ante, verified and ex post kWh savings are shown in Table 4-6 for each project sampled in PY4.

Table 4-5. Gross kWh Savings by Sample Stratum

Stratum	*Ex Ante kWh Savings*	*Verified kWh Savings*	*Ex Post kWh Savings*	*Gross Realization Rate*
4	5,184,932	5,184,932	4,775,633	92%
3	7,612,072	7,612,072	7,865,862	103%
2	3,574,236	3,574,236	2,759,096	77%
1	2,200,522	2,200,522	889,821	40%
Total	18,571,762	18,571,762	16,290,413	88%

Table 4-6. Gross kWh Savings for C&I RCxL Program by Sampled Project

Project ID	*Ex Ante kWh Savings*	*Verified kWh Savings*	*Ex Post kWh Savings*	*Project Gross Realization Rate*
AEPIM-13-000064-R	2,835,563	2,835,563	2,383,166	84%
AEPIM-13-000073-R	966,960	966,960	841,401	87%
AEPIM-13-000075-R	1,107,074	1,107,074	750,444	68%
AEPIM-13-000077-R	73,943	73,943	82,159	111%
AEPIM-13-000122-R	853,717	853,717	656,887	77%
AEPIM-13-000177-R	455,358	455,358	182,595	40%
AEPIM-13-000179-R	572,028	572,028	612,617	107%
AEPIM-13-000227-R	1,486,348	1,486,348	2,087,242	140%
AEPIM-13-000235-R	49,979	49,979	4,731	9%
AEPIM-13-000339-R	299,430	299,430	84,300	28%
AEPIM-13-000409-R	2,349,369	2,349,369	2,392,467	102%
All Non-Sample Projects	7,521,993	7,521,993	6,212,404	83%
Total	18,571,762	18,571,762	16,290,413	88%

4.2.2 Gross Peak kW Savings

The gross peak kW reductions of the C&I Incentives Program during the period January 2013 through December 2013 are 1,662 kW.

4.3 Methodology for Estimating Net Savings

To estimate net impacts for the program, data were collected and analyzed for all four customer decision makers who completed projects over the current program year. The results of the analysis are reported in this section. Appendix L contains the survey used to collect data for the C&I Incentives Program.

4.3.1 Procedures Used to Estimate Net Savings

The net savings analysis determines the portion of gross energy impacts achieved by program participants that are attributable to the effects of the program. The savings induced by the program are the "net" savings that are attributable to the program. The savings attributable to the program are the savings "net" of the total gross savings associated with the project.

Net savings may be less than gross savings because of free ridership impacts, which arise to the extent that participants in a program would have adopted energy efficiency measures and achieved the observed energy changes even in the absence of the program. Free riders for a program are defined as those participants that would have installed the same energy efficiency measures without the program.

The goal of the net-to-gross analysis is to estimate the impacts of energy efficiency measures attributable to the program that are net of free ridership. That is, because the energy savings realized by free riders are not induced by the program, these savings should not be included in the estimates of the program's actual impacts. Without adjustment for free ridership, some savings that would have occurred naturally would be attributed to the program. The measurement of the net impact of the program requires estimation of the marginal effect of the program over and above the "naturally occurring" patterns for installation and use of energy efficient equipment.

Information collected from program participants through a customer survey was used for the net-to-gross analysis. Appendix L provides a copy of the survey instrument..

Based on review of this information, the preponderance of evidence regarding free ridership inclinations was used to attribute a customer’s savings to free ridership.

Several criteria were used for determining what portion of a customer’s savings for a particular project should be attributed to free ridership. The first criterion was based on the response to the question: “Would your organization have been financially able to retro-commission the facility at the [Location] without the assistance from the Retro-Commissioning Lite Program?” If a customer answered “No” to this question, a free ridership score of 0 was assigned to the project. That is, if a customer required financial assistance from the RCxL Program to undertake a project, then that customer was not deemed a free rider.

For decision makers that indicated that they were able to undertake energy efficiency projects without financial assistance from the program, three factors were analyzed to determine what percentage of savings may be attributed to free ridership. The three factors are:

- Plans and intentions of firm to install a measure even without support from the program
- Influence that the program had on the decision to install a measure
- A firm’s previous experience with a measure installed under the program

For each of these factors, rules were applied to develop binary variables indicating whether or not a participant’s behavior showed free ridership. These rules made use of answers to questions on the decision maker survey questionnaire. (A copy of the questionnaire is provided as Appendix L.)

The first factor required determining if a participant stated that his or her intention was to install an energy efficiency measure even without the program. The answers to a combination of several questions were used with a set of rules to determine whether a participant’s behavior indicates likely free ridership. Two binary variables were constructed to account for customer plans and intentions: one, based on a more restrictive set of criteria that may describe a high likelihood of free ridership, and a second, based on a less restrictive set of criteria that may describe a relatively lower likelihood of free ridership.

The first, more restrictive criteria indicating customer plans and intentions that likely signify free ridership are as follows:

- The respondent answered “yes” to the following two questions: “Did you have plans to complete the retro-commissioning project at the [Location] before participating in the Retro-Commissioning Lite Program?” and “Would you have gone ahead with this planned retro-commissioning even if you had not participated in the program?”
- The respondent answered “definitely would have” to the following question: “If the financial incentive provided by the Retro-Commissioning Lite Program had not been available, how likely is it that you would have had the [Location] retro-commissioned anyway?”
- The respondent answered “did not affect timing” to the following question: “Did you retro-commission the facility earlier than you otherwise would have without the program?”
- The respondent answered “no” in response to the following question: “Did you implement more energy efficiency improvements than you otherwise would have without the program?”

The second, less restrictive criteria indicating customer plans and intentions that likely signify free ridership are as follows:

- The respondent answered “yes” to the following two questions: “Did you have plans to install the measure before participating in the program?” and “Would you have gone ahead with this planned installation of the measure even if you had not participated in the C&I Incentives Program?”
- Either the respondent answered “definitely would have” or “probably would have” to the following question: “If the financial incentive provided by the Retro-Commissioning Lite Program had not been available, how likely is it that you would have had the [Location] retro-commissioned anyway?”
- Either the respondent answered “did not affect timing of purchase and installation” to the following question: “Did you retro-commission the facility earlier than you otherwise would have without the program?” or the respondent indicated that that while program information and financial incentives did affect the timing of equipment purchase and installation, in the absence of the program they would have purchased and installed the equipment within the next two years.
- The respondent answered “no” in response to the following question: “Did you implement more energy efficiency improvements than you otherwise would have without the program?”

The second factor required determining if a customer reported that a recommendation from a RCxL Program representative or past experience with the program was influential in the decision to install a particular piece of equipment or measure.

The criterion indicating that program influence may signify a lower likelihood of free ridership is that either of the following conditions is true:

- The respondent answered “very important” to the following question: “How important was previous experience with the Retro-Commissioning Lite Program in making your decision to retro-commission the facility?”
- The respondent answered “yes” to the following question: “Did a Retro-Commissioning Lite Program representative or other I&M representative recommend that you retro-commission the facility at the [Location] and “probably would not have” or “definitely would not have” to the question: “If the Retro-Commissioning Lite Program representative or other I&M representative had not recommended that you retro-commission the facility, how likely is it that you would have done it anyway?”

The third factor required determining if a participant in the program indicated that he or she had previously installed an energy efficiency measure similar to one that they installed under the program without an energy efficiency program incentive during the last three years. A participant indicating that he or she had installed a similar measure is considered to have a likelihood of free ridership.

The criteria indicating that previous experience may signify a higher likelihood of free ridership are as follows:

- The respondent answered “yes” to the following question: “Before participating in the Retro-Commissioning Lite Program, had you completed similar energy use optimization projects at the [Location]
- The respondent answered “yes, paid for energy efficiency improvements but did not apply for incentive.” to the following question: “Has your organization paid for any energy efficiency improvements in the last three years for which you did not apply for a financial incentive through an energy efficiency program?”

The four sets of rules just described were used to construct four different indicator variables that address free ridership behavior. For each customer, a free ridership value was assigned based on the combination of variables. With the four indicator variables, there were 11 applicable combinations for assigning free ridership scores for each respondent, depending on the combination of answers to the questions creating the indicator variables. Table 4-7 displays each possible combination along with corresponding free ridership values.

Table 4-7. Free Ridership Scores for Combinations of Indicator Variable Responses

Indicator Variables				*Free Ridership Score*
Had Plans and Intentions to Install Measure without RCxL Program? (Definition 1)	*Had Plans and Intentions to Install Measure without RCxL Program? (Definition 2)*	*RCxL Program had influence on Decision to Install Measure?*	*Had Previous Experience with Measure?*	
Y	N/A	Y	Y	100%
Y	N/A	N	N	100%
Y	N/A	N	Y	100%
Y	N/A	Y	N	67%
N	Y	N	Y	67%
N	N	N	Y	33%
N	Y	N	N	33%
N	Y	Y	Y	33%
N	Y	Y	N	0%
N	N	N	N	0%
N	N	Y	N	0%
N	N	Y	Y	0%

4.4 Results of Net Savings Estimation

The procedures described in the preceding section were used to estimate free ridership rates and net-to-gross ratios for the RCxL Program the period January 2013 through December 2013.

4.4.1 Ex Post Net kWh Savings

The data used to assign free ridership scores were collected through a customer survey of eleven customer decision makers for projects completed during the period January 2013 through December 2013.

As discussed in Section 4.3, the first criteria in determining what proportion of energy savings from a project should be assigned to free ridership was whether a participant was financially able to undertake the project without financial assistance from the RCxL Program. If a decision maker respondent answered “No” to the question of “Would your organization have been financially able to retro-commission the facility at the [Location] without the assistance from the Retro-Commissioning Lite Program?” a free ridership score of 0 was assigned to the project. That is, if a participant required financial assistance from the RCxL Program to undertake a project, then that participant was judged to not be a free rider.

Under this criterion, the other free ridership scoring criteria were applied only to projects for participants who answered “Yes” to the question: “Would your organization have been financially able to retro-commission the facility at the [Location] without the assistance from the Retro-Commissioning Lite Program?” However, respondents who answered “No” to this question would be judged to have zero free ridership even if the other free ridership criteria were applied, due to the nature of their specific survey responses.

Table 4-8 shows the percentage of survey respondents who relayed the following: They had plans and intentions to install the measures without any program incentive (under two alternative definitions as described in the preceding section), that the program influenced their decision to install the measure, or that they previously installed a similar energy efficiency measure without an energy efficiency program incentive during the last three years. Percentages reported are averages weighted by project gross realized (ex post) savings.

Table 4-8. Weighted Average Indicator Variable Values

Had Financial Ability	*Had Plans and Intentions to Install Measure without RCxL Program (Definition 1)*	*Had Plans and Intentions to Install Measure without RCxL Program (Definition 2)*	*RCxL Program had influence on Decision to Install Measure*	*Had Previous Experience with Measure*
45.9%	0.0%	0.0%	53.7%	9.1%

Table 4-9 shows percentages of total realized gross custom incentive energy savings that are associated with different combinations of free ridership indicator variable values. Fifty-four percent of the savings is associated with respondents who indicated that they were financially unable to implement the project in the absence of the program incentive. None of the customer decision makers met the criteria for having plans prior to participating.

Table 4-9. Estimated Free-ridership for kWh Savings from RCxL Program

Had Plans and Intentions to Install Measure without C&I Program? (Definition 1)	*Had Plans and Intentions to Install Measure without C&I Program? (Definition 2)*	*C&I Program had influence on Decision to Install Measure?*	*Had Previous Experience with Measure?*	*Percentage of Total Realized Gross kWh Savings*	*Free Ridership Score*
N	N	Y	N	29.6%	0.0%
N	N	N	Y	9.1%	33.3%
N	N	N	N	7.2%	0.0%
Required program incentive to implement measures.				54.1%	0.0%
Total				100.0%	3.0%

None of the participants indicated that they had implemented any additional measures that would count towards program spillover savings.

The realized, or ex post, energy savings of the RCxL Program during the period January 2013 through December 2013 are summarized in Table 4-10. During this period, ex post net energy savings for the program totaled 15,571,762 kWh. The net-to-gross ratio for the C&I RCxL Program is 97%.

Table 4-10 Summary of kWh Savings from RCxL Program

Ex Ante kWh Savings	*Ex Post Gross kWh Savings*	*Free Ridership*	*Spillover*	*Ex Post Net kWh Savings*	*Net to Gross Ratio*
18,571,762	16,290,413	490,146	0	15,800,267	97%

4.4.2 Ex Post Net Peak kW Savings

The ex post net peak kW reductions of the RCxL Program during the period January 2013 through December 2013 are summarized in Table 4-11. The achieved net peak demand savings for the program are 1,601 kW.

Table 4-11. Summary of Peak kW Savings from RCxL Program

Ex Post Gross Peak kW Savings	*Free Ridership*	*Spillovers*	*Ex Post Net Peak kW Savings*	*Net to Gross Ratio*
1,662	61	0	1,601	96%

4.5 Process Evaluation

The process evaluation of the RCxL Program focuses on the effectiveness of program policies and organization, as well as the program delivery framework. The purpose of the process evaluation is to assess the design and recent results of the program in order to determine how effectively it is achieving its intended outcomes. This evaluation is based upon analysis of program structure and interviews with Registered Service Providers, I&M energy efficiency staff, program implementation contractor staff, and program documentation.

The chapter begins with a discussion of the overall progress of the program. This is followed by an examination of certain issues that are critical to the future success of the program. This chapter also presents strategic planning and process recommendations, and highlights key findings from the interviews of participants, service providers, and program operations staff.

4.6 Evaluation Objectives

The purpose of the process evaluation is to examine program operations and results throughout the program operating year, and to identify potential program improvements that may prospectively increase program efficiency or effectiveness. This process evaluation was designed to document the operations and delivery of the RCxL Program during program year four (PY4).

Key research questions to be addressed by this evaluation of PY4 activity include:

> *Has the program implementation contractor made progress in developing the RCxL Program infrastructure?*
>
> *Is RCxL Program well designed to reduce barriers to increased energy efficiency project implementation?*

Has program staff or Registered Service Providers Identified any issues with program design or operations?

Are participants satisfied with the program and the participation process?

4.7 Summary of Primary Data Collection

- **Survey of RCxL Program Participants:** Surveys are conducted with program participants to better understand their experiences with the program and how those experiences impact their decision making process. The survey is also designed to elicit feedback about the level of satisfaction that participants have with various program components, such as program staff, the application process, trade allies, the measures installed, and the energy savings they notice on their monthly utility bills.

- **Interviews with I&M Staff:** Interviews with I&M staff provide insight into various aspects of the program and its organization. I&M staff members also provide information regarding recent organizational and procedural improvements that have been implemented in order to enhance program efficiency and effectiveness.

- **Interview with Lockheed Martin Staff:** Interviews with Lockheed Martin program implementation staff provide information regarding program progress and observations regarding service providers and customers. Lockheed Martin staff report on recent program changes and future plans to improve program operational efficiency.

- **Interviews with Registered Service Providers:** Interviews with registered service providers provide data with which the program is analyzed from the market perspective. The objective of the interviews is to gain insight into the process for becoming an Approved Service Provider and the level of customer interest in the program. Service providers report on their experiences with customers, program marketing strategies, and provide opinions of how the program could be improved.

4.8 Summary of Conclusions and Recommendations

The following key conclusions were developed to provide readers with an idea of the common themes that surfaced throughout the evaluation. The conclusions are followed by recommendation that were developed to improve the program delivery structure and increase the energy savings impacts.

- **Program Activity has Increased:** Twenty-eight retro-commissioning projects were completed in 2013 whereas no projects were completed in 2012. Research shows that the program has turned a corner in terms of generating awareness and interest. According to program staff the increased activity is due to not only the program maturing and projects in the pipeline from 2012 reaching completion, but also from increase efforts to further develop the service provider network. Staff feel that they are have reduced the service provider network to those that are most engaged and capable of producing good projects.

The bonus incentive offer was had a positive impact on program activity. The program offered a 10% bonus incentive to customers that completed retro-commissioning projects and a $1,000 bonus to service providers who completed a project by the end of the program year. During this time, the number of applications received more than doubled.

- **Few projects Account for Large Portion of Project Savings:** Twenty-eight projects were completed through the RCxL program during PY4. Of these projects, four accounted for more than one-half of program savings. Because a relatively small share of projects account for a large share of savings, gross and net program savings may fluctuate from year-to-year.
- **Service Providers and Equipment Vendors are Critical to Program Success:** Program research shows that the private sector companies responsible for performing retro-commissioning services are the primary driver behind program participation. Most of these are equipment vendors and contractors that have expanded their offerings to include retro-commissioning services that are in-line with the program incentive tracks. Staff stressed the value of their role and explained the efforts that have gone into further developing and strengthening the network of Registered Service Providers (RSPs). Customers also indicated that they primarily rely on equipment vendors for not only information on energy efficiency strategies, but also on utility incentive programs.
- **Service Providers More Satisfied with Application Requirements than Participants:** Surveyed participants found the administrative requirements more burdensome than service providers did. While customers were mostly satisfied with the program overall, they were less satisfied with the application and documentation requirements. Service providers were generally more satisfied with the application and data collection requirements than customers. Additionally, most service providers considered the training events to be valuable and a good way to learn about program happenings and network with existing and potential clients.
- **The Program is Supporting Business Growth in I&M's Service Territory:** The majority of program activity is occurring through service providers with an existing client base in the Indiana service territory. However, the program has encouraged contractors without an established customer base in the territory to enter the regional market. In general, the program seems to be creating opportunities for retro-commissioning service providers to grow their businesses.

  However, there are geographic areas where few qualified services providers exist. The program implementation contractor noted that there are few service providers in some regions of the state and that this may be limiting program activity. Steps are being taken to recruit additional service providers in these areas.

- **The RCxL Program Fell Short of the 2013 Energy Savings Goal:** Interviews with implementation staff indicated that there are two primary reasons the program did not meet its 2013 goal; challenging savings targets and strict program requirements that significantly reduced the number of eligible projects. Unlike a traditional retro-commissioning program, the RCxL Program only funds certain approved measures. The list of approved measures is intended to prevent the program from targeting savings for projects that qualify for another incentive program. However, the measures eligible for funding through the RCxL Program was expanded during the program year.

- **Communication is Sufficient in Some Program Areas, but Not All:** Service providers are in regular communication with program staff and are generally very satisfied with the support they receive. The most common reasons for these communications were qualifying projects and measures, calculating energy savings, and sales leads. The level of communication among utility and implementation staff is sufficient from an oversight and program management perspective, however, better support from customer service representatives for access and information needs for projects may be needed. The implementation contractor, Lockheed Martin, stated that while some utility representatives are cooperative, some are not. The lack of support can make gaining access to participating sites and information such as billing data more difficult.

- **Barriers to Participation Exist**: Initial project cost is the primary barrier to completing retro-commissioning projects through the program, followed by service providers' lack of access to financial decision makers, the time and resources it takes to complete a project, and knowledge about retro-commissioning solutions. Additionally, the identification of energy savings can be a sensitive subject to explore with building operators. Some building operators perceive that the identification of energy savings through retro commissioning may suggest that they are not performing well at managing the buildings energy use. Therefore, the service providers' approach and delivery strategy can be pivotal to whether an organization follows through with the project or not.

  Interviews with service providers suggest that program awareness is still relatively low. Most of the service providers interviewed said that the program could improve its marketing and outreach efforts. Additionally, program participants need typically need clarification on what incentives are available and what is required to receive them. Some entities do not understand how it works, that significant incentives are available, that they have to pay a share of the project cost, or that they have already paid into the program through their utility bills.

The following recommendations are offered for consideration to further develop the RCxL Program:

- **The Implementation Contractor should continue to increase its Efforts to Further Develop the Network of Registered Service Providers (RSPs):** Significant progress has been made to reduce the number of RSPs and focus on those that are the most engaged. Research shows that this strategy has been beneficial to the program. Additional efforts are needed to engage RSPs from the South Bend region. Program staff has reduced the list of RSPs to those that have been active in the program, thereby emphasizing the capacity of RSPs to generate projects rather than the total number of RSPs. However, there may also be an opportunity for program staff to educate less active RSPs on how to develop new RCxL projects and their role in promoting the program.

- **The RCxL Program should consider additional Bonus Incentive Offers to Generate Additional Program Activity as Needed:** As the program matures these bonus offers should not be necessary but they were effective at boosting activity during 2013.
- **Consider a Program Structure that would allow for Additional Flexibility for Incentivized Measures:** These measures include more capital-intensive measures, such as VFDs and air compressor storage tanks. Although there may be some overlap with other I&M incentive programs, incentivizing these through the RCxL Program could improve the program impacts and streamline the participation process and would provide customers a one-stop-shop for retro-commissioning projects.
- **Consider Additional Efforts to Coordinate Project Level Activities.** The program implementer suggested that more consistent support from I&M account representatives would facility program implementation, particularly with regards to gaining site access and information for specific projects.
- **Amend the Program Application to Include Resources for Calculating Expected Energy Savings**: Several RSPs stated that accurately calculating energy savings was a challenge they encountered. One specific suggestion was to include a few case studies to better understand typical expected energy savings for similar projects.
- **Consider Providing Information on Project Financing Mechanisms**: Initial cost was a barrier to completing projects noted by service providers. Providing information on financing resources may help and enable customers fund projects.
- **Consider Incentives for the Study Cost if Needed:** Several interviewees said that an incentive for the study costs, payable to the service provider, could further reduce costs to the customer and increase program participation. However, the progress made by the program to achieve its goals and the overall cost effectiveness need to be considered.

4.8.1 RCxL Program Customer Profile

As shown in Table 4-12 , 28 RCxL Program projects were completed during the program year. Of the three retro-commissioning tracks offered through the program, the 16 building optimization projects accounted for most program activity in terms of the number of projects. However, in terms of expected savings, a larger share of program activity stemmed from compressed air optimization projects. Compressed air projects accounted for 811,869 kWh in annual expected savings. Additionally, one refrigeration optimization project was completed and one project was completed that included savings from all three program tracks.

Table 4-12 RCxL Program Project Characteristics

Program Track	*Number of Projects*	*Average Ex Ante kWh Savings*	*Average Incentives Paid*	*Total Ex Ante kWh Savings*	*Total Incentives Paid*
Building Optimization	16	623,660	$31,723	9,978,559	$507,566
Compressed Air Optimization	10	811,869	$49,611	8,118,693	$496,111
Refrigeration Optimization	1	14,756	$500	14,756	$500
Multiple Types	1	294,085	$10,157	294,085	$10,157

Figure 4-1 displays the cumulative and monthly savings associated with project start dates. Ex post savings associated with project start dates remained fairly consistent from month-to-month. Cumulative program year savings increased steadily throughout the period.

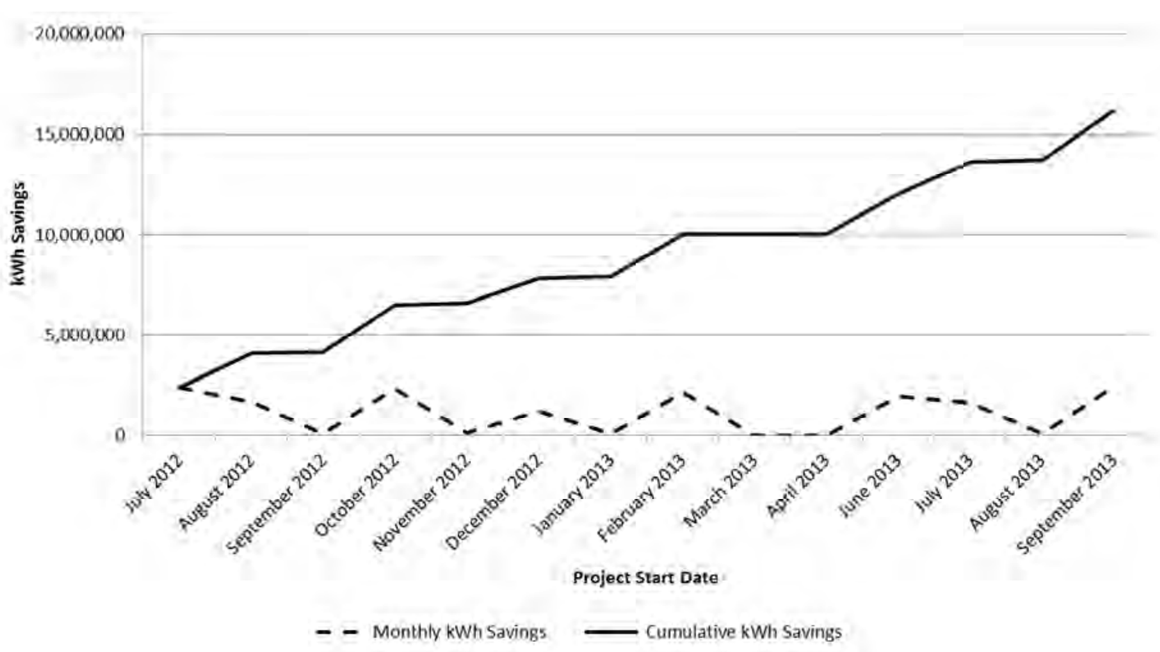


Figure 4-1 Monthly and Cumulative Ex Post Savings Based on Project Start Date

Figure 4-2 displays the cumulative and monthly savings associated with project completion date. In contrast to savings associated with project start date, savings associated with project completion date remained relatively flat until August and then increased rapidly through the period ending in December. The increase in completed projects at the end of the program year may have been due in part to a 10% bonus incentive offered to customers for completing a project during the year. The bonus incentive was offered from the end of June to the middle of December.

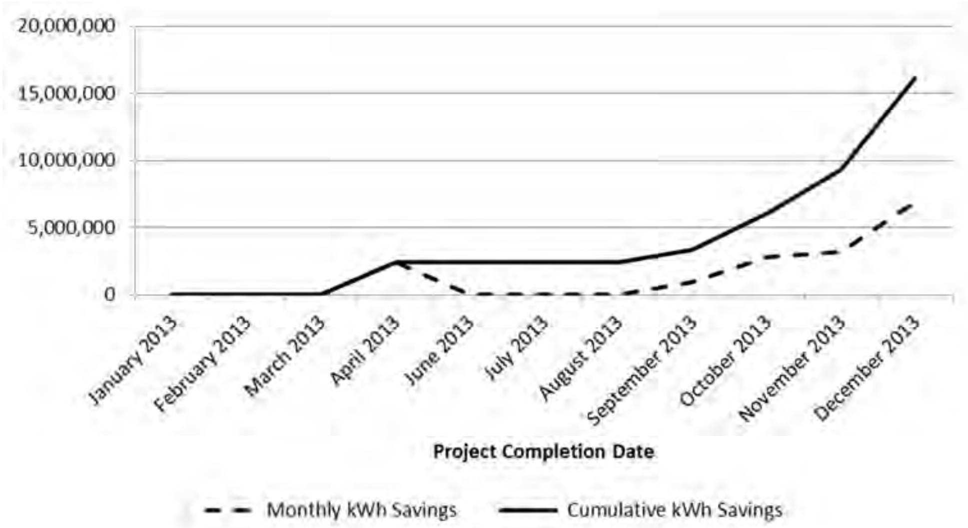


Figure 4-2 Monthly and Cumulative Ex Post Savings Based on Project Completion Date

Project savings are shown in Figure 4-3. Four of the projects completed accounted for more than 50% of project savings. It is not uncommon to see relatively few retro-commissioning projects account for a large share of program savings.

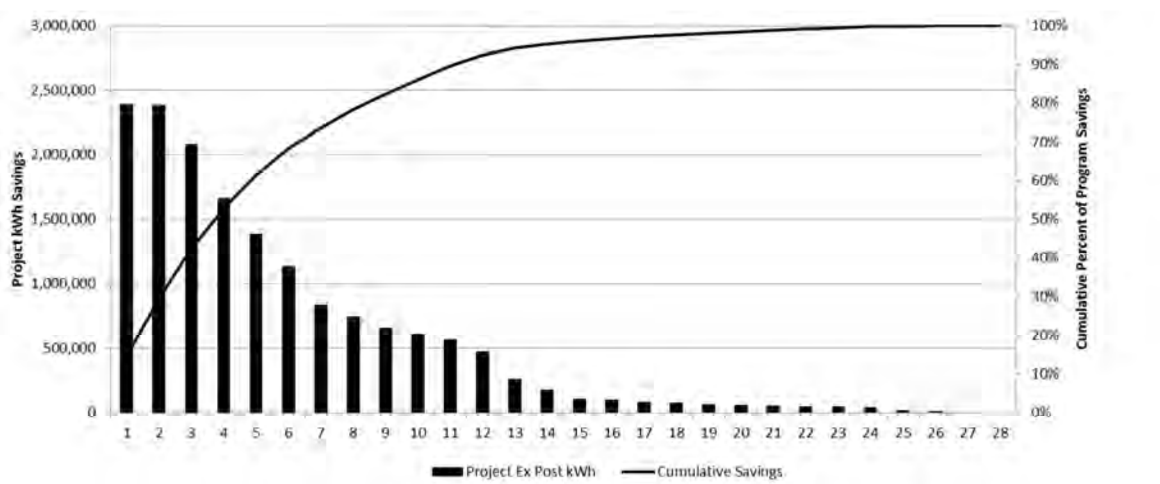


Figure 4-3 Project Savings and Cumulative Program Savings

4.8.2 Customer Outcomes

Telephone surveys were conducted with eleven of the twenty-three RCxL program participants, which represent a 48% response rate. The purpose of the survey is to collect data about customer decision-making, preferences, and opinions of the C&I Retro-Commissioning Lite Program. Additionally, participant responses are used to better understand what they would have done in the absence of the program and how program participation impacts their future decisions about retro-commissioning projects.

It is important to the note that, while the survey results discussed below are used as inputs for the calculation of estimated free ridership, customer responses to individual survey items do not, in isolation from additional factors, infer specific levels of free-ridership. Section 4.3 details the methodology used to estimate free ridership based on survey response data, while this chapter provides a qualitative discussion of participant responses.

4.8.2.1. Customer Profiles and Sources of Information about Energy Efficiency

Customers were asked to respond to several questions about the size and scope of their organizations, as well as what sources they rely on for information about energy efficiency. Understanding the sources of information that customers rely on can inform program design and marketing decisions as the program outreach strategy evolves. Five respondents (45%) indicated that their organization has over 250 employees, while four (36%) indicated that they have between 50-250 employees, and two respondents indicated that their firm has between 10-50 employees. Participants were also asked to identify what their industry. Six respondents (55%) indicated educational services, while the other four indicated (36%) manufacturing.

RCxL Program participants were asked what sources of information they use to learn about energy efficiency and how they first learned about the program. Figure 4-4 below displays the results. Respondents indicated that they primarily rely on equipment vendors, energy consultants, or the I&M website and account representatives. Similarly participants indicated that they learned of the program through equipment vendors, retro-commissioning service providers, or some other sources. Other sources that customers rely on for information about energy efficiency are brochures and advertisements, as well as trade associates and business groups. None of the customers indicated that they learned of the program through these sources. Consequently they may represent a potential marketing channel for the program.

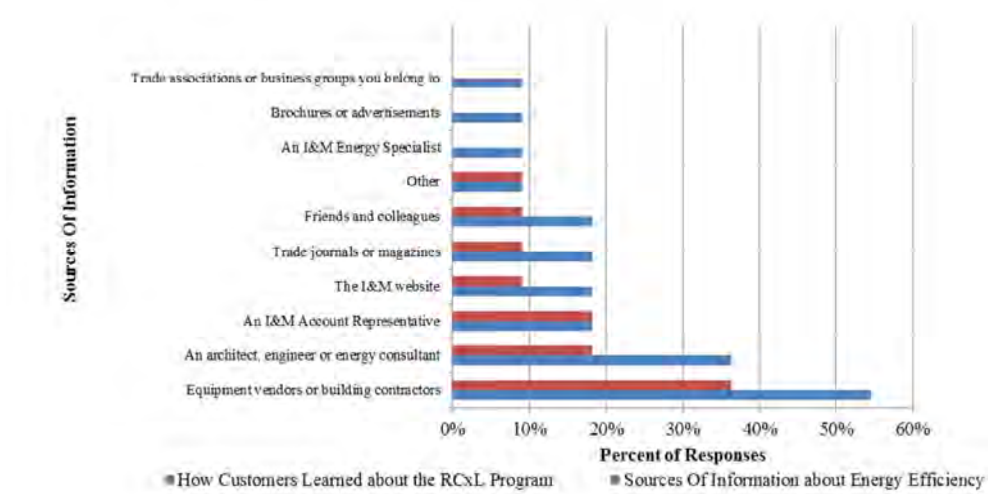


Figure 4-4 Sources of Information for RCxL Program Participants

4.8.2.2. Customers Internal Policies for Making Energy Efficiency Decisions

Customers were asked a series of questions about their companies' internal policies for making decisions about energy efficiency and capital investments. Corporate policies that incorporate energy efficiency in operations and procurement, as well as energy management plans were the most common responses. Three customers indicated that their firm has no internal policy guiding decisions about energy efficiency, while another three stated that they have numeric goals for energy cost reductions or energy savings.

Organizational decision-making processes also vary across respondents. Fifty-five percent of respondents indicated that one or two key people make energy efficiency decisions; 27% indicated that decisions are made based on staff recommendations; while the remaining 18% said decisions are made by a larger group or in some other way. Customers were then asked what financial metrics are used to assess efficiency improvements.. Figure 4-5 below displays the responses. The two primary financial metrics that guide decision-making are simple payback and Internal Rate of Return (ROI), followed by the initial cost.

In summary, these results indicate that most survey respondents' organizations utilize financial metrics to evaluate efficiency projects and decisions about projects are made by one or two individuals or are based on staff recommendations. Therefore, accessing these decision makers and presenting the business case in terms of simple payback and internal rate of return is critical to program success.

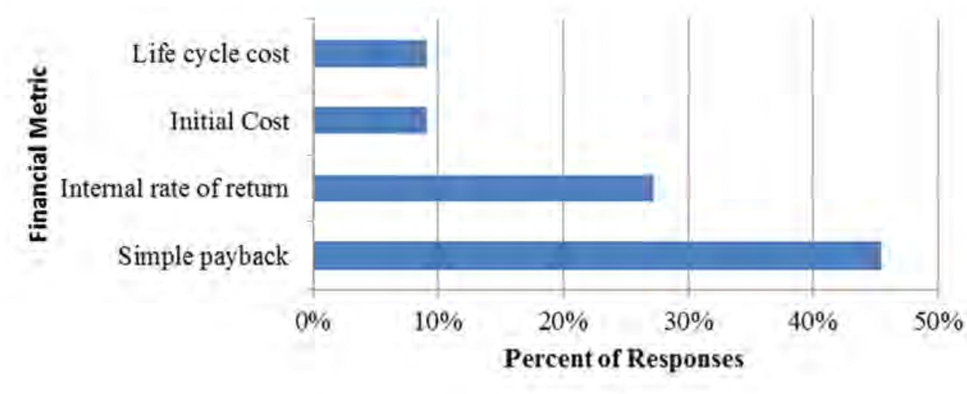


Figure 4-5 Financial Metrics that Guide Decision Making

4.8.2.3. Application Process and Staff Support

Participants were asked a series of questions regarding the application process and support they received from program staff.

When participants were asked who initiated the discussion about program incentives, 64% of participants indicated that their organization initiated it, while 36% said the service provider did. Additionally, all survey respondents indicated that they knew how to find a service provider.

Five of the survey respondents indicated that they were involved in completing the application for the program. All five of these respondents indicated that the instructions were mostly or completely clear. Additionally, four out of the five indicated that they knew who to contact if they needed assistance with the application.

Survey respondents were also asked to rate the acceptability of various aspects of the participation process. Table 4-13 displays the results. Most participants found each part of the process to be completely or somewhat acceptable. However, one participant indicated that ease of using the application forms was somewhat unacceptable.

Table 4-13 Acceptability of Application Process

Element of Application Process	*Completely acceptable*	*Somewhat acceptable*	*Somewhat unacceptable*	*Completely unacceptable*	*Don't Know*
Clarity of Incentive Process on Website (n=5)	40%	40%	0%	0%	20%
Ease of Using the Application Forms (n=5)	0%	60%	20%	0%	20%
Time to Approve Application (n=5)	40%	40%	0%	0%	20%
Effort to Provide Supporting Documentation (n=5)	40%	60%	0%	0%	0%
Overall Process (n=5)	60%	40%	0%	0%	0%

4.8.2.4. Measures Implemented and Customer Expectations

Participants were asked about the efficiency measures implemented through the RCxL Program and if their expectations were met. Nine of the 11 participants interviewed indicated that they implemented all of the energy savings recommendations identified during through the study. Additionally, ten of the 11 respondents said that the measures implemented either met or exceeded their expectations. One participant could not comment on these two questions.

Next participants were asked how the incentive amount that they received compared to what they were expecting. Ten of the 11 respondents said the incentive amount was about what they expected and one participant thought it was somewhat more than they expected.

The responses to these questions indicate that customers are implementing most of the measures recommended by the service providers and that the performance of the measures and the incentives they receive are meeting their expectations.

Participants were asked if they received any training from the service provider after the measures identified in the study were implemented. Two participants said yes they had received training from their service provider, while eight said they had not received training. As part of the service providers' scope of work as define in the RCxL Program Request for Qualifications (RFQ) Application form, registered service providers are required to train building operator staff on the implement projects. The training is supposed to cover system documentation, RCxL tools or procedures used, and strategies for maintaining persistence of savings.[3] Although a minority of respondents stated they had received training, this could be because someone at the facility other than the decision-maker received the training.

[3] Intro to Form 1500RFQ, http://electricideas.com/_pdfs/RCxLServiceProviderIntroApplication.pdf

4.8.2.5. Program Influence on Non-Incentivized Measures

Program impacts often extend beyond the single incentivized projects that are documented through participation. A positive experience with an energy efficiency program and the energy saving improvements made may lead participants to implement additional energy saving measures without seeking an incentive. Two survey respondents indicated that they had purchased and installed additional energy savings equipment. However, one of these participants indicated that the program was not important to this decision. Additionally, during a follow-up call with the other participant it was determined that the equipment had not yet been installed and that the participant intended to apply for an incentive for it.

4.8.2.6. Customer Satisfaction with the Program

Next, the participants were asked to reflect on their experiences with program staff and their overall impressions of the program. Five of the eleven respondents indicated that they had interactions with program staff and considered them to be fairly knowledgeable, which was the highest rating available as a response. One respondent was dissatisfied with the responsiveness of the staff, while the remainder indicated that they were satisfied or very satisfied. Four of the five respondents were satisfied or very satisfied with the thoroughness of the staff, while the other respondent was neither satisfied nor dissatisfied.

All surveyed participants were asked to rate their level of satisfaction for ten different aspects of the RCxL Program. Table 4-14 below displays the results. Participants were mostly satisfied with program staff's responsiveness and thoroughness, however at least one participant indicated that they were neutral or dissatisfied each of these aspects. All eleven participants indicated that they were either very satisfied or mostly satisfied with the program recommendations and measures that were implemented. Participants were less satisfied with the savings on their monthly bills and the application process, although none reported dissatisfaction with these. The majority of participants were very satisfied or mostly satisfied with the incentive amount, the timing of the incentive payment, and the quality of work performed by the service provider. There was one respondent who indicated that they were dissatisfied with the responsiveness of staff and the timing of the incentive payment. Every participant that responded to the survey said they were either very satisfied or mostly satisfied with the RCxL Program overall.

Table 4-14 Participant Satisfaction with the Program

Element of Program Experience	*Very satisfied*	*Satisfied*	*Neither satisfied nor dissatisfied*	*Dissatisfied*	*Very dissatisfied*
The recommendations made for saving energy	45%	55%	0%	0%	0%
The energy saving improvements you made	55%	45%	0%	0%	0%
The savings on your monthly bill	27%	36%	36%	0%	0%
The incentive amount	64%	27%	9%	0%	0%
The timing of incentive payment	45%	45%	0%	9%	0%
The quality of service provider's work	64%	27%	9%	0%	0%
The application process	18%	55%	27%	0%	0%
The program overall	64%	36%	0%	0%	0%

4.8.2.1. Summary of Participant Survey Findings

Key trends and issues addressed by respondents include:

- **Equipment Vendors and Contractors Were the Most Frequently Mentioned Source of Program Awareness:** Twenty-seven percent of survey respondents reported that they learned about the program through an equipment vendor or contractor. Equipment vendors and contractors were also the most common means that participants reported learning about energy efficiency. In contrast, only one of the respondents reported hearing about the program from an approved retro-commissioning service provider. This finding corroborates program staff comments that suggested service providers are not yet driving much of the program activity.

- **Participants Firms have Key Staff that rely heavily on Simple Payback and Internal Rate of Return for Decision Making.** These results indicate that most RCxL Program participant have some sort of internal policy regarding energy efficiency procedures and policies, and those decisions are ultimately made by key staff members. Therefore, accessing these decision makers and presenting the business case in terms of simple payback and internal rate of return are important to program success.

- **Customers Satisfaction Varies:** Most customers are aware of where they need to go for assistance and find the staff knowledgeable and helpful. Participants were mostly satisfied with program staff's responsiveness and thoroughness, however at least one participant indicated that they were neutral or dissatisfied with these aspects of their interactions with staff. All eleven participants indicated that they were either very satisfied or mostly satisfied with the recommendations made through the retro-commissioning study and measures that were implemented. Additionally, the majority of participants were very satisfied or mostly satisfied with the incentive amount, the timing of the incentive payment, and the quality of work performed by the service provider. There was one respondent who indicated that they were dissatisfied with the responsiveness of staff and the timing of the incentive payment. Every participant that responded to the survey said they were either very satisfied or mostly satisfied with the RCxL Program overall.

- **Measures Implemented and Incentive Amounts Met Customers Expectations:** The majority of participants interviewed indicated that they implemented all of the energy saving recommendations that were identified during the study, and those measures either met or exceeded their expectations. Similarly, respondents indicated that the incentive amount was either what they expected or higher

4.9 Service Provider Interviews

ADM staff interviewed six of the nine registered service providers that completed projects through Indiana Michigan's Retro-Commissioning Lite (RCxL) Program during program year four (PY4). The service providers were interviewed by telephone and were asked to respond to a series of questions that included the following topics:

- The firm's past experience with the program;
- Their efforts to promote the program;
- Barriers their customers face to implementing retro-commissioning projects;
- The impact the RCxL program had on customers' decisions to complete the projects; and
- Suggestions for improving the program.

The following sections summarize the findings from the interviews with RCxL service providers.

4.9.1 Service Providers First Experience with the RCxL Program

Respondents were asked how they first became a registered RCxL service provider. Responses indicate that most service providers joined after becoming aware of the program and completing independent research on how to become a registered service provider. Two respondents stated that program staff solicited their firm to join the service provider network. Below is a selection of the comments made by service providers:

> *"When I learned about the RCxL Program I reached out and requested additional information about becoming a partner. I applied with an application and that was that."*

> *"So, Locked Martin reached out to us. Early on in the program we gave them our ideas on the program design, so when the program was up and running they asked us to register as a partner."*

> *"We first became aware of it when the program was first conceived. We went to a seminar and thought we'd be into it. We were one of the earlier enrollees into the program. "*

> *"We were approached by representatives of the program. "*

Service providers were also asked to estimate what portion of their firms work is represented by jobs related to the program. Figure 4-6 displays the responses. The majority of RCxL registered service providers stated that less than 5% of their firm's work is represented by jobs related to the program.

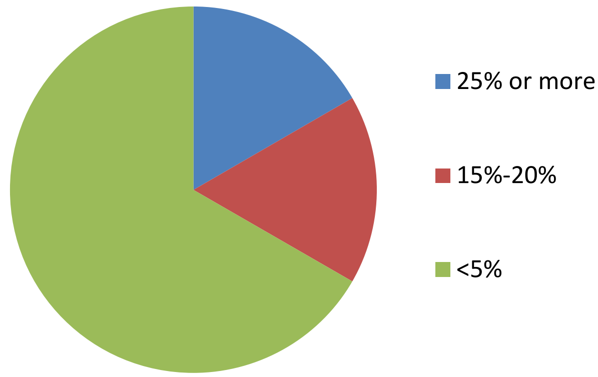


Figure 4-6 Percentage of Firms' Work Represented by Jobs Related to the Program (n=6)

Five of the service providers indicated that they had some or many established clients in I&M's Indiana service territory, while one of the six respondents indicated that they did not have many established clients in the service territory. These responses suggest that the service providers who are completing projects have an existing client base in I&M's Indiana territory. This network of service providers will likely be key to driving future program activity.

4.9.2 Experience with Program Staff

Interviewees were asked about the level of interaction they have with program staff, the purposes of those interactions, and if they considered program staff to be responsive and helpful. These questions were designed to better understand the nature of communication and to determine if service providers were satisfied with the overall level of support they are receiving from program staff. All six respondents indicated that they have regular communication with implementation staff from Lockheed Martin. Most indicated that the frequency of communication fluctuates with program activity. Specifically, more communication with program staff occurs during the early stages of a project or at periods when they have more customers participating in the program. Interviewees said they typically spoke with staff once a week, up to three or four times a week when needs were greater.

Figure 4-7 below represents the primary program areas that service providers and program staff discuss most often. Respondents indicated three primary reasons for communication are to discuss the status of projects and application material, inquiring business development opportunities and sales leads, and qualifying projects and measures prior to implementation.

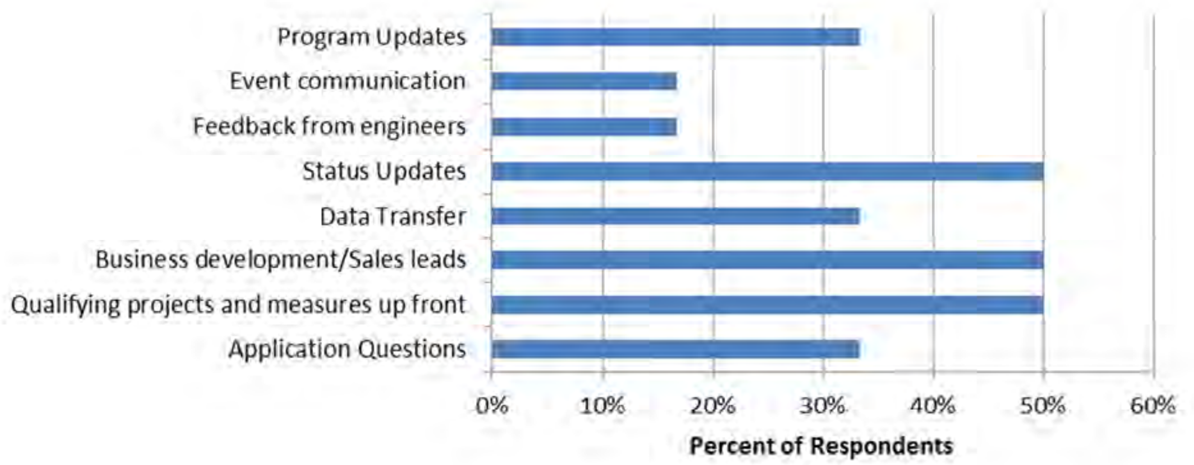


Figure 4-7 Program Areas that RCxL Service Providers Inquire About

All respondents indicated that staff was very responsive and helpful. All service providers enthusiastically complimented the program staff, stating that they are very knowledgeable and diligent about finding answers and responding in a timely manner. Overall, service providers are in regular communication with program staff and are generally very satisfied with the support they are receiving.

4.9.3 Program Training

Service providers were asked if they had attended any program training events. Four of the six respondent said that they had participated in a program sponsored training event. Respondents who had attended training were asked follow-up questions pertaining to the content of the event, the perceived value of attending; and were asked to provide recommendations on how events could be improved in the future.

Three of the respondents indicated that the majority of the content presented in the training they attended was related to the participation process and how the program work. Feedback also indicated that training events are not strictly designed for service providers; past and potential customers are also encouraged to attend.

Those service providers who said they attended an event thought it was a valuable experience. Below are examples of comments made by the interviewees.

> *"Yes, sometimes clients are there, and sometimes they provide updates. I try not to miss them."*

> *"Yes, it's helpful and provides clarity on how the program works. We get good direction."*

> *"Yes! There were a lot of customers that attended and we invited potential customers. They walked them through how the process works."*

Additionally, one respondent indicated that the event was advertised as a Lunch n' Learn, but the duration lasted several hours, which from his perspective was much longer than expected.

When asked how the events could be improved, suggestions included increasing the number of events offered. This service provider thought the event he attended was valuable and that more should be offered. He also expressed the need to increase awareness and attendance at these events. Another suggestion made was to advertise Lunch n' Learns as a half day seminar when the planed duration exceeds an hour.

In summary, those that attended found value in the program sponsored training events and thought they were a good way to learn about program happenings and network with existing and potential clients.

4.9.4 Participation Process

Service providers were asked if they felt that any part of the participation process could be improved. Almost all of the service providers indicated that the application phase is streamlined and that the turnaround time is quick, although one service provider stated that he thought the turnaround time was long and created delays. Another respondent was more specific and explained that the turnaround time on applications depends on the complexity of the project.

ADM staff reviewed the number and type of projects completed in comparison to the responses to this question. This review found that the service provider dissatisfied with the application process had only completed one project through the program. Consequently, it may be the case that the delay in application process this service provider experienced was an isolated incident. Overall, the service providers were very satisfied with the various participation phases and offered few recommendations for improvement.

A service provider that specializes in building optimization did offer one recommendation. The service provider suggested that energy savings are often underestimated for building optimization projects because the energy savings potential is difficult to quantify. They currently base their savings calculations on adjusted run times. However, they are finding much more opportunities for savings once the retro-commissioning project is underway. The service provider emphasized that the energy savings are often apparent until the work on the equipment has begun. Therefore, the service provider suggested that the program application include resources to better understand typical expected energy savings for similar projects.

4.9.5 Customer Feedback

Interviewees were asked about customer feedback after projects were completed. Several of the service providers stated that customers were initially skeptical of the energy savings and the incentive dollars they would receive, but were ultimately surprised and very happy with the energy savings and incentive amount. Below are several comments from service providers about customers' experience with the program. The feedback indicates high levels of satisfaction with project outcomes.

> *"They [customers who completed projects] were very happy. They were very happy with the incentive amount and the contractor's system. They had mentioned that if they had questions I&M returned their questions quickly."*

> *"Yes, when we get done with the project there is a lot of disbelief. But when the check comes in or when customers realize savings they are always happy. When results happen it's great."*
>
> *"All of the customers have been extremely grateful. They know its money they are paying into the program, and are grateful that the utility organized everything. We have a press conference coming up with the county. They are going to share their story. We've really haven't received any negative comments, at all."*
>
> *"They love the program. It's a great service for a great deal. They are happy with incentive and energy savings. This covers work that most owners know they need to do."*
>
> *"They are happy with the end result but reluctant about the costs."*

4.9.6 Other Utility Programs

Service providers indicated if they provide retro-commissioning services through any other utility programs. As a follow up question, they were asked how those programs compare to the Indiana Michigan's RCxL Program. Five out of the six respondents indicated that they had experience working with other programs around the country. Three of the five service providers thought that the RCxL program was easier to navigate, had higher incentives, and thought the program eligible measures were more comprehensive. The other two service providers suggested that Indiana Michigan's program was comparable in structure and offerings to other programs they had worked with.

4.9.7 Program Promotion

Service providers were asked a series of questions about their existing relationships with customers, to what degree they promote the program, and if there is anything the program could do to help them to be more effective in promoting the program. Of the six RCxL service providers that were interviewed, four indicted that they had prior working relationships with the program participants; two service providers indicated that they did not have prior working relationships. These responses indicate that the majority of program activity is occurring through existing service providers in the Indiana service territory. However, the program has encouraged other contractors that provide retro-commissioning services to enter the regional market. In general, the program seems to be creating opportunities for retro-commissioning service providers to grow their businesses.

Additionally, all six service providers interviewed stated that they consistently promote the program to all potential customers. Several noted that utility incentives help build the business case for the projects and factoring these in, is becoming a standard practice for bidding projects. Specific responses regarding service providers' promotion of the program are provided below.

> *" A lot, we want to grow our business and utility programs support business growth."*
>
> *"We offer it to all customers."*

> *"Whenever we find a new program we let them know. Every time we quote a job we try to include the utility program."*
>
> *"Every customer I work with. When I look at an opportunity, I always bring in the utility incentives. Sometimes there aren't any or they don't qualify. A lot of customers ask if there is anything out there."*

When service providers were asked if there is anything the program could do to help them be more effective in promoting the program, four of the six respondents indicated that the program could improve its marketing. To be more specific, two respondents said the program should increase its overall outreach efforts to improve program awareness. According to service providers, there are still a lot of organizations that do not know the program exists. Additionally, the program needs to continually improve clarity about what incentives available and what is required to receive them. Some entities do not understand how it works, that significant incentives are available, that they have to pay a share of the project cost, or that they have already paid into the program through their utility bills.

4.9.8 Barriers to Participation

Understanding the barriers to making energy efficiency improvements and program participation faced by utility customers are critical to long-term program success; especially in early program years as program design and market awareness is still evolving. To understand the types of barriers to completing retro-commissioning projects faced by I&M's commercial and industrial customers, service providers were asked a series of questions pertaining to their perception of what barriers customers face to implementing retro-commissioning projects and to participating in the program. Follow up questions were asked about how these barriers affect different industries and what can be done to overcome barriers to implementing retro-commissioning projects and to participating the RCxL program.

Figure 4-8 below displays the barriers to completing retro-commissioning projects identified by service providers; service providers may have identified multiple barriers. All six respondents indicated that the initial costs are the primary barrier for retro-commissioning project implementation, followed by accessing the decision maker, the time and resources it takes to complete a project, and knowledge about retro-commissioning solutions. Two service providers indicated that it is often difficult to locate and speak with the appropriate facility staff. In order to sell their customers on the value of completing a retro-commissioning project, service providers seek to speak with the individuals responsible for managing building performance and making financial decisions. Building operators do not often have an office or direct line and financial decision makers are usually not savvy about the operational and maintenance needs associated with building systems. Selling a retro-commissioning project requires access to both of these stakeholders, which can be challenging for service providers.

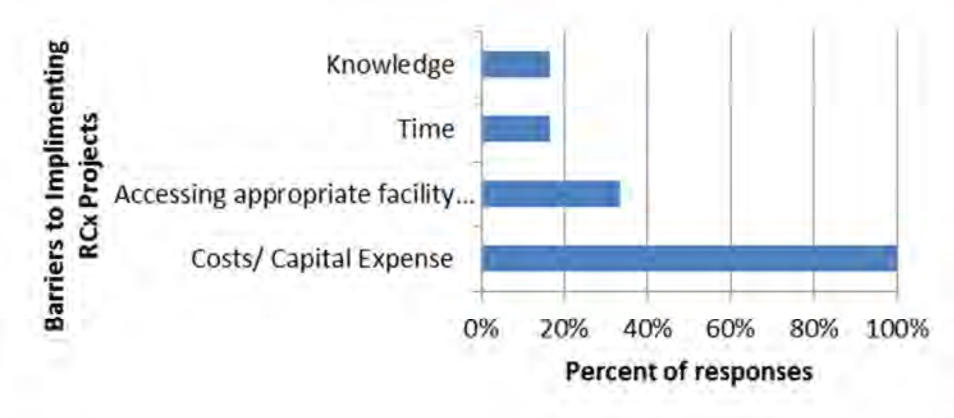


Figure 4-8 Barriers to Implementing RCxL Projects

Several service providers made suggestions on how these barriers could be overcome. The most common recommendation was additional financing options. One service provider stated that they offer 90 days interest-free financing, as well as training seminars to their customers, both of which have encouraged projects. In addition to the discussion barriers to retro-commissioning, generally, service providers were asked about barriers to program participation their customers face. The two most common responses were related to customers' perception of the program and the time it takes to make a decision about whether to participate. Additionally, some service providers stated that despite the incentives, in many cases, customers still cannot afford the recommended measures or do not have the time and resources to explore equipment upgrades.

Several service providers also indicated that some building operators are concerned that the study will suggest that they are not managing the buildings energy use effectively The identification of energy savings can be a sensitive subject to explore with building operators because energy saving potential may suggest an oversight or knowledge gap on their part. Therefore, the service providers' approach and delivery strategy can be pivotal to whether an organization commits to a project. Two service providers offered similar suggestions on how service providers could navigate this sensitive subject with facilities staff. A team environment must be created between the service provider firm's staff and the facility staff. Service providers need to be able to support facility mangers in crafting the cost/benefit message associated with implementing a retro-commissioning project. It is also important to create a transparent and cooperative working relationship where facility staff can learn about the value of retro-commissioning as a means to cut costs and maintain energy savings in the future.

4.9.9 Program Influence of Projects

Service providers were asked about specific projects they worked on, and what the customer would likely have done in the absence of the program. Although these questions provide some insight into the influence of the program incentives on customer decision-making, the service providers' remarks do not in and of themselves suggest a specific level of free ridership associated with a project. Rather, it is more appropriate to infer free ridership from decision maker survey responses.

Most of the services providers indicated that their customers would not have completed the retro commissioning without the incentives available through the program, although one thought the participant probably would have. In addition to the programs influence on the decision to complete the retro commissioning, service provides.

All of the service providers suggested that their customers were aware of the issues leading related to the building less than optimal energy use. However, they awareness was limited, and that their customers did not understand the full extent of the inefficiencies or the costs associated. Moreover, two-thirds of the service providers stated that customers were not aware of the energy saving recommendations, while the other third stated that they customers were generally aware of what was recommended. Overall, these responses indicate that service providers have the impression that customers are not fully aware of the extent of the energy waste in their facilities or the actions that would optimize energy consumption.

4.9.10 Program Satisfaction and Recommendations

Overall registered service providers were highly satisfied with I&M's RCxL Program. However, service providers did offer several recommendations to improve the RCxL program and the role of the service provider. The summary of all service provider recommendations are provided below:

- Service providers expressed interest in incentives for the study costs, payable to the service provider, could further reduce costs to the customer and increase program participation.
- Two respondents stated that there is a need to champion service providers that specialize in specific building measures or whose projects produce the expected savings. One service provider suggested implementing a rating system that acknowledges the companies that are driving participation and delivering expecting energy savings.
- A service provider that specializes in building optimization noted that it is difficult to estimate project savings before the project has begun. This service provider suggested that the program application include resources to better understand typical expected energy savings for similar projects.
- Most service providers indicated that the primary barrier to implementing retro-commissioning projects was capital expense. Therefore, there is a need for more lending products and service providers think that financing options would significantly reduce the barriers to participation.

4.9.11 Summary of Interview Findings

Key trends and issues addressed by respondents include:

- **Service Providers have an Existing Client Base in Utility Service Territory:** These responses suggest that the service providers who are completing projects have an existing client base in I&M's Indiana territory. This network of service providers will likely be key to driving future program activity.

- **Service Providers are Satisfied with Program Staff Communication:** Service providers are in regular communication with program staff and are generally very satisfied with the support they receive. The most common topics discussed were qualifying projects and measures, calculating energy savings, and sales leads.

- **Program Training Events were Valuable:** Those that attended found value in the program sponsored training events and thought they were a good way to learn about program happenings and network with existing and potential clients.

- **The RCxL Program Compares Favorably to Other Utility Programs:** Three of the five service providers thought that the RCxL program was easier to navigate, had higher incentives, and thought the program eligible measures were more comprehensive. The other two service providers that indicated that I&M's program was comparable in structure and offerings to those offered by other utilities.

- **Increase Marketing:** Most of the service providers interviewed indicated that the program could improve its marketing and that the program needs to increase its overall outreach efforts to improve program awareness. Additionally, the program should improve clarity about what incentives available and what is required to receive them. Some entities do not understand how the program works, that significant incentives are available, that they have to pay a share of the project cost, or that they have already paid into the program through their utility bills.

- **Barriers to Participation:** Initial cost is the primary barrier for retro-commissioning project implementation, followed by accessing the decision maker, the time and resources it takes to complete a project, and knowledge about retro-commissioning solutions. Additionally, building operators concerns about being perceived that they are not effectively managing the building's energy use can also create challenges to getting commitments to retro-commissioning projects. Service providers approach and delivery can be pivotal to whether an organization undertakes a project.

4.10 Program Operations Perspective

The following section summarizes key findings from interviews with three I&M and Lockheed Martin staff members. Staff interviews provide insight into some of the overarching aspects of program design, administration, and participation. This feedback provides perspective on how the program is progressing from year to year, the changes that are made to improve the program design, and how the established communication channels facilitate collaboration within the program delivery structure.

4.10.1.1. Summary of Interview Findings

Key trends and issues addressed by respondents include:

- **RCxL Program Progress:** Activity increased significantly during the 2013 program cycle, twenty-eight projects were completed in 2013 compared to none in 2012. Program staff was asked how the program is progressing and what accounts for the increased activity. Staff indicated that 2012 was the first year of the RCxL Program and that service providers new to providing retro commissioning had to develop the capability to provide this service. The majority of service providers in the Indiana Michigan service territory specialized in equipment sales, not energy services, which according to implementation staff, is common to regions where retro-commissioning programs are relatively new.

  As the 2012 program year ended and 2013 program year progressed, Lockheed Martin staff worked to identify and invest in the more active and engaged service providers. The implementation contractor provided individualized training on how an equipment vendor could transition their business model and sales strategy to a more systematic approach to demand side optimization. Companies were not accustomed to offering energy savings as a value proposition.

  The number of registered service providers was reduced by approximately 50% to less than ten by the end of 2013. Staff feels that they have reduced the service provider network to those that are most engaged and capable of producing good projects and believe that the increased program activity is attributable to this change.

- **Program Goals and Design:** The expected savings for the program was approximately 48% of the program's planning goal. Program staff were asked what they believe contributed to the lower than expected level of program savings. Program implementation staff discussed two issues that they view as contributing to the program not meeting its goal, namely, challenging savings targets and strict program requirements that reduced the number of eligible measures.

  Although based on an assessment of market potential, the implementation contractor indicated that program's saving goal was set too high given the program's design. Implementation staff indicated that they could be a resource for developing more realistic savings expectations in the future.

  Implementation staff also indicated that the restrictions placed on some capital improvement measures also limited the programs savings potential. The intent of these restrictions is to reduce overlap with other Core and Core Plus programs. Staff cited VFDs for chiller units or compressed air systems and storage tanks for a compressed air system as two examples of measures that are typical components of retro-commissioning projects but cannot receive incentives through the RCxL Program. To install these measures, a customer would need to apply for an incentive through the C&I Incentives custom program. Implementation staff argued that these measures are not strictly a custom project that involves retrofitting equipment with more efficient options. Rather, a service provider would recommend them because the study has taken a holistic approach to optimizing the system and the inclusion of those measures maximizes overall system performance. Although staff recommend that customers apply for the incentive through another program for these measures, staff indicated that there were several cases during 2013 when the customer did not install those measures. Staff indicated the belief that removing the restrictions would improve the participants experience and increase program savings.

- **Program Implementation Staff Efforts Drive Program Activity:** Lockheed Martin staff indicated that they actively promote the program to Indiana Michigan's C&I customers. Data provided to the implementation contractor by the utility guides outreach efforts. Lockheed Martin begins by segmenting the market based on building types, and then targets the high usage customers first.
- **Bonus Incentive Offered during the Program Year:** The program offered a bonus incentive of 10% to customers that completed retro-commissioning projects and a $1000 bonus to service providers who completed a project by the end of the program year. During this time, the volume of applications more than doubled. The implementation contractor will be surveying the service providers about the bonus.
- **Some Regions Less well Served by Service Providers:** Implementation staff indicated that the different regions of I&M's service territory are not all equally well served. In some regions there are fewer service providers or the service providers are less active in promoting the program. Program staff cited as an example one firm with a Fort Wayne office that is very engaged in the program and a South Bend office that is not.
- **Communication between Program Implementation and Utility Staff:** Program staff commented on the nature of communication between the utility team and the implementation team. Both I&M and Lockheed Martin indicated that weekly calls allow for program management staff to discuss overall program progress and project level issues that require attention. Interviewees were satisfied with the frequency of commutation and said that meetings are positive and productive. Beyond the regularly scheduled calls, ad hoc communication is normal throughout the week. Lockheed Martin staff often seeks utility staff assistance to obtain data, request building access at project sites, or coordinate site visits. Lockheed Martin indicated that some utility staff members are more cooperative than others. Lockheed Martin staff indicated that consistent communication and support form utility account representatives is lacking and that site visits often hinge on their availability and willingness to support the implementation contractor's field staff.

5. Commercial and Industrial HVAC Program

The C&I HVAC Program did not achieve any completed projects during the 2013 program year, and therefore did not require an impact evaluation to assess program savings. The evaluation of this program consists of a process evaluation that assesses the current status of the program and cross-program awareness of it. Impact evaluations will be conducted in future years when projects are completed through the C&I HVAC Program.

This chapter presents the results of the process evaluation for Indiana Michigan Power's (I&M) HVAC Rooftop Unit Tune-Up (HVAC RTU) Program during the second year of program operation. The process evaluation focuses on the current program status, efforts made to increase program activity, and cross-program awareness of the incentives offered through it. This evaluation is based upon interviews with I&M energy efficiency staff, program implementation contractor staff, program documentation, and surveys of participants in other I&M programs.

5.1 Evaluation Objectives

This process evaluation was designed to document the operations and delivery of the HVAC RTU Program during program year four (PY4), the second year the program operated. No projects were completed during this period. Consequently, the process evaluation focused on issues of program design, efforts made to promote the program, and cross-program awareness.

Key research questions to be addressed by this evaluation of PY4 activity include:

What efforts have been made to increase program participation?

What are the perceived barriers to program participation?

Are participants in other I&M C&I programs aware of the HVAC RTU Program?

What design changes have been made or are being considered to increase program activity?

5.2 Summary of Primary Data Collection

- **Interviews with I&M Staff Members:** Interviews with I&M staff members provide insight into various aspects of the program and its organization. I&M staff members also provide information regarding recent organizational and procedural improvements that have been implemented in order to enhance program efficiency and effectiveness.

- **Interview with Lockheed Martin Staff:** Interviews with Lockheed Martin program implementation staff provide information regarding program progress and observations regarding service providers and customers. Lockheed Martin staff report on recent program changes and future plans to improve program operational efficiency.

- **Surveys of Participants in Other I&M C&I Programs:** Participants in the C&I Incentives Program and the C&I Audit Program were asked questions about the presence of qualifying equipment at their facilities and their awareness of the incentives available through the RTU HVAC Program.

- **Interviews with HVAC Tune-Up Service Providers:** Interviews were completed with five of the 11 registered service providers. Service providers were asked questions about their history with the program and providing tune-up services, reasons why customers do not participate, and ways that participation in the program could be increased.

5.3 Summary of Conclusions and Recommendations

The 2013 year was the second year of RTU HVAC Program Operations. While no projects were completed during the program year, program staff made significant efforts to promote the program among HVAC service providers.

- **Limited Interest among Customers:** Program staff report that various factors limit interest in the HVAC RTU program. The reasons given for the lack of interest include the program measures do not produce enough savings given the service territory's climate, only electric savings are incentivized, the incentives are low, and customers are unwilling to invest in equipment maintenance.

- **Increased Number of Service Providers Registered with the Program:** Service providers play a key role in marketing and promoting the HVAC RTU program. Program staff reported that they made extensive efforts to engage HVAC contractors throughout the service territory with the program. Their effort increased the number of listed service providers from three at the end of the prior year, to 11 at the end of the current program year.

- **Program Changes Considered:** Program staff recognize that changes need to be made to the program to increase the level of program activity. These changes will occur in the future.

The following recommendations are for consideration by program staff:

- **Increase Cross-Promotion of the Program among Participants in Other Programs:** Seventeen customers who responded to the survey of C&I Customers reported that they had roof top units that met the size requirements for the HVAC RTU program. Of these customers, 88% reported that they were not aware of the incentives offered. This suggests that there might be an opportunity to increase program awareness and activity by cross promoting it to participants in other I&M programs, and specifically, in the C&I Incentives Program. Although the two programs have different implementation contractors, I&M should consider requesting that outreach staff members of the C&I Incentives Program assess whether customers they contact qualify for a tune-up project.

If the customer qualifies, the outreach staff member should direct the customer to the HVAC RTU program.

- **Develop Marketing Materials for Contractors:** Implementation contractor staff should consider developing marketing materials to assist contractors with promoting the program. These materials should promote the potential estimated electricity cost savings, the benefits to equipment longevity resulting from maintenance, and the potential improvement of equipment performance and comfort of business occupants from the additional maintenance.

5.4 Cross Program Awareness

Participants in I&M's C&I Incentives Program and the Prescriptive Refrigeration Incentive Component of the C&I Audit program were asked about their awareness of the incentives offered through the HVAC RTU Program. None of the participants in the Prescriptive Refrigeration Incentive Component of the C&I Incentives Program reported that they had qualifying equipment for the program. However, 17 of the C&I Incentives Program respondents reported that they had qualifying equipment. Of these survey respondents, 15 were not aware of the program and two stated that they were aware of the program. The two customers who were aware of the program both indicated that they had considered completing a tune-up project.

The lack of awareness of the program among participants in the C&I Incentives Program suggests that there may be an opportunity to increase program activity by promoting the HVAC RTU Program to C&I Incentives Program participants.

5.5 HVAC Contractor Perspectives

Five out of the 11 HVAC Tune-Up contractors listed on the program website were interviewed about their perceptions of the program and customers' reactions to the incentives offered through it. The interviewed service providers offer services throughout I&M's Indiana service territory. Three of the five indicated that they had been a service provider for the program for four or five months, while the other two indicated that it had been less than a year.

The key findings from these interviews are summarized below:

- **Extent of Program Promotion:** Three of the five service providers interviewed indicated that they actively promote the program to most of their customers. Two of the three indicated that they had promoted the program with about 25 of their customers and the third said they had promoted the program with 70% of his or her customers. The other two contractors had only promoted the program to a few customers (i.e., less than 5). Some of the reasons that contractors who indicated that they are not actively promoting the program were that their customers do not have the proper equipment, the paperwork is too complicated, and that incentives are insufficient.

When discussing the program to customers, some of the appealing features to recommend are the preventative maintenance, energy savings, and most noteworthy amongst interviewed, the rebates. One contractor noted that they get program staff to calculate the savings available through the program.

- **HVAC Tune-Up Program Compliments Most Service Provider Businesses:** Of the service providers interviewed, all but one agreed that the program compliments their projects and services offered. One of the service providers who had not previously offered tune-up services prior to his or her participation stated that the program did not entirely complement the existing business. This contractor stated that the program process was cumbersome and difficult, and there was not enough of an incentive.

- **Customer Reasons for Not Completing Projects:** Service providers mentioned that customers who did not want to complete the project either wanted to replace the unit rather than perform maintenance or faced budgetary constraints that prevented their participation. Service providers indicated that they thought the primary reasons for not participating were the high cost of the project and the lack of perceived value of preventative maintenance.

- **Service Provider Suggestions for Increasing Participation:** Three of the five service providers offered suggestions for increasing participation in the program. They suggested to increase the incentive and to increase the number of contractors promoting it.

- **Activity May Increase During Summer:** One of the service providers noted that they are planning to do more tune-ups during the summer season. Customers may be more interested in participating in the summer when their electric bills increase from higher air conditioning usage.

5.6 Program Operations Perspective

This section summarizes the core findings from interviews conducted with program staff of I&M and Lockheed Martin for the purposes of developing market environment and internal program management perspectives.

To gain insight into the operation and delivery of HVAC Rooftop Unit Tune Up (HVAC RTU) Program, interviews were conducted with key members of the utility and implementer program staff. These interviews focused on program operations, the overall effectiveness of the program process, and the identification of areas for future program improvement.

Respondents shared their perspective on the program's development. Interview questions related the respondents' individual roles in administering the program and their perceptions of overall program strengths, weaknesses, and opportunities for the future.

5.6.1 Summary of Interview Findings

Key trends and issues addressed by respondents include:

- **Limited Activity and Interest in Program:** No HVAC RTU projects were completed during the program year. Some reasons for the lack of interest in the HVAC program are the lack of large savings in the weather climate, the incentives only cover electric savings, the incentive levels are low, and customers' unwillingness to invest in equipment maintenance.
- **Outreach Efforts to HVAC Contractors:** Both utility and implementer staff extensively outreached to contractors to encourage them to promote the program with their customers. The program implementer attempted to promote the HVAC Tune-Up Program with all HVAC contractors providing services in the utility's territory. These efforts increased the number of service providers from three at the end of the prior year to eleven at the end of the current year. Additionally, audits through the C&I Audit Program often include HVAC maintenance recommendations.
- **Equipment Eligibility Requirement Changed:** The age requirement for the rooftop HVAC units was increased to 11 years old in order to generate program participation. Previously, three and four ton units were required to be less than seven years old and five to 20 ton units were required to be less than 10 years old.
- **Program Redesign Planned for the Future:** Program staff reported that they intend to re-evaluate the current the HVAC RTU Program to increase program activity.

6. Cost Effectiveness Testing

In evaluating the 2013 I&M Residential Portfolio, ADM performed cost-effectiveness testing at the program levels. In order to provide an evaluation of the overall impact of each of I&M's Residential programs relative to their costs, a portfolio of tests was conducted using the following inputs: verified gross kWh/kW savings, net kWh and kW savings, administration costs, incentive amounts, participant costs, cost of electric generation at peak and non-peak hours, market based prices of energy, I&M's weighted average cost of capital, and customer rate forecasts. The specific tests describe the impact of the program from varying perspectives. The five most widely accepted tests conducted in evaluations of energy efficiency programs across North America are summarized below[4]:

- Utility Cost Test (UTC): Comparison of program administrator costs to resource supply costs.
- Total Resource Cost Test (TRC): Comparison of program administrator and customer costs to utility resource savings.
- Ratepayer Impact Measure Test (RIM): Impact of the program on all ratepayers, including non-participants.
- Societal Cost Test (SCT): Comparison of total societal costs to resource savings and non-monetized benefits.
- Participant Cost Test (PCT): Comparison of costs and benefits from the perspective of the customer implementing the measures.

The key questions answered by each cost test are shown in Table 6-1.[5]

[4] National Action Plan for Energy Efficiency (2008). ***Understanding Cost-Effectiveness of Energy Efficiency Programs: Best Practices, Technical Methods, and Emerging Issues for Policy-Makers.*** Energy and Environmental Economics, Inc. and Regulatory Assistance Project. <www.epa.gov/eeactionplan>

[5] http://www.epa.gov/cleanenergy/documents/suca/cost-effectiveness.pdf

Table 6-1 Questions Addressed by the Various Cost Tests

Cost Test	*Questions Addressed*
Participant Cost Test	• Is it worth it to the customer to install energy efficiency? • Is the customer likely to want to participate in a utility program that promotes energy efficiency?
Ratepayer Impact Measure	• What is the impact of the energy efficiency project on the utility's operating margin? • Would the project require an increase in rates to reach the same operating margin?
Utility Cost Test (Same as program administrator cost test (PACT))	• Do total utility costs increase or decrease? • What is the change in total customer bills required to keep the utility whole?
Total Resource Cost Test	• What is the regional benefit of the energy efficiency project including the net costs and benefits to the utility and its customers? • Are all of the benefits greater than all of the costs (regardless of who pays the costs and who receives the benefits)? • Is more or less money required by the region to pay for energy needs?
Societal Cost Test	• What is the overall benefit to the community of the energy efficiency project including indirect benefits? • Are all of the benefits, including indirect benefits, greater than all of the costs (regardless of who pays the cost and who receives the benefits)?

Overall, the results of all five-cost effectiveness tests provide a more comprehensive picture than the use of any one test alone. The TRC and SCT cost tests help to answer whether energy efficiency is cost-effective overall. The PCT, UCT, and RIM help to answer where the selection of measures and design of the program is balanced from participant, utility, and non-participant perspectives respectively. The scope of the benefit and cost components included in each test ADM performed are summarized in Table 6-2***.***[6]

[6] http://www.epa.gov/cleanenergy/documents/suca/cost-effectiveness.pdf

Table 6-2 Summary of Benefits and Costs Included in Each Cost-Effectiveness Test

Test	*Benefit*	*Costs*
PCT (Benefits and costs from the perspective of the customer installing the measure)	• Incentive payments • Bill Savings • Applicable tax credits or incentives	• Incremental equipment costs • Incremental installation costs
UCT (Perspective of utility, government agency, or third party implementing the program	• Energy-related costs avoided by the utility • Capacity-related costs avoided by the utility, including generation, transmission, and distribution	• program overhead costs • Utility/program administrator incentive costs • Utility/program administrator installation costs
TRC (Benefits and costs from the perspective of all utility customers in the utility service territory)	• Energy-related costs avoided by the utility • Capacity-related costs avoided by the utility, including generation, transmission, and distribution • Additional resource savings • Monetized environmental and non-energy benefits • Applicable tax credits	• program overhead costs • program installation costs • Incremental measure costs
SCT (Benefits and cost to all in the utility service territory, state, or nation as a whole.	• Energy-related costs avoided by the utility • Capacity-related costs avoided by the utility, including generation, transmission, and distribution • Additional resource savings • Non-monetized environmental and non-energy benefits	• program overhead costs • program installation costs • Incremental measure costs
RIM (Impact of efficiency measure on non-participating ratepayers overall)	• Energy-related costs avoided by the utility • Capacity-related costs avoided by the utility, including generation, transmission, and distribution	• program overhead costs • Utility/program administrator incentive costs • Utility/program administrator installation costs • Lost revenue due to reduced energy bills

6.1 Incremental Cost Calculations

Using the Database for Energy Efficient Resources (DEER)[7], ADM compiled incremental costs by measure. The incremental costs were scaled from the measure level to the program level using the quantity of each measure as verified by ADM. These incremental costs are included in the PCT, TRC and SCT tests.

6.2 Effective Useful Life Calculations

ADM calculated the Effective Useful Life (EUL) by measure referencing the DEER EUL database. Those values were aggregated at the program level using a weighted average of EUL by gross kWh savings. For the C&I Incentives program the weighted average EUL equals 12 years, and for the C&I Audit program the corresponding value is 16. An EUL of 5 was used for RCxL projects.

6.3 Cost Effectiveness Results by Program

Using the inputs sent to ADM from I&M and the software package DSMore, ADM calculated results for each of the 5 cost effectiveness tests for each active program during 2013. The results of the above cost effectiveness tests and their corresponding benefits (numerator of each cost test) are presented in Table 6-3 through Table 6-5 below.

Table 6-3 C&I Incentives Program Cost Effectiveness Test Results

Test	*Score*	*Benefits (2013 dollars)*
Utility Cost Test	8.43	23,173,730
Total Resource Cost Test	4.87	23,173,730
Ratepayer Impact Measure Test	0.89	23,173,730
Societal Cost Test	5.69	25,558,797
Participant Cost Test	5.36	17,820,968

Table 6-4 C&I Audit Program Cost Effectiveness Test Results

Test	*Score*	*Benefits (2013 dollars)*
Utility Cost Test	6.14	2,350,422
Total Resource Cost Test	3.66	2,350,422
Ratepayer Impact Measure Test	0.85	2,350,422
Societal Cost Test	4.29	2,596,374
Participant Cost Test	4.42	2,093,979

[7] The DEER database can be downloaded here: http://www.energy.ca.gov/deer/

Table 6-5 C&I Retro-Commissioning Lite Program Cost Effectiveness Test Results

Test	*Score*	*Benefits (2013 dollars)*
Utility Cost Test	2.62	4,604,135
Total Resource Cost Test	1.22	4,604,135
Ratepayer Impact Measure Test	0.64	4,604,135
Societal Cost Test	1.37	4,787,975
Participant Cost Test	1.88	4,939,301

Table 6-6 summarizes the cost effectiveness testing results by program for each test performed.

Table 6-6 Cost Effectiveness Test Scores by Program

Program	*UCT*	*TRC*	*RIM*	*SCT*	*PCT*
C&I Incentives	8.43	4.87	0.89	5.69	5.36
C&I Audit	6.14	3.66	0.85	4.29	4.42
C&I Retro-Commissioning Lite	2.62	1.22	0.64	1.37	1.88
C&I HVAC	-	-	-	-	-

Appendix A: C&I Incentives Project-Level Analyses

This section contains project-level analyses for the impact evaluation of the Commercial and Industrial Incentives Program.

Project Number AEPIM-13-0012

Executive Summary

Under project AEPIM-13-0012, the customer received incentives from Indiana Michigan Power for installing insulated cooler doors on 140 feet of open-air coolers and replacing T8 fluorescent case lights with LED lighting.

Project Description

The customer installed insulated cooler doors on the following:

- 68 feet of dairy case,
- 36 feet of deli case,
- 28 feet of produce case, and
- 8 feet of additional produce case.

The customer retrofitted the following fixtures:

- (72) T8 fluorescent case lights were replaced with (75) LED fixtures.

Measurement and Verification Effort

During the M&V site visit, ADM verified that 140 feet of insulated cooler doors were installed, as expected. The lack of reliable monitoring data on-site necessitated ADM's revision of ex-ante calculations that were performed by GNV GL. GNV GL's method involved a savings ratio analysis contingent upon normalized savings, per foot of cooler doors. Two project sites in the Midwest, with similar energy efficiency measures, were used for reference in their method of analysis.

Provided in the table below are the ex ante and ex post savings generated by installing insulated cooler doors.

Cooler Doors Savings Calculations

Measure	*Expected kWh Savings*	*Realized kWh Savings*	*Expected kW Savings*	*Realized kW Savings*
Insulated Cooler Doors	135,598	110,224	9.05	6.88

With the exception of one LED fixture, ADM verified that the facility lighting was in operation as expected. ADM confirmed store operating hours and developed an operational profile using information that was collected during the site visit.

In compliance with the Indiana TRM, Section III, p. 182, lighting retrofit energy savings are calculated as:

$$kWh_{savings} = (W_{base} - W_{asbuilt}) / 1000 * hours * (1+WHF_e)$$

Where:

$kWh_{savings}$	= *Annual energy savings*
W_{base}	= *Wattage of baseline fixtures*
$W_{asbuilt}$	= *Wattage of as-built fixtures*
1000	= *unit conversion factor (W/kW)*
hours	= *Lighting operating hours*
WHF_e	= *Waste Heat Factor for energy (0.41 for refrigerated space and 0.52 for freezer space)*

Lighting retrofit demand savings are calculated as:

$$kW_{savings} = (W_{base} - W_{asbuilt}) / 1000 * (1+WHF_d) * CF$$

Where:

$kW_{savings}$	= *Annual energy savings*
W_{base}	= *Wattage of baseline fixtures*
$W_{asbuilt}$	= *Wattage of as-built fixtures*
1000	= *unit conversion factor (W/kW)*
WHF_e	= *Waste Heat Factor for demand (0.41 for refrigerated space and 0.52 for freezer space)*
CF	= *Summer Peak Coincidence Factor (0.92 for lighting in food sales)*

Ex ante and ex post energy savings, from lighting retrofit, are provided in the table below.

Lighting Retrofit Savings Calculations

Measure	*Quantity (Fixtures)*		*Wattage*		*Hours*		*Expected kWh Savings*	*Realized kW Savings*
	Old	*New*	*Old*	*New*	*Old*	*New*		
T8 fluorescent fixtures with LED strip fixtures	72	75	32	21.6	8,760	8,760	8,448	0.89

Results and Summary

Verified Gross Savings/Realization Rates

Measure Category	*kWh Savings*		
	Expected	*Realized*	*Realization Rate*
Insulated Cooler Doors	135,598	110,224	81%
Lighting Retrofit	5,803	8,448	146%
Total	141,401	118,672	84%

The insulated cooler door measure realization rate is 81%. The discrepancy between estimated and realized savings can be attributed to an overstatement of pre-installation load factor and efficiency in the analysis of another grocery store which was used to estimate the ex ante savings. Pre-installation calculations for this site were unrealistic, as 100% load factor and efficiency were assumed. ADM revised this analysis to include typical values for these variables.

The lighting retrofit realization rate is 146%. ADM’s field staff verified that one less LED fixture was installed than what was initially proposed for project implementation. Additionally, the ex-post analysis included a waste heat factor in the savings calculation for reduced cooling load, resulting from energy efficient fixtures. As a result of these observations, the realization rate exceeded expectations.

The overall realization rate for this project is 84%.

Project Number AEPIM-13-00019

Executive Summary

Under project AEPIM-13-00019, the customer received incentives from Indiana Michigan Power for retrofitting air compressors and associated equipment in the facility. The realization rate for this project is 129%.

Project Description

The customer implemented the following equipment:

- (3) Joy Turbo Air Compressor (350 HP)
- (6) Allen Bradley Control System
- Dryers capable of operating independent of associated air compressor

Measurement and Verification Effort

During the M&V site visit, ADM verified that the facility's three primary and three secondary air compressors were operative. ADM used pre and post monitoring data provided by the implementer to calculate energy savings. During the site visit, ADM verified the post monitoring data to ensure operating conditions were consistent.

The energy savings are calculated as:

$$kW_{Reduction} = kW_{Baseline} - kW_{As-Built}$$

$$kWh = kW_{Reduction} \times 8{,}760$$

Where,

kW = Average kilo-watt energy demand during pre and post monitoring period

8,760 = Annual operating hours

During the baseline monitoring period, it was determined that the three primary compressors were inoperative. In an effort to meet recommendations for air system efficiency, these compressors were replaced by fully modulating compressors. During the site visit, it was discovered that the primary compressors are in full operation for 8,760 hours annually. As a result of this finding, ex-post savings were dramatically improved. The secondary compressors possessed modulating capability and were supplying the facility while being monitored. ADM's field engineer verified the baseline monitoring data and found that one of the secondary compressors was operating at near full capacity. ADM assumed this profile was the baseline condition for ex-ante savings calculations.

The Total Energy Savings

	Air Compressor	*Dryer*	*Total Demand*	*Total Consumption*
As Built	788	20	808	7,075,390
Baseline	672	20	691	6,057,116
Total Savings				1,018,274

Results

Verified Gross Savings/Realization Rates

Measure Category	*kWh Savings*		
	Expected	*Realized*	*Realization Rate*
Compressor Retrofit	790,071	1,018,274	129%
Total	790,071	1,018,274	129%

The project-level realization rate is 129%. The ex-ante savings analysis assumed the baseline operation with modulating air compressors and therefore, not all savings from the project were claimed. ADM verified that the baseline air compressors were running on on/off basis and more savings were realized from this project.

Project Number AEPIM-13-00027

Executive Summary

Under project AEPIM-13-00027, the customer received incentives from Indiana Michigan Power for retrofitting one air compressor in the facility. The realization rate for this project is 102%.

Project Description

The customer implemented the following upgrade:

- (1) Atlas GA VSD Air Compressor (160 HP)

Measurement and Verification Effort

During the M&V visit, ADM verified that the air compressor on site was in operation as expected. ADM used pre and post monitoring data, provided in addition to the application, to calculate savings. The facility maintained two air compressors, the Gardner-Denver and Kaeser air compressors, which operate collaboratively. It was determined that the operation of the Gardner-Denver air compressor was inferior to recommended performance standards. In an effort to improve air system efficiency, it was replaced with an Atlas VSD air compressor. The Kaeser air compressor was deemed suitable for meeting demand, and thus remained in service. Both air compressors were subject to pre and post monitoring. During the visit, post monitoring data were verified, once more, to ensure the same operating condition.

The monitoring period involved two weeks of pre-monitoring and six days of post-monitoring the project installations. In an effort to enhance the accuracy of savings analysis, ADM's field staff created distinct load profiles for weekends and weekdays to reflect the facility's hours of operation.

The annual energy savings is calculated as:

$$kWh_{Savings} = \left(5 \times kW_{Baseline\_Weekday} + 2 \times kW_{Baseline\_Weekend} - 5 \times kW_{As\_Built\_Weekday} + 2 \times kW_{As\_Built\_Weekend}\right) \times {}^{365}/_{7}$$

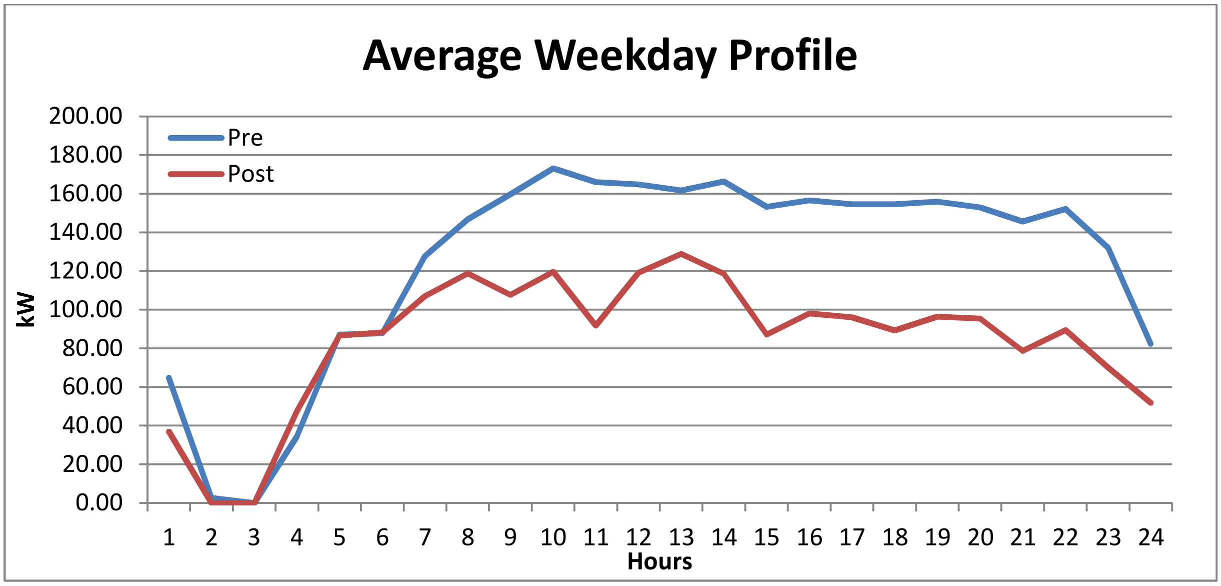
Where,

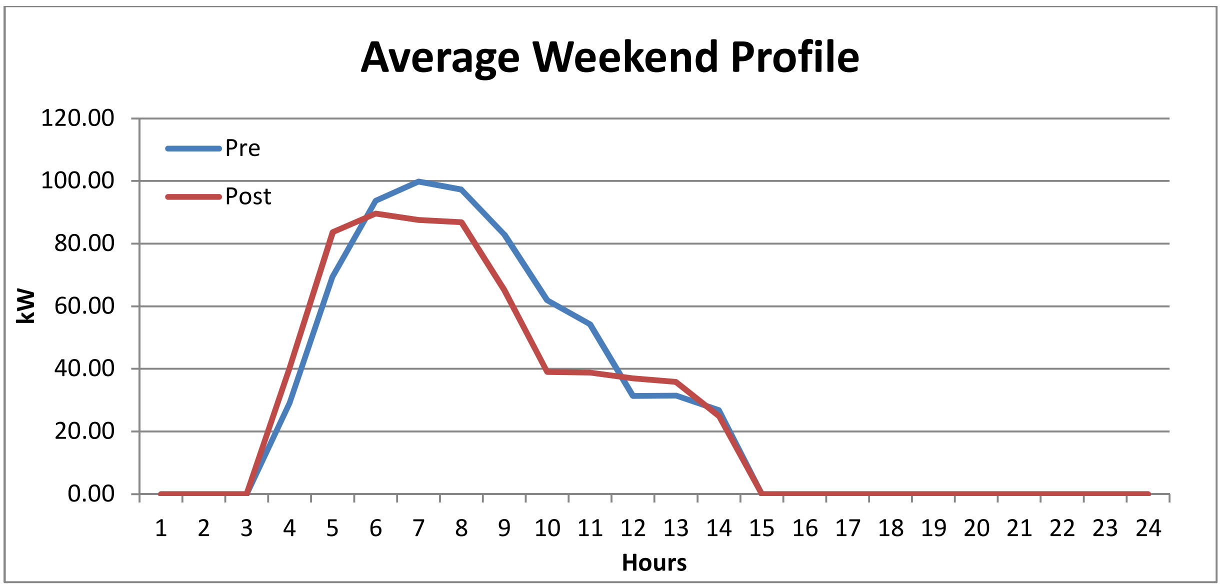
kW = Average kilo-watt energy during pre and post monitoring period

365 = Number of Days

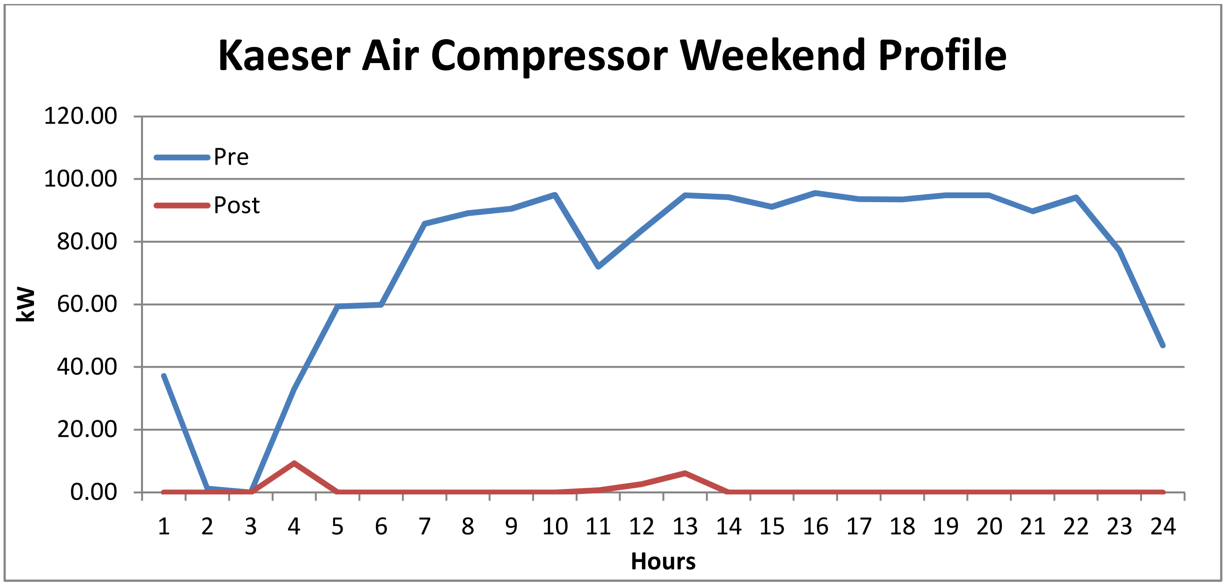
7 = Number of Days in a Week

The difference between energy profiles on weekdays and weekends is illustrated below.





A significant portion of savings can be attributed to shifting load from the existing Kaiser air compressor to a more energy efficient measure.



The Total Energy Savings

	Weekday	*Weekend*	*Peak kW*	*Annual kWh*
Baseline	124.27	28.25	156.60	848,281
As Built	84.29	26.18	99.07	592,968
Total Savings			57.53	255,314

Results

Verified Gross Savings/Realization Rates

Measure Category	*kWh Savings*		
	Expected	*Realized*	*Realization Rate*
Compressor Air Retrofit	249,718	255,314	102%
Total	249,718	255,314	102%

The project-level realization rate is 102%. ADM used consistent methodology and monitoring data in as the ex ante analysis, and the realization rate was a product of this congruity.

Project Number AEPIM-13-00033

Executive Summary

Under project AEPIM-13-00033, the customer received incentives from Indiana Michigan Power for retrofitting lighting in the manufacturing, office, break room, storage and exterior areas of the facility. The realization rate for this project is 69%.

Project Description

The customer retrofitted the following fixtures:

- (8) Incandescent exit sign fixtures to (8) LED exit sign fixtures
- (1) 175W metal halide wallpack fixture to (1) 2 lamp 26W CFL wallpack fixture
- (4) 400W metal halide wallpack fixtures to (4) 2 lamp 57W CFL wallpack fixtures
- (3) Delamped 400W metal halide fixtures
- (36) 2 lamp 2’ T12 fixtures to (36) 2 lamp 2’ T8 fixtures
- (76) 4 lamp 4’ T12 fixtures to (76) 2 lamp 4’ T8 fixtures
- (6) 2 lamp 4’ T12 fixtures to (6) 2 lamp 4’ T8 fixtures
- (14) 2 lamp 4’ T12 fixtures to (14) 2 lamp 4’ T8 fixtures on occupancy sensors
- (5) 4 lamp 4’ T12 fixtures to (5) 4 lamp 4’ T8 fixtures on occupancy sensors
- (3) 4 lamp 4’ T12 fixtures to (3) 2 lamp 4’ T8 fixtures
- (6) 2 lamp 4’ T12 fixtures to (2) 2 lamp 4’ T8 fixtures
- (61) 2 lamp 8’ T12 fixtures to (73) 4 lamp 8’ T8 fixtures
- (8) 2 lamp 8’ T12 fixtures to (8) 4 lamp 8’ T8 fixtures on occupancy sensors
- (12) 2 lamp 8’ T12 fixtures to (12) 4 lamp 8’ T8 fixtures

Measurement and Verification Effort

During the M&V visit, ADM verified that the facility lighting was in operation as expected. ADM developed an operational profile using scheduling data that was collected during an on-site interview.

Lighting retrofit energy savings are calculated as:

$$kWh_{savings} = \sum_{Area} \left[HCIF \times t \times \left(N_{base} \times W_{base} - N_{as-built} \times W_{as-built} \right) / 1000 \right]$$

Where:

$kWh_{savings}$	= *Annual energy savings*
N	= *Number of fixtures*
W	= *Wattage of each fixture*
t	= *Lighting operating hours*
$HCIF$	= *HVAC interactive factor*

Provided in the table below are the expected and realized energy savings for lighting retrofit.

Lighting Retrofit Savings Calculations

Measure	Quantity (Fixtures)		Wattage		Hours	Realized kWh Savings	Heating Cooling Interaction Factor
	Old	New	Old	New			
Incand. Exist signs to LED exit signs	8	8	40	5	8,760	2,453	1.000
175W MH to 2L CFL	1	1	215	56	4,300	701	1.000
400W MH to 2L CFL	4	4	458	114	4,300	5,917	1.000
400W MH removed	3	0	458	0	3,956	5,435	1.000
2L 2’ T12 to 2L 2’ T8	36	36	86	56	4,152	4,484	1.000
4L 4’ T12 to 2L 4’ T8	18	18	172	56	4,152	8,668	1.000
4L 4’ T12 to 2L 4’ T8	58	58	172	56	3,956	28,919	1.087
2L 4’ T12 to 2L 4’ T8	6	6	86	56	3,956	774	1.087
2L 4’ T12 to 2L 4’ T8	14	14	86	56	2,066	2,321	1.087
4L 4’ T12 to 4L 4’ T8	5	5	172	111	2,066	1,669	1.087
4L 4’ T12 to 2L 4’ T8	3	3	172	56	3,956	1,496	1.087
2L 4’ T12 to 2 L 4’ T8	6	2	86	56	3,956	1,598	1.000
2L 8’ T12 to 4L 8’ T8	61	73	220	111	3,956	21,034	1.000
2L 8’ T12 to 4L 8’ T8	8	8	220	111	1,095	4,933	1.000
2L 8’ T12 to 4L 8’ T8	7	7	220	111	3,956	3,018	1.000
2L 8’ T12 to 4L 8’ T8	5	5	220	111	3,956	2,156	1.000
Total						95,575	

Results

Verified Gross Savings/Realization Rates

Measure Category	kWh Savings			kW Savings
	Expected	Realized	Realization Rate	Realized
Lighting Retrofit	138,954	95,575	69%	17.50
Total	138,954	95,575	69%	17.50

The project-level realization rate is 69%. The discrepancy between estimated and realized savings can be attributed to an overstatement of annual operating hours in ex-ante savings calculations. ADM’s field staff conducted monitoring in four distinct areas of the building in an attempt to determine operating hours. In addition to this effort, ADM confirmed the facility lighting schedule with site contacts.

Project Number AEPIM-13-00036

Executive Summary

Under project AEPIM-13-00036, the customer received incentives from Indiana Michigan Power for retrofitting interior lighting in the retail floor area. The realization rate for this project is 93.4%.

Project Description

The customer retrofitted the following fixtures:

- (1,734) 75W halogen fixtures with (1,734) 12W LED fixtures.

Measurement and Verification Effort

During the M&V visit, ADM verified that the facility lighting was in operation as expected. ADM used lighting logger data collected by the implementation contractor as well as information collected on site in order to develop an operational profile.

Lighting retrofit energy savings are calculated as:

$$kWh_{savings} = \sum_{Area} \left[HCIF \times t \times \left(N_{base} \times W_{base} - N_{as-built} \times W_{as-built} \right) / 1000 \right]$$

Where:

$kWh_{savings}$	= *Annual energy savings*
N	= *Number of fixtures*
W	= *Wattage of each fixture*
t	= *Lighting operating hours*
$HCIF$	= *HVAC interactive factor*

The table shown below presents expected and realized energy savings for the lighting retrofit installed under the project.

Lighting Retrofit Savings Calculations

Measure	*Quantity (Fixtures)*		*Wattage*		*Hours*	*Realized kWh Savings*	*Heating Cooling Interaction Factor*
	Old	*New*	*Old*	*New*			
75W Halogen to 12W LED	1,734	1,734	75	12	3,843	465,191	1.108
Total						465,191	

Results

Verified Gross Savings/Realization Rates

Measure Category	*kWh Savings*		
	Expected	*Realized*	*Realization Rate*
Lighting Retrofit	497,871	465,191	93.4%
Total	497,871	465,191	93.4%

The project-level realization rate is 93.4%. The realization rate is slightly lower because ex post calculation used an HCIF that was lower than ex ante calculations; ex post used a value for large retail while ex ante used a value for warehouses.

Project Number AEPIM-13-0057

Executive Summary

Under project AEPIM-13-0057, the customer received incentives from Indiana Michigan Power for retrofitting interior lighting in the office floor area. The realization rate for this project is 95.4%.

Project Description

The customer retrofitted the following fixtures:

- (32) 400W Metal Halide fixtures with 100W Induction fixtures;
- (45) 400W Metal Halide fixtures with (43) 100W Induction fixtures;
- (104) 400W Metal Halide fixtures with (104) 100W Induction fixtures;
- (105) 400W Metal Halide fixtures with (105)100W Induction fixtures.

Measurement and Verification Effort

During the M&V visit, ADM verified that the facility lighting was in operation as expected. ADM used lighting logger data collected by the implementation contractor as well as information collected on site in order to develop an operational profile.

Lighting retrofit energy savings are calculated as:

$$kWh_{savings} = \sum_{Area} \left[HCIF \times t \times \left(N_{base} \times W_{base} - N_{as-built} \times W_{as-built} \right) / 1000 \right]$$

Where:

$kWh_{savings}$	= *Annual energy savings*
N	= *Number of fixtures*
W	= *Wattage of each fixture*
t	= *Lighting operating hours*
$HCIF$	= *HVAC interactive factor*

The table shown below presents expected and realized energy savings for the lighting retrofit installed under the project.

Lighting Retrofit Savings Calculations

Measure	*Quantity (Fixtures)*		*Wattage*		*Hours*	*Heating Cooling Interaction Factor*	*Realized kWh Savings*
	Old	*New*	*Old*	*New*			
400W Metal Halide to 100W Induction	32	32	458	105	4,547	1.084	55,657
400W Metal Halide to 100W Induction	45	43	458	105	4,127	1.084	67,881
400W Metal Halide to 100W Induction	104	104	458	105	4,349	1.084	173,009
400W Metal Halide to 100W Induction	105	105	458	105	4,306	1.084	172,945
						Total	469,493

Results

Verified Gross Savings/Realization Rates

Measure Category	*kWh Savings*		
	Expected	*Realized*	*Realization Rate*
Lighting Retrofit	491,954	469,493	95.4%
Total	491,954	469,493	95.4%

The project-level realization rate is 95.4%. The realization rate is slightly lower because ex post calculations used an HCIF that was lower than ex ante calculations.

Project Number AEPIM-13-00059

Executive Summary

Under project AEPIM-13-00059, the customer received incentives from Indiana Michigan Power for retrofitting interior lighting in the warehouse floor area. The realization rate for this project is 101.6%.

Project Description

The customer retrofitted the following fixtures:

- (59) Metal Halide fixtures with 4' 4-lamp T8 fixtures;
- (4) Metal Halide fixtures with 4' 6-lamp T8 fixtures;
- (2) Metal Halide fixtures removed;
- (26) 2' 2-lamp T12 fixtures with 4' 6-lamp T8 fixtures;
- (1) 4' 4-lamp T12 fixtures with 4' 4-lamp T8 fixtures;
- (42) 4-lamp T12 fixtures with 4' 2-lamp T8 fixtures;
- (17) 8' 2-lamp T12 fixtures with 4' 4-lamp T8 fixtures;
- (51) 4' 2-lamp T12 wrap around fixtures with 4' 2-lamp T8 fixtures;
- (3) 4' 2-lamp T12 fixtures with 4' 2-lamp T8 fixtures;
- (16) 4' 4-lamp T12 fixtures with 4'4-lamp T8 fixtures;
- (7) Metal Halide Exit Sign with LED Exit sign, with battery backup spots; and,
- (4) Metal Halide Exit Sign with LED Exit sign.

Measurement and Verification Effort

During the M&V visit, ADM verified that the facility lighting was in operation as expected. ADM used lighting logger data collected by the implementation contractor as well as information collected on site in order to develop an operational profile.

Lighting retrofit energy savings are calculated as:

$$kWh_{savings} = \sum_{Area} \left[HCIF \times t \times \left(N_{base} \times W_{base} - N_{as-built} \times W_{as-built} \right) / 1000 \right]$$

Where:

$kWh_{savings}$	= *Annual energy savings*
N	= *Number of fixtures*
W	= *Wattage of each fixture*
t	= *Lighting operating hours*
$HCIF$	= *HVAC interactive factor*

The table shown below presents expected and realized energy savings for the lighting retrofit installed under the project.

Lighting Retrofit Savings Calculations

Measure	*Quantity (Fixtures)*		*Wattage*		*Hours*		*Realized kWh Savings*	*Heating Cooling Interaction Factor*
	Old	*New*	*Old*	*New*	*Old*	*New*		
Metal Halide fixtures with 4’ 4-lamp T8 fixtures	32	32	458	144	8,755	7,596	93,310.91	1.000
Metal Halide fixtures with 4’ 4-lamp T8 fixtures on occ sensors	10	10	458	144	8,755	4,995	32,905.82	1.000
Metal Halide fixtures with 4’ 6-lamp T8 fixtures	4	4	458	221	8,755	7,596	9,324.30	1.000
Metal Halide fixtures removed	2	0	458	0	8,755	0	8,019.58	1.000
Metal Halide fixtures with 4’ 4-lamp T8 fixtures on occ sensors	8	8	458	144	8,755	1,443	30,415.98	1.000
Metal Halide fixtures with 4’ 4-lamp T8 fixtures	9	9	458	144	8,755	7,596	26,243.69	1.000
8’ 2-lamp T12 fixtures with 4’ 4-lamp T8 fixtures	4	4	228	144	8,755	7,596	3,609.26	1.000
4’ 2-lamp T12 fixtures with 4’ 2-lamp fixtures	51	51	82	56	5,408	6,308	4,985.24	1.084
4’ 4-lamp T12 fixtures with 4’ 2-lamp fixtures	16	16	164	56	3,165	1,700	7,348.75	1.084
4’ 4-lamp T12 fixtures with 4’ 2-lamp fixtures	42	42	164	56	5,408	6,308	24,287.81	1.084
8’ 2-lamp fixtures with 4’ 4-lamp T8 fixtures	13	13	228	144	3,960	3,960	4,685.86	1.084
4’ 2-lamp T12 fixtures with 4’ 2-lamp T8 fixtures	1	1	82	56	3,960	3,960	111.57	1.084
2’ 2-lamp Metal Halide fixture with 4’ 6-lamp T8 fixtures	6	6	458	221	7,749	7,607	11,517.71	1.028
4’ 2-lamp T12 fixtures with 4’ 2-lamp T8 fixtures	2	2	82	56	3,960	3,960	205.92	1.000
Metal Halide Exit Sign with LED Exit sign, with battery backup spots	7	7	40	6	8,760	8,760	2,084.88	1.000
Metal Halide Exit Sign with LED Exit sign, with battery backup spots	4	4	40	6	8,760	8,760	1,191.36	1.000
2’ 2-lamp Metal Halide fixture with 4’ 6-lamp T8 fixtures	20	20	458	221	7,579	7,579	36,919.25	1.028
4-lamp T12 fixtures with 4’4-Lamp T8 fixtures	1	1	164	144	7,579	7579	155.78	1.028
Total							297,324	

Results

Verified Gross Savings/Realization Rates

Measure Category	*kWh Savings*		
	Expected	*Realized*	*Realization Rate*
Lighting Retrofit	292,667	297,324	101.6%
Total	292,667	297,324	101.6%

The project-level realization rate is 101.6%.

Project Number AEPIM-13-00062

Executive Summary

Under project AEPIM-13-00062, the customer received incentives from Indiana Michigan Power for retrofitting lighting in the interior and exterior areas of the facility. The realization rate for this project is 97%.

Project Description

The customer retrofitted the following fixtures:

- (10) 400W metal halide fixtures to (10) 6 lamp 32W T8 fixtures
- (176) 400W high pressure sodium fixtures to (176) 78W LED fixtures
- (6) 250W metal halide wall pack fixtures to (6) 52W LED wall pack fixtures
- (13) 400W metal halide fixtures to (13) 78W LED fixtures
- (17) 400W high pressure sodium fixtures to (17) 140W LED fixtures
- (14) 1000W metal halide fixtures to (14) 750W metal halide pulse start fixtures
- (46) 150W metal halide wall pack fixtures to (46) 52W LED wall pack fixtures
- (2) 60W incandescent fixtures to (2) A19 LED fixtures
- (1) 250W metal halide fixtures to (1) 78W LED fixtures
- (1,459) 1000W metal halide fixtures to
    - (30) 153W high bay LED fixtures
    - (766) 172W high bay LED fixtures
    - (663) 255W high bay LED fixtures
- (7) Delamped 1000W metal halide fixtures
- (21) Delamped 8’ 32W T8 fixtures
- (394) 1000W metal halide fixtures to (394) 172W high bay LED fixtures
- (255) 400W metal halide fixtures to (255) 146W high bay LED fixtures
- (23) 250W metal halide to (23) 78W LED fixtures
- (14) 250W high pressure sodium to (14) 78W LED fixtures
- (8) 4 lamp 8’ T12 fixtures to (8) 2 lamp 4’ T8 fixtures
- (2,200) 6 lamp 32W T8 fixtures to (2,200) 6 lamp 28W T8 fixtures
- (1,080) 3 lamp 32W T8 fixtures to (1,080) 3 lamp 28W T8 fixtures

The customer also installed occupancy sensors on high bay fixtures, but savings associated with these installations were unaccounted for in ex-ante calculations.

Measurement and Verification Effort

During the M&V site visit, ADM verified that the facility lighting was in operation as expected. ADM developed an operational profile using scheduling data that were collected during an on-site interview.

Lighting retrofit energy savings are calculated as:

$$kWh_{savings} = \sum_{Area} \left[HCIF \times t \times \left(N_{base} \times W_{base} - N_{as-built} \times W_{as-built} \right) / 1000 \right]$$

Where:

$kWh_{savings}$	= *Annual energy savings*
N	= *Number of fixtures*
W	= *Wattage of each fixture*
t	= *Lighting operating hours*
$HCIF$	= *HVAC interactive factor*

The table provided below presents expected and realized energy savings for lighting retrofit installations.

Lighting Retrofit Savings Calculations

Measure	*Quantity (Fixtures)*		*Wattage*		*Hours*	*Realized kWh Savings*	*Heating Cooling Interaction Factor*
	Old	*New*	*Old*	*New*			
MH to 6LT8	10	10	458	218	7,063	16,952	1.000
HPS to LED	176	176	465	78	4,300	292,882	1.000
MH to LED wall pack	6	6	295	52	4,300	6,269	1.000
MH to LED	13	13	458	78	4,300	21,242	1.000
HPS to LED high bay	17	17	465	140	4,300	23,758	1.000
MH to MH P/S	14	14	1080	805	4,300	16,555	1.000
MH to LED wall pack	46	46	195	52	4,300	28,285	1.000
Incandescent to A19 LED	2	2	60	12	4,300	413	1.000
MH to LED	1	1	295	78	4,300	933	1.000
MH to LED high bay	30	30	1080	153	7,063	196,427	1.000
MH to LED high bay	766	766	1080	172	7,063	4,912,641	1.000
MH to LED high bay	663	663	1080	255	7,063	3,863,384	1.000
Delamped MH	7	0	1080	0	7,063	53,398	1.000
Delamped 8’ T8s	114	0	110	0	8,760	109,850	1.000
MH to LED high bay	394	394	1080	172	7,063	2,526,867	1.000
MH to LED high bay	255	255	458	146	7,063	561,947	1.000
MH to LED	23	23	295	78	7,063	35,252	1.000
MH to LED	14	14	295	78	7,063	21,458	1.000
4L 8’ T12s to 2L 4’ T8s	8	8	160	65	7,063	5,368	1.000
6L 32W T8s to 6L 28W T8s	2,200	2,200	216	182	7,510	561,748	1.000
3L 32W T8s to 3L 28W T8s	1,080	1,080	84	72	8,760	113,530	1.000
Total						13,369,158	

Results

Verified Gross Savings/Realization Rates

Measure Category	*kWh Savings*			*kW Savings*
	Expected	*Realized*	*Realization Rate*	*Realized*
Lighting Retrofit	13,855,069	13,369,158	97%	1,457.26
Total	13,855,069	13,369,158	97%	1,457.26

The project-level realization rate is 97%. The discrepancy in savings can be attributed to ADM overestimating pre-retrofit operating hours in ex-ante calculations.

Project Number AEPIM-13-0070

Executive Summary

Under project AEPIM-13-0070, the customer received incentives from Indiana Michigan Power for retrofitting interior lighting in the retail floor area. The realization rate for this project is 93.6%.

Project Description

The customer retrofitted the following fixtures:

- (146) 400W metal halide fixtures with (220) 4-lamp T8 fixtures;
- (42) 4-lamp T8 fixtures with (50) 2-lamp T8 fixtures;
- (29) 4-lamp T8 fixtures with (30) 2-lamp T8 fixtures with occupancy sensors; and,
- (5) 4-lamp T8 fixtures with (10) 4-lamp T8 fixtures with occupancy sensors.

Measurement and Verification Effort

During the M&V visit, ADM verified that the facility lighting was in operation as expected. ADM used lighting logger data collected by the implementation contractor as well as information collected on site in order to develop an operational profile.

Lighting retrofit energy savings are calculated as:

$$kWh_{savings} = \sum_{Area} \left[HCIF \times t \times \left(N_{base} \times W_{base} - N_{as-built} \times W_{as-built} \right) / 1000 \right]$$

Where:

$kWh_{savings}$	= *Annual energy savings*
N	= *Number of fixtures*
W	= *Wattage of each fixture*
t	= *Lighting operating hours*
$HCIF$	= *HVAC interactive factor*

The table shown below presents expected and realized energy savings for the lighting retrofit installed under the project.

Lighting Retrofit Savings Calculations

Measure	Quantity (Fixtures)		Wattage		Hours		Heating Cooling Interaction Factor	Realized kWh Savings
	Old	New	Old	New	Old	New		
400W metal halide fixtures to 4-L T8 fixtures	146	220	458	90	5,954	5,954	1.115	312,371
4-L T8 fixtures to 2-L T8 fixtures	42	50	112	90	5,954	5,954	1.115	1,354
4-L T8 fixtures to 2-L T8 fixtures with occupancy sensors	15	15	112	44	7,816	4,136	1.115	11,594
4-L T8 fixtures to 2-L T8 fixtures with occupancy sensors	14	15	112	44	7,816	572	1.115	13,240
4-L T8 fixtures to 4-L T8 fixtures with occupancy sensors	5	10	112	44	6,588	3,018	1.115	2,632
							Total	341,190

Results

Verified Gross Savings/Realization Rates

Measure Category	kWh Savings		
	Expected	Realized	Realization Rate
Lighting Retrofit	364,335	341,190	93.6%
Total	364,335	341,190	93.6%

The project-level realization rate is 93.6%. The realization rate is slightly lower because ex post calculations used an HCIF that was lower than ex ante calculations.

Project Number AEPIM-13-00075

Executive Summary

Under project AEPIM-13-00075, the customer received incentives from Indiana Michigan Power for retrofitting interior lighting in the retail floor area. The realization rate for this project is 93.4%.

Project Description

The customer retrofitted (742) 90W halogen lamps with (742) 17W LEDs on the retail floor.

Measurement and Verification Effort

During the M&V visit, ADM verified that the facility lighting was in operation as expected. ADM used lighting logger data collected by the implementation contractor as well as information collected on site in order to develop an operational profile.

Lighting retrofit energy savings are calculated as:

$$kWh_{savings} = \sum_{Area} \left[HCIF \times t \times \left(N_{base} \times W_{base} - N_{as-built} \times W_{as-built} \right) / 1000 \right]$$

Where:

$kWh_{savings}$	= *Annual energy savings*
N	= *Number of fixtures*
W	= *Wattage of each fixture*
t	= *Lighting operating hours*
$HCIF$	= *HVAC interactive factor*

The table shown below presents expected and realized energy savings for the lighting retrofit installed under the project.

Lighting Retrofit Savings Calculations

Measure	*Quantity (Fixtures)*		*Wattage*		*Hours*	*Heating Cooling Interaction Factor*	*Realized kWh Savings*
	Old	*New*	*Old*	*New*			
90W Halogen to 17W LED	371	371	90	17	3,553	1.108	106,626
90W Halogen to 17W LED	371	371	90	17	3,236	1.108	97,113
Total							203,739

Results

Verified Gross Savings/Realization Rates

Measure Category	*kWh Savings*		
	Expected	*Realized*	*Realization Rate*
Lighting Retrofit	218,066	203,739	93.4%
Total	218,066	203,739	93.4%

The project-level realization rate is 93.4%. The slightly low realization rate can be attributed to the ex post calculation using a HCIF that was lower than that used ex ante calculations.

Project Number AEPIM-13-00076

Executive Summary

Under project AEPIM-13-00106, the customer received incentives from Indiana Michigan Power for retrofitting lighting in the hallways and common areas of the facility. The realization rate for this project is 96%.

Project Description

The customer retrofitted the following fixtures:

- (511) 1 lamp 8' T12 fixtures to (210) LED down light fixtures
- (70) 2 lamp 60W incandescent sconce fixtures to (70) 2 lamp 13W CFL fixtures
- (70) 66W incandescent spotlight fixtures to (196) LED down light fixtures
- (50) 90W incandescent fixtures to (50) PAR38 LED fixtures
- (50) 60W incandescent fixtures to (50) PAR20 LED fixtures
- (52) 60W incandescent fixtures to (17) 2 lamp 4' 32W T8 fixtures
- (30) 60W incandescent fixtures to (3) A19 LED floor lamp fixtures
- (30) 60W incandescent fixtures to (4) BR30 LED pendulum fixtures

Measurement and Verification Effort

During the M&V visit, ADM verified that the facility lighting was in operation, as expected. ADM developed an operational profile using scheduling data that was collected during an on-site interview.

Lighting retrofit energy savings are calculated as:

$$kWh_{savings} = \sum_{Area} \left[HCIF \times t \times \left(N_{base} \times W_{base} - N_{as-built} \times W_{as-built} \right) / 1000 \right]$$

Where:

$kWh_{savings}$	= *Annual energy savings*
N	= *Number of fixtures*
W	= *Wattage of each fixture*
t	= *Lighting operating hours*
$HCIF$	= *HVAC interactive factor*

Expected and realized energy savings for lighting retrofit are provided in the table below.

Lighting Retrofit Savings Calculations

Measure	*Quantity (Fixtures)*		*Wattage*		*Hours*	*Realized kWh Savings*	*Heating Cooling Interaction Factor*
	Old	*New*	*Old*	*New*			
1L 8' T12 to LED	511	210	38	13	8,760	168,394	1.152
2L Incandescent to 2L CFL	70	70	120	26	8,760	66,397	1.152
Incandescent to LED	70	188	66	13	8,760	21,957	1.152
Incandescent to PAR38 LED	50	48	90	20.3	8,760	35,576	1.152
Incandescent to PAR20 LED	50	36	60	9	8,760	27,003	1.152
Incandescent to 2L T8	52	15	60	43	6,500	18,531	1.152
Incandescent to A19 LED	30	3	60	50	6,500	12,354	1.152
Incandescent to BR30 LED	30	4	60	13.8	6,500	13,064	1.152
Total						363,277	

Results

Verified Gross Savings/Realization Rates

Measure Category	*kWh Savings*			*kW Savings*
	Expected	*Realized*	*Realization Rate*	*Realized*
Lighting Retrofit	378,759	363,277	96%	16.13
Total	378,759	363,277	96%	16.13

The project-level realization rate is 96%. The discrepancy between savings can be attributed to a slight difference in HCIF values used in ex-ante and ex-post savings calculations. Additionally, ADM conducted separate site visits at which they determined that not all LED and T8 fixtures had been installed.

Project Number AEPIM-13-00077

Executive Summary

Under project AEPIM-13-00077, the customer received incentives from Indiana Michigan Power for retrofitting interior lighting in the grocery floor, storage, and office areas. The realization rate for this project is 100%.

Project Description

The customer retrofitted the following fixtures:

- (27) 400W Metal Halide fixtures with (82) 8’ 4-lamp 28W T8 fixtures;
- (25) 400W Metal Halide fixtures with (7) 4’ 2-lamp 28W T8 fixtures;
- (6) 4’ 4-lamp T8 fixture with (6) 4’ 2-lamp 28W T8 fixtures, with occupancy sensors;
- (8) 8’ 4-lamp T8 fixtures with (8) 8’ 4-lamp 28W T8 fixtures, with occupancy sensors; and,
- (8) 4’ 2-lamp T8 fixtures with (8) 4’ 2-lamp 28W T8 fixtures, with occupancy sensors.

Measurement and Verification Effort

During the M&V visit, ADM verified that the facility lighting was in operation as expected. ADM used lighting logger data collected by the implementation contractor as well as information collected on site in order to develop an operational profile.

Lighting retrofit energy savings are calculated as:

$$kWh_{savings} = \sum_{Area} \left[HCIF \times t \times \left(N_{base} \times W_{base} - N_{as-built} \times W_{as-built} \right) / 1000 \right]$$

Where:

$kWh_{savings}$	= *Annual energy savings*
N	= *Number of fixtures*
W	= *Wattage of each fixture*
t	= *Lighting operating hours*
$HCIF$	= *HVAC interactive factor*

The table shown below presents expected and realized energy savings for the lighting retrofit installed under the project.

Lighting Retrofit Savings Calculations

Measure	*Quantity (Fixtures)*		*Wattage*		*Hours*		*Realized kWh Savings*	*Heating Cooling Interaction Factor*
	Old	*New*	*Old*	*New*	*Old*	*New*		
400W Metal Halide fixtures with 8’ 4-lamp 28W T8 fixtures	27	82	459	90	4,821	4,821	26,004	1.076
400W Metal Halide fixtures with 4’ 2-lamp 28W T8 fixtures	25	7	459	44	4,821	4,821	57,928	1.076
4’ 4-lamp 32W T8 fixtures with 4’ 2-lamp 28W T8 fixtures, with occupancy sensors	6	6	118	44	4,821	3,375	2,714	1.076
4’ 4-lamp 32W T8 fixtures with 4’ 2-lamp 28W T8 fixtures, with occupancy sensors	8	8	59	44	4,821	3,375	1,170	1.076
8’ 4-lamp 32W T8 fixtures with 8’ 4-lamp 28W T8 fixtures, with occupancy sensors	8	8	118	90	4,821	3,375	2,282	1.076
Total							90,099	

Results

Verified Gross Savings/Realization Rates

Measure Category	*kWh Savings*		
	Expected	*Realized*	*Realization Rate*
Lighting Retrofit	90,098	90,099	100%
Total	90,098	90,099	100%

The project-level realization rate is 100%.

Project Number AEPIM-13-0087

Executive Summary

Under project AEPIM-13-0087, the customer received incentives from Indiana Michigan Power for retrofitting interior lighting in the warehouse floor area. The realization rate for this project is 100%.

Project Description

The customer retrofitted the following fixtures:

- (27) 2-lamp T12 High Output (HO) fixtures with (6) 4-lamp T5 HO fixtures;
- (2) 2-lamp T12 HO fixtures with (2) 4-lamp T5 HO fixtures;
- (14) 400W metal halide fixtures with (13) 4-L T5HO fixtures;
- (29) 2-lamp T12 HO fixtures with (6) 4-lamp T5 HO fixtures with occupancy sensors;
- (29) 2-lamp T12 HO fixtures with (6) 4-lamp T5 HO fixtures with occupancy sensors;
- (29) 2-lamp T12 HO fixtures with (9) 4-lamp T5 HO fixtures with occupancy sensors;
- (29) 2-lamp T12 HO fixtures with (6) 4-lamp T5 HO fixtures with occupancy sensors;
- (29) 2-lamp T12 HO fixtures with (9) 4-lamp T5 HO fixtures with occupancy sensors;
- (29) 2-lamp T12 HO fixtures with (6) 4-lamp T5 HO fixtures with occupancy sensors;
- (27) 2-lamp T12 HO fixtures with (12) 4-lamp T5 HO fixtures with occupancy sensors;
- (2) 2-lamp T12 HO fixtures with (2) 4-lamp T5 HO fixtures with occupancy sensors;
- Removal of (1) 400W metal halide fixture;
- (29) 2-lamp T12 HO fixtures with (9) 4-lamp T5 HO fixtures with occupancy sensors;

Measurement and Verification Effort

During the M&V visit, ADM verified that the facility lighting was in operation as expected. ADM used lighting logger data collected by the implementation contractor as well as information collected on site in order to develop an operational profile.

Lighting retrofit energy savings are calculated as:

$$kWh_{savings} = \sum_{Area} \left[HCIF \times t \times \left(N_{base} \times W_{base} - N_{as-built} \times W_{as-built} \right) / 1000 \right]$$

Where:

$kWh_{savings}$	= *Annual energy savings*
N	= *Number of fixtures*
W	= *Wattage of each fixture*
t	= *Lighting operating hours*
$HCIF$	= *HVAC interactive factor*

The table shown below presents expected and realized energy savings for the lighting retrofit installed under the project.

Lighting Retrofit Savings Calculations

Measure	*Quantity (Fixtures)*		*Wattage*		*Hours*		*Heating Cooling Interaction Factor*	*Realized kWh Savings*
	Old	*New*	*Old*	*New*	*Old*	*New*		
2-lamp T12HO fixtures to 4-L T5HO fixtures	27	6	207	234	6,007	6,007	1.000	25,139
2-lamp T12HO fixtures to 4-L T5HO fixtures	2	2	207	234	8,760	8,760	1.000	-473
400W Metal Halide to 4-L T5HO	14	13	458	234	6,303	6,303	1.000	21,241
2-lamp T12HO fixtures to 4-L T5HO fixtures	29	6	207	234	6,007	6,007	1.000	27,626
2-lamp T12HO fixtures to 4-L T5HO fixtures	29	6	207	234	6,007	6,007	1.000	27,626
2-lamp T12HO fixtures to 4-L T5HO fixtures	29	9	207	234	6,007	6,007	1.000	23,409
2-lamp T12HO fixtures to 4-L T5HO fixtures	29	6	207	234	6,007	6,007	1.000	27,626
2-lamp T12HO fixtures to 4-L T5HO fixtures	29	9	207	234	6,007	6,007	1.000	23,409
2-lamp T12HO fixtures to 4-L T5HO fixtures	29	6	207	234	6,007	6,007	1.000	27,626
2-lamp T12HO fixtures to 4-L T5HO fixtures	27	12	207	234	6,007	6,007	1.000	16,705
2-lamp T12HO fixtures to 4-L T5HO fixtures	2	2	207	234	8,760	8,760	1.000	-473
400W Metal Halide to 4-L T5HO	1	0	458	0	6,007	0	1.000	2,751
2-lamp T12HO fixtures to 4-L T5HO fixtures	29	9	207	234	6,007	6,007	1.000	23,409
Total								245,624

Results

Verified Gross Savings/Realization Rates

Measure Category	*kWh Savings*		
	Expected	*Realized*	*Realization Rate*
Lighting Retrofit	245,621	245,624	100%
Total	245,621	245,624	100%

The project-level realization rate is 100%.

Project Number AEPIM-13-00088

Executive Summary

Under project AEPIM-13-00088, the customer received incentives from Indiana Michigan Power for replacing a 250hp centrifugal air compressor with a 200hp screw air compressor. The realization for this project is 93%

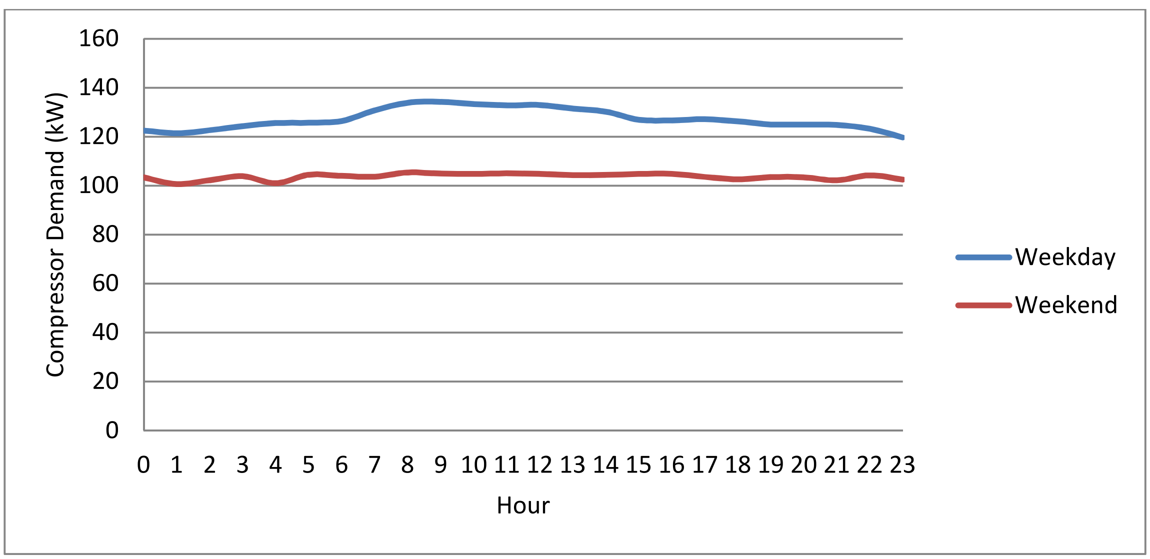
Project Description

The customer installed an Ingersoll-Rand H200W air compressor, which regulates system pressure by unloading when pressure reaches a maximum value of 120 psig, and loading when it drops to 90 psig. The new installation replaced a 250hp centrifugal compressor which regulated system pressure with a bypass valve. The elimination of blow-off and abbreviated demand during non-load periods were the primary determinants of savings.

Measurement and Verification Effort

During the M&V site visit, ADM verified that the new air compressor was in operation as expected. ADM installed power monitoring on the compressor for a period of 17 days, to be used in conjunction with pre- and post-monitoring data provided with project documentation. ADM also interviewed the site contact to determine the annual usage profile of the compressor. As-Built compressor demand was separated into Weekday and Weekend profiles which can be seen in the following graphic:

Typical As-Built Compressor Demand Profiles



Energy savings were calculated as follows:

$kWh_{savings} = (kW_{pre\_weekday} - kW_{post\_weekday}) \times hours_{weekday} + (kW_{pre\_weekend} - kW_{post\_weekend}) \times hours_{weekend}$

Where:

$kWh_{savings}$	= *Annual energy savings*
$kW_{pre\_weekday}$	= *Average baseline compressor kW demand during weekdays*
$kW_{post\_weekday}$	= *Average as-built compressor kW demand during weekdays*
$hours_{weekdays}$	= *Annual weekday operating hours*
$kW_{pre\_weekend}$	= *Average baseline compressor kW demand during weekends*
$kW_{post\_weekend}$	= *Average as-built compressor kW demand during weekends*
$hours_{weekend}$	= *Annual weekend operating hours*

Results

Verified Gross Savings/Realization Rates

Measure Category	*kWh Savings*			*kW Savings*
	Expected	*Realized*	*Realization Rate*	*Realized*
Air Compressor	622,207	581,334	93%	27.2
Total	622,207	581,334	93%	27.2

The project-level realization rate is 93%. The discrepancy in savings can be attributed to the ex-ante savings calculation assuming 8,760 hours of operation. During the site visit, ADM was informed that production is stopped for quarterly maintenance, thus resulting in fewer operating hours than what was initially assumed.

Project Number AEPIM-13-00092

Executive Summary

Under project AEPIM-13-00092, the customer received incentives from Indiana Michigan Power for retrofitting interior lighting in the retail floor area. The realization rate for this project is 100%.

Project Description

The customer retrofitted (30) 400W High Pressure Sodium fixtures with (30) 4' 6-Lamp 32W T8 fixtures.

Measurement and Verification Effort

During the M&V visit, ADM verified that the facility lighting was in operation as expected. ADM used lighting logger data collected by the implementation contractor as well as information collected on site in order to develop an operational profile.

Lighting retrofit energy savings are calculated as:

$$kWh_{savings} = \sum_{Area} \left[HCIF \times t \times \left(N_{base} \times W_{base} - N_{as-built} \times W_{as-built} \right) / 1000 \right]$$

Where:

$kWh_{savings}$	= *Annual energy savings*
N	= *Number of fixtures*
W	= *Wattage of each fixture*
t	= *Lighting operating hours*
$HCIF$	= *HVAC interactive factor*

The table shown below presents expected and realized energy savings for the lighting retrofit installed under the project.

Lighting Retrofit Savings Calculations

Measure	*Quantity (Fixtures)*		*Wattage*		*Hours*	*Heating Cooling Interaction Factor*	*Realized kWh Savings*
	Old	*New*	*Old*	*New*			
400W High Pressure Sodium to 4' 6-L T8	30	30	465	226	4,300	1.000	30,831
						Total	30,831

Results

Verified Gross Savings/Realization Rates

Measure Category	*kWh Savings*		
	Expected	*Realized*	*Realization Rate*
Lighting Retrofit	30,831	30,831	100%
Total	30,831	30,831	100%

The project-level realization rate is 100%.

Project Number AEPIM-13-00106

Executive Summary

Under project AEPIM-13-00106, the customer received incentives from Indiana Michigan Power for retrofitting lighting in the offices and manufacturing floors of the facility. The realization rate for this project is 97%.

Project Description

The customer retrofitted the following fixtures:

- (762) 4 lamp 4' 34W T12 fixtures to (762) 2 lamp 4' 28W T5 fixtures
- (3,400) 2 lamp 4' 34W T12 fixtures to (3,400) 1 lamp 4' 54W T5 fixtures
- (1,020) 4 lamp 4' 34W T12 fixtures to (1,020) 4' 43W LED recessed fixtures
- (150) 4 lamp 4' 34W T12 fixtures to (150) 50W LED wrap-around fixtures

Measurement and Verification Effort

During the M&V site visit, ADM verified that the facility lighting was in operation as expected. ADM developed an operational profile using scheduling data that was collected during an on-site interview.

Lighting retrofit energy savings are calculated as:

$$kWh_{savings} = \sum_{Area} \left[HCIF \times t \times \left(N_{base} \times W_{base} - N_{as-built} \times W_{as-built} \right) / 1000 \right]$$

Where:

$kWh_{savings}$ = *Annual energy savings*

N = *Number of fixtures*

W = *Wattage of each fixture*

t = *Lighting operating hours*

$HCIF$ = *HVAC interactive factor*

Provided in the table below are the expected and realized energy savings for the lighting retrofit.

Lighting Retrofit Savings Calculations

Measure	*Quantity (Fixtures)*		*Wattage*		*Hours*	*Realized kWh Savings*	*Heating Cooling Interaction Factor*
	Old	*New*	*Old*	*New*			
4L 4' T12 to 2L 4' T5	762	762	144	64	8,760	534,010	1.000
2L 4' T12 to 1L 4' T5	3,400	3,400	72	62	8,760	397,840	1.000
4L 4' T12 to 43W LED	1,020	1,020	144	43	8,760	977,176	1.116
4L 4' T12 to 50W LED	150	150	144	50	8,760	133,743	1.116
Total						1,942,768	

Results

Verified Gross Savings/Realization Rates

Measure Category	*kWh Savings*			*kW Savings*
	Expected	*Realized*	*Realization Rate*	*Realized*
Lighting Retrofit	2,013,886	1,942,768	97%	194.32
Total	2,013,886	1,942,768	97%	194.32

The project-level realization rate is 97%. The discrepancy between estimated and realized savings can be attributed to a slight difference in HCIF values used in ex-ante and ex-post savings calculations.

Project Number AEPIM-13-00110

Executive Summary

Under project AEPIM-13-00110, the customer received incentives from Indiana Michigan Power for retrofitting interior lighting in the warehouse floor area. The realization rate for this project is 93.2%.

Project Description

The customer retrofitted the following fixtures:

- (31) 1,000W Metal Halide fixtures with (31) 4’ 6-Lamp 32W HO T8 fixtures;
- (51) 400W Metal Halide fixtures with (51) 4’ 6-Lamp 32W HO T8 fixtures;
- (55) Metal Halide fixtures with (55) 4’ 6-Lamp 32W HO T8 fixtures.

Measurement and Verification Effort

During the M&V visit, ADM verified that the facility lighting was in operation as expected. ADM used lighting logger data collected by the implementation contractor as well as information collected on site in order to develop an operational profile.

Lighting retrofit energy savings are calculated as:

$$kWh_{savings} = \sum_{Area} \left[HCIF \times t \times \left(N_{base} \times W_{base} - N_{as-built} \times W_{as-built} \right) / 1000 \right]$$

Where:

$kWh_{savings}$	= *Annual energy savings*
N	= *Number of fixtures*
W	= *Wattage of each fixture*
t	= *Lighting operating hours*
$HCIF$	= *HVAC interactive factor*

The table shown below presents expected and realized energy savings for the lighting retrofit installed under the project.

Lighting Retrofit Savings Calculations

Measure	*Quantity (Fixtures)*		*Wattage*		*Hours*	*Heating Cooling Interaction Factor*	*Realized kWh Savings*
	Old	*New*	*Old*	*New*			
1000W Metal Halide to 4’ 6-L T8	31	31	1,080	226	6,000	1.000	158,844
400W Metal Halide to 4’ 6-L T8	51	51	458	226	6,000	1.000	70,992
8’ 2-L T12 to 4’ 6-L T8	55	55	128	226	6,000	1.000	-32,340
						Total	197,496

Results

Verified Gross Savings/Realization Rates

Measure Category	*kWh Savings*		
	Expected	*Realized*	*Realization Rate*
Lighting Retrofit	211,897	197,496	93.2%
Total	211,897	197,496	93.2%

The project-level realization rate is 93.2%. The slightly low realization rate can be attributed to slightly different wattages used in ex ante and ex post savings calculations. The evaluators verified an actual lighting operation schedule that had fewer hours than used in ex ante calculations, also contributing to the lower realization rate.

Project Number AEPIM-13-00113

Executive Summary

Under project AEPIM-13-00124, the customer received incentives from Indiana Michigan Power for retrofitting interior lighting in the cafeteria floor area. The realization rate for this project is 94.8%.

Project Description

The customer retrofitted the following fixtures:

- (123) 90W Halogen lamps with 19W LED lamps;
- (320) 75W Halogen lamps with 12W LED lamps;
- (140) 50W Halogen lamps with 7W LED lamps; and
- (156) 50W Halogen lamps with 9W LED lamps.

Measurement and Verification Effort

During the M&V visit, ADM verified that the facility lighting was in operation as expected. ADM used lighting logger data collected by the implementation contractor as well as information collected on site in order to develop an operational profile.

Lighting retrofit energy savings are calculated as:

$$kWh_{savings} = \sum_{Area} \left[HCIF \times t \times \left(N_{base} \times W_{base} - N_{as-built} \times W_{as-built} \right) / 1000 \right]$$

Where:

$kWh_{savings}$	= *Annual energy savings*
N	= *Number of fixtures*
W	= *Wattage of each fixture*
t	= *Lighting operating hours*
$HCIF$	= *HVAC interactive factor*

The table shown below presents expected and realized energy savings for the lighting retrofit installed under the project.

Lighting Retrofit Savings Calculations

Measure	*Quantity (Fixtures)*		*Wattage*		*Hours*	*Heating Cooling Interaction Factor*	*Realized kWh Savings*
	Old	*New*	*Old*	*New*			
90W Halogen lamps to 19W LED lamps	123	123	90	19	5,632	1.166	57,369
75W Halogen lamps to 12W LED lamps;	340	340	75	12	5,632	1.166	132,437
50W Halogen lamps with 7W LED lamps	140	140	50	7	5,632	1.166	39,547
50W Halogen lamps to 9W LED lamps	156	156	50	9	5,632	1.166	42,017
						Total	271,370

Results

Verified Gross Savings/Realization Rates

Measure Category	*kWh Savings*		
	Expected	*Realized*	*Realization Rate*
Lighting Retrofit	286,208	271,370	94.8%
Total	286,208	271,370	94.8%

The project-level realization rate is 94.8%. The evaluator could not verify 22 LED lamps.

Project Number AEPIM-13-00124

Executive Summary

Under project AEPIM-13-00124, the customer received incentives from Indiana Michigan Power for retrofitting interior lighting in the gymnasium floor area. The realization rate for this project is 85%.

Project Description

The customer retrofitted the following fixtures:

- (50) 400W Metal Halide fixtures with 250W Induction fixtures;
- (36) 400W Metal Halide fixtures with 200W Induction fixtures.

Measurement and Verification Effort

During the M&V visit, ADM verified that the facility lighting was in operation as expected. ADM used lighting logger data collected by the implementation contractor as well as information collected on site in order to develop an operational profile.

Lighting retrofit energy savings are calculated as:

$$kWh_{savings} = \sum_{Area} \left[HCIF \times t \times \left(N_{base} \times W_{base} - N_{as-built} \times W_{as-built} \right) / 1000 \right]$$

Where:

$kWh_{savings}$	= *Annual energy savings*
N	= *Number of fixtures*
W	= *Wattage of each fixture*
t	= *Lighting operating hours*
$HCIF$	= *HVAC interactive factor*

The table shown below presents expected and realized energy savings for the lighting retrofit installed under the project.

Lighting Retrofit Savings Calculations

Measure	*Quantity (Fixtures)*		*Wattage*		*Hours*	*Heating Cooling Interaction Factor*	*Realized kWh Savings*
	Old	*New*	*Old*	*New*			
400W Metal Halide to 250W Induction	50	50	458	262	3,600	1.045	36,863
400W Metal Halide to 200W Induction	36	36	458	210	3,600	1.045	33,583
						Total	70,447

Results

Verified Gross Savings/Realization Rates

Measure Category	*kWh Savings*		
	Expected	*Realized*	*Realization Rate*
Lighting Retrofit	82,927	70,447	85%
Total	82,927	70,447	85%

The project-level realization rate is 85%. The low realization rate can be attributed to a lower heating cooling interactive factor used in the ex post savings calculations than in ex ante calculations. The ex post HCIF was created by the evaluator for Indiana regions and is specific to the facility type and region.

Project Number AEPIM-13-00135

Executive Summary

Under project AEPIM-13-00135, the customer received incentives from Indiana Michigan Power for retrofitting lighting in the open bay car wash. The realization rate for this project is 100%.

Project Description

The customer retrofitted the following fixtures:

- (12) 320W metal halide fixtures with (12) 100W induction fixtures

Measurement and Verification Effort

During the M&V visit, ADM verified that the facility lighting was in operation as expected. ADM developed an operational profile using scheduling data that was collected during an on-site interview.

Lighting retrofit energy savings are calculated as:

$$kWh_{savings} = \sum_{Area} \left[HCIF \times t \times \left(N_{base} \times W_{base} - N_{as-built} \times W_{as-built} \right) / 1000 \right]$$

Where:

$kWh_{savings}$ = *Annual energy savings*

N = *Number of fixtures*

W = *Wattage of each fixture*

t = *Lighting operating hours*

$HCIF$ = *HVAC interactive factor*

Expected and realized energy savings for lighting retrofit are provided in the table below.

Lighting Retrofit Savings Calculations

Measure	*Quantity (Fixtures)*		*Wattage*		*Hours*	*Realized kWh Savings*	*Heating Cooling Interaction Factor*
	Old	*New*	*Old*	*New*			
400W MH to LED	12	12	365	154	8,760	22,180	1.000
Total						22,180	

Results

Verified Gross Savings/Realization Rates

Measure Category	*kWh Savings*			*kW Savings*
	Expected	*Realized*	*Realization Rate*	*Realized*
Lighting Retrofit	22,180	22,180	100%	2.53
Total	22,180	22,180	100%	2.53

The project-level realization rate is 100%. The realization rate is a reflection of consistent data and methodology maintained by ADM's staff in their calculations of ex-ante and ex-post savings.

Appendix B: C&I Incentives Questionnaire for Decision Maker Survey

1. What are the sources your organization relies on for information about energy efficient equipment, materials and design features? (Check all that apply)
    1. An I&M Energy Specialist
    2. An I&M Account Representative
    3. The I&M website
    4. Brochures or advertisements
    5. Trade associations or business groups you belong to
    6. Trade journals or magazines
    7. Friends and colleagues
    8. An architect, engineer or energy consultant
    9. Equipment vendors or building contractors
    99. Other (please describe)

2. Which of the following policies or procedures does your organization have in place regarding energy efficiency improvements at this facility? (Check all that apply)
    1. An energy management plan
    2. Corporate policies that incorporate energy efficiency in operations and procurement
    3. Active training of staff on saving energy
    4. A numeric goal for energy savings
    5. A numeric goal for energy cost reduction
    6. None
    99. Other (please describe)

3. How does your organization decide to make energy efficiency improvements for this facility? Is the decision:
    1. Made by one or two key people
    2. Based on staff recommendations to a decision maker
    3. Made by a group or committee
    4. Made in some other way
    5. Depends on how much the investment is

4. About how many employees work for your organization?
    1. 1-9 employees
    2. 10-50 employees
    3. 50-250 employees
    4. Over 250 employees

5. How important are incentive payments from I&M for your decision making regarding energy efficiency improvements?
    1. Very important
    2. Somewhat important

3. Only slightly important
4. Not important at all
98. Don't know

6. When deciding whether to make energy efficiency improvements, how important is your past experience with energy efficient equipment?
   1. Very important
   2. Somewhat important
   3. Only slightly important
   4. Not important at all
   98. Don't know

7. How important is advice and/or recommendations received from I&M for your decision making regarding energy efficiency improvements?
   1. Very important
   2. Somewhat important
   3. Only slightly important
   4. Not important at all
   98. Don't know

8. How important is advice and/or recommendations received from KEMA for your decision making regarding energy efficiency improvements?
   1. Very important
   2. Somewhat important
   3. Only slightly important
   4. Not important at all
   98. Don't know

9. How important is advice and/or recommendations from equipment vendors for your decision making regarding energy efficiency improvements?
   1. Very important
   2. Somewhat important
   3. Only slightly important
   4. Not important at all
   98. Don't know

10. How important are your organization's policies for your decision making regarding energy efficiency improvements?
   1. Very important
   2. Somewhat important
   3. Only slightly important
   4. Not important at all
   98. Don't know

11. Which financial methods does your organization typically use to evaluate energy efficiency improvements for this facility? (Select all that apply)

1. Initial Cost
2. Simple payback (provide numeric payback time if possible):
3. Internal rate of return (provide numeric rate of return if possible):
4. Life cycle cost
5. None of these

12. How did you learn of the C&I Incentive Program? (Select all that apply)
    1. Approached directly by representative of the C&I Incentive Program
    2. Received an information brochure on the C&I Incentive Program
    3. An I&M customer service representative mentioned it
    4. I&M website
    5. Friends or colleagues
    6. An architect, engineer or energy consultant
    7. An equipment vendor or building contractor
    8. A utility bill insert
    9. An email from I&M
    98. Other (please explain)

13. When you have to replace equipment at this facility, how often do you try to purchase and install energy efficient equipment?
    1. Always
    2. Usually
    3. Sometimes
    4. Occasionally
    5. Never
    98. Don't know

14. Before participating in the C&I Incentive Program, had you installed any equipment or measure similar to energy efficient [Measure/Equipment Type] at this facility?
    1. Yes
    2. No

15. Has your organization purchased any energy efficient equipment in the last three years for which you did not apply for a financial incentive through an energy efficiency program?
    1. Yes, purchased energy efficient equipment but did not apply for incentive.
    2. No equipment was purchased by organization.
    3. No, an incentive was applied for.
    98. Don't know

[DISPLAY Q15A IF Q15 = 1]

15A. Why didn't you apply for a financial incentive for that equipment?
    1. Didn't know whether equipment qualified for financial incentives
    2. Didn't know about financial incentives until after equipment was purchased

3. Didn’t have time to complete paperwork for financial incentive application
4. Too much paperwork for the financial incentive application
5. Financial incentive was insufficient

Other (please specify)

[DISPLAY Q15B IF Q15 = 3]

15B. Did you receive all of your incentives for these past energy efficiency projects?

1. Yes
2. No

98. Don't know

16. Did you have plans to install energy efficient [Measure/Equipment Type] at this facility before participating in the C&I Incentive Program?
    1. Yes
    2. No

[DISPLAY Q16A IF Q16 = 1]

16A. Would you have gone ahead with this planned installation even if you had not participated in the program?

1. Yes
2. No

17. How important was previous experience with the C&I Incentive Program in making your decision to install energy efficient [Measure/Equipment Type]?
    1. Did not have previous experience with program
    2. Very important
    3. Somewhat important
    4. Only slightly important
    5. Not at all important

    98. Don't know

18. Did a C&I Incentive Program or other I&M representative recommend that you install energy efficient [Measure/Equipment Type]?
    1. Yes
    2. No

[DISPLAY Q18A IF Q18 = 1]

18A. If the C&I Incentive Program representative had not recommended installing the equipment, how likely is it that you would have installed it anyway?

1. Definitely would have installed
2. Probably would have installed
3. Probably would not have installed
4. Definitely would not have installed

98. Don't know

19. Would you have been financially able to install energy efficient [Measure/Equipment Type] without the financial incentive from the C&I Incentive Program?
    1. Yes
    2. No

20. If the financial incentive from the C&I Incentive Program had not been available, how likely is it that you would have installed energy efficient [Measure/Equipment Type] anyway?
    1. Definitely would have installed
    2. Probably would have installed
    3. Probably would not have installed
    4. Definitely would not have installed
    98. Don't know

21. How did the availability of information and financial incentives through the C&I Incentive Program affect the quantity (or number of units) of energy efficient [Measure/Equipment Type] that you purchased and installed? Did you purchase and install more [Measure/Equipment Type] than you otherwise would have without the program?
    1. Yes
    2. No, program did not affect quantity purchased and installed.

[DISPLAY Q21A IF Q21 = 1]
21A. Which part of the project would you <u>have not</u> implemented without the information and financial incentives available through the C&I Incentive Program?

22. How did the availability of information and financial incentives through the C&I Incentive Program affect the level of energy efficiency you chose for energy efficient [Measure/Equipment Type]? Did you choose equipment that was more energy efficient than you otherwise would have chosen because of the program?
    1. Yes
    2. No, program did not affect level of efficiency chosen for equipment.

[DISPLAY Q22A IF Q22 = 1]
22A. How much more efficient [Measure/Equipment Type] did you install? (i.e., "xx% more efficient")

23. How did the availability of information and financial incentives through the C&I Incentive Program affect the timing of your purchase and installation of energy efficient [Measure/Equipment Type]? Did you purchase and install energy efficient [Measure/Equipment Type] earlier than you otherwise would have without the program?
    1. Yes
    2. No, program did not affect did not affect timing of purchase and installation.

[DISPLAY Q23A IF Q23 = 1]

23A. When would you otherwise have installed the equipment?
1. Less than 6 months later
2. 6-12 months later
3. 1-2 years later
4. 3-5 years later
5. More than 5 years later

24. Was there an open bidding process for choosing a vendor who did your installation, or did you only offer it to one firm?
1. Bidding process
2. One firm
3. Self installed/No vendor used
98. Don't know

[DISPLAY Q24A IF Q24 = 1 or 2]
24A. Did you select a vendor that promoted the program?
1. Yes
2. No
98. Don't know

[DISPLAY Q24B IF Q24 = 1 or 2]
24B. Had you previously worked with this vendor/contractor?
1. Yes
2. No
98. Don't know

25. Did the project implementation go smoothly?
1. Yes
2. For the most part
3. No
98. Don't know

[DISPLAY Q25A IF Q25 = 2 or 3]
25A. Please explain in what ways the project implementation did not go smoothly.

26. Did the energy efficiency measure meet your expectations?
1. My expectations were exceeded
2. My expectations were met
3. My expectations were mostly met
4. My expectations were not met
98. Don't know

[DISPLAY Q26A IF Q26 = 4]
26A. Please explain in what ways the energy efficiency measure did not meet your expectations.

27. Did anyone from I&M or KEMA come to this facility to do a pre-inspection?
    1. Yes
    2. No
    98. Don't know

[DISPLAY Q27A-C IF Q27 = 1]
27A. What did the pre-inspection consist of?

27B. Did anything change in the project design as a result of the pre-inspection?
    1. Yes
    2. No
    98. Don't know

27C. Please explain the way in which the project design changed as a result of the pre-inspection.

28. Did anyone from I&M or KEMA come to this facility to do a post-inspection?
    1. Yes
    2. No
    98. Don't know

[DISPLAY Q28A-B IF Q28 = 1]
28A. What did the post-inspection consist of?

28B. Did anything change in the incentive amount as a result of the post-inspection?
    1. Yes
    2. No
    98. Don't know

[DISPLAY Q28C IF Q28B = 1]
28C. Please explain how the incentive amount changed as a result of the post-inspection.

29. Did you have any issues with process required to receive the incentive (e.g., paper work) for your energy efficiency project?
    1. Yes
    2. No
    98. Don't know

[DISPLAY Q29A IF Q29 = 1]
29A. Could you explain what issues you ad with the process?

30. Were there any issues receiving the incentive check?
    1. Yes
    2. No
    98. Don't know

[DISPLAY Q30A IF Q30 = 1]
30A. Please describe the issues you had with receiving the incentive check.

31. Was there any additional energy efficient equipment you wanted to install, but didn't because no financial incentive was offered by I&M?
    1. Yes
    2. No
    98. Don't know

32. Because of your experience with the incentive program, have you bought, or are you likely to buy, energy efficient equipment without applying for a financial incentive or rebate?
    1. Yes, have already bought non-incentivized efficiency equipment because of the experience with the program.
    2. Yes, likely to buy efficiency equipment because of the experience with the program.
    3. No
    98. Don't know

[DISPLAY Q32A IF Q32 = 2 or 98]
32A.We'd like to call you in a few months for a very short follow-up about other efficiency purchases, if that would be alright. Please provide us with the best person to contact and their phone number.

[DISPLAY Q32B-D and Q32E IF Q32 = 1]
32B. What energy efficient equipment did you purchase?

32C. What motivated you to purchase this equipment?

32D. Have you installed the equipment?
    1. Yes
    2. No
    98. Don't know

[DISPLAY Q32D.1 IF Q32D = 1]
32D.1 In what month and year did you install that equipment?

32E. Was this equipment installed, or will it be installed, at the same facility (or facilities) as where the incentive project was completed?
    1. Yes
    2. No
    1. Don't know

[DISPLAY Q32E.1 IF Q32E = 2]
32E.1. Where was (or will be) the equipment installed?

32F. How important was your experience with the program to your decision to implement the additional energy efficiency measures?

1. Very important
2. Somewhat important
3. Only slightly important
4. Not at all important
1. Don't know

32G. How important was your past participation in any programs offered by Indiana-Michigan Power to your decision to implement the additional energy efficiency measures?

1. Very important
2. Somewhat important
3. Only slightly important
4. Not at all important
98. Don't know

32H. Why didn’t you apply for or receive incentives for those items?

1. Didn't know whether equipment qualified for financial incentives
2. Equipment did not qualify for financial incentives
3. Too much paperwork for the financial incentive application
4. Financial incentive was insufficient
5. Didn't have time to complete paperwork for financial incentive application
6. Didn't know about financial incentives until after equipment was purchased
98. Other reason (please describe):

33. Does your facility have a roof-top HVAC unit?

1. Yes
2. No
98. Don’t know

[DISPLAY Q33A IF Q33 = 1]

33A. Is its size between 3 and 20 tons?

1. Yes
2. No
98. Don’t know

[DISPLAY Q33B IF Q33A = 1]

33B. Did you know that I&M offers a HVAC Tune-Up Program that provides incentives for tuning up rooftop units that are between 3 and 25 tons?

1. Yes
2. No
98. Don’t know

[DISPLAY Q33C IF Q33B = 1]

33C. Have you considered completing an HVAC Tune-Up Program Project?
1. Yes
2. No
98. Don't know

[DISPLAY Q33D IF Q33C = 2]
33D. Why not?

34. Compared to before you participated in the C&I incentive program, would you say that your current knowledge of energy-efficient equipment and practices is greater than before, the same as before, or less than before?
    1. Greater than before
    2. Same as before
    3. Less than before

35. Since participating in the C&I Incentives Program, have you recommended <u>the program</u> to colleagues?
    1. Yes
    2. No
    98. Don't know

36. Since participating in the C&I Incentives Program, have you recommended the energy efficiency equipment you implemented through the program to colleagues?
    1. Yes
    2. No
    98. Don't know

37. On a scale of 1 to 5, where 5; is very satisfied and 1; is very dissatisfied, and a 3 is neither satisfied nor dissatisfied, how would you rate your satisfaction with the following?

	1	2	3	4	5	DK
a. Performance of the equipment installed						
b. Savings on your monthly bill						
c. Incentive amount						
d. The effort required for the application process						
e. Information provided by I&M Account Representative						
f. Quality of the work provided by your contractor						
g. The elapsed time until you received the incentive						
h. Overall program experience						

[DISPLAY Q38 IF Q37a-h = 1 or 2]
38. Please describe in what ways you were not satisfied with the program.

39. Do you have any other comments that you would like to relay to I&M about energy efficiency in commercial and industrial facilities or about their programs?

40. What industry is your organization in?
    1. Agriculture, Forestry, Fishing, and Hunting
    2. Mining
    3. Utilities
    4. Construction
    5. Manufacturing
    6. Wholesale Trade
    7. Retail Trade
    8. Transportation and Warehousing
    9. Information
    10. Finance and Insurance
    11. Real Estate Rental and Leasing
    12. Professional, Scientific, and Technical Services
    13. Management of Companies and Enterprises
    14. Administrative and Support and Waste Management and Remediation Services
    15. Educational Services
    16. Health Care and Social Assistance
    17. Arts, Entertainment, and Recreation
    18. Accommodation and Food Services
    19. Other Services
    20. Public Administration

Appendix C: C&I Incentives Decision Maker Survey Responses

As part of the evaluation work effort, a survey was conducted with all four decision makers for facilities that received incentives under the C&I Incentives Program. The survey provided the information used in Section 2.3 to estimate free ridership for projects in the C&I Incentives Program. Additionally, the survey provided further general information pertaining to the making of decisions to improve energy efficiency by program participants.

Each respondent was interviewed using the survey instrument provided in Appendix B. The interviews were conducted by telephone. During the interview, a participant was asked questions about (1) his or her general decision making regarding purchasing and installing energy efficient equipment, (2) his or her knowledge of and satisfaction with the C&I Incentives Program, and (3) the influence that the C&I Incentives Program had on his or her decision to install energy efficiency measures (e.g., lighting measures, VFDs).

The following tabulations summarize I&M customer survey responses. Three columns of data are presented. The first column presents the number of survey respondents (***n***). The second column presents the percentage of survey respondents. The third column shows the percentage of total program realized gross energy savings represented by the respondents.

	Response	*(n=42)*	*Percent of Respondents*
What are the sources your organization relies on for information about energy efficient equipment, materials and design features?	An I&M Energy Specialist	0	0%
	An I&M Account Representative	5	12%
	The I&M website	6	14%
	Brochures or advertisements	1	2%
	Trade associations or business groups you belong to	2	5%
	Trade journals or magazines	7	17%
	Friends and colleagues	5	12%
	An architect, engineer or energy consultant	4	10%
	Equipment vendors or building contractors	28	67%
	Other	0	0%

	Response	*(n=41)*	*Percent of Respondents*
Which of the following policies or procedures does your organization have in place regarding energy efficiency improvements at this facility?	An energy management plan	14	34%
	Corporate policies that incorporate energy efficiency in operations and procurement	17	41%
	Active training of staff.	0	0%
	A numeric goal for energy savings	8	20%
	A numeric goal for energy cost reduction	10	24%
	Other	0	0%
	None	14	34%

	Response	*(n=42)*	*Percent of Respondents*
How does your organization decide to make energy efficiency improvements for this facility? Is the decision:	Made by one or two key people?	22	52%
	Based on staff recommendations to a decision maker?	10	24%
	Made by a group or committee?	10	24%
	Made in some other way?	0	0%
	Depends on how much the investment is	0	0%

	Response	*(n=41)*	*Percent of Respondents*
About how many employees work for your organization?	1-9 employees	2	5%
	10-50 employees	14	34%
	50-250 employees	16	39%
	Over 250 employees	9	22%

	Response	*(n=41)*	*Percent of Respondents*
How important are incentive payments from I&M for your decision making regarding energy efficiency improvements?	Very important	31	76%
	Somewhat important	7	17%
	Only slightly important	2	5%
	Not important at all	1	2%
	Don't know	0	0%

	Response	*(n=42)*	*Percent of Respondents*
When deciding whether to make energy efficiency improvements, how important is past experience with energy efficient equipment?	Very important	25	60%
	Somewhat important	14	33%
	Only slightly important	1	2%
	Not important at all	2	5%
	Don't know	0	0%

	Response	*(n=41)*	*Percent of Respondents*
How important is advice and/or recommendations received from I&M for your decision making regarding energy efficiency improvements?	Very important	21	51%
	Somewhat important	11	27%
	Only slightly important	5	12%
	Not important at all	3	7%
	Don't know	1	2%

	Response	*(n=42)*	*Percent of Respondents*
How important is advice and/or recommendations received from KEMA for your decision making regarding energy efficiency improvements?	Very important	3	7%
	Somewhat important	8	19%
	Only slightly important	5	12%
	Not important at all	6	14%
	Don't know	20	48%

	Response	*(n=41)*	*Percent of Respondents*
How important is advice and/or recommendations from equipment vendors for your decision making regarding energy efficiency improvements?	Very important	21	51%
	Somewhat important	16	39%
	Only slightly important	4	10%
	Not important at all	0	0%
	Don't know	0	0%

	Response	*(n=41)*	*Percent of Respondents*
How important are your organization's policies for your decision making regarding energy efficiency improvements?	Very important	16	39%
	Somewhat important	18	44%
	Only slightly important	1	2%
	Not important at all	5	12%
	Don't know	1	2%

	Response	*(n=33)*	*Percent of Respondents*
Which financial methods does your organization typically use to evaluate energy efficiency improvements for your facility?	Initial Cost	19	58%
	Simple payback	24	73%
	Internal rate of return	21	64%
	Life cycle cost	13	39%
	None of these	1	3%

	Response	*(n=35)*	*Percent of Respondents*
How did you learn of the C&I Incentive Program?	Approached directly by representative of the C&I Incentive Program	1	3%
	Received an information brochure on the C&I Incentive Program	0	0%
	An I&M customer service representative mentioned it	8	23%
	I&M website	2	6%
	Friends or colleagues	2	6%
	An architect, engineer or energy consultant	0	0%
	An equipment vendor or building contractor	31	89%
	A utility bill insert	1	3%
	An email from I&M	1	3%
	Other (please explain)	3	9%

	Response	*(n=42)*	*Percent of Respondents*
When you have to replace equipment at this facility, how often do you try to purchase and install energy efficient equipment?	Always	19	45%
	Usually	15	36%
	Sometimes	4	10%
	Occasionally	4	10%
	Never	0	0%
	Don't know	0	0%

	Response	*(n=42)*	*Percent of Respondents*
Has your organization purchased any energy efficient equipment in the last three years for which you did not apply for a financial incentive through an energy efficiency program?	Yes, purchased energy efficient equipment but did not apply for incentive.	14	33%
	No equipment was purchased by organization.	13	31%
	No, an incentive was applied for.	1	2%
	Don't know	10	24%

	Response	*(n=18)*	*Percent of Respondents*
Why didn't you apply for a financial incentive for that equipment?	Didn't know whether equipment qualified for financial incentives	4	22%
	Didn't know about financial incentives until after equipment was purchased	10	56%
	Didn't have time to complete paperwork for financial incentive application	2	11%
	Too much paperwork for the financial incentive application	4	22%
	Financial incentive was insufficient	0	0%
	Other	1	6%

	Response	*(n=42)*	*Percent of Respondents*
Before participating in the C&I Incentive Program, had you installed any equipment or measure similar to the energy efficient [Equipment/ Measure] at the [Location] ?	Yes	14	33%
	No	27	64%
	Don't know	1	2%

	Response	*(n=42)*	*Percent of Respondents*
Did you have plans to install energy efficient [Equipment/ Measure] at this facility before participating in the C&I Incentive Program?	Yes	22	52%
	No	20	48%
	Don't know	0	0%

	Response	*(n=22)*	*Percent of Respondents*
Would you have gone ahead with this planned installation even if you had not participated in the program?	Yes	12	55%
	No	10	45%

	Response	*(n=42)*	*Percent of Respondents*
How important was previous experience with the C&I Incentive Program in making your decision to install [Equipment/Measure]?	Did not have previous experience with program	36	86%
	Very important	3	7%
	Somewhat important	0	0%
	Only slightly important	0	0%
	Not at all important	1	2%
	Don't know	2	5%

Did a C&I Incentive Program or other I&M representative recommend that you install energy efficient [Equipment/Measure]?	*Response*	*(n=41)*	*Percent of Respondents*
	Yes	6	15%
	No	35	85%

If the C&I Incentive Program representative had not recommended installing the equipment, how likely is it that you would have installed it anyway?	*Response*	*(n=6)*	*Percent of Respondents*
	Definitely would have installed	2	33%
	Probably would have installed	3	50%
	Probably would not have installed	0	0%
	Definitely would not have installed	1	17%
	Don't know	0	0%

Would you have been financially able to install [Equipment/Measure] without the financial incentive from the C&I Incentive Program?	*Response*	*(n=40)*	*Percent of Respondents*
	Yes	28	70%
	No	12	30%

If the financial incentive from the C&I Incentive Program had not been available, how likely is it that you would have installed [Equipment/ Measure] anyway?	*Response*	*(n=42)*	*Percent of Respondents*
	Definitely would have installed	8	19%
	Probably would have installed	13	31%
	Probably would not have installed	14	33%
	Definitely would not have installed	5	12%
	Don't know	2	5%

Did you purchase and install more [Equipment/Measure] than you otherwise would have without the program?	*Response*	*(n=42)*	*Percent of Respondents*
	Yes	17	40%
	No, program did not affect quantity purchased and installed.	25	60%

Did you choose equipment that was more energy efficient than you otherwise would have chosen because of the program?	*Response*	*(n=41)*	*Percent of Respondents*
	Yes	21	51%
	No, program did not affect level of efficiency chosen for equipment.	19	46%

Did you purchase and install energy efficient [Equipment/Measure] earlier than you otherwise would have without the program?	*Response*	*(n=42)*	*Percent of Respondents*
	Yes	28	67%
	No, program did not affect did not affect timing of purchase and installation.	14	33%

When would you otherwise have installed the equipment?	*Response*	*(n=27)*	*Percent of Respondents*
	Less than 6 months later	0	0%
	6-12 months later	0	0%
	1-2 years later	7	26%
	3-5 years later	7	26%
	More than 5 years later	13	48%

Was there an open bidding process for choosing a vendor who did your installation, or did you only offer it to one firm?	*Response*	*(n=42)*	*Percent of Respondents*
	Bidding process	19	45%
	One firm	11	26%
	Self installed/No vendor used	10	24%
	Don't know	2	5%

Did you select a vendor that promoted the program?	*Response*	*(n=30)*	*Percent of Respondents*
	Yes	24	80%
	No	5	17%
	Don’t know	0	0%

Had you previously worked with this vendor/contractor?	*Response*	*(n=30)*	*Percent of Respondents*
	Yes	18	60%
	No	12	40%
	Don't know	0	0%

Did the implementation go smoothly?	*Response*	*(n=42)*	*Percent of Respondents*
	Yes	39	93%
	For the most part	1	2%
	No	2	5%
	Don't know	0	0%

Did the energy efficiency measure meet your expectation?	*Response*	*(n=42)*	*Percent of Respondents*
	My expectations were exceeded	9	21%
	My expectations were met	22	52%
	My expectations were mostly met	2	5%
	My expectations were not met	0	0%
	Don't know	9	21%

Did anyone from I&M or KEMA come to this facility to do a pre-inspection?	*Response*	*(n=42)*	*Percent of Respondents*
	Yes	19	45%
	No	10	24%
	Don't know	13	31%

Did anything change in the project design as a result of the pre-inspection?	*Response*	*(n=18)*	*Percent of Respondents*
	Yes	1	6%
	No	15	83%
	Don't know	2	11%

Did anyone from I&M or KEMA come to this facility to do a post-inspection?	*Response*	*(n=42)*	*Percent of Respondents*
	Yes	25	60%
	No	3	7%
	Don't know	14	33%

Did anything change in the incentive amount as a result of the post-inspection?	*Response*	*(n=23)*	*Percent of Respondents*
	Yes	3	13%
	No	17	74%
	Don't know	3	13%

Did you have any issues with the process required to receive the incentive (e.g., paperwork) for your energy efficiency project?	*Response*	*(n=40)*	*Percent of Respondents*
	Yes	10	25%
	No	24	60%
	Don't know	6	15%

Question	*Response*	*(n=42)*	*Percent of Respondents*
Were there any issues receiving the incentive check?	Yes	4	10%
	No	32	76%
	Don't know	6	14%

Question	*Response*	*(n=42)*	*Percent of Respondents*
Was there any additional energy efficient equipment you wanted to install, but didn't because no financial incentive was offered by I&M?	Yes	8	19%
	No	33	79%
	Don't know	1	2%

Question	*Response*	*(n=42)*	*Percent of Respondents*
Because of your experience with the incentive program, have you bought, or are you likely to buy, energy efficient equipment without applying for a financial incentive or rebate?	Yes	4	10%
	No	27	64%
	Don't know	11	26%

Question	*Response*	*(n=4)*	*Percent of Respondents*
How important was your experience with the program to your decision to implement the additional energy efficiency measures?	Very important	0	0%
	Somewhat important	3	75%
	Only slightly important	0	0%
	Not at all important	1	25%
	Don't know	0	0%

Question	*Response*	*(n=4)*	*Percent of Respondents*
How important was your past participation in any programs offered by Indiana-Michigan Power to your decision to implement the additional energy efficiency measures?	Very important	0	0%
	Somewhat important	2	50%
	Only slightly important	1	25%
	Not at all important	1	25%
	Don't know	0	0%

Question	*Response*	*(n=41)*	*Percent of Respondents*
Does your facility have a roof-top HVAC unit?	Yes	25	61%
	No	15	37%
	Don't know	1	2%

Is its size between 3 and 20 tons?	*Response*	*(n=25)*	*Percent of Respondents*
	Yes	17	68%
	No	2	8%
	Don't know	6	24%

Did you know that I&M offers a HVAC Tune-Up Program that provides incentives for tuning up rooftop units that are between 3 and 25 tons?	*Response*	*(n=17)*	*Percent of Respondents*
	Yes	2	12%
	No	15	88%
	Don't know	0	0%

Have you considered completing an HVAC Tune-Up Program Project?	*Response*	*(n=2)*	*Percent of Respondents*
	Yes	2	100%
	No	0	0%
	Don't know	0	0%

Compared to before you participated in the C&I incentive program, would you say that your current knowledge of energy-efficient equipment and practices is greater than before, the same as before, or less than before?	*Response*	*(n=42)*	*Percent of Respondents*
	Greater than before	27	64%
	Same as before	15	36%
	Less than before	0	0%

Since participating in the C&I Incentives Program, have you recommended the program to colleagues?	*Response*	*(n=42)*	*Percent of Respondents*
	Yes	27	64%
	No	15	36%
	Don't know	0	0%

Since participating in the C&I Incentives Program, have you recommended the energy efficient equipment you implemented through the program to colleagues?	*Response*	*(n=42)*	*Percent of Respondents*
	Yes	24	57%
	No	18	43%
	Don't know	0	0%

	Response	*(n=42)*	*Percent of Respondents*
On a sale of 1 to 5, where "5" is very satisfied and "1" is very unsatisfied, how satisfied are you with the performance of the equipment installed?	Very satisfied	0	0%
	Satisfied	0	0%
	Neither satisfied nor dissatisfied	0	0%
	Dissatisfied	8	19%
	Very dissatisfied	34	81%
	Don't know	0	0%

	Response	*(n=42)*	*Percent of Respondents*
On a sale of 1 to 5, where "5" is very satisfied and "1" is very unsatisfied, how satisfied are you with the savings on your monthly bill?	Very satisfied	0	0%
	Satisfied	0	0%
	Neither satisfied nor dissatisfied	5	12%
	Dissatisfied	2	5%
	Very dissatisfied	12	29%
	Don't know	23	55%

	Response	*(n=42)*	*Percent of Respondents*
On a scale of 1 to 5, where “5” is very satisfied and “1” is very unsatisfied, how satisfied are you with the incentive amount?	Very satisfied	0	0%
	Satisfied	0	0%
	Neither satisfied nor dissatisfied	7	17%
	Dissatisfied	16	38%
	Very dissatisfied	17	40%
	Don't know	2	5%

	Response	*(n=42)*	*Percent of Respondents*
On a sale of 1 to 5, where "5" is very satisfied and "1" is very unsatisfied, how satisfied are you with the effort required for the application process?	Very satisfied	2	5%
	Satisfied	4	10%
	Neither satisfied nor dissatisfied	9	21%
	Dissatisfied	12	29%
	Very dissatisfied	10	24%
	Don't know	5	12%

	Response	*(n=42)*	*Percent of Respondents*
On a sale of 1 to 5, where "5" is very satisfied and "1" is very unsatisfied, how satisfied are you with the information provided by an I&M Account Representative?	Very satisfied	2	5%
	Satisfied	2	5%
	Neither satisfied nor dissatisfied	6	14%
	Dissatisfied	11	26%
	Very dissatisfied	12	29%
	Don't know	9	21%

	Response	*(n=42)*	*Percent of Respondents*
On a sale of 1 to 5, where "5" is very satisfied and "1" is very unsatisfied, how satisfied are you with the quality of work conducted by your contractor?	Very satisfied	0	0%
	Satisfied	0	0%
	Neither satisfied nor dissatisfied	0	0%
	Dissatisfied	7	17%
	Very dissatisfied	34	81%
	Don't know	1	2%

	Response	*(n=42)*	*Percent of Respondents*
On a sale of 1 to 5, where "5" is very satisfied and "1" is very unsatisfied, how satisfied are you with the elapsed time until you received your incentive?	Very satisfied	2	5%
	Satisfied	2	5%
	Neither satisfied nor dissatisfied	5	12%
	Dissatisfied	10	24%
	Very dissatisfied	15	36%
	Don't know	8	19%

	Response	*(n=42)*	*Percent of Respondents*
On a sale of 1 to 5, where "5" is very satisfied and "1" is very unsatisfied, how satisfied are you with the overall program experience?	Very satisfied	1	2%
	Satisfied	0	0%
	Neither satisfied nor dissatisfied	8	19%
	Dissatisfied	10	24%
	Very dissatisfied	22	52%
	Don't know	1	2%

	Response	*(n=42)*	*Percent of Respondents*
What industry is your organization in?	Agriculture, Forestry, Fishing, and Hunting	0	0%
	Mining	2	5%
	Utilities	2	5%
	Construction	0	0%
	Manufacturing	17	40%
	Wholesale Trade	1	2%
	Retail Trade	3	7%
	Transportation and Warehousing	1	2%
	Information	0	0%
	Finance and Insurance	1	2%
	Real Estate Rental and Leasing	0	0%
	Professional, Scientific, and Technical Services	0	0%
	Management of Companies and Enterprises	1	2%
	Administrative and Support and Waste Management and Remediation Services	0	0%
	Educational Services	4	10%
	Health Care and Social Assistance	0	0%
	Arts, Entertainment, and Recreation	1	2%
	Accommodation and Food Services	2	5%
	Other Services	7	17%
	Public Administration	0	0%

Appendix D: C&I Interview Guide for Trade Ally Interviews

1. Approximately how many employees work at your firm?
    1. 1 to 4 employees
    2. 5 to 9 employees
    3. 10 to 19 employees
    4. 20 to 99 employees
    5. 100 to 499 employees
    6. 500 or more employees

2. How would you characterize your type of business? (Do not read list)
    1. Architect
    2. Contractor –Electrical
    3. Contractor – Mechanical
    4. Distributor
    5. Engineer
    6. Manufacturer
    7. Manufacturer representative
    8. Vendor / Retailer
    99. Other (please specify)

3. How would you characterize the types of services and products that you provide to your customers and clients? (Do not read list, select all the apply)
    1. Building design
    2. Commissioning
    3. Compressed air systems
    4. Controls
    5. Energy analysis
    6. Foodservice equipment
    7. Grocery equipment
    8. HVAC
    9. Insulation
    10. Lighting
    11. Motors/drives
    12. Windows
    99. Other (please specify)

4. How did you find out about I&M's C&I Incentives Program?

5. According to our records, you helped implement [Number of projects] in 2013 through the C&I Incentives Program. Did you assist with the completion of the application for [these projects/this project]?
    1. Yes
    2. No
    98. Don't know

[DISPLAY Q6 and Q7 IF Q5 = 1]

6. How many did you assist with?

7. Are there any aspects of the C&I incentives Program application process that you would recommend be modified?
    1. Yes
    2. No
    98. Don't know

[DISPLAY Q8 IF Q7 = 1]

8. In what ways would you recommend the application process be changed?

9. Did you participate in any training provided by the program?
    1. Yes
    2. No
    98. Don’t know

[DISPLAY Q10, Q11, and Q12 IF Q9 = 1]

10. What training have you participated in?

11. What topics were covered during the training? (Read all)
    1. General application requirements
    2. Qualifying equipment
    3. Calculating custom savings and incentives
    4. M&V requirements
    5. How to sell the benefits of energy efficiency
    99. Other

12. How useful was the training?
    1. Very useful
    2. Somewhat useful
    3. Not at all useful
    98. Don’t know

[DISPLAY Q13 IF Q10 = 2 OR 3]
13. What would have made the training more useful to you?

14. Have you sought any assistance from C&I Incentives Program staff for incentive projects you were working on?
    1. Yes
    2. No
    98. Don't know

[DISPLAY Q15, Q16, and Q17 IF Q14 = 1]
15. What did you need help with? (Do not read, select all that apply)
    1. Co-branding (logo) rules
    2. General program information
    3. Questions about how to fill out incentive application
    4. Check on status of incentive application
    5. Assistance with energy saving or incentive calculations
    6. Verify that equipment qualified for program incentives
    7. Other, specify
    98. Don't know

16. Do you know if you spoke with someone from I&M or someone from KEMA (the program implementer)? (Select all that apply)
    1. I&M staff
    2. KEMA staff
    3. Name (if provided)_______________
    98. Don't know

17. Did you get the assistance that you needed?
    1. Yes
    2. No
    98. Don't know

[DISPLAY Q18 IF Q17 = 2]
18. What additional help would you have liked?

19. Does the C&I Incentive program help you to sell your services or products?
    1. Yes
    2. No
    98. Don't know

[DISPLAY Q20 IF Q19 = 1]
20. In what ways does the program help you to sell your services or products?

21. Has your involvement in the C&I Incentives Program affected the types of equipment or services that you provide?
    1. Yes
    2. No
    98. Don't know

[DISPLAY Q22 IF Q21 = 1]
22. In what ways has your involvement in the C&I Incentives Program affected the types of equipment or services that you provide?
    1. Offer more program qualifying equipment to customers
    2. Focus more on project energy savings
    3. Stock more energy efficient / program qualifying equipment
    99. Other

23. Are the incentive levels adequate to encourage customers to select energy efficient equipment options?
    1. Yes
    2. No
    98. Don't know

24. Are there specific technologies or measures for which incentives should be higher?
    1. Yes
    2. No
    98. Don't know

[DISPLAY Q25 and Q26 IF Q24 = 1]
25. Which technologies or measures should have a higher incentive?

26. How much higher should the incentive be for the technologies or measures you mentioned above?

27. Is there any equipment that doesn't qualify for the program that you think should qualify?
    1. Yes
    2. No
    98. Don't know

[DISPLAY Q28 IF Q25 = 1]
28. What equipment should qualify for the program?

29. Have you noticed any recent trends relating to equipment choices that customers are making?
    1. Yes
    2. No

98. Don't know

[DISPLAY Q30 IF Q29 = 1]
30. What trends relating to equipment choices that customers are making have you noticed?

31. Are there ways in which I&M could market the C&I Incentive Program more effectively?
    1. Yes
    2. No
    98. Don't know

[DISPLAY Q32 IF Q31= 1]
32. Please describe how I&M could more effectively C&I Incentive Program.

33. Do you actively market the C&I Incentive Program to your customers?
    1. Yes
    2. No
    98. Don't know

[DISPLAY Q34 IF Q33 = 1]
34. About what percentage of your customers were aware that they could get incentives from I&M's C&I Incentives Program for upgrading energy –using equipment—that is before you mentioned it to them?

35. In which types of businesses or building types you work with is awareness of the incentives highest?

36. In which types of businesses or building types you work with is awareness of the incentives lowest?

37. Do you have any suggestions for how awareness could be improved with these businesses or building types?

38. Have you had customers decline to complete incentive projects through the C&I Incentives Program?
    1. Yes
    2. No
    98. Don't know

[DISPLAY Q39 IF Q38 = 1]
39. What reasons do these customers give for not completing the projects?

40. How active do you expect your firm to be in I&M's C&I Incentives Program during the next year?
    1. More active
    2. About the same level of activity
    3. Less active

98. Don't know

[DISPLAY Q41 IF Q40 = 3]

41. Why do you expect to be less active?

42. Overall, how satisfied or dissatisfied are you with your experiences in working with the C&I Incentive Program?
    1. Very Satisfied
    2. Satisfied
    3. Neither Satisfied nor Dissatisfied
    4. Very Dissatisfied
    5. Dissatisfied
    98. Don't know

[DISPLAY Q43 IF Q42 = 1 OR 2]

43. Please describe why you were not satisfied with the program.

44. Is there anything else you would like to tell us about your experience with I&M's C&I Incentive Program?

45. Do you have any other comments that you would like to relay to I&M about energy efficiency in commercial and industrial facilities or about their programs?

Appendix E: C&I Incentives Trade Ally Interview Responses

	Response	*(n=23)*	*Percent of Respondents*
Approximately how many employees work at your firm?	20 to 99 employees	7	30%
	5 to 9 employees	5	22%
	10 to 19 employees	6	26%
	100 to 499 employees	3	13%
	1 to 4 employees	2	9%
	500 or more employees	0	0%

	Response	*(n=23)*	*Percent of Respondents*
How would you characterize your type of business?	Contractor /Electrical	8	35%
	Distributor	3	13%
	Engineer	3	13%
	Manufacturer	1	4%
	Vendor / Retailer	1	4%
	Manufacturer representative	1	4%
	Architect	0	0%
	Contractor /Mechanical	0	0%
	Other	6	26%

	Response	*(n=23)*	*Percent of Respondents*
How would you characterize the types of services and products that you provide to your customers and clients?	Lighting	19	83%
	Energy analysis	6	26%
	HVAC	4	17%
	Building design	2	9%
	Compressed air systems	2	9%
	Motors/drives	2	9%
	Controls	1	4%
	Windows	1	4%
	Commissioning	0	0%
	Foodservice equipment	0	0%
	Grocery equipment	0	0%
	Insulation	0	0%
	Other	5	22%

According to our records, you helped implement [number of projects] in 2013 through the C&I Incentives Program. Did you assist with the completion of the application for [these projects/this project]?	*Response*	*(n=23)*	*Percent of Respondents*
	Yes	18	78%
	No	4	17%
	Don't know	1	4%

Are there any aspects of the C&I Incentives Program application process that you would recommend be modified?	*Response*	*(n=18)*	*Percent of Respondents*
	Yes	7	39%
	No	10	56%
	Don't know	1	6%

Did you participate in any training provided by the program?	*Response*	*(n=23)*	*Percent of Respondents*
	Yes	2	9%
	No	21	91%
	Don't know	0	0%

Have you sought any assistance from C&I Incentives Program staff for incentive projects you were working on?	*Response*	*(n=23)*	*Percent of Respondents*
	Yes	14	61%
	No	8	35%
	Don't know	1	4%

What did you need help with?	*Response*	*(n=14)*	*Percent of Respondents*
	Verify that equipment qualified for program incentives	8	57%
	Questions about how to fill out incentive applications	5	36%
	Assistance with energy saving or incentive calculations	6	43%
	General program information	4	29%
	Check on status of incentive applications	4	29%
	Co-branding (logo) rules	0	0%
	Other	2	14%
	Don't know	0	0%

	Response	*(n=14)*	*Percent of Respondents*
Do you know if you spoke with someone from I&M or someone from KEMA (the program implementer)?	KEMA Staff	11	79%
	I&M Staff	4	29%
	Name (if provided)	0	0%
	Don’t know	0	0%

	Response	*(n=14)*	*Percent of Respondents*
Did you get the assistance that you needed?	Yes	14	100%
	No	0	0%
	Don’t know	0	0%

	Response	*(n=23)*	*Percent of Respondents*
Does the C&I Incentive Program help you to sell your services or products?	Yes	22	96%
	No	1	4%
	Don't know	0	0%

	Response	*(n=22)*	*Percent of Respondents*
Has your involvement in the C&I Incentive Program affected the types of equipment or services that you provide?	Yes	5	23%
	No	16	73%
	Don't know	1	5%

	Response	*(n=5)*	*Percent of Respondents*
In what ways has your involvement in the C&I Incentives Program affected the types of equipment or services that you provide?	Offer more program qualifying equipment to customers	4	80%
	Focus more on project energy savings	1	20%
	Stock more energy efficient / program qualifying equipment	1	20%
	Other	1	20%

	Response	*(n=23)*	*Percent of Respondents*
Are the incentive levels adequate to encourage customers to select energy efficient equipment options?	Yes	16	70%
	No	6	26%
	Don't know	1	4%

Are there specific technologies or measures for which incentives should be higher?	*Response*	*(n=23)*	*Percent of Respondents*
	Yes	14	61%
	No	6	26%
	Don't know	3	13%

Is there any equipment that doesn't qualify for the program that you think should qualify?	*Response*	*(n=23)*	*Percent of Respondents*
	Yes	8	35%
	No	12	52%
	Don't know	3	13%

Have you noticed any recent trends relating to equipment choices that customers are making?	*Response*	*(n=23)*	*Percent of Respondents*
	Yes	17	74%
	No	6	26%
	Don't know	0	0%

Are there ways in which I&M could market the C&I Incentives Program more effectively?	*Response*	*(n=22)*	*Percent of Respondents*
	Yes	14	64%
	No	7	32%
	Don't know	1	5%

Do you actively market the C&I Incentive Program to your customers?	*Response*	*(n=23)*	*Percent of Respondents*
	Yes	19	83%
	No	4	17%
	Don't know	0	0%

Have you had customers decline to complete incentive projects through the C&I Incentives Program?	*Response*	*(n=21)*	*Percent of Respondents*
	Yes	6	29%
	No	14	67%
	Don't know	1	5%

How active do you expect your firm to be in the C&I Incentives Program during the next year?	*Response*	*(n=23)*	*Percent of Respondents*
	More active	10	43%
	About the same level of activity	12	52%
	Less active	1	4%
	Don't know	0	0%

	Response	*(n=23)*	*Percent of Respondents*
Overall, how satisfied or dissatisfied are you with your experiences in working with the C&I Incentive Program?	Very Satisfied	12	52%
	Somewhat satisfied	10	43%
	Neither Satisfied nor dissatisfied	1	4%
	Somewhat dissatisfied	0	0%
	Very dissatisfied	0	0%

Appendix F: C&I Audit Project-Level Analyses

This section contains the project-level analyses for the customer who participated in the Prescriptive Refrigeration Incentives component of the Commercial and Industrial Audit Program.

Project Number AEPIM-13-00214-S

Executive Summary

Under project AEPIM-13-00214-S, the customer received incentives from Indiana Michigan Power for retrofitting refrigerated cases with LED lights. The realization rate for this project is 0%.

Project Description

The customer's application describes the following retrofitted fixtures:

- 555 feet of LED lighting replacing pre-existing T8s

Measurement and Verification Effort

During an attempt to schedule an M&V site visit, ADM was informed that the facility had been closed after the customer declined to renew their lease. The retrofitted refrigerated cases were moved to a storage unit until they are needed in an alternative location.

Results

Verified Gross Savings/Realization Rates

Measure Category	*kWh Savings*			*kW Savings*
	Expected	*Realized*	*Realization Rate*	*Realized*
Lighting Retrofit	61,050	0	0%	0
Total	61,050	0	0%	0

The project-level realization rate is 0%. The absence of realized savings is the result of store closure.

Project Number AEPIM-13-00215-S

Executive Summary

Under project AEPIM-13-00215-S, the customer received incentives from Indiana Michigan Power for retrofitting refrigerated case lighting. The realization rate for this project is 142%.

Project Description

The customer retrofitted the following fixtures:

- (102) T12 fluorescent fixtures with (102) LED fixtures

Measurement and Verification Effort

During the M&V site visit, ADM verified that the facility lighting was in operation as expected. ADM developed an operational profile using scheduling data that were collected during an on-site interview.

Lighting retrofit energy savings are calculated as:

$$kWh_{savings} = \sum_{Area} \left[HCIF \times t \times \left(N_{base} \times W_{base} - N_{as-built} \times W_{as-built} \right) / 1000 \right]$$

Where:

$kWh_{savings}$ = *Annual energy savings*

N = *Number of fixtures*

W = *Wattage of each fixture*

t = *Lighting operating hours*

$HCIF$ = *HVAC interactive factor = 1 + WHF*

WHF = Waste Heat Factor

Provided in the table below are the expected and realized savings for lighting retrofit installations.

Lighting Retrofit Savings Calculations

Measure	*Quantity (Fixtures)*		*Wattage*		*Hours*	*Realized kWh Savings*	*Heating Cooling Interaction Factor*
	Old	*New*	*Old*	*New*			
T12 to LED Case Lights	102	102	104.3	17.2	8,760	118,260	1.52
Total						118,260	

Results

Verified Gross Savings/Realization Rates

Measure Category	kWh Savings			kW Savings
	Expected	Realized	Realization Rate	Realized
Lighting Retrofit	83,130.0	118,260	142%	12.42
Total	83,130.0	118,260	142%	12.42

The project-level realization rate is 142%. ADM's staff assumed a savings value that underestimated the hours of operation, resulting in higher realized savings. It was discovered that store lighting was in continuous operation throughout the year.

Project Number AEPIM-13-00228-S

Executive Summary

Under project AEPIM-13-00228-S, the customer received incentives from Indiana Michigan Power for retrofitting refrigerated case lighting with LEDs. The realization rate for this project is 89%.

Project Description

The customer installed 602 feet of LED lighting in various refrigerated cases. The LEDs replaced pre-existing T12 fixtures of various configurations.

Measurement and Verification Effort

During the M&V site visit, ADM verified that the facility lighting was in operation as expected. ADM installed lighting loggers in multiple refrigerated cases to determine typical operating hours for the new installations.

Lighting retrofit energy savings are calculated as:

$$kWh_{savings} = \sum_{Area} \left[HCIF \times t \times \left(N_{base} \times W_{base} - N_{as-built} \times W_{as-built} \right) / 1000 \right]$$

Where:

$kWh_{savings}$	= *Annual energy savings*
N	= *Number of fixtures*
W	= *Wattage of each fixture*
t	= *Lighting operating hours*
$HCIF$	=*Heating/Cooling Interactive Factor*

The table provided below presents expected and realized energy savings for lighting retrofit installations.

LED Lighting Retrofit Savings

Location	*Measure*	*Quantity (Fixtures)*		*Wattage*		*Hours*		*Realized kWh Savings*	*Heating Cooling Interaction Factor*
		Old	*New*	*Old*	*New*	*Old*	*New*		
End Case 1	T12 to 8 LED Mullion	3	4	112.0	12.8	5,442	5,442	2,356	1.52
Ice Cream	T12 to 6 LED Mullion	2	2	112.0	9.6	5,442	5,442	1,694	1.52
Ice Cream	T12 to 15 LED Mullion	13	14	112.0	24.0	5,442	5,442	9,265	1.52
Pizza	T12 to 15 LED Mullion	22	23	112.0	24.0	5,442	5,442	15,816	1.52
Dairy	4’ 2L T12 to 18 LED Mullion	8	8	120.0	28.8	5,442	5,442	5,598	1.41
Milk	T12 to 9 LED Mullion	1	2	112.0	14.4	5,442	5,442	638	1.41
Milk	T12 to 18 LED Mullion	4	4	112.0	28.8	5,442	5,442	2,554	1.41
End Case 2	T12 to 8 LED Mullion	3	4	112.0	12.8	5,442	5,442	2,356	1.52
Produce	4’ 2L T12 to 18 LED Mullion	18	18	120.0	28.8	5,442	5,442	12,597	1.41
Frozen Meat	T12 to 12 LED Mullion	10	11	112.0	19.2	5,442	5,442	7,518	1.52
Meat	4’ 2L T12 to 11 LED Mullion	18	18	120.0	17.6	5,442	5,442	14,144	1.41
Meat	4’ 1L T12 to 11 LED Mullion	27	27	60.0	17.6	5,442	5,442	8,784	1.41
Total								83,320	

Results

Verified Gross Savings/Realization Rates

Measure Category	*kWh Savings*			*kW Savings*
	Expected	*Realized*	*Realization Rate*	*Realized*
Lighting Retrofit	93,134	83,320	89%	14.25
Total	93,134	83,320	89%	14.25

The project-level realization rate is 89%. The discrepancy in savings can be attributed to ADM’s use of deemed savings for LED fixtures in ex-ante analysis. A generic value contingent on the average savings observed for LEDs in similar settings was applied in ex-ante calculations. This value disregards relevant information, such as the store’s hours of operation and the specifications of pre-retrofit and post-retrofit lighting fixtures.

Project Number AEPIM-13-000253-S

Executive Summary

Under project AEPIM-13-000253, the customer received incentives from Indiana Michigan Power for installing LED lighting inside their walk-in coolers and freezers. The realization for this project is 25%

Project Description

- Customer installed a total of 25 – 2’ 29W LED fixtures replacing 4’ 1L T8s in their walk-in coolers and freezer.

Measurement and Verification Effort

ADM verified that the LED fixtures were installed in the walk-in coolers and freezers as expected. Additionally, ADM installed three lighting loggers to determine the typical lighting schedule for these fixtures. LED lighting savings were calculated as follows:

$$kWh_{savings} = \sum_{Area} \left[HCIF \times t \times \left(N_{base} \times W_{base} - N_{as-built} \times W_{as-built} \right) / 1000 \right]$$

Where:

$kWh_{savings}$	= *Annual energy savings*
N	= *Number of fixtures*
W	= *Wattage of each fixture*
t	= *Lighting operating hours*
$HCIF$	= *HVAC interactive factor = 1 + WHF*
WHF	= *Waste Heat Factor*

Provided in the table below are the expected and realized energy savings resulting from lighting installations.

LED Lighting Retrofit Savings Calculations

Location	*Quantity (Fixtures)*		*Wattage*		*Hours*		*Realized kWh Savings*	*Heating Cooling Interaction Factor*
	Old	*New*	*Old*	*New*	*Old*	*New*		
Deli 1	1	1	38	29	1,612	1,612	20	1.41
Dairy	5	5	38	29	2,970	2,970	188	1.41
Freezer	3	3	38	29	2,970	2,970	122	1.52
Meat Cooler 1	4	4	38	29	907	907	46	1.41
Meat Cooler 2	3	3	38	29	2,970	2,970	113	1.41
Produce	3	3	38	29	2,970	2,970	113	1.41
All (24/7 Safety Cooler)	6	6	38	29	8,760	8,760	667	1.41
All (24/7 Safety Freezer)	1	1	38	29	8,760	8,760	120	1.52
Total							1,390	

Results

Verified Gross Savings/Realization Rates

Measure Category	*kWh Savings*			*kW Savings*
	Expected	*Realized*	*Realization Rate*	*Realized*
LED Lighting	5,550	1,390	25%	0.16
Total	5,550	1,390	25%	0.16

The project-level realization rate is 25%. The lack of realized savings can be attributed to ADM's inaccurate use of deemed savings for T12 fixture replacements. During the site visit, ADM discovered that the facility had replaced T8's with LED fixtures.

Project Number AEPIM-13-000264-S

Executive Summary

Under project AEPIM-13-000264, the customer received incentives from Indiana Michigan Power for installing Anti Sweat Heater Controls on 332 feet of low temperature cases. The realization for this project is 68%

Project Description

The customer installed controls to reduce operating hours of anti-sweat heaters on low temperature cases. Originally, the anti-sweat heaters would operate continuously regardless of the potential of condensation build up on the case doors. Controls allow for cycling of the anti-sweat heaters relative to store air conditions.

Measurement and Verification Effort

During the M&V site visit, ADM verified that the controls were in operation as expected. ADM installed CTs on the ASH controllers for a four week period. A linear regression was created to compare time-of-use with corresponding weather data. It was determined that the operation of the ASH controls had a direct correlation with the exterior dew point temperature. The regression formula is shown below:

$$\% \text{ time "on"} = 0.00783 \times \text{dew point} + 0.22865$$

Where:

% time "on"	*= The percent time on for a given dew point temperature*
Dew point	*= Outside air dew point temperature for a given hour*

TMY3 weather data were then used to determine annual usage of the heater. The following formula from the Indiana TRM was used to calculate savings:

$$kWh_{Savings} = kW_{base} * \#doors * ESF * BF * 8{,}760$$

Where:

$kWh_{Savings}$	*= Annual energy savings due to the installation of ASH controllers*
kW_{Base}	*= Average kW demand of anti-sweat heaters per door*
#doors	*= Number of doors being controlled by ASH controllers*
ESF	*= Percentage of time anti-sweat heaters are off due to controls*
BF	*= Bonus factor for increased savings from reduction in cooling load in low temperature cases*

Results

Verified Gross Savings/Realization Rates

Measure Category	*kWh Savings*			*kW Savings*
	Expected	*Realized*	*Realization Rate*	*Realized*
ASH Controls	152,056	103,520	68%	11.70
Total	152,056	103,520	68%	11.70

The project-level realization rate is 68%. The discrepancy in savings can be attributed to ADM applying a deemed savings of 458 kWh/ft of cooler door in their ex-ante analysis. At the conclusion of the monitoring period, it was determined that savings should have been valued at 312 kWh/ft.

Project Number AEPIM-13-000276-S

Executive Summary

Under project AEPIM-13-000276-S, the customer received incentives from Indiana Michigan Power for installing evaporator fan controls, floating head pressure and floating suction pressure controls in both the cooler and freezer areas. The realization rate for this project is 164%.

Project Description

The facility is a refrigerated warehouse that provides perishable and frozen food storage. The perishable food storage (cooler) area is approximately 106,000 ft^2, while the frozen food (freezer) area is 104,000 ft^2. The cooler areas are maintained at an average temperature of 37.9F, and are accommodated by 117 evaporator fans. The freezer areas are maintained at an average temperature of 4.4F and include a total of 150 evaporator fans. All of the evaporator fans were upgraded to include controls that halt operation when the temperature set-point is attained.

Cooling these areas requires 2,000 hp of air compressors with evaporative-cooled condensers. The compressors were also retrofitted with floating head and floating suction pressure controls.

Measurement and Verification Effort

During the M&V visit, ADM verified that the evaporator fan, floating head and suction controls had been implemented and were functioning. ADM's staff collected information on evaporator fan motor sizes, temperature set-points, and compressor types.

The savings for the evaporator fan controls were calculated using deemed savings values that were adjusted for evaporator fan sizes. DEER provides deemed savings values for evaporator fans with significantly smaller motor sizes. ADM adjusted these values to reflect the motor sizes observed at the facility. ADM referenced DEER's values and reviewed literature regarding established savings calculations to determine that evaporator fan controls could result in an annual reduction of 3,432 operating hours for both the cooler and freezer evaporator fans. The savings for both cooler and freezer fans are provided in the table below.

Evaporator Fan Savings Summary

Location	*No of Fans*	*Avg. Fan kW*	*Baseline Run Hours [hr/yr]*	*As Built Run Hours*	*Savings [kWh/yr]*
Cooler	117	0.663	8,760	5,328	266,416
Freezer	150	0.680	8,273	4,841	350,083
Totals	**267**				**616,499**

Several energy simulation models were created using eQUEST (ver 3-64) simulation software. Baseline compressor usage was established using a model that included standard, constant head, and suction pressure controls. Energy savings for floating head and suction compressor controls were evaluated independently. ADM's ex-post analysis applied a prototypical model with normalized savings to reflect the size of the compressor.

Results

Verified Gross Savings/Realization Rates

Measure Category	*kWh Savings*			*kW Savings*
	Expected	*Realized*	*Realization Rate*	*Realized*
Evaporator Fan Controls	127,092	616,499	485%	72.7
Compressor Controls	730,000	791,894	108%	51.7
Total	857,092	1,408,393	164%	124.4

The realized savings for this project exceeded ex-ante estimates because the fan motors were larger than the typical motor used in deemed savings appraisals. Generally, evaporator fans range between 88W and 132 W in deemed savings calculations. ADM determined an average magnitude of 663W and 680W in the cooler and freezer areas, respectively. The disparity between these magnitudes resulted in higher realized savings.

Project Number AEPIM-13-000288

Executive Summary

Under project AEPIM-13-000288, the customer received incentives from Indiana Michigan Power for installing LED case lighting and doors on refrigerated casework. The realization for this project is 72%

Project Description

The customer installed LED lighting to replace fluorescent fixtures in refrigerated cases to reduce the lighting load. Additionally, display doors were installed on open refrigerator cases to reduce the infiltration of ambient air, thus reducing cooling load.

Measurement and Verification Effort

During the M&V site visit, ADM verified that new lighting and doors were installed as expected. ADM used the following formula to determine energy savings from lighting measures:

$$kWh_{savings} = \sum_{Area} \left[HCIF \times t \times \left(N_{base} \times W_{base} - N_{as-built} \times W_{as-built} \right) / 1000 \right]$$

Where:

$kWh_{savings}$	= *Annual energy savings*
N	= *Number of fixtures*
W	= *Wattage of each fixture*
t	= *Lighting operating hours*
$HCIF$	=*Heating/Cooling Interactive Factor*

LED Lighting Retrofit Savings

Location	*Measure*	*Quantity (Fixtures)*		*Wattage*		*Hours*		*Realized kWh Savings*	*Heating Cooling Interaction Factor*
		Old	*New*	*Old*	*New*	*Old*	*New*		
A11a – Medium Temp	2LT12 to 3' Single LED	34	18	112	18.3	8,712	8,712	42,731	1.41
A11a – Medium Temp	2' Single LED	0	17	0	12.4	8,712	8,712	-2,589	1.41
Total								40,142	

ADM used DEER's prototypical model of grocery stores to determine energy savings for the case door retrofits. The baseline model assumes that medium temperature cases are without doors. Infiltration of ambient air into the refrigerated cases can be reduced by installing case doors. Baseline and as-built infiltration rates are dependent on ASHRAE's "Infiltration by Direct Flow through Doorways" methodology, which can be seen on Page 13.8 in the 2006 ASHRAE

Handbook. The model simulations used normalized TMY3 weather data from the customer's site.

Results

Verified Gross Savings/Realization Rates

Measure Category	*kWh Savings*			*kW Savings*
	Expected	*Realized*	*Realization Rate*	*Realized*
LED Case Lighting	14,344	40,142	280%	4.24
Case Doors	59,274	12,976	22%	12.25
Total	73,618	53,118	72%	16.49

The project-level realization rate is 72%. The realization rate for LED case lighting can be attributed to the understated deemed savings used in ex-ante analysis. Deemed savings of 163 kWh were assumed for ex-ante analysis, but essential information regarding the lighting schedule and fixture specifications were omitted from this estimate. ADM accounted for these variables and determined a savings of 456 kWh/linear foot.

The lack of realized savings for the cooler door retrofit can be attributed to overlooking interactive effects between the refrigerated case work and the HVAC system. The baseline refrigerators allowed cool air to flow from the cases into the HVAC zone, thus reducing cooling load and energy consumption. The installment of doors disallowed this process and imposed a greater demand on the HVAC system to cool the facility.

Project Number AEPIM-13-000295

Executive Summary

Under project AEPIM-13-000295, the customer received incentives from Indiana Michigan Power for installing anti-sweat heater controls, LED case lighting, and doors on refrigerated casework. The realization for this project is 33%

Project Description

- The customer installed ASH controls to reduce the time-of-use of the anti-sweat heaters in low temperature cases.
- The customer installed LED lighting to replace fluorescent fixtures in its refrigerated cases to reduce lighting load.
- The customer installed display doors on open refrigerated cases to reduce the infiltration of ambient air into the conditioned space in the cases, thus reducing cooling load.

Measurement and Verification Effort

During the M&V site visit, ADM did not find anti-sweat heater controls. Monitoring at the supply panel revealed invariable demand, indicating that controls had not been installed.

ADM verified new case lighting, but determined that the number of fixtures installed was less than claimed. ADM used the following formula to determine energy savings from lighting measures:

$$kWh_{savings} = \sum_{Area} \left[HCIF \times t \times \left(N_{base} \times W_{base} - N_{as-built} \times W_{as-built} \right) / 1000 \right]$$

Where:

$kWh_{savings}$	= *Annual energy savings*
N	= *Number of fixtures*
W	= *Wattage of each fixture*
t	= *Lighting operating hours*
$HCIF$	=*Heating/Cooling Interactive Factor*

LED Lighting Retrofit Savings

Location	*Measure*	*Quantity (Fixtures)*		*Wattage*		*Hours*		*Realized kWh Savings*	*Heating Cooling Interaction Factor*
		Old	*New*	*Old*	*New*	*Old*	*New*		
Medium Temp	2LT12 to Side LED	8	4	112	14	5,590	5,590	6,621	1.41
Medium Temp	Center LED	0	6	0	28	5,590	5,590	-1,324	1.41
Low Temp	2LT12 to Side LED	6	4	112	14	5,590	5,590	5,234	1.52
Low Temp	Center LED	0	4	0	28	5,590	5,590	-952	1.52
Total								9,579	

ADM used DEER's prototypical model of grocery stores to determine energy savings for the case door retrofits. The baseline model assumes that medium temperature cases are without doors. Infiltration of ambient air into the refrigerated cases can be reduced by installing case doors. Baseline and as-built infiltration rates are dependent on ASHRAE's "Infiltration by Direct Flow through Doorways" methodology, which can be seen on Page 13.8 in the 2006 ASHRAE Handbook. The model simulations used normalized TMY3 weather data from the customer's site. The model generated savings of 147.96 kWh and 0.158 kW/ ft.

Results

Verified Gross Savings/Realization Rates

Measure Category	*kWh Savings*			*kW Savings*
	Expected	*Realized*	*Realization Rate*	*Realized*
ASH controls	2,888	0	0	0
LED Case Lights	15,816	9,579	61%	1.58
Case Doors	19,758	2,959	15%	3.15
Total	38,462	12,538	33%	4.73

The project-level realization rate is 33%. During the site visit, ADM was unable to locate ASH controllers in the refrigerated cases, thus nullifying savings.

Realized savings from LED case lighting retrofits were lower than expected because the customer installed fewer fixtures than what was initially claimed. Additionally, there was a computational error in the project summary that calculated (10) 6 foot fixtures as 72 feet.

The lack of realized savings for the cooler door retrofit can be attributed to overlooking interactive effects between the refrigerated case work and the HVAC system. The baseline refrigerators allowed cool air to flow from the cases into the HVAC zone, thus reducing cooling load and energy consumption. The installment of doors disallowed this process and imposed a greater demand on the HVAC system to cool the facility.

Project Number AEPIM-13-000303

Executive Summary

Under project AEPIM-13-000303, the customer received incentives from Indiana Michigan Power for installing anti-sweat heater controls, LED case lighting, and doors on refrigerated casework. The realization for this project is 47%

Project Description

- The customer installed ASH controls to reduce the time-of-use of the anti-sweat heaters in low temperature cases.
- The customer installed LED lighting to replace fluorescent fixtures in its refrigerated cases to reduce lighting load.
- The customer installed display doors on open refrigerated cases to reduce the infiltration of ambient air into the conditioned space in the cases, thus reducing cooling load.

Measurement and Verification Effort

During the M&V site visit, ADM did not find anti-sweat heater controls. Monitoring at the supply panel revealed invariable demand, indicating that controls had not been installed.

ADM verified new case lighting, but determined that the number of fixtures installed was less than claimed. ADM used the following formula to determine energy savings from lighting measures:

$$kWh_{savings} = \sum_{Area} \left[HCIF \times t \times \left(N_{base} \times W_{base} - N_{as-built} \times W_{as-built} \right) / 1000 \right]$$

Where:

$kWh_{savings}$	= *Annual energy savings*
N	= *Number of fixtures*
W	= *Wattage of each fixture*
t	= *Lighting operating hours*
$HCIF$	=*Heating/Cooling Interactive Factor*

LED Lighting Retrofit Savings

Location	*Measure*	*Quantity (Fixtures)*		*Wattage*		*Hours*		*Realized kWh Savings*	*Heating Cooling Interaction Factor*
		Old	*New*	*Old*	*New*	*Old*	*New*		
Medium Temp	2LT12 to Side LED	8	4	112	14	8,760	8,760	10,375	1.41
Medium Temp	Center LED	0	6	0	28	8,760	8,760	-2,075	1.41
Low Temp	2LT12 to Side LED	6	4	112	14	8,760	8,760	8,202	1.52
Low Temp	Center LED	0	4	0	28	8,760	8,760	-1,491	1.52
Total								15,011	

ADM used DEER’s prototypical model of grocery stores to determine energy savings for the case door retrofits. The baseline model assumes that medium temperature cases are without doors. Infiltration of ambient air into the refrigerated cases can be reduced by installing case doors. Baseline and as-built infiltration rates are dependent on ASHRAE's "Infiltration by Direct Flow through Doorways" methodology, which can be seen on Page 13.8 in the 2006 ASHRAE Handbook. The model simulations used normalized TMY3 weather data from the customer’s site. The model generated savings of 147.96 kWh and 0.158 kW/ ft.

Results

Verified Gross Savings/Realization Rates

Measure Category	*kWh Savings*			*kW Savings*
	Expected	*Realized*	*Realization Rate*	*Realized*
ASH controls	2,888	0	0	0
LED Case Lights	15,816	15,011	95%	1.58
Case Doors	19,758	2,959	15%	3.15
Total	38,462	17,970	47%	4.73

The project-level realization rate is 47%. During the site visit ADM was unable to locate ASH controllers in the refrigerated cases, thus nullifying savings.

The discrepancy in savings for lighting retrofits can be attributed to the customer installing fewer fixtures than what was initially claimed. Additionally, the deemed savings used in ex-ante calculations omitted essential information, such as the lighting schedule and specifications for pre- and post-retrofit fixtures.

The lack of realized savings for the cooler door retrofit can be attributed to overlooking interactive effects between the refrigerated case work and the HVAC system. The baseline refrigerators allowed cool air to flow from the cases into the HVAC zone, thus reducing cooling load and energy consumption. The installment of doors disallowed this process and imposed a greater demand on the HVAC system to cool the facility.

Project Number AEPIM-13-000380

Executive Summary

Under project AEPIM-13-000380, the customer received incentives from Indiana Michigan Power for installing Anti Sweat Heater Controls and retrofitting case lights with LEDs. The realization for this project is 51%

Project Description

- The customer installed controls to reduce operating hours of anti-sweat heaters for 6 low temperature case doors.
- The customer retrofitted T8 fluorescent case lighting with LEDs in low and medium temperature cases.

Measurement and Verification Effort

During the M&V site visit, ADM verified that the controls were in operation as expected. ADM referenced CT data from a similar store to create a linear regression. The regression model compared time-of-use with corresponding weather data, and determined that the operation of ASH controls had a direct correlation with the exterior dew point temperature. The regression formula is shown below:

$$\%\text{ time “on”} = 0.02086 \times \text{dew point} + 0.07366$$

Where:

% time "on"	*= The percent time on for a given dew point temperature*
Dew point	*= Outside air dew point temperature for a given hour*

TMY3 weather data were then used to determine annual usage of the heater. The following formula from the Indiana TRM was used to calculate savings:

$$kWh_{Savings} = kW_{base} * \#doors * ESF * BF * 8{,}760$$

Where:

$kWh_{Savings}$	*= Annual energy savings due to the installation of ASH controllers*
kW_{Base}	*= Average kW demand of anti-sweat heaters per door*
#doors	*= Number of doors being controlled by ASH controllers*
ESF	*= Percentage of time anti-sweat heaters are off due to controls*
BF	*= Bonus factor for increased savings from reduction in cooling load in low temperature cases*

ADM verified that the LED case lights were installed and operational, and installed a light logger to monitor the lighting schedule. LED case light savings were calculated as follows:

$$kWh_{savings} = \sum_{Area}\left[HCIF \times t \times \left(N_{base} \times W_{base} - N_{as-built} \times W_{as-built}\right)/1000\right]$$

Where:

$kWh_{savings}$	= *Annual energy savings*
N	= *Number of fixtures*
W	= *Wattage of each fixture*
t	= *Lighting operating hours*
$HCIF$	= *HVAC interactive factor = 1 + WHF*
WHF	= *Waste Heat Factor*

Provided in the table below are expected and realized energy savings for lighting retrofits.

Lighting Retrofit Savings Calculations

Measure	*Quantity (Fixtures)*		*Wattage*		*Hours*	*Realized kWh Savings*	*Heating Cooling Interaction Factor*
	Old	*New*	*Old*	*New*			
Med. Temp. T8 to Side Bar LED	4	4	38	14	5,137	695	1.41
Med. Temp. T8 to Mullion LED	7	7	76	28	5,137	2,434	1.41
Low Temp. T8 to Side Bar LED	4	4	38	14	5,137	750	1.52
Low Temp. T8 to Mullion LED	4	4	76	28	5,137	1,499	1.52
Total						5,378	

Results

Verified Gross Savings/Realization Rates

Measure Category	*kWh Savings*			*kW Savings*
	Expected	*Realized*	*Realization Rate*	*Realized*
ASH Controls	7,328	3,122	43%	0.35
LED Case Lights	9,372	5,378	57%	1.04
Total	16,700	8,500	51%	1.39

The project-level realization rate is 51%. The discrepancy in savings for the ASH controls can be attributed to ADM applying a deemed savings of 458 kWh/ft of cooler door in their ex-ante analysis. At the conclusion of the monitoring period, it was determined that savings should have been valued at 208 kWh/ft. Additionally, ex-ante calculations overestimated the hours of operation, thus resulting in reduced savings. Deemed savings calculations assumed continuous use of the LED case lights, while ADM determined that the case lighting operates approximately 5,137 hours annually.

Project Number AEPIM-13-000382

Executive Summary

Under project AEPIM-13-000382, the customer received incentives from Indiana Michigan Power for installing Anti Sweat Heater Controls and retrofitting case lights with LEDs. The realization for this project is 32%

Project Description

- The customer installed controls to reduce operating hours of anti-sweat heaters for 6 low temperature case doors.
- The customer retrofitted T8 fluorescent case lighting with LEDs in low and medium temperature cases.

Measurement and Verification Effort

During the M&V visit, ADM verified that the controls were installed as expected. ADM monitored the ASH controls with CTs at the electric panel. ADM verified that LED case lights were installed and operational. ADM determined the annual hours of operation by referencing monitoring data that were collected from a similar site. Savings from the LED lighting retrofit are calculated as follows:

$$kWh_{savings} = \sum_{Area} \left[HCIF \times t \times \left(N_{base} \times W_{base} - N_{as-built} \times W_{as-built} \right) / 1000 \right]$$

Where:

$kWh_{savings}$	= *Annual energy savings*
N	= *Number of fixtures*
W	= *Wattage of each fixture*
t	= *Lighting operating hours*
$HCIF$	= *HVAC interactive factor = 1 + WHF*
WHF	= *Waste Heat Factor*

The expected and realized savings for lighting retrofit are presented in the following table:

Lighting Retrofit Savings Calculations

Measure	*Quantity (Fixtures)*		*Wattage*		*Hours*	*Realized kWh Savings*	*Heating Cooling Interaction Factor*
	Old	*New*	*Old*	*New*			
Med. Temp. T8 to Side Bar LED	4	4	38	14	5,137	695	1.41
Med. Temp. T8 to Mullion LED	7	7	76	28	5,137	2,434	1.41
Low Temp. T8 to Side Bar LED	4	4	38	14	5,137	750	1.52
Low Temp. T8 to Mullion LED	4	4	76	28	5,137	1,499	1.52
Total						5,378	

Results

Verified Gross Savings/Realization Rates

Measure Category	*kWh Savings*			*kW Savings*
	Expected	*Realized*	*Realization Rate*	*Realized*
ASH Controls	7,328	0	0	--
LED Case Lights	9,372	5,378	57%	1.04
Total	16,700	5,378	32%	1.04

The project-level realization rate is 32%. The discrepancy in savings can be attributed to several factors. ADM's monitoring data showed a constant supply of current to the ASH, which could possibly indicate poor calibration of the controls. Additionally, ex-ante estimates for lighting retrofit assumed continuous use of facility lighting. ADM's monitoring data revealed that the case lights operate 5,137 hours annually.

Project Number AEPIM-13-000384

Executive Summary

Under project AEPIM-13-000384, the customer received incentives from Indiana Michigan Power for installing Anti Sweat Heater Controls and retrofitting case lights with LEDs. The realization for this project is 46%

Project Description

- The customer installed controls to reduce operating hours of anti-sweat heaters for 5 low temperature case doors.
- The customer retrofitted T8 fluorescent case lighting with LEDs in low and medium temperature cases.

Measurement and Verification Effort

During the M&V site visit, ADM verified that the controls were in operation as expected. ADM referenced CT data from a similar store to create a linear regression. The regression model compared time-of-use with corresponding weather data, and determined that the operation of ASH controls had a direct correlation with the exterior dew point temperature. The regression formula is shown below:

$$\%\text{ time “on”} = 0.02086 \times \text{dew point} + 0.07366$$

Where:

% time “on” = *The percent time on for a given dew point temperature*

Dew point = *Outside air dew point temperature for a given hour*

TMY3 weather data were then used to determine annual usage of the heater. The following formula from the Indiana TRM was used to calculate savings:

$$kWh_{Savings} = kW_{base} * \#doors * ESF * BF * 8{,}760$$

Where:

$kWh_{Savings}$ = *Annual energy savings due to the installation of ASH controllers*

kW_{Base} = *Average kW demand of anti-sweat heaters per door*

#doors = *Number of doors being controlled by ASH controllers*

ESF = *Percentage of time anti-sweat heaters are off due to controls*

BF = *Bonus factor for increased savings from reduction in cooling load in low temperature cases*

ADM verified that the LED case lights were installed and operational, and installed a light logger to monitor the lighting schedule. LED case light savings were calculated as follows:

$$kWh_{savings} = \sum_{Area} \left[HCIF \times t \times \left(N_{base} \times W_{base} - N_{as-built} \times W_{as-built} \right) / 1000 \right]$$

Where:

$kWh_{savings}$ = *Annual energy savings*

N = *Number of fixtures*

W = *Wattage of each fixture*

t = *Lighting operating hours*

$HCIF$ = *HVAC interactive factor = 1 + WHF*

WHF = *Waste Heat Factor*

Provided in the table below are expected and realized energy savings for lighting retrofits.

Lighting Retrofit Savings Calculations

Measure	*Quantity (Fixtures)*		*Wattage*		*Hours*	*Realized kWh Savings*	*Heating Cooling Interaction Factor*
	Old	*New*	*Old*	*New*			
Med. Temp. T8 to Side Bar LED	4	4	38	14	5,137	695	1.41
Med. Temp. T8 to Mullion LED	7	7	76	28	5,137	2,434	1.41
Low Temp. T8 to Side Bar LED	2	2	38	14	5,137	375	1.52
Low Temp. T8 to Mullion LED	4	4	76	28	5,137	1,499	1.52
Total						5,003	

Results

Verified Gross Savings/Realization Rates

Measure Category	*kWh Savings*			*kW Savings*
	Expected	*Realized*	*Realization Rate*	*Realized*
ASH Controls	7,328	2,602	36%	0.29
LED Case Lights	9,372	5,003	53%	0.96
Total	16,700	7,605	46%	1.26

The project-level realization rate is 46%. The discrepancy in savings can be attributed to ADM's staff overestimating demand load for anti-sweat heaters. ADM's measurement of door width exceeded the value reported in the application, leading to overstated savings. Additionally, ex-ante lighting analysis overstated savings as a result of assuming longer hours of operation.

Project Number AEPIM-13-000420

Executive Summary

Under project AEPIM-13-000420, the customer received incentives from Indiana Michigan Power for installing LED case lighting, occupancy sensors and doors on refrigerated casework. The realization for this project is 107%

Project Description

The customer reduced lighting load by replacing fluorescent fixtures in refrigerated cases with LED fixtures. Occupancy sensors were also installed on several cases to reduce lighting consumption.

Furthermore, the customer installed glass doors on open refrigerated cases to reduce the infiltration of ambient air, thus reducing cooling load.

Measurement and Verification Effort

During the M&V visit, ADM verified that lighting fixtures and doors were installed as expected. ADM used the following formula to determine energy savings from lighting and occupancy sensor measures:

$$kWh_{savings} = \sum_{Area} \left[HCIF \times t \times \left(N_{base} \times W_{base} - N_{as-built} \times W_{as-built} \right) / 1000 \right]$$

Where:

$kWh_{savings}$ = *Annual energy savings*

N = *Number of fixtures*

W = *Wattage of each fixture*

t = *Lighting operating hours*

$HCIF$ =*Heating/Cooling Interactive Factor*

LED Lighting Retrofit Savings

Location	*Measure*	*Quantity (Fixtures)*		*Wattage*		*Hours*		*Realized kWh Savings*	*Heating Cooling Interaction Factor*
		Old	*New*	*Old*	*New*	*Old*	*New*		
Dairy Walk-in Cooler	2LT8 to 5’ Single LED	14	2	76	10	8,712	8,712	12,824	1.41
Dairy Walk-in Cooler	5’ Double LED	0	13	0	19.9	8,712	8,712	-3,178	1.41
GDFF - 5 door cases	2LT8 to 5’ Single LED	110	44	76	10	8,712	8,712	104,879	1.52
GDFF - 5 door cases	5’ Double LED	0	88	0	19.9	8,712	8,712	-23,190	1.52
GDFF - 4 door cases	2LT8 to 5’ Single LED	12	6	76	10	8,712	8,712	11,282	1.52
GDFF - 4 door cases	5’ Double LED	0	9	0	19.9	8,712	8,712	-2,372	1.52
GD Cake - 4 door case	2LT8 to 5’ Single LED	4	2	76	10	8,712	8,712	3,489	1.41
GD Cake - 4 door case	5’ Double LED	0	3	0	19.9	8,712	8,712	-733	1.41
GDFF - 3 door cases	2LT8 to 5’ Single LED	6	4	76	10	8,712	8,712	5,509	1.52

Location	*Measure*	*Quantity (Fixtures)*		*Wattage*		*Hours*		*Realized kWh Savings*	*Heating Cooling Interaction Factor*
		Old	*New*	*Old*	*New*	*Old*	*New*		
GDFF - 3 door cases	5' Double LED	0	4	0	19.9	8,712	8,712	-1,054	1.52
GD Deli - 3 door case	2LT8 to 5' Single LED	3	2	76	10	8,712	8,712	2,555	1.41
GD Deli - 3 door case	5' Double LED	0	2	0	19.9	8,712	8,712	-489	1.41
GD Produce - 3 door case	2LT8 to 5' Single LED	3	2	76	10	8,712	8,712	2,555	1.41
GD Produce - 3 door case	5' Double LED	0	2	0	19.9	8,712	8,712	-489	1.41
GD Floral - 5 door case	2LT8 to 6' Single LED	5	2	76	12	8,712	8,712	4,373	1.41
GD Floral - 5 door case	6' Double LED	0	4	0	23.9	8,712	8,712	-1,174	1.41
GDFF - 2-door case	2LT8 to 5' Center LED	2	3	76	32.4	8,712	8,712	726	1.52
GD End Cases - 2-door cases	2LT8 to 5' Center LED	4	6	76	32.4	8,712	8,712	1,451	1.52
GD Seafood - 5 door case	2LT12 to 5' Center LED	5	6	112	32.4	8,712	8,712	4,841	1.52
Total								121,805	

Occupancy Sensor Savings

Location	*Measure*	*Quantity (Fixtures)*		*Wattage*		*Hours*		*Realized kWh Savings*	*Heating Cooling Interaction Factor*
		Old	*New*	*Old*	*New*	*Old*	*New*		
GDFF - 5 door cases	Occupancy Sensors	44	44	10	10	8,712	4,407	2,879	1.52
GDFF - 5 door cases	Occupancy Sensors	88	88	19.9	19.9	8,712	4,407	11,459	1.52
GDFF - 4 door cases	Occupancy Sensors	6	6	10	10	8,712	4,407	393	1.52
GDFF - 4 door cases	Occupancy Sensors	9	9	19.9	19.9	8,712	4,407	1,172	1.52
GD Cake - 4 door case	Occupancy Sensors	2	2	10	10	8,712	4,407	121	1.41
GD Cake - 4 door case	Occupancy Sensors	3	3	19.9	19.9	8,712	4,407	362	1.41
GDFF - 3 door cases	Occupancy Sensors	4	4	10	10	8,712	4,407	262	1.52
GDFF - 3 door cases	Occupancy Sensors	4	4	19.9	19.9	8,712	4,407	521	1.52
GD Fr. Seafood - 5 door case	Occupancy Sensors	4	4	23.9	23.9	8,712	4,407	626	1.52
GDFF - 2-door case	Occupancy Sensors	3	3	32.4	32.4	8,712	4,407	636	1.52
Total								18,431	

ADM used DEER's prototypical model of grocery stores to determine energy savings for the case door retrofits. The baseline model assumes that medium temperature cases are without doors. Infiltration of ambient air into the refrigerated cases can be reduced by installing case doors. Baseline and as-built infiltration rates are dependent on ASHRAE's "Infiltration by Direct Flow through Doorways" methodology, which can be seen on Page 13.8 in the 2006 ASHRAE Handbook. The model simulations used normalized TMY3 weather data from the customer's site. The model generated savings of 190.82 kWh and 0.180 kW/ ft.

Results

Verified Gross Savings/Realization Rates

Measure Category	*kWh Savings*			*kW Savings*
	Expected	*Realized*	*Realization Rate*	*Realized*
LED Case Lighting	84,748	121,805	144%	12.86
Motion Sensors	23,012	18,431	80%	0
Case Doors	29,637	6,869	23%	6.48
Total	137,397	147,105	107%	19.34

The project-level realization rate is 107%. The realization rate for LED case lighting can be attributed to the understated deemed savings used in ex-ante analysis. Deemed savings of 163 kWh were assumed for ex-ante analysis, but essential information regarding the lighting schedule and fixture specifications were omitted from this estimate.

Due to reorganization of the facility's casework, ADM's ex-ante analysis used an overstated lighting load for occupancy sensors, which resulted in reduced savings.

The lack of realized savings for the cooler door retrofit can be attributed to overlooking interactive effects between the refrigerated case work and the HVAC system. The baseline refrigerators allowed cool air to flow from the cases into the HVAC zone, thus reducing cooling load and energy consumption. The installment of doors disallowed this process and imposed a greater demand on the HVAC system to cool the facility.

Project Number AEPIM-13-000487-S

Executive Summary

Under project AEP-13-000487-S, the customer received incentives from Indiana Michigan Power for installing floating head pressure controls on compressors that supplied the refrigerated warehouse. The realization rate for this project is 94%.

Project Description

The facility is a refrigerated warehouse that provides beverage storage. Cooling is provided to the warehouse by air-cooled condensers with 135 HP, collectively. Originally, the compressors maintained a constant head pressure set-point in order to reduce energy consumption of the compressor rack. 100 HP of compressors were retrofitted with floating head pressure controls.

Measurement and Verification Effort

During the M&V site visit, ADM verified that the floating head controls had been implemented and were functioning. ADM's staff collected information on the condenser units, evaporator fans, temperature set-points, and compressor types.

Energy savings resulting from the floating head pressure controls were calculated using a prototypical DEER model. The original model relied on R-707 and evaporative condensers, while the current facility relies on R-22 and air cooled condensers. Given the impacts of these differences, ADM chose to make the necessary upgrades to the refrigeration system.

ADM's evaluation of normalized savings required baseline and as-built models for comparison. Baseline usage for the compressor was established using a model that included standard, constant head, and suction pressure controls. The As-built model simulation incorporated floating head pressure controls to reflect changes made during project implementation. The following table summarizes the results of the simulation:

Prototypical Model Normalized Savings

	Baseline	*W/Float Head*	*Savings*
kWh	2,719,572	2,631,549	88,022
Peak	341.85	329.49	12.36
Controlled Hp	197.80	197.80	-
Savings kWh/Hp	-	-	445.00
Savings kW/Hp	-	-	0.06

Results

Verified Gross Savings/Realization Rates

Measure Category	*kWh Savings*			*kW Savings*
	Expected	*Realized*	*Realization Rate*	*Realized*
Floating Head Controls	47,200	44,500	94%	6.25
Total	47,200	44,500	94%	6.25

Appendix G: C&I Audit Questionnaire for Decision Maker Survey

1. What sources, if any, does your organization rely on for information about ways to save energy? (Check all that apply)
    1. An I&M Energy Specialist
    2. An I&M Account Representative
    3. The I&M website
    4. Brochures or advertisements
    5. Trade associations or business groups you belong to
    6. Trade journals or magazines
    7. Friends and colleagues
    8. An architect, engineer or energy consultant
    9. Equipment vendors or building contractors

    99. Other (please describe)

2. Which of the following policies or procedures, if any, does your organization have in place regarding energy efficiency?
    1. An energy management plan
    2. Corporate policies that incorporate energy efficiency in operations and procurement
    3. Active training of staff on saving energy
    4. A numeric goal for energy savings
    5. A numeric goal for energy cost reduction
    6. None

    99. Other (please describe)

3. How does your organization decide to make energy efficiency improvements for [this facility/these facilities]? Is the decision:

    Made by one or two key people
    1. Based on staff recommendations to a decision maker
    2. Made by a group or committee
    3. Depends on how much the investment is
    4. Made in some other way

4. Which financial methods, if any, does your organization typically use to evaluate energy efficiency improvements for this facility? (Select all that apply)

    Initial Cost
    1. Life cycle cost
    2. Simple payback (provide numeric payback time if possible)
    3. Internal rate of return (provide numeric rate of return if possible)
    4. None of these

5. How did you learn of the C&I Audit Program? (Select all that apply)
1. Approached directly by representative of the C&I Audit Program
2. Received an information brochure on the C&I Audit Program

3. An I&M customer service representative mentioned it
4. Received information from a Lockheed Martin staff member
5. I&M website
6. Friends or colleagues
7. An architect, engineer or energy consultant
8. An equipment vendor or building contractor
9. A utility bill insert
10. An email from I&M
11. Other (please explain)

6. Did you work on completing the application for the program, including gathering any required documentation?
   1. Yes
   2. No
   98. Don't know

[DISPLAY Q7 IF Q6 = 1]
7. Thinking back to the application process, please rate the clarity of information on how to complete the application. Would you say…
   1. Not at all clear
   2. Somewhat clear
   3. Mostly clear
   4. Completely clear
   98. Don't know

[DISPLAY Q8 IF Q7 = 1 OR 2]
8. What information, including instructions on forms, needs to be further clarified?

[DISPLAY Q9 IF Q6 = 1]
9. Using a scale of completely unacceptable, somewhat unacceptable, somewhat acceptable, and completely acceptable, how would you rate the following…
   a. the ease of finding how to apply for the audit program on I&M's website
   b. the ease of using the application forms
   c. the time it took to have the application approved
   e. the overall application process

[DISPLAY Q10 IF Q6 = 1]
10. Did you have a clear sense of whom to go to for assistance with the application process?
    1. Yes
    2. No
    98. Don't know

11. Now I would like to ask you about the audit process. Using a scale of completely disagree, somewhat disagree, neither disagree nor agree, somewhat agree, and completely agree, please rate your agreement with the following statements:
    a. The auditor was courteous

b. The auditor was efficient
c. The auditor minimized disruption to our business

[DISPLAY Q12 IF Q1A, Q1B , or Q1C = 1 OR 2]

12. What could the auditor have done differently to improve your experience with the program?

13. Did you review the audit report that you received?
    1. Yes
    2. No
    98. Don't know

[DISPLAY Q14 IF Q13 = 1]

14. How easy or difficult was the audit report to understand? Would you say….
    1. Very easy to understand
    2. Somewhat easy to understand
    3. Somewhat difficult to understand
    4. Very difficult to understand
    98. Don't know

[DISPLAY Q15 IF Q14= 3 OR 4]

15. Do you have any suggestions for how the information in the audit report could be presented more clearly?

[DISPLAY Q16 IF Q12 = Yes]

16. Did the audit report present sufficient information for you to make a decision about whether or not to implement the recommendations? Would you say….(Read List)
    1. Yes
    2. For the most part
    3. No
    98. Don't know

[DISPLAY Q17 IF Q16 = 2 OR 3]

17. What additional information would you need to help you make a decision?

[DISPLAY Q18 IF Q12 = Yes]

18. After reviewing the report, was it clear to you how to apply for financial incentives for the recommended energy saving improvements? Would you say….
    1. Very clear
    2. Somewhat clear
    3. Somewhat unclear
    4. Very unclear
    98. Don't know

[DISPLAY Q19 IF Q18= 3 or 4]

19. Do you have any suggestions for how the report could be clearer about how to apply for incentives?

Now I would like to ask you some questions about the recommendations you received for the audited [facility/facilities]

[DISPLAY Q20 IF = LIGHTING CONTROLS RECOMMENDED]

20. In the audit report, you received recommendations to retrofit your facility with occupancy sensors or daylighting controls. Have you installed any of the recommended lighting controls?
    1. Yes, at all of the locations audited
    2. Yes, at some of the locations audited
    3. No
    98. Don't know

[DISPLAY Q21 IF Q20 = 1 OR 2]

21. Did you receive or apply for an incentive through an I&M or Energizing Indiana program for all or some of the lighting controls you installed?
    1. Yes, for all of the lighting controls
    2. Yes, for some of the lighting controls
    3. No, did not apply for or receive an incentive
    98. Don’t know

[DISPLAY Q22 IF Q21 = 2 OR 3]
Now I would like to ask you some questions about the recommended lighting controls that you installed without applying for or receiving an incentive.

[DISPLAY Q22 IF Q21 = Yes, for some OR No]

22. Did you have plans to install the lighting controls before receiving the audit?
    1. Yes
    2. No
    98. Don't know

[DISPLAY Q23 IF Q22=1]

23. Would you have gone ahead with these plans had you not received the audit?
    1. Yes
    2. No
    98. Don't know

[DISPLAY Q24 IF Q21 = 2 OR 3]

24. Before you received the audit, had you implemented energy saving equipment similar to the lighting controls recommended at your facility or facilities?
    1. Yes
    2. No
    98. Don't know

[DISPLAY Q25 IF Q21 = 2 OR 3]

25. How important was the information provided to you in the audit report to your decision to install the recommended lighting controls? Would you say….(Read List)
    1. Very important
    2. Somewhat important
    3. Slightly important
    4. Not at all important
    98. Don't know

[DISPLAY Q26 IF Q21 = 2 OR 3

26. What type of lighting controls did you install without applying for or receiving an incentive?
    1. Occupancy Sensors
    2. Daylighting Controls
    3. Other
    98. Don't know

[DISPLAY Q27 IF Q26= 1]

27. Now I would like to ask you a few questions about the lights controlled by the occupancy sensors. For these questions I only want information about occupancy sensors for which you did not apply for or receive an incentive.

    How many fixtures are controlled by the occupancy sensors, what type of fixture (e.g., fluorescent, metal halide) are they, and what is the wattage of those fixtures?

    If you are unable to provide the information on the project specifics, please continue the survey but if there is someone else who could better answer this question, please provide their contact information (name, phone number) at the end of the survey.

[DISPLAY Q28 IF Q26= 2]

28. Now I would like to ask you a few questions about the lights controlled by the daylighting controls. For these questions I only want information about daylighting controls for which you did not apply for or receive an incentive.

    How many fixtures are controlled by the daylighting control, what type of fixture (e.g., fluorescent, metal halide) are they, and what is the wattage of those fixtures?

    If you are unable to provide the information on the project specifics, please continue the survey but if there is someone else who could better answer this question, please provide their contact information (name, phone number) at the end of the survey.

[DISPLAY Q29 IF Q26= 1]

29. How many hours per day did the lights controlled by the occupancy sensors operate before the controls were installed?

[DISPLAY Q30 IF Q26= 1]

30. Do the hours of operation for the occupancy sensor-controlled lights change on weekends or holidays? If so, what are the hours of operation during weekends or holidays?

[DISPLAY Q31 IF Q26= 2]
31. How many hours per day did the lights controlled by the daylighting controls operate before the controls were installed?

[DISPLAY Q32 IF Q26= 2]
32. Do the hours of operation for the daylighting controlled lights change on weekends or holidays? If so, what are the hours of operation during weekends or holidays?

[DISPLAY Q33 IF Q20 = 2 OR 3]
33. What was the total estimated project cost for the lighting controls? Please be as specific as possible.

[DISPLAY Q34 IF Q20 = 2 OR 3]
34. Is there somebody we can contact about the lighting controls that was installed after the audit? Please provide a name, phone number, and email address.
Name: ____
Phone Number: ____
Email Address: ____

[DISPLAY Q35 IF = VFDs RECOMMENDED]
35. In the audit report, you received recommendations to retrofit your facility with variable frequency drives, or VFDs. Have you installed any of the recommended VFDs?
1. Yes, at all of the locations audited
2. Yes, at some of the locations audited
3. No
98. Don't know

[DISPLAY Q0 IF Q35 = 1 or 2]
36. Did you receive or apply for an incentive through an I&M or Energizing Indiana program for all or some of the VFD's you installed?
1. Yes, for all of the VFDs
2. Yes, for some of the VFDs
3. No, did not apply for or receive an incentive
98. Don't know

[DISPLAY IF Q0 = 2 or 3]
Now I would like to ask you some questions about the recommended VFD's that you installed without applying for or receiving an incentive.

[DISPLAY Q0 IF Q0 = 2 or 3]
37. Did you have plans to install the VFDs before receiving the audit?

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

[DISPLAY Q38 IF Q0 = 1]
38. Would you have gone ahead with these plans had you not received the audit?

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

[DISPLAY Q39 IF Q0 = 2 or 3]
39. Before you received the audit, had you implemented energy saving equipment similar to the recommended VFD(s) that you installed?

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

[DISPLAY Q40 IF Q0 = 2 or 3]
40. How important was the information provided to you in the audit to your decision to install the recommended VFD(s)?

1. Very important
2. Somewhat important
3. Slightly important
4. Not at all important
98. Don't know

[DISPLAY Q41 IF Q0 = 2 or 3]
41. Were the VFDs installed on motors that are part of an HVAC system?

1. Yes
2. No
3. Some were part of an HVAC system, some were not
98. Don't know

[DISPLAY Q0 IF Q41 = 1 or 3]
Now I would like to ask you a few questions about the VFDs installed that are part of an HVAC system. For these questions I only want information about the recommended VFDs installed for which you did not apply for or receive an incentive.

42. For each of the VFDs installed, please provide the application, the number of motors controlled, and the number of VFDs installed.

If you are unable to provide the information on the project specifics, please continue the survey. If there is someone else who could better answer this question, please provide their contact information (name, phone number) at the end of the survey.

[DISPLAY Q43 IF Q41 = 2 or 3]
43. For the existing motors of the VFDs that were not used in an HVAC system, what is the total number of motors, total motor horsepower controlled by the VFDs, operation hours, and motor efficiency?

Number of motors:
Individual motor horsepower:
Operation hours:
Motor efficiency:

[DISPLAY Q44 IF Q41 = 2 or 3]
44. What was the total estimated project cost for the VFD's you installed? Please be as specific as possible.

[DISPLAY Q45 IF Q0 = 2 or 3]
45. Is there somebody we can contact about the variable frequency drives that was installed after the audit? Please provide a name, phone number, and email address.

Name:
Phone Number:
Email Address:

[DISPLAY Q46 IF = REFRIGERATION EQUIPMENT RECOMMENDED AND PRESCRIPTIVE REBATE = NO]
46. In the audit report, you received recommendations to retrofit some refrigeration equipment. Have you installed any of the recommended refrigeration equipment?

1. Yes, at all of the locations audited
2. Yes, at some of the locations audited
3. No
98. Don't know

[DISPLAY Q47 IF Q46 = 1 or 2]
47. Did you receive or apply for an incentive through an I&M or Energizing Indiana program all or some of the recommended refrigeration equipment you installed?

1. Yes, for all of the refrigeration equipment
2. Yes, for some of the refrigeration equipment
3. No, did not apply for or receive an incentive
98. Don't know

[DISPLAY IF Q47 = 2 or 3 or PRESCRIPTIVE REBATE=YES]
Now I would like to ask you some questions about the recommended refrigeration equipment that you installed without applying for or receiving an incentive.

[DISPLAY Q48 IF Q47 = 2 or 3]
48. Did you have plans to install the recommended refrigeration equipment before receiving the audit?

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

[DISPLAY Q49 IF Q48 = 1]
49. Would you have gone ahead with these plans had you not received the audit?

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

[DISPLAY Q50 IF Q47 = 2 or 3]
50. Before you received the audit, had you implemented energy efficient equipment similar to the recommended refrigeration equipment that you installed?

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

[DISPLAY Q51 IF Q47 = 2 or 3]
51. How important was the information provided to you in the audit to your decision to install the recommended refrigeration equipment?

1. Very important
2. Somewhat important
3. Slightly important
4. Not at all important
98. Don't know

[DISPLAY Q52 IF Q47 = 2 or 3]
52. Can you please describe the refrigeration equipment you installed, being as detailed as possible with regard to equipment types and project scope? If this project involved replacing old equipment, please provide information regarding the equipment that was removed.

[DISPLAY Q53 IF Q47 = 2 or 3]
53. What was the total estimated project cost for the refrigeration equipment you installed? Please be as specific as possible.

[DISPLAY Q52 IF Q47 = 2 or 3]
54. Is there somebody we can contact about the refrigeration equipment that was installed after the audit? Please provide a name, phone number, and email address.

Name:
Phone Number:

Email Address:

[DISPLAY Q55 IF = REFRIGERATION EQUIPMENT RECOMMENDED AND PRESCRIPTIVE REBATE = YES]

55. According to our records, you received a rebate for [PRESCRIPTIVE MEASURE] that you installed at [PRESCRIPTIVE LOCATION]. Is that correct?

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

56. Before participating in the program, had you installed any equipment similar to the energy efficient [PRESCRIPTIVE MEASURE] installed through the program at [this facility/these facilities]?

1. Yes
2. No
98. Don’t know

57. Did you have plans to install energy efficient [PRESCRIPTIVE MEASURE]at [this facility/these facilities] before participating in the program?

1. Yes
2. No
98. Don’t know

[DISPLAY Q58 IF Q57 = 1]

58. Would you have gone ahead with this planned installation even if you had not participated in the program?

1. Yes
2. No
98. Don’t know

59. How important was previous experience with the program in making your decision to install energy efficient [PRESCRIPTIVE MEASURE]?

1. Did not have previous experience with program
2. Very important
3. Somewhat important
4. Only slightly important
5. Not at all important
98. Don't know

60. Did you receive a recommendation for the [PRESCRIPTIVE MEASURE] that you received an incentive for in the audit report?

1. Yes
2. No

98. Don’t know

[DISPLAY Q61 IF Q60 = 1]
61. If the [PRESCRIPTIVE MEASURE] was not recommended in the audit report, how likely is it that you would have installed it anyway?

1. Definitely would have installed
2. Probably would have installed
3. Probably would not have installed
4. Definitely would not have installed
98. Don't know

62. Would you have been financially able to install the energy efficient [PRESCRIPTIVE MEASURE] without the financial incentive from the program?

1. Yes
2. No
98. Don’t know

63. If the financial incentive from the program had not been available, how likely is it that you would have installed the energy efficient [PRESCRIPTIVE MEASURE] anyway?

1. Definitely would have installed
2. Probably would have installed
3. Probably would not have installed
4. Definitely would not have installed
98. Don't know

64. How did the availability of information and financial incentives through the program affect the quantity (or number of units) of energy efficient [PRESCRIPTIVE MEASURE] that you purchased and installed? Did you purchase and install more refrigeration equipment than you otherwise would have without the program?

1. Yes
2. No, program did not affect quantity purchased and installed.
98. Don’t know

[DISPLAY Q0 IF Q64 = 1]
65. Which part of the project would you have not implemented without the information and financial incentives available through the program?
[DISPLAY Q66 IF MEASURE/EQUIPMENT TYPE IS NOT CONTROLS]
66. How did the availability of information and financial incentives through the program affect the level of energy efficiency you chose for the [Measure/Equipment Type]? Did you choose equipment that was more energy efficient than you otherwise would have chosen because of the program?

1. Yes

2. No, program did not affect level of efficiency chosen for equipment.

[DISPLAY Q67 IF Q66 = 1]
67. How much more efficient [Measure/Equipment Type] did you install? (i.e., "xx% more efficient")

68. How did the availability of information and financial incentives through the program affect the timing of your purchase and installation of energy efficient [PRESCRIPTIVE MEASURE]? Did you purchase and install energy efficient [PRESCRIPTIVE MEASURE] earlier than you otherwise would have without the program?

1. Yes
2. No, program did not affect did not affect timing of purchase and installation.
98. Don’t know

[DISPLAY Q69 IF Q68 = 1]
69. When would you otherwise have installed the equipment?

1. Less than 6 months later
2. 6-12 months later
3. 1-2 years later
4. 3-5 years later
5. More than 5 years later
98. Don’t know

[DISPLAY Q70 IF = KITCHEN EQUIPMENT RECOMMENDED]
70. In the audit report, you received recommendations to retrofit some kitchen equipment. Have you installed any of the recommended kitchen equipment?

1. Yes, at all of the locations audited
2. Yes, at some of the locations audited
3. No
98. Don't know

[DISPLAY Q71 IF Q70 = 1 or 2]
71. Did you receive or apply for an incentive through an I&M or Energizing Indiana program for all or some of the recommended kitchen equipment you installed?

1. Yes, for all of the kitchen equipment
2. Yes, for some of the kitchen equipment
3. No, did not apply for or receive an incentive
98. Don't know

[DISPLAY IF Q71 = 2 or 3]
Now I would like to ask you some questions about the recommended kitchen equipment that you installed without applying for or receiving an incentive.

[DISPLAY Q72 IF Q71 = 2 or 3]
72. Did you have plans to install the recommended kitchen equipment before receiving the audit?
1. Yes
2. No
98. Don't know

[DISPLAY Q73 IF Q72 = 1]
73. Would you have gone ahead with these plans had you not received the audit?
1. Yes
2. No
98. Don't know

[DISPLAY Q74 IF Q71 = 2 or 3]
74. Before you received the audit, had you installed energy efficient equipment similar to the recommended kitchen equipment that you installed?
1. Yes
2. No
98. Don't know

[DISPLAY Q75 IF Q71 = 2 or 3]
75. How important was the information provided to you in the audit report to your decision to install the recommended kitchen equipment?
1. Very important
2. Somewhat important
3. Slightly important
4. Not at all important
98. Don't know

[DISPLAY Q76 IF Q71 = 2 or 3]
76. Can you please describe the kitchen equipment you installed, being as detailed as possible with regard to equipment types and project scope? If this project involved replacing old equipment, please provide information regarding the equipment that was removed.

[DISPLAY Q77 IF Q71 = 2 or 3]
77. What was the total estimated project cost for the kitchen equipment you installed? Please be as specific as possible.

[DISPLAY Q78 IF Q71 = 2 or 3]
78. Is there somebody we can contact about this kitchen equipment that may have been installed after the audit? Please provide a name, phone number, and email address.

Name:
Phone Number:
Email Address:

[DISPLAY Q79 IF = MAINTENANCE AND REPAIR RECOMMENDED]
79. In the audit report, you received recommendations for maintenance and repairs. Have you implemented any of the recommended maintenance or repairs?

1. Yes, at all of the locations audited
2. Yes, at some of the locations audited
3. No
98. Don't know

[DISPLAY Q80 IF Q79 = 2 or 3]
80. Did you have plans to complete the recommended maintenance or repairs before receiving the audit?

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

[DISPLAY Q81 IF Q80 = 1]
81. Would you have gone ahead with these plans had you not received the audit?

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

[DISPLAY Q82 IF Q79 = 2 or 3]
82. Before you received the audit, had you completed any maintenance and repairs similar to those recommended in the audit report?

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

[DISPLAY Q83 IF Q79 = 2 or 3]
83. How important was the information provided to you in the audit to your decision to implement the recommended maintenance and repair?

1. Very important
2. Somewhat important
3. Slightly important
4. Not at all important
98. Don't know

[DISPLAY Q84 IF Q79 = 2 or 3]
84. Can you please describe the new maintenance and/or repair practices, being as detailed as possible with regard to maintenance schedules and equipment serviced?

[DISPLAY Q85 IF Q79 = 2 or 3]
85. What was the total estimated project cost for the maintenance and repairs you completed? Please be as specific as possible.

[DISPLAY Q86 IF Q79 = 2 or 3]
86. Is there somebody we can contact about the maintenance and repairs completed after the audit? Please provide a name, phone number, and email address.

Name:
Phone Number:
Email Address:

[DISPLAY Q87 IF = VENDING MACHINE CONTROLS RECOMMENDED]
87. In the audit report, you received recommendations for vending machine controls. Have you installed any of the recommended vending machine controls?

1. Yes, at all of the locations audited
2. Yes, at some of the locations audited
3. No
98. Don't know

[DISPLAY Q88 IF Q87 = 1 or 2]
88. Did you receive or apply for an incentive through an I&M or Energizing Indiana program for all or some of the vending machine controls you implemented?

1. Yes, for all of the vending machine controls
2. Yes, for some of the vending machine controls
3. No, did not apply for or receive an incentive
98. Don't know

[DISPLAY IF Q88 = 2 or 3]
Now I would like to ask you some questions about the recommended vending machine controls that you installed without applying for or receiving an incentive.

[DISPLAY Q89 IF Q88 = 2 or 3]
89. Did you have plans to install the recommended vending machine controls before receiving the audit?

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

[DISPLAY Q90 IF Q89 = 1]
90. Would you have gone ahead with these plans had you not received the audit?

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

[DISPLAY Q91 IF Q88 = 2 or 3]
91. Before you received the audit, had you implemented energy saving equipment similar to the vending machine controls recommended at your facility or facilities?

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

[DISPLAY Q92 IF Q88 = 2 or 3]
92. How important was the information provided to you in the audit to your decision to install the recommended vending machine controls?

1. Very important
2. Somewhat important
3. Slightly important
4. Not at all important
98. Don't know

[DISPLAY Q93 IF Q88 = 2 or 3]
93. Can you please describe the vending machine controls you installed, including the number of controls and type of controls?

[DISPLAY Q94 IF Q88 = 2 or 3]
94. What was the total estimated project cost for the vending machine controls you installed? Please be as specific as possible.

[DISPLAY Q95 IF Q88 = 2 or 3]
95. Is there somebody we can contact about the vending machine controls that may have been installed after the audit? Please provide a name, phone number, and email address.

Name:
Phone Number:
Email Address:

[LED and T5/T8 LIGHTING - DO NOT DISPLAY]
[DISPLAY Q0 IF = LIGHTING RECOMMENDED]
Q0. In the audit report, you received recommendations to retrofit some lighting with T5,T8, or LED lights. The recommendations I am referring to are not recommendations to replace screw-in incandescent light bulbs with compact fluorescent light bulbs that you may have received. Have you installed any of the recommended lighting?

1. Yes, at all of the locations audited
2. Yes, at some of the locations audited
3. No
98. Don't know

[DISPLAY Q96 IF Q0 = 1 or 2]
96. Did you receive or apply for an incentive through an I&M or Energizing Indiana program for all or some of the lighting you installed?

1. Yes, for all of the lighting
2. Yes, for some of the lighting
3. No, did not apply for or receive an incentive
98. Don't know

[DISPLAY IF Q96 = 2 or 3]
Now I would like to ask you some questions about the recommended lighting retrofits that you installed without applying for or receiving an incentive.

[DISPLAY Q97 IF Q96 = 2 or 3]
97. Did you have plans to install the recommended lighting before receiving the audit?

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

[DISPLAY Q98 IF Q97 = 1]
98. Would you have gone ahead with these plans had you not received the audit?

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

[DISPLAY Q99 IF Q96 = 2 or 3]
99. Before you received the audit, had you implemented energy efficient equipment similar to the lighting that was recommended in the audit report?

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

[DISPLAY Q100 IF Q96 = 2 or 3]
100. How important was the information provided to you in the audit to your decision to install the recommended lighting?

1. Very important
2. Somewhat important
3. Slightly important
4. Not at all important
98. Don't know

[DISPLAY Q101 IF Q96 = 2 or 3]
101. We would like to collect some information about the fixtures that were in place prior to your installation of energy efficient lighting. For each energy efficient fixture you installed, please provide the type (such as T12) and wattage of the fixture that was replaced.

[DISPLAY Q100 IF Q96 = 2 or 3]
102. How many hours per day are the lights operational? If this varies among fixtures or across facility locations, please provide operational hours for each case.

[DISPLAY Q103 IF Q96 = 2 or 3]
103. Do the hours of operation for the lights change on weekends or holidays? If so, what are the hours of operation during weekends or holidays?

[DISPLAY Q104 IF Q96 = 2 or 3]
104. What was the total estimated project cost for the lighting retrofits you installed? Please be as specific as possible.

[DISPLAY Q105 IF Q96 = 2 or 3]
105. Is there somebody we can contact about the lighting that may have been installed after the audit? Please provide a name, phone number, and email address.

Name:
Phone Number:
Email Address:

[DISPLAY Q106 IF = LIGHTING RECOMMENDED]
106. In the audit report, you received recommendations to retrofit some incandescent light bulbs with compact fluorescent lights, or CFLs. Have you installed any of the recommended CFLs?

1. Yes, at all of the locations audited
2. Yes, at some of the locations audited
3. No
98. Don't know

[DISPLAY Q107 IF Q106 = 1 or 2]
107. Did you receive a discount on the CFLs that you purchased and installed?

1. Yes, for all of the CFLs
2. Yes, for some of the CFLs
3. No, did not apply for or receive an incentive
98. Don't know

[DISPLAY IF Q107 = 2 or 3]
Now I would like to ask you some questions about the recommended CFLs that you installed without applying for or receiving an incentive.

[DISPLAY Q108 IF Q107 = 2 or 3]
108. Did you have plans to replace the incandescent light bulbs with the recommended CFLs before receiving the audit?

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

[DISPLAY Q109 IF Q107 = 1]
109. Would you have gone ahead with these plans had you not received the audit?

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

[DISPLAY Q110 IF Q107 = 2 or 3]
110. Before you received the audit, had you implemented energy efficient light bulbs similar to the CFLs that were recommended in the audit report?

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

[DISPLAY Q111 IF Q107 = 2 or 3]
111. How important was the information provided to you in the audit to your decision to install the recommended CFLs?

1. Very important
2. Somewhat important
3. Slightly important
4. Not at all important
98. Don't know

[DISPLAY Q112 IF Q107 = 2 or 3]
112. We would like to collect some information about the CFLs you installed. For those CFLs that you did not receive a discount, can you provide the number of recommended CFLs that you installed, their wattage, and if you know it, the wattage of the incandescent lights they replaced?

113. What was the total estimated project cost for the CFLs you installed? Please be as specific as possible.

Now I would like to ask you about additional energy saving equipment that you may have installed, but that was not recommended to you through the audit program.

114. Because of your experience with the audit program, have you bought, or are you likely to buy, energy efficient equipment without applying for a financial incentive or rebate?

1. Yes, have already bought non-incentivized efficiency equipment because of the experience with the program.
2. Yes, likely to buy efficiency equipment because of the experience with the program.
3. No
98. Don't know

[DISPLAY Q115 IF Q112 = 2 or 3]
115. We'd like to call you in a few months for a very short follow-up about other efficiency purchases, if that would be alright. Please provide us with the best person to contact and their phone number.

[DISPLAY Q116 IF Q112 = 1]
116. What energy efficient equipment did you purchase?

[DISPLAY Q117 IF Q112 = 1]
117. What motivated you to purchase this equipment?

[DISPLAY Q118 IF Q112 = 1]
118. Have you installed the equipment?
1. Yes
2. No
98. Don't know

[DISPLAY Q119 IF Q118 = 1]
119. In what month and year did you install that equipment?

[DISPLAY Q120 IF Q112 = 1 or 2]
120. Was this equipment installed, or will it be installed, at the same facility (or facilities) as where the audit was completed?
1. Yes
2. No
98. Don't know

[DISPLAY Q121 IF Q120 = 2]
121. Where was (or will be) the equipment installed?

[DISPLAY Q122 IF Q112 = 1 or 2]
122. How important was your experience with the program to your decision to implement the additional energy efficiency measures?
1. Very important
2. Somewhat important
3. Only slightly important
4. Not at all important

98. Don't know

[DISPLAY Q123 IF Q112 = 1 or 2]
123. How important was your past participation in any programs offered by Indiana-Michigan Power to your decision to implement the additional energy efficiency measures?

1. Very important
2. Somewhat important
3. Only slightly important
4. Not at all important
98. Don't know

[DISPLAY Q124 IF Q112 = 1 or 2]
124. Why didn’t you apply for or receive incentives for those items?

1. Didn't know whether equipment qualified for financial incentives
2. Equipment did not qualify for financial incentives
3. Too much paperwork for the financial incentive application
4. Financial incentive was insufficient
5. Didn't have time to complete paperwork for financial incentive application
6. Didn't know about financial incentives until after equipment was purchased
99. Other reason (please describe):

125. Using a scale of very dissatisfied, dissatisfied, neither satisfied nor dissatisfied, satisfied, or very satisfied, how would you rate your satisfaction with the following?

a. Professionalism of the person performing the audit
b. The report recommendations
c. The usefulness of the audit report
d. The effort required for the application process
e. Information provided by an I&M Account Representative
f. Savings on your monthly bill
g. Overall program experience

126. Please describe in what ways you were not satisfied with the program.

127. Do you have any other comments that you would like to relay to I&M about energy efficiency in commercial and industrial facilities or about their programs?

This completes the survey. If you have any additional questions regarding this survey or the program please contact Robert Bournique at Indiana/Michigan Power at 765.677.6003. Thank you very much for your time!

Appendix H: C&I Audit Decision Maker Survey Responses

As part of the evaluation work effort, a survey was conducted of four out of the eleven decision makers for facilities that received audits under the C&I Audit Program. The survey provided information on the implementation status of the audit recommendations. Additionally, the survey provided further general information pertaining to the making of decisions to improve energy efficiency by program participants.

Each respondent was interviewed using the survey instrument provided in Appendix F. The interviews were conducted by telephone. During the interview, a participant was asked questions about (1) his or her general decision making regarding purchasing and installing energy efficient equipment, (2) his or her knowledge of and satisfaction with the C&I Audit Program, and (3) the influence that the C&I Audit Program had on his or her decision to make energy efficiency improvements.

The following tabulations summarize I&M customer survey responses. Two columns of data are presented. The first column presents the number of survey respondents (***n)***. The second column presents the percentage of survey respondents.

	Response	*(n=11)*	*Percent of Respondents*
What sources, if any, does your organization rely on for information about ways to save energy?	An I&M Account Representative	5	45%
	The I&M website	2	18%
	An I&M Energy Specialist	1	9%
	Trade associations or business groups you belong to	1	9%
	Trade journals or magazines	1	9%
	Friends and colleagues	1	9%
	An architect, engineer or energy consultant	1	9%
	Equipment vendors or building contractors	1	9%
	Brochures or advertisements	0	0%
	Other	2	18%

	Response	*(n=12)*	*Percent of Respondents*
Which of the following policies or procedures, if any, does your organization have in place regarding energy efficiency?	Corporate policies that incorporate energy efficiency in operations and procurement	6	50%
	Active training of staff.	5	42%
	An energy management plan	4	33%
	A numeric goal for energy savings	4	33%
	A numeric goal for energy cost reduction	3	25%
	None	3	25%
	Other	0	0%

	Response	*(n=12)*	*Percent of Respondents*
How does your organization decide to make energy efficiency improvements for [this facility/these facilities]? Is the decision:	Made by one or two key people	8	67%
	Based on staff recommendations to a decision maker	3	25%
	Made by a group or committee	1	8%
	Depends on how much the investment is	0	0%
	Made in some other way	0	0%

	Response	*(n=11)*	*Percent of Respondents*
Which financial methods, if any, does your organization typically use to evaluate energy efficiency improvements for [LOCATION]? (Select all that apply)	Simple payback (provide numeric payback time if possible)	9	82%
	Initial Cost	6	55%
	Internal rate of return (provide numeric rate of return if possible)	6	55%
	Life cycle cost	3	27%
	None of these	2	18%

	Response	*(n=12)*	*Percent of Respondents*
How did you learn of the C&I Audit Program?	Approached directly by representative of the C&I Audit Program	5	42%
	An I&M customer service representative mentioned it	5	42%
	Friends or colleagues	1	8%
	Received an information brochure on the C&I Audit Program	0	0%
	Received information from a Lockheed Martin staff member	0	0%
	I&M website	0	0%
	An architect, engineer or energy consultant	0	0%
	An equipment vendor or building contractor	0	0%
	A utility bill insert	0	0%
	An email from I&M	0	0%
	Other	2	17%

	Response	*(n=4)*	*Percent of Respondents*
Did you work on completing the application for the program, including gathering any require documentation?	Yes	7	58%
	No	4	33%
	Don't know	1	8%

<table>
<tr><td rowspan="6">Thinking back to the application process, please rate the clarity of information on how to complete the application. Would you say…</td><th>Response</th><th>(n=7)</th><th>Percent of Respondents</th></tr>
<tr><td>Not at all clear</td><td>0</td><td>0%</td></tr>
<tr><td>Somewhat clear</td><td>0</td><td>0%</td></tr>
<tr><td>Mostly clear</td><td>4</td><td>57%</td></tr>
<tr><td>Completely clear</td><td>1</td><td>14%</td></tr>
<tr><td>Don't know</td><td>2</td><td>29%</td></tr>
</table>

<table>
<tr><td rowspan="6">Using a scale of completely unacceptable, somewhat unacceptable, somewhat acceptable, and completely acceptable, how would you rate the ease of finding how to apply for the audit program on I&M's website?</td><th>Response</th><th>(n=7)</th><th>Percent of Respondents</th></tr>
<tr><td>Completely unacceptable</td><td>0</td><td>0%</td></tr>
<tr><td>Somewhat unacceptable</td><td>0</td><td>0%</td></tr>
<tr><td>Somewhat acceptable</td><td>1</td><td>14%</td></tr>
<tr><td>Completely acceptable</td><td>5</td><td>71%</td></tr>
<tr><td>Don't know</td><td>1</td><td>14%</td></tr>
</table>

<table>
<tr><td rowspan="6">Using a scale of completely unacceptable, somewhat unacceptable, somewhat acceptable, and completely acceptable, how would you rate the ease of using the application forms?</td><th>Response</th><th>(n=7)</th><th>Percent of Respondents</th></tr>
<tr><td>Completely unacceptable</td><td>0</td><td>0%</td></tr>
<tr><td>Somewhat unacceptable</td><td>0</td><td>0%</td></tr>
<tr><td>Somewhat acceptable</td><td>1</td><td>14%</td></tr>
<tr><td>Completely acceptable</td><td>5</td><td>71%</td></tr>
<tr><td>Don't know</td><td>1</td><td>14%</td></tr>
</table>

<table>
<tr><td rowspan="6">Using a scale of completely unacceptable, somewhat unacceptable, somewhat acceptable, and completely acceptable, how would you rate the time it took to have the application approved?</td><th>Response</th><th>(n=7)</th><th>Percent of Respondents</th></tr>
<tr><td>Completely unacceptable</td><td>1</td><td>14%</td></tr>
<tr><td>Somewhat unacceptable</td><td>0</td><td>0%</td></tr>
<tr><td>Somewhat acceptable</td><td>1</td><td>14%</td></tr>
<tr><td>Completely acceptable</td><td>4</td><td>57%</td></tr>
<tr><td>Don't know</td><td>1</td><td>14%</td></tr>
</table>

<table>
<tr><td rowspan="6">Using a scale of completely unacceptable, somewhat unacceptable, somewhat acceptable, and completely acceptable, how would you rate the overall application process?</td><th>Response</th><th>(n=7)</th><th>Percent of Respondents</th></tr>
<tr><td>Completely unacceptable</td><td>0</td><td>0%</td></tr>
<tr><td>Somewhat unacceptable</td><td>0</td><td>0%</td></tr>
<tr><td>Somewhat acceptable</td><td>3</td><td>43%</td></tr>
<tr><td>Completely acceptable</td><td>4</td><td>57%</td></tr>
<tr><td>Don't know</td><td>0</td><td>0%</td></tr>
</table>

Did you have a clear sense of whom to go to for assistance with the application process?	*Response*	*(n=7)*	*Percent of Respondents*
	Yes	7	100%
	No	0	0%
	Don't know	0	0%

Using a scale of completely of completely disagree, somewhat disagree, neither disagree nor agree, somewhat agree, and completely agree, please rate your agreement with the following statements: the auditor was courteous.	*Response*	*(n=12)*	*Percent of Respondents*
	Completely disagree	0	0%
	Somewhat disagree	0	0%
	Neither disagree nor agree	0	0%
	Somewhat agree	3	25%
	Completely agree	9	75%
	Don't know	0	0%

Using a scale of completely of completely disagree, somewhat disagree, neither disagree nor agree, somewhat agree, and completely agree, please rate your agreement with the following statements: the auditor was efficient.	*Response*	*(n=12)*	*Percent of Respondents*
	Completely disagree	0	0%
	Somewhat disagree	0	0%
	Neither disagree nor agree	1	8%
	Somewhat agree	5	42%
	Completely agree	6	50%
	Don't know	0	0%

Using a scale of completely of completely disagree, somewhat disagree, neither disagree nor agree, somewhat agree, and completely agree, please rate your agreement with the following statements: the auditor minimized disruption to our business.	*Response*	*(n=12)*	*Percent of Respondents*
	Completely disagree	0	0%
	Somewhat disagree	0	0%
	Neither disagree nor agree	1	8%
	Somewhat agree	3	25%
	Completely agree	8	67%
	Don't know	0	0%

Did you review the audit report that you received?	*Response*	*(n=12)*	*Percent of Respondents*
	Yes	11	92%
	No	0	0%
	Don't know	1	8%

How easy or difficult was the audit report to understand? Would you say…	*Response*	*(n=11)*	*Percent of Respondents*
	Very easy to understand	5	45%
	Somewhat easy to understand	4	36%
	Somewhat difficult to understand	2	18%
	Very difficult to understand	0	0%
	Don't know	0	0%

Did the audit report present sufficient information for you to make a decision about whether or not to implement the recommendations? Would you say...	*Response*	*(n=11)*	*Percent of Respondents*
	Yes	11	100%
	For the most part	0	0%
	No	0	0%
	Don't know	0	0%

After reviewing the report, was it clear to you how to apply for financial incentives for the recommended energy saving improvements? Would you say…	*Response*	*(n=11)*	*Percent of Respondents*
	Very clear	6	55%
	Somewhat clear	2	18%
	Somewhat unclear	0	0%
	Very unclear	0	0%
	Don’t know	3	27%

In the audit report, you received recommendations to retrofit your facility with variable frequency drives, or VFDs. Have you installed any of the recommended VFDs?	*Response*	*(n=2)*	*Percent of Respondents*
	Yes, at all of the locations audited	0	0%
	Yes, at some of the locations audited	1	50%
	No	1	50%
	Don't know	0	0%

Did you receive or apply for an incentive through an I&M or Energizing Indiana program for all or some of the VFD's you installed?	*Response*	*(n=1)*	*Percent of Respondents*
	Yes, for all of the VFDs	0	0%
	Yes, for some of the VFDs	1	100%
	No, did not apply for or receive an incentive	0	0%
	Don't know	0	0%

Did you have plans to install the VFDs before receiving the audit?	*Response*	*(n=1)*	*Percent of Respondents*
	Yes	1	100%
	No	0	0%
	Don't know	0	0%

Would you have gone ahead with these plans had you not received the audit?	*Response*	*(n=1)*	*Percent of Respondents*
	Yes	0	0%
	No	0	0%
	Don't know	1	100%

Before you received the audit, had you implemented energy saving equipment similar to the recommended VFD(s) that you installed?	*Response*	*(n=1)*	*Percent of Respondents*
	Yes	0	0%
	No	1	100%
	Don't know	0	0%

How important was the information provided to you in the audit to your decision to install the recommended VFD(s)? Would you say…	*Response*	*(n=1)*	*Percent of Respondents*
	Very important	0	0%
	Somewhat important	1	100%
	Slightly important	0	0%
	Not at all important	0	0%
	Don't know	0	0%

Have you installed any of the recommended lighting? [T5 or T8 fluorescent lighting]	*Response*	*(n=1)*	*Percent of Respondents*
	Yes, at all of the locations audited	0	0%
	Yes, at some of the locations audited	0	0%
	No	0	0%
	Don't know	1	100%

In the audit report, you received recommendations to retrofit some lighting with T5 or T8 fluorescent lighting. The recommendations I am referring to are not recommendations to replace screw-in incandescent light bulbs with compact fluorescent light bulbs that you may have received. Have you installed any of the recommended lighting?	*Response*	*(n=12)*	*Percent of Respondents*
	Yes, at all of the locations audited	1	8%
	Yes, at some of the locations audited	1	8%
	No	9	75%
	Don't know	1	8%

Question	*Response*	*(n=2)*	*Percent of Respondents*
Did you receive or apply for an incentive through an I&M or Energizing Indiana program for all or some of the lighting you installed?	Yes, for all of the lighting	0	0%
	Yes, for some of the lighting	0	0%
	No, did not apply for or receive an incentive	1	50%
	Don't know	1	50%

Question	*Response*	*(n=1)*	*Percent of Respondents*
Did you have plans to install the recommended lighting before receiving the audit?	Yes	0	0%
	No	1	100%
	Don't know	0	0%

Question	*Response*	*(n=0)*	*Percent of Respondents*
Would you have gone ahead with these plans had you not received the audit?	Yes	0	0%
	No	0	0%
	Don't know	0	0%

Question	*Response*	*(n=1)*	*Percent of Respondents*
Before you received the audit, had you implemented energy efficient equipment similar to the lighting that was recommended in the audit report?	Yes	1	100%
	No	0	0%
	Don't know	0	0%

Question	*Response*	*(n=1)*	*Percent of Respondents*
How important was the information provided to you in the audit to your decision to install the recommended lighting? Would you say…	Very important	0	0%
	Somewhat important	1	100%
	Slightly important	0	0%
	Not at all important	0	0%
	Don’t know	0	0%

Question	*Response*	*(n=9)*	*Percent of Respondents*
In the audit report, you received recommendations to retrofit some refrigeration equipment. Have you installed any of the recommended refrigeration equipment?	Yes	0	0%
	No	8	89%
	Don't know	1	11%

Did you receive or apply for an incentive through an I&M or Energizing Indiana program for all or some of the recommended refrigeration equipment you installed?	*Response*	*(n=0)*	*Percent of Respondents*
	Yes, for all of the refrigeration equipment	0	0%
	Yes, for some of the refrigeration equipment	0	0%
	No, did not apply for or receive an incentive	0	0%
	Don't know	0	0%

Did you have plans to install the recommended refrigeration equipment before receiving the audit?	*Response*	*(n=0)*	*Percent of Respondents*
	Yes	0	0%
	No	0	0%
	Don't know	0	0%

Would you have gone ahead with these plans had you not received the audit?	*Response*	*(n=0)*	*Percent of Respondents*
	Yes	0	0%
	No	0	0%
	Don't know	0	0%

Before you received the audit, had you implemented energy efficient equipment similar to the recommended refrigeration equipment that you installed?	*Response*	*(n=0)*	*Percent of Respondents*
	Yes	0	0%
	No	0	0%
	Don't know	0	0%

How important was the information provided to you in the audit to your decision to install the recommended refrigeration equipment? Would you say…	*Response*	*(n=0)*	*Percent of Respondents*
	Very important	0	0%
	Somewhat important	0	0%
	Slightly important	0	0%
	Not at all important	0	0%
	Don't know	0	0%

According to our records, you received a rebate for some refrigeration equipment. Is that correct?	*Response*	*(n=2)*	*Percent of Respondents*
	Yes	2	100%
	No	0	0%
	Don't know	0	0%

Before participating in the program, had you installed any equipment similar to the energy efficient refrigeration equipment installed through the program?	*Response*	*(n=2)*	*Percent of Respondents*
	Yes	2	100%
	No	0	0%
	Don't know	0	0%

Did you have plans to install the energy efficient refrigeration equipment before participating in the program?	*Response*	*(n=2)*	*Percent of Respondents*
	Yes	2	100%
	No	0	0%
	Don't know	0	0%

Would you have gone ahead with this planned installation even if you had not participated in the program?	*Response*	*(n=2)*	*Percent of Respondents*
	Yes	2	100%
	No	0	0%
	Don't know	0	0%

How important was previous experience with the program in making your decision to install the energy efficient refrigeration equipment?	*Response*	*(n=2)*	*Percent of Respondents*
	Did not have previous experience with program	2	100%
	Very important	0	0%
	Somewhat important	0	0%
	Only slightly important	0	0%
	Not at all important	0	0%
	Don't know	0	0%

Did you receive a recommendation for the refrigeration equipment that you received an incentive for in the audit report?	*Response*	*(n=2)*	*Percent of Respondents*
	Yes	0	0%
	No	1	50%
	Don't know	1	50%

If the refrigeration equipment was not recommended in the audit report, how likely is it that you would have installed anyway?	*Response*	*(n=0)*	*Percent of Respondents*
	Definitely would have installed	0	0%
	Probably would have installed	0	0%
	Probably would not have installed	0	0%
	Definitely would not have installed	0	0%
	Don't know	0	0%

	Response	*(n=2)*	*Percent of Respondents*
Would you have been financially able to install the energy efficient refrigeration equipment without the financial incentive for the program?	Yes	2	100%
	No	0	0%
	Don't know	0	0%

	Response	*(n=2)*	*Percent of Respondents*
If the financial incentive from the program had not been available, how likely is it that you would have installed the energy efficient refrigeration equipment anyway?	Definitely would have installed	1	50%
	Probably would have installed	1	50%
	Probably would not have installed	0	0%
	Definitely would not have installed	0	0%
	Don't know	0	0%

	Response	*(n=2)*	*Percent of Respondents*
Did you purchase and install more refrigeration equipment than you otherwise would have without the program?	Yes	1	50%
	No	0	0%
	Don't know	0	0%

	Response	*(n=2)*	*Percent of Respondents*
Did you choose equipment that was more energy efficient than you otherwise would have chosen because of the program?	Yes	1	50%
	No	0	0%
	Don't know	0	0%

	Response	*(n=2)*	*Percent of Respondents*
Did you purchase and install the energy efficient refrigeration equipment earlier than you otherwise would have without the program?	Yes	1	50%
	No	0	0%
	Don't know	0	0%

	Response	*(n=1)*	*Percent of Respondents*
When would you have otherwise installed the equipment?	Less than 6 months	0	0%
	6-12 months later	0	0%
	1-2 years later	1	100%
	3-5 years later	0	0%
	More than 5 years later	0	0%
	Don't know	0	0%

In the audit report, you received recommendations to retrofit some kitchen equipment. Have you installed any of the recommended kitchen equipment?	*Response*	*(n=11)*	*Percent of Respondents*
	Yes, at all of the locations audited	0	0%
	Yes, at some of the locations audited	1	9%
	No	7	64%
	Don't know	3	27%

Did you receive or apply for an incentive through an I&M or Energizing Indiana program for all or some of the recommended kitchen equipment you installed?	*Response*	*(n=1)*	*Percent of Respondents*
	Yes, for all of the kitchen equipment	0	0%
	Yes, for some of the kitchen equipment	0	0%
	No, did not apply for or receive an incentive	1	100%
	Don't know	0	0%

Did you have plans to install the recommended kitchen equipment before receiving the audit?	*Response*	*(n=1)*	*Percent of Respondents*
	Yes	0	0%
	No	1	100%
	Don't know	0	0%

Would you have gone ahead with these plans had you not received the audit?	*Response*	*(n=0)*	*Percent of Respondents*
	Yes	0	0%
	No	0	0%
	Don't know	0	0%

Before you received the audit, had you installed energy efficient equipment similar to the recommended kitchen equipment that you installed?	*Response*	*(n=1)*	*Percent of Respondents*
	Yes	1	100%
	No	0	0%
	Don't know	0	0%

How important was the information provided to you in the audit report to your decision to install the recommended kitchen equipment? Would you say...	*Response*	*(n=1)*	*Percent of Respondents*
	Very important	0	0%
	Somewhat important	1	100%
	Slightly important	0	0%
	Not at all important	0	0%
	Don't know	0	0%

In the audit report, you received recommendations to retrofit some lighting with exterior LED lights. Have you installed any of the recommended lighting?	*Response*	*(n=5)*	*Percent of Respondents*
	Yes, at all of the locations audited	1	20%
	Yes, and some of the locations audited	0	0%
	No	4	80%
	Don't know	0	0%

Did you receive or apply for an incentive through an I&M or Energizing Indiana program for all or some of the lighting you installed?	*Response*	*(n=1)*	*Percent of Respondents*
	Yes, for all of the lighting	1	100%
	Yes, for some of the lighting	0	0%
	No, did not apply for or receive an incentive	0	0%
	Don't know	0	0%

Did you have plans to install the lighting before receiving the audit?	*Response*	*(n=0)*	*Percent of Respondents*
	Yes	0	0%
	No	0	0%
	Don't know	0	0%

Would you have gone ahead with these plans had you not received the audit?	*Response*	*(n=0)*	*Percent of Respondents*
	Yes	0	0%
	No	0	0%
	Don't know	0	0%

Before you received the audit, had you implemented energy saving equipment similar to the lighting recommended in the audit report?	*Response*	*(n=0)*	*Percent of Respondents*
	Yes	0	0%
	No	0	0%
	Don't know	0	0%

How important was the information provided to you in the audit to your decision to install the recommended lighting? Would you say…	*Response*	*(n=0)*	*Percent of Respondents*
	Very important	0	0%
	Somewhat important	0	0%
	Slightly important	0	0%
	Not at all important	0	0%
	Don't know	0	0%

According to our records, you received a rebate for some exterior LED lighting. Is this correct?	*Response*	*(n=1)*	*Percent of Respondents*
	Yes	1	100%
	No	0	0%
	Don't know	0	0%

Before participating in the program, had you installed any equipment similar to the energy efficient exterior LED lighting installed through the program?	*Response*	*(n=1)*	*Percent of Respondents*
	Yes	1	100%
	No	0	0%
	Don't know	0	0%

Did you have plans to install the energy efficient exterior LED lighting before participating in the program?	*Response*	*(n=0)*	*Percent of Respondents*
	Yes	0	0%
	No	0	0%
	Don't know	0	0%

Would you have gone ahead with this planned installation even if you had not participated in the program?	*Response*	*(n=0)*	*Percent of Respondents*
	Yes	0	0%
	No	0	0%
	Don't know	0	0%

How important was previous experience with the program in making your decision to install the energy efficient exterior LED lighting?	*Response*	*(n=1)*	*Percent of Respondents*
	Did not have previous experience with program	1	100%
	Very important	0	0%
	Somewhat important	0	0%
	Only slightly important	0	0%
	Not at all important	0	0%
	Don't know	0	0%

Did you receive a recommendation for the exterior LED lighting that you received an incentive for in the audit report?	*Response*	*(n=1)*	*Percent of Respondents*
	Yes	0	0%
	No	0	0%
	Don't know	1	100%

If the exterior LED lighting was not recommended in the audit report, how likely is it that you would have installed anyway?	*Response*	*(n=0)*	*Percent of Respondents*
	Definitely would have installed	0	0%
	Probably would have installed	0	0%
	Probably would not have installed	0	0%
	Definitely would not have installed	0	0%
	Don't know	0	0%

Would you have been financially able to install the energy efficient exterior LED lighting without the financial incentive for the program?	*Response*	*(n=1)*	*Percent of Respondents*
	Yes	1	100%
	No	0	0%
	Don't know	0	0%

If the financial incentive from the program had not been available, how likely is it that you would have installed the energy efficient exterior LED lighting anyway?	*Response*	*(n=1)*	*Percent of Respondents*
	Definitely would have installed	0	0%
	Probably would have installed	1	100%
	Probably would not have installed	0	0%
	Definitely would not have installed	0	0%
	Don't know	0	0%

Did you purchase and install more exterior LED lighting than you otherwise would have without the program?	*Response*	*(n=1)*	*Percent of Respondents*
	Yes	1	100%
	No	0	0%
	Don't know	0	0%

Did you choose equipment that was more energy efficient than you otherwise would have chosen because of the program?	*Response*	*(n=1)*	*Percent of Respondents*
	Yes	0	0%
	No, program did not affect level of efficiency chosen for equipment.	1	100%
	Don’t' know	0	0%

Did you purchase and install the energy efficient exterior LED lighting earlier than you otherwise would have without the program?	*Response*	*(n=1)*	*Percent of Respondents*
	Yes	1	100%
	No	0	0%
	Don't know	0	0%

	Response	(n=1)	Percent of Respondents
When would you have otherwise installed the equipment?	Less than 6 months	0	0%
	6-12 months later	0	0%
	1-2 years later	0	0%
	3-5 years later	1	100%
	More than 5 years later	0	0%
	Don't know	0	0%

	Response	(n=1)	Percent of Respondents
In the audit report, you received recommendations for maintenance and repairs. Have you implemented any of the recommended maintenance and repairs?	Yes	0	0%
	No	0	0%
	Don't know	1	100%

	Response	(n=0)	Percent of Respondents
Did you have plans to complete the recommended maintenance and repairs before receiving the audit?	Yes	0	0%
	No	0	0%
	Don't know	0	0%

	Response	(n=0)	Percent of Respondents
Would you have gone ahead with these plans had you not received the audit?	Yes	0	0%
	No	0	0%
	Don't know	0	0%

	Response	(n=0)	Percent of Respondents
Before you received the audit, had you completed any maintenance and repairs similar to those recommended in the audit?	Yes	0	0%
	No	0	0%
	Don't know	0	0%

	Response	(n=0)	Percent of Respondents
How important was the information provided to you in the audit to your decision to implement the recommended maintenance and repairs? Would you say...	Very important	0	0%
	Somewhat important	0	0%
	Slightly important	0	0%
	Not at all important	0	0%
	Don't know	0	0%

In the audit report, you received recommendations for vending machine controls. Have you installed any of the recommended vending machine controls?	*Response*	*(n=3)*	*Percent of Respondents*
	Yes, at all of the locations audited	0	0%
	Yes, at some of the locations audited	1	33%
	No	2	67%
	Don't know	0	0%

Did you receive or apply for an incentive through an I&M or Energizing Indiana program for all or some of the vending machine controls you implemented?	*Response*	*(n=1)*	*Percent of Respondents*
	Yes, for all of the vending machine controls	0	0%
	Yes, for some of the vending machine controls	0	0%
	No, did not apply for or receive an incentive	0	0%
	Don't know	1	100%

Did you have plans to install the recommended vending machine controls before receiving the audit?	*Response*	*(n=0)*	*Percent of Respondents*
	Yes	0	0%
	No	0	0%
	Don't know	0	0%

Would you have gone ahead with these plans had you not received the audit?	*Response*	*(n=0)*	*Percent of Respondents*
	Yes	0	0%
	No	0	0%
	Don't know	0	0%

Before you received the audit, had you implemented energy saving equipment similar to the vending machine controls recommended at your facility or facilities?	*Response*	*(n=0)*	*Percent of Respondents*
	Yes	0	0%
	No	0	0%
	Don't know	0	0%

How important was the information provided to you in the audit to your decision to install the recommended vending machine controls? Would you say…	*Response*	*(n=0)*	*Percent of Respondents*
	Very important	0	0%
	Somewhat important	0	0%
	Slightly important	0	0%
	Not at all important	0	0%
	Don't know	0	0%

In the audit report, you received recommendations to retrofit some incandescent light bulbs with compact fluorescent lights, or CFLs. Have you installed any of the recommended CFLs?	*Response*	*(n=7)*	*Percent of Respondents*
	Yes, at all of the locations audited	0	0%
	Yes, and some of the locations audited	0	0%
	No	5	71%
	Don't know	2	29%

Did you receive a discount for the CFLs that you purchased and installed?	*Response*	*(n=0)*	*Percent of Respondents*
	Yes, for all of the CFLs	0	0%
	Yes, for some of the CFLs	0	0%
	No, did not apply for or receive an incentive	0	0%
	Don't know	0	0%

Did you have plans to replace the incandescent light bulbs with the recommended CFLs before receiving the audit?	*Response*	*(n=0)*	*Percent of Respondents*
	Yes	0	0%
	No	0	0%
	Don't know	0	0%

Would you have gone ahead with these plans had you not received the audit?	*Response*	*(n=0)*	*Percent of Respondents*
	Yes	0	0%
	No	0	0%
	Don't know	0	0%

Before you received the audit, had you implemented energy saving light bulbs similar to the CFLs that were recommended in the audit report?	*Response*	*(n=0)*	*Percent of Respondents*
	Yes	0	0%
	No	0	0%
	Don't know	0	0%

How important was the information provided to you in the audit to your decision to install the recommended CFLs? Would you say…	*Response*	*(n=0)*	*Percent of Respondents*
	Very important	0	0%
	Somewhat important	0	0%
	Slightly important	0	0%
	Not at all important	0	0%
	Don't know	0	0%

In the audit report, you received recommendations to retrofit your facility with occupancy sensors or daylighting controls. Have you installed any of the recommended lighting controls?	*Response*	*(n=8)*	*Percent of Respondents*
	Yes, at all of the locations audited	1	13%
	Yes, at some of the locations audited	1	13%
	No	6	75%
	Don't know	0	0%

Did you receive or apply for an incentive through an I&M or Energizing Indiana program for all or some of the lighting controls you installed?	*Response*	*(n=2)*	*Percent of Respondents*
	Yes, for all of the lighting controls	1	50%
	Yes, for some of the lighting controls	0	0%
	No, did not apply for or receive an incentive	1	50%
	Don't know	0	0%

Did you have plans to install the lighting controls before receiving the audit?	*Response*	*(n=1)*	*Percent of Respondents*
	Yes	0	0%
	No	1	100%
	Don't know	0	0%

Would you have gone ahead with these plans had you not received the audit?	*Response*	*(n=0)*	*Percent of Respondents*
	Yes	0	0%
	No	0	0%
	Don't know	0	0%

Before you received the audit, had you implemented energy saving equipment similar to the lighting controls recommended at your facility or facilities?	*Response*	*(n=1)*	*Percent of Respondents*
	Yes	0	0%
	No	1	100%
	Don't know	0	0%

How important was the information provided to you in the audit to your decision to install the recommended lighting controls? Would you say…	*Response*	*(n=1)*	*Percent of Respondents*
	Very important	1	100%
	Somewhat important	0	0%
	Slightly important	0	0%
	Not at all important	0	0%
	Don't know	0	0%

What type of lighting controls did you install without applying for or receiving an incentive?	*Response*	*(n=1)*	*Percent of Respondents*
	Occupancy sensors	1	100%
	Daylighting controls	0	0%
	Other (please specify)	0	0%
	Don't know	0	0%

Because of your experience with the audit program, have you bought, or are you likely to buy, energy efficient equipment without applying for a financial incentive or rebate?	*Response*	*(n=12)*	*Percent of Respondents*
	Yes, have already bought non-incentivized efficiency equipment because of the experience with the program	1	8%
	Yes, likely to buy efficiency equipment because of the experience with the program.	0	0%
	No	9	75%
	Don't know	1	8%

Have you installed the equipment?	*Response*	*(n=1)*	*Percent of Respondents*
	Yes	1	100%
	No	0	0%
	Don't know	0	0%

Was this equipment installed, or will it be installed, at the same facility (or facilities) as where the audit was completed?	*Response*	*(n=3)*	*Percent of Respondents*
	Yes	3	100%
	No	0	0%
	Don't know	0	0%

How important was your experience with the program to your decision to implement the additional energy efficiency measures?	*Response*	*(n=3)*	*Percent of Respondents*
	Very important	0	0%
	Somewhat important	2	67%
	Neither important or unimportant	0	0%
	Somewhat unimportant	0	0%
	Very unimportant	1	33%

	Response	*(n=3)*	*Percent of Respondents*
How important was your past participation in any programs offered by Indiana-Michigan Power to your decision to implement the additional energy efficiency measures?	Very important	0	0%
	Somewhat important	2	67%
	Neither important or unimportant	0	0%
	Somewhat unimportant	0	0%
	Very unimportant	0	0%
	Did not implement any recommendations	1	33%

	Response	*(n=3)*	*Percent of Respondents*
Why didn't you apply for or receive incentives for those items?	Didn't know whether equipment qualified for financial incentives	0	0%
	Equipment did not qualify for financial incentives	1	33%
	Too much paperwork for the financial incentive application	1	33%
	Financial incentive was insufficient	0	0%
	Other reason	1	33%

	Response	*(n=12)*	*Percent of Respondents*
Using a scale of very dissatisfied, dissatisfied, neither satisfied nor dissatisfied, satisfied, or very satisfied, how would you rate your satisfaction with the following: Professionalism of the person performing the audit.	Very dissatisfied	0	0%
	Dissatisfied	0	0%
	Neither satisfied nor dissatisfied	0	0%
	Satisfied	1	8%
	Very satisfied	11	92%

	Response	*(n=12)*	*Percent of Respondents*
Using a scale of very dissatisfied, dissatisfied, neither satisfied nor dissatisfied, satisfied, or very satisfied, how would you rate your satisfaction with the following: The report recommendations.	Very dissatisfied	0	0%
	Dissatisfied	0	0%
	Neither satisfied nor dissatisfied	5	42%
	Satisfied	2	17%
	Very satisfied	5	42%

	Response	*(n=12)*	*Percent of Respondents*
Using a scale of very dissatisfied, dissatisfied, neither satisfied nor dissatisfied, satisfied, or very satisfied, how would you rate your satisfaction with the following: The usefulness of the audit report.	Very dissatisfied	1	8%
	Dissatisfied	2	17%
	Neither satisfied nor dissatisfied	0	0%
	Satisfied	4	33%
	Very satisfied	3	25%

Using a scale of very dissatisfied, dissatisfied, neither satisfied nor dissatisfied, satisfied, or very satisfied, how would you rate your satisfaction with the following: The effort required for the application process.	*Response*	*(n=12)*	*Percent of Respondents*
	Very dissatisfied	1	8%
	Dissatisfied	0	0%
	Neither satisfied nor dissatisfied	3	25%
	Satisfied	5	42%
	Very satisfied	3	25%

Using a scale of very dissatisfied, dissatisfied, neither satisfied nor dissatisfied, satisfied, or very satisfied, how would you rate your satisfaction with the following: Information provided by an I&M Account representative.	*Response*	*(n=12)*	*Percent of Respondents*
	Very dissatisfied	0	0%
	Dissatisfied	1	8%
	Neither satisfied nor dissatisfied	4	33%
	Satisfied	3	25%
	Very satisfied	4	33%

Using a scale of very dissatisfied, dissatisfied, neither satisfied nor dissatisfied, satisfied, or very satisfied, how would you rate your satisfaction with the following: Savings on your monthly bill.	*Response*	*(n=11)*	*Percent of Respondents*
	Very dissatisfied	1	9%
	Dissatisfied	0	0%
	Neither satisfied nor dissatisfied	9	82%
	Satisfied	1	9%
	Very satisfied	0	0%

Using a scale of very dissatisfied, dissatisfied, neither satisfied nor dissatisfied, satisfied, or very satisfied, how would you rate your satisfaction with the following: Overall program experience.	*Response*	*(n=11)*	*Percent of Respondents*
	Very dissatisfied	1	9%
	Dissatisfied	0	0%
	Neither satisfied nor dissatisfied	1	9%
	Satisfied	4	36%
	Very satisfied	5	45%

Appendix I: Prescriptive Refrigeration Incentive Questionnaire for Decision Maker Survey:

1. What are the sources your organization relies on for information about energy efficient equipment, materials and design features? (Select all that apply)
   1. An I&M Energy Specialist
   2. An I&M Account Representative
   3. The I&M website
   4. Brochures or advertisements
   5. Trade associations or business groups you belong to
   6. Trade journals or magazines
   7. Friends and colleagues
   8. An architect, engineer or energy consultant
   9. Equipment vendors or building contractors
   99. Other (please specify)

2. Which of the following policies or procedures does your organization have in place regarding energy efficiency improvements at this facility? (Select all that apply)
   1. An energy management plan
   2. Corporate policies that incorporate energy efficiency in operations and procurement
   3. Active training of staff.
   4. A numeric goal for energy savings
   5. A numeric goal for energy cost reduction
   6. None
   99. Other (Please Specify)

3. How does your organization decide to make energy efficiency improvements for this facility? Is the decision:
   1. Made by one or two key people
   2. Based on staff recommendations to a decision maker
   3. Made by a group or committee
   4. Depends on how much the investment is
   5. Made in some other way

4. Did you work on completing the application for the program, including gathering any required documentation?
   1. Yes
   2. No
   98. Don't know

[DISPLAY Q7 IF Q6 = 1]

5. Thinking back to the application process, please rate the clarity of information on how to complete the application.
   1. Not at all clear

2. Somewhat clear
3. Mostly clear
4. Completely clear
98. Don't know

[DISPLAY Q8 IF Q7 = 1 or 2]

6. What information, including instructions on forms, needs to be further clarified?

[DISPLAY Q9 IF Q6 = 1]

7. Using a scale of completely unacceptable, somewhat unacceptable, somewhat acceptable, and completely acceptable, how would you rate the following…
   a. The ease of finding how to apply for the audit program on I&M's website
   b. The ease of using the application forms
   c. The time it took to have the application approved
   d. The overall application process

[DISPLAY Q10 IF Q6 = 1]

8. Did you have a clear sense of whom to go to for assistance with the application process?
   1. Yes
   2. No
   98. Don't know

9. Now I would like to ask you about the audit process. Using a scale of completely disagree, somewhat disagree, neither disagree nor agree, somewhat agree, and completely agree, please rate your agreement with the following statements:
   a. The auditor was courteous
   b. The auditor was efficient
   c. The auditor minimized disruption to our business

[DISPLAY Q12 IF Q1A, Q1B , or Q1C = Completely disagree or Somewhat disagree]

10. What could the auditor have done differently to improve your experience with the program?

11. Did you review the audit report that you received?
   1. Yes
   2. No
   98. Don't know

[DISPLAY Q14 IF Q13 = 1]

12. How easy or difficult was the audit report to understand?
   1. Very easy to understand
   2. Somewhat easy to understand
   3. Somewhat difficult to understand
   4. Very difficult to understand
   98. Don't know

[DISPLAY Q15 IF Q14= 3 or 4]

13. Do you have any suggestions for how the information in the audit report could be presented more clearly?

[DISPLAY Q16 IF Q13 = Yes]

14. Did the audit report present sufficient information for you to make a decision about whether or not to implement the recommendations?
    1. Yes
    2. For the most part
    3. No
    98. Don't know

[DISPLAY Q17 IF Q16 =2]

15. What additional information would you need to help you make a decision?

[DISPLAY Q18 IF Q13 = 1]

16. After reviewing the report, was it clear to you how to apply for financial incentives for the recommended energy saving improvements?
    1. Very clear
    2. Somewhat clear
    3. Somewhat unclear
    4. Very unclear
    98. Don't know

[DISPLAY Q19 IF Q18= 3 or 4]

17. Do you have any suggestions for how the report could be clearer about how to apply for incentives?

18. Which financial methods does your organization typically use to evaluate energy efficiency improvements for this facility? (Select all that apply)
    1. Initial Cost
    2. Simple payback (provide numeric payback time if possible):
    3. Internal rate of return (provide numeric rate of return if possible):
    4. Life cycle cost
    5. None of these

19. How did you learn of the Prescriptive Refrigeration Incentives Program? (Select all that apply)
    1. Approached directly by representative of the Prescriptive Refrigeration Incentives Program
    2. Received an information brochure on the Prescriptive Refrigeration Incentives Program
    3. An I&M customer service representative mentioned it
    4. I&M website

5. Friends or colleagues
6. An architect, engineer or energy consultant
7. An equipment vendor or building contractor
8. A utility bill insert
9. An email from I&M
98. Other (please explain)

20. Has your organization purchased any energy efficient equipment in the last three years for which you did not apply for a financial incentive through an energy efficiency program?
    1. Yes, purchased energy efficient equipment but did not apply for incentive.
    2. No equipment was purchased by organization.
    3. No, an incentive was applied for.
    98. Don't know

[DISPLAY Q20A IF Q20 = 1]

20A. Why didn’t you apply for a financial incentive for that equipment?
1. Didn’t know whether equipment qualified for financial incentives
2. Didn’t know about financial incentives until after equipment was purchased
3. Didn’t have time to complete paperwork for financial incentive application
4. Too much paperwork for the financial incentive application
5. Financial incentive was insufficient
98. Other (please specify)

[DISPLAY Q20B IF Q20 = 3]

20B. Did you receive all of your incentives for these past energy efficiency projects?
1. Yes
2. No
98. Don't know

[Repeat Q21 through Q29 for each measure type]

21. Before participating in the Prescriptive Refrigeration Incentives Program, had you installed any equipment similar to the energy efficient [Measure/Equipment Type] installed through the program at [this facility/these facilities]?
    1. Yes
    2. No
    98. Don’t know

22. Did you have plans to install energy efficient [Measure/Equipment Type] at [this facility/these facilities] before participating in the Prescriptive Refrigeration Incentives Program?
    1. Yes
    2. No

[DISPLAY Q22A IF Q22 = 1]

22A. Would you have gone ahead with this planned installation even if you had not participated in the program?

1. Yes
2. No

23. How important was previous experience with the Prescriptive Refrigeration Incentives Program in making your decision to install energy efficient [Measure/Equipment Type]?
    1. Did not have previous experience with program
    2. Very important
    3. Somewhat important
    4. Only slightly important
    5. Not at all important
    98. Don't know

24. Did a representative of the Prescriptive Refrigeration Incentives Program recommend that you install the [Measure/Equipment Type]?
    1. Yes
    2. No
    98. Don't know

[DISPLAY Q24A IF Q24 = 1]

24A. If the program representative had not recommended installing the [Measure/Equipment Type], how likely is it that you would have installed it anyway?

1. Definitely would have installed
2. Probably would have installed
3. Probably would not have installed
4. Definitely would not have installed
98. Don't know

25. Would you have been financially able to install the energy efficient [Measure/Equipment Type] without the financial incentive from the Prescriptive Refrigeration Incentives Program?
    1. Yes
    2. No
    98. Don't know

26. If the financial incentive from the program had not been available, how likely is it that you would have installed the energy efficient [Measure/Equipment Type] anyway?
    1. Definitely would have installed
    2. Probably would have installed
    3. Probably would not have installed
    4. Definitely would not have installed
    98. Don't know

27. How did the availability of information and financial incentives through the Prescriptive Refrigeration Incentives Program affect the quantity (or number of units) of energy

efficient [Measure/Equipment Type] that you purchased and installed? Did you purchase and install more refrigeration equipment than you otherwise would have without the program?

1. Yes
2. No, program did not affect quantity purchased and installed.

[DISPLAY Q27A IF Q27 = 1]

27A. Which part of the project would you have not implemented without the information and financial incentives available through the Prescriptive Refrigeration Incentives Program?

[DISPLAY Q66 IF Measure/Equipment Type is not Controls]

28. How did the availability of information and financial incentives through the Prescriptive Refrigeration Incentives Program affect the level of energy efficiency you chose for the [Measure/Equipment Type]? Did you choose equipment that was more energy efficient than you otherwise would have chosen because of the program?
    1. Yes
    2. No, program did not affect level of efficiency chosen for equipment.

[DISPLAY Q28A IF Q66 = 1]

28A. How much more efficient [Measure/Equipment Type] did you install? (i.e., "xx% more efficient")

29. How did the availability of information and financial incentives through the Prescriptive Refrigeration Incentives Program affect the timing of your purchase and installation of energy efficient [Measure/Equipment Type]? Did you purchase and install energy efficient [Measure/Equipment Type] earlier than you otherwise would have without the program?
    1. Yes
    2. No, program did not affect did not affect timing of purchase and installation.

[DISPLAY Q29A IF Q29 = 1]

29A. When would you otherwise have installed the equipment?

1. Less than 6 months later
2. 6-12 months later
3. 1-2 years later
4. 3-5 years later
5. More than 5 years later

30. Because of your experience with the incentive program, have you bought, or are you likely to buy, energy efficient equipment without applying for a financial incentive or rebate?
    1. Yes, have already bought non-incentivized efficiency equipment because of the experience with the program.
    2. Yes, likely to buy efficiency equipment because of the experience with the program.

3. No
98. Don't know

[DISPLAY Q30A IF Q30 = 2 or 98]
30A.We'd like to call you in a few months for a very short follow-up about other efficiency purchases, if that would be alright. Please provide us with the best person to contact and their phone number.

[DISPLAY Q30B IF Q30 = 1]
30B. What energy efficient equipment did you purchase?

30C. What motivated you to purchase this equipment?

30D. Have you installed the equipment?
1. Yes
2. No
98. Don't know

[DISPLAY Q30D.1 IF Q30D = 1]
30D.1 In what month and year did you install that equipment?

30E. Was this equipment installed, or will it be installed, at the same facility (or facilities) as where the incentive project was completed?
1. Yes
2. No
98. Don't know

[DISPLAY Q30E.1 IF Q30E = 2]
30E.1. Where was (or will be) the equipment installed?

30F. How important was your experience with the program to your decision to implement the additional energy efficiency measures?
1. Very important
2. Somewhat important
3. Only slightly important
4. Not at all important
98. Don't know

30G. How important was your past participation in any programs offered by Indiana-Michigan Power to your decision to implement the additional energy efficiency measures?
1. Very important
2. Somewhat important
3. Only slightly important
4. Not at all important
98. Don't know

30H. Why didn’t you apply for or receive incentives for those items?

1. Didn't know whether equipment qualified for financial incentives
2. Equipment did not qualify for financial incentives
3. Too much paperwork for the financial incentive application
4. Financial incentive was insufficient
5. Didn't have time to complete paperwork for financial incentive application
6. Didn't know about financial incentives until after equipment was purchased

99. Other reason (please describe):

31. Does your facility have a roof-top HVAC unit?

1. Yes
2. No

98. Don’t know

[DISPLAY Q31A IF Q31= 1]

31A. Is its size between 3 and 20 tons?

1. Yes
2. No

98. Don’t know

[DISPLAY Q31B IF Q31A = 1]

31B. Did you know that I&M offers a HVAC Tune-Up Program that provides incentives for tuning up rooftop units that are between 3 and 25 tons?

1. Yes
2. No

98. Don’t know

[DISPLAY Q31C IF Q31B = 1]

31C. Have you considered completing an HVAC Tune-Up Program Project?

1. Yes
2. No

98. Don’t know

[DISPLAY Q31D IF Q31C = 2]

31D. Why not?

32. On a scale of 1 to 5, where 5 is very satisfied, and 1 is very dissatisfied, and a 3 is neither satisfied nor dissatisfied, how would you rate your satisfaction with the following.

a. The effort required for the application process
b. Information provided by an I&M Account Representative
c. Performance of the equipment installed
d. The elapsed time to receive the incentive
e. Savings on your monthly bill
f. Incentive amount

g. Quality of work performed by your contractor
h. Overall program experience

[DISPLAY Q33 IF Q32A-Q32H = 1 or 2]
33. Please describe in what ways you were not satisfied with the program.

34. Do you have any other comments that you would like to relay to I&M about energy efficiency in commercial and industrial facilities or about their programs?

This completes the survey. If you have any additional questions regarding this survey or the program please contact Robert Bournique at Indiana/Michigan Power at 765.677.6003. Thank you very much for your time!

Appendix J: Prescriptive Refrigeration Incentive Decision Maker Survey Responses

As part of the evaluation work effort, a survey was conducted with the single decision makers for facilities that received incentives under the Prescriptive Refrigeration Incentives Program. The survey provided the information used in Section 2.3 to estimate free ridership for projects in the Prescriptive Refrigeration Incentives Program. Additionally, the survey provided further general information pertaining to participants' energy efficiency decision making.

Each respondent was interviewed using the survey instrument provided in Appendix H. The interviews were conducted by telephone. During the interview, a participant was asked questions about (1) his or her general decision making regarding purchasing and installing energy efficient equipment, (2) his or her knowledge of and satisfaction with the Prescriptive Refrigeration Incentives Program, and (3) the influence that the Prescriptive Refrigeration Incentives Program had on his or her decision to install energy efficient refrigeration measures.

The following tabulations summarize I&M customer survey responses. Three columns of data are presented. The first column presents the number of survey respondents (***n***). The second column presents the percentage of survey respondents. The third column shows the percentage of total program realized gross energy savings represented by the respondents.

	Response	*(n=4)*	*Percent of Respondents*
What are the sources your organization relies on for information about energy efficient equipment, materials and design features?	An I&M Energy Specialist	0	0%
	An I&M Account Representative	2	50%
	The I&M website	0	0%
	Brochures or advertisements	0	0%
	Trade associations or business groups you belong to	0	0%
	Trade journals or magazines	0	0%
	Friends and colleagues	0	0%
	An architect, engineer or energy consultant	0	0%
	Equipment vendors or building contractors	2	50%
	Other	1	25%

	Response	*(n=4)*	*Percent of Respondents*
Which of the following policies or procedures does your organization have in place regarding energy efficiency improvements at this facility?	An energy management plan	4	100%
	Corporate policies that incorporate energy efficiency in operations and procurement	3	75%
	Active training of staff on saving energy	0	0%
	A numeric goal for energy savings	3	75%
	A numeric goal for energy cost reduction	2	50%
	Other	0	0%
	None	0	0%

	Response	*(n=4)*	*Percent of Respondents*
How does your organization decide to make energy efficiency improvements for this facility? Is the decision:	Made by one or two key people	0	0%
	Based on staff recommendations to a decision maker	2	50%
	Made by a group or committee	2	50%
	Made in some other way	0	0%
	Depends on how much the investment is	0	0%

	Response	*(n=4)*	*Percent of Respondents*
Which financial methods does your organization typically use to evaluate energy efficiency improvements for this facility?	Initial Cost	2	50%
	Simple payback	3	75%
	Internal rate of return	3	75%
	Life cycle cost	2	50%
	None of these	0	0%

	Response	*(n=4)*	*Percent of Respondents*
How did you learn of the Prescriptive Refrigeration Incentives Program?	An I&M customer service representative mentioned it	2	50%
	I&M website	1	25%
	An architect, engineer or energy consultant	1	25%
	Approached directly by representative of the program	0	0%
	Received an information brochure on the program	0	0%
	Friends or colleagues	0	0%
	An equipment vendor or building contractor	0	0%
	A utility bill insert	0	0%
	An email from I&M	0	0%
	Other	1	25%

	Response	*(n=4)*	*Percent of Respondents*
Did you work on completing the application for the program, including gathering any required documentation	Yes	3	75%
	No	1	25%
	Don't know	0	0%

	Response	*(n=3)*	*Percent of Respondents*
Thinking back to the application process, please rate the clarity of information on how to complete the application. Would you say…	Not at all clear	0	0%
	Somewhat clear	1	33%
	Mostly clear	2	67%
	Completely clear	0	0%
	Don't know	0	0%

	Response	*(n=3)*	*Percent of Respondents*
Using a scale of completely unacceptable, somewhat unacceptable, somewhat acceptable, completely acceptable, how would you rate the following: the ease of finding how to apply for the audit program on I&M's website	Completely unacceptable	0	0%
	Somewhat unacceptable	1	33%
	Somewhat acceptable	1	33%
	Completely acceptable	1	33%
	Don't know	0	0%

	Response	*(n=3)*	*Percent of Respondents*
Using a scale of completely unacceptable, somewhat unacceptable, somewhat acceptable, completely acceptable, how would you rate the following: the ease of using the application forms	Completely unacceptable	0	0%
	Somewhat unacceptable	1	33%
	Somewhat acceptable	0	0%
	Completely acceptable	2	67%
	Don't know	0	0%

	Response	*(n=3)*	*Percent of Respondents*
Using a scale of completely unacceptable, somewhat unacceptable, somewhat acceptable, completely acceptable, how would you rate the following: the time it took to have the application approved	Completely unacceptable	0	0%
	Somewhat unacceptable	1	33%
	Somewhat acceptable	0	0%
	Completely acceptable	2	67%
	Don't know	0	0%

	Response	*(n=3)*	*Percent of Respondents*
Using a scale of completely unacceptable, somewhat unacceptable, somewhat acceptable, completely acceptable, how would you rate the following: the overall process	Completely unacceptable	0	0%
	Somewhat unacceptable	1	33%
	Somewhat acceptable	1	33%
	Completely acceptable	1	33%
	Don't know	0	0%

Did you have a clear sense of whom you could go to for assistance with the application process?	*Response*	*(n=3)*	*Percent of Respondents*
	Yes	3	100%
	No	0	0%
	Don't know	0	0%

Has your organization purchased any energy efficient equipment in the last three years for which you did not apply for a financial incentive through an energy efficiency program?	*Response*	*(n=4)*	*Percent of Respondents*
	Yes, paid for energy efficiency improvements but did not apply for incentive.	1	25%
	No energy efficiency improvements were paid for by the organization.	1	25%
	No, an incentive was applied for.	0	0%
	Don't know	2	50%

Why didn't you apply for a financial incentive for the energy efficiency improvements?	*Response*	*(n=1)*	*Percent of Respondents*
	Didn't know whether improvements qualified for incentives	0	0%
	Didn't know about incentives until after efficiency improvements were completed	0	0%
	Didn't have time to complete paperwork for incentive application	0	0%
	Too much paperwork for the incentive application	0	0%
	The incentive was insufficient	0	0%
	Other	1	100%
	Don't know	0	0%

Did you receive all of your incentives for these past energy efficiency projects?	*Response*	*(n=0)*	*Percent of Respondents*
	Yes	0	0%
	No	0	0%
	Don't know	0	0%

Question	*Response*	*(n=4)*	*Percent of Respondents*
Before participating in the Prescriptive Refrigeration Incentives Program, had you installed any equipment similar to the energy efficient refrigeration equipment installed through the program at the [LOCATION]?	Yes	1	25%
	No	3	75%
	Don't know	0	0%

Question	*Response*	*(n=0)*	*Percent of Respondents*
Before participating in the Prescriptive Refrigeration Incentives Program, had you installed any equipment similar to the energy efficient exterior LED lighting installed through the program at the [LOCATION]?	Yes	0	0%
	No	0	0%
	Don't know	0	0%

Question	*Response*	*(n=4)*	*Percent of Respondents*
Did you have plans to install energy efficient refrigeration equipment at the [LOCATION] before participating in the Prescriptive Refrigeration Incentives Program?	Yes	2	50%
	No	2	50%
	Don't know	0	0%

Question	*Response*	*(n=0)*	*Percent of Respondents*
Did you have plans to install energy efficient exterior LED lighting at the [LOCATION] before participating in the Prescriptive Refrigeration Incentives Program?	Yes	0	0%
	No	0	0%
	Don't know	0	0%

Question	*Response*	*(n=2)*	*Percent of Respondents*
Would you have gone ahead with this planned installation even if you had not participated in the program?	Yes	2	100%
	No	0	0%
	Don't know	0	0%

Question	*Response*	*(n=0)*	*Percent of Respondents*
Would you have gone ahead with this planned installation even if you had not participated in the program?	Yes	0	0%
	No	0	0%
	Don't know	0	0%

How important was previous experience with the Prescriptive Refrigeration Incentives Program in making your decision to install energy efficient refrigeration equipment?	*Response*	*(n=4)*	*Percent of Respondents*
	Very important	2	50%
	Somewhat important	0	0%
	Only slightly important	0	0%
	Not important at all	0	0%
	Did not have previous experience	2	50%
	Don't know	0	0%

How important was previous experience with the Prescriptive Refrigeration Incentives Program in making your decision to install energy efficient exterior LED lighting?	*Response*	*(n=0)*	*Percent of Respondents*
	Very important	0	0%
	Somewhat important	0	0%
	Only slightly important	0	0%
	Not important at all	0	0%
	Did not have previous experience	0	0%
	Don't know	0	0%

Did a representative of the Prescriptive Refrigeration Incentives Program recommend that you install the refrigeration equipment?	*Response*	*(n=4)*	*Percent of Respondents*
	Yes	2	50%
	No	1	25%
	Don’t know	0	0%

Did a representative of the Prescriptive Refrigeration Incentives Program recommend that you install the exterior LED lighting?	*Response*	*(n=0)*	*Percent of Respondents*
	Yes	0	0%
	No	0	0%
	Don’t know	0	0%

If the program representative had not recommended installing the refrigeration equipment, how likely is it that you would have installed it anyway?	*Response*	*(n=2)*	*Percent of Respondents*
	Definitely would have	1	50%
	Probably would have	1	50%
	Probably would not have	0	0%
	Definitely would not have	0	0%
	Don't know	0	0%

	Response	*(n=0)*	*Percent of Respondents*
If the program representative had not recommended installing the exterior LED lighting, how likely is it that you would have installed it anyway?	Definitely would have	0	0%
	Probably would have	0	0%
	Probably would not have	0	0%
	Definitely would not have	0	0%
	Don't know	0	0%

	Response	*(n=4)*	*Percent of Respondents*
Would you have been financially able to install the energy efficient refrigeration equipment without the financial incentive from the Prescriptive Refrigeration Incentives Program?	Yes	3	75%
	No	1	25%
	Don't know	0	0%

	Response	*(n=0)*	*Percent of Respondents*
Would you have been financially able to install the energy efficient exterior LED lighting without the financial incentive from the Prescriptive Refrigeration Incentives Program?	Yes	0	0%
	No	0	0%
	Don't know	0	0%

	Response	*(n=4)*	*Percent of Respondents*
If the financial incentive from the program had not been available, how likely is it that you would have installed the energy efficient refrigeration equipment anyway?	Definitely would have	1	25%
	Probably would have	1	25%
	Probably would not have	1	25%
	Definitely would not have	0	0%
	Don't know	1	25%

	Response	*(n=0)*	*Percent of Respondents*
If the financial incentive from the program had not been available, how likely is it that you would have installed the energy efficient exterior LED lighting anyway?	Definitely would have	0	0%
	Probably would have	0	0%
	Probably would not have	0	0%
	Definitely would not have	0	0%
	Don't know	0	0%

	Response	*(n=4)*	*Percent of Respondents*
Did you purchase and install more refrigeration equipment than you otherwise would have without the program?	Yes	2	50%
	No, program did not affect quantity purchased and installed	2	50%

	Response	*(n=0)*	*Percent of Respondents*
Did you purchase and install more exterior LED lighting than you otherwise would have without the program?	Yes	0	0%
	No, program did not affect quantity purchased and installed	0	0%

	Response	*(n=4)*	*Percent of Respondents*
Did you choose equipment that was more energy efficient than you otherwise would have chosen because of the program?	Yes	2	50%
	No	2	50%
	Don't know	0	0%

	Response	*(n=0)*	*Percent of Respondents*
Did you choose equipment that was more energy efficient than you otherwise would have chosen because of the program?	Yes	0	0%
	No	0	0%
	Don't know	0	0%

	Response	*(n=4)*	*Percent of Respondents*
Did you purchase and install energy efficient exterior LED lighting earlier than you otherwise would have without the program?	Yes	2	50%
	No	2	50%
	Don't know	0	0%

	Response	*(n=0)*	*Percent of Respondents*
Did you purchase and install energy efficient refrigeration equipment earlier than you otherwise would have without the program?	Yes	0	0%
	No	0	0%
	Don't know	0	0%

	Response	*(n=2)*	*Percent of Respondents*
When would you otherwise have installed the energy efficient refrigeration equipment?	Less than 6 months later	0	0%
	6-12 months later	0	0%
	1-2 years later	1	50%
	3-5 years later	0	0%
	More than 5 years later	0	0%
	Don't know	1	50%

	Response	*(n=0)*	*Percent of Respondents*
When would you otherwise have installed the exterior LED lights?	Less than 6 months later	0	0%
	6-12 months later	0	0%
	1-2 years later	0	0%
	3-5 years later	0	0%
	More than 5 years later	0	0%
	Don't know	0	0%

	Response	*(n=4)*	*Percent of Respondents*
Because of your experience with the incentive program, have you bought, or are you likely to buy, energy efficient equipment without applying for a financial incentive or rebate?	Yes, have already bought non-incentivized efficiency equipment because of the experience with the program	0	0%
	Yes, likely to buy efficiency equipment because of the experience with the program	0	0%
	No	2	50%
	Don't know	1	25%

	Response	*(n=1)*	*Percent of Respondents*
Have you installed the equipment?	Yes	1	100%
	No	0	0%
	Don't know	0	0%

	Response	*(n=2)*	*Percent of Respondents*
Was this equipment installed, or will it be installed at the same facility (or facilities) as where the incentive project was completed?	Yes	1	50%
	No	1	50%
	Don't know	0	0%

How important was your experience with the program to your decision to implement the additional energy efficiency measures?	*Response*	*(n=2)*	*Percent of Respondents*
	Very important	2	100%
	Somewhat important	0	0%
	Only slightly important	0	0%
	Not important at all	0	0%
	Don't know	0	0%

How important was your past participation in any programs offered by Indiana-Michigan Power to your decision to implement the additional energy efficiency measures?	*Response*	*(n=2)*	*Percent of Respondents*
	Very important	2	100%
	Somewhat important	0	0%
	Only slightly important	0	0%
	Not important at all	0	0%
	Don't know	0	0%

Why didn't you apply for or receive incentives for those items?	*Response*	*(n=1)*	*Percent of Respondents*
	Didn't know whether equipment qualified for financial incentives	0	0%
	Equipment did not qualify for financial incentives	1	100%
	Too much paperwork for the financial incentive application	0	0%
	Financial incentive was insufficient	0	0%
	Didn't have time to complete paperwork for financial incentive application	0	0%
	Didn't know about financial incentives until after equipment was purchased	0	0%
	Other	0	0%

Does your facility have a roof-top HVAC unit?	*Response*	*(n=4)*	*Percent of Respondents*
	Yes	2	50%
	No	1	25%
	Don't know	1	25%

Is its size between 3 and 20 tons?	*Response*	*(n=2)*	*Percent of Respondents*
	Yes	0	0%
	No	1	50%
	Don't know	1	50%

Did you know that I&M offers a HVAC Tune-Up Program that provides incentives for tuning up rooftop units that are between 3 and 25 tons?	*Response*	*(n=0)*	*Percent of Respondents*
	Yes	0	0%
	No	0	0%
	Don't know	0	0%

Have you considered completing an HVAC Tune-Up Program Project?	*Response*	*(n=0)*	*Percent of Respondents*
	Yes	0	0%
	No	0	0%
	Don't know	0	0%

Using a scale of very dissatisfied, dissatisfied, neither satisfied nor dissatisfied, satisfied, very satisfied, please indicate how satisfied or dissatisfied are you with: The effort required for the application process	*Response*	*(n=4)*	*Percent of Respondents*
	Very dissatisfied	0	0%
	Dissatisfied	0	0%
	Neither satisfied nor dissatisfied	0	0%
	Satisfied	0	0%
	Very satisfied	4	100%
	Don't know	0	0%

Using a scale of very dissatisfied, dissatisfied, neither satisfied nor dissatisfied, satisfied, very satisfied, please indicate how satisfied or dissatisfied are you with: Information provided by an I&M Account Representative	*Response*	*(n=4)*	*Percent of Respondents*
	Very dissatisfied	0	0%
	Dissatisfied	0	0%
	Neither satisfied nor dissatisfied	0	0%
	Satisfied	1	25%
	Very satisfied	3	75%
	Don't know	0	0%

Using a scale of very dissatisfied, dissatisfied, neither satisfied nor dissatisfied, satisfied, very satisfied, please indicate how satisfied or dissatisfied are you with: Performance of the equipment installed	*Response*	*(n=4)*	*Percent of Respondents*
	Very dissatisfied	0	0%
	Dissatisfied	0	0%
	Neither satisfied nor dissatisfied	0	0%
	Satisfied	0	0%
	Very satisfied	4	100%
	Don't know	0	0%

	Response	*(n=4)*	*Percent of Respondents*
Using a scale of very dissatisfied, dissatisfied, neither satisfied nor dissatisfied, satisfied, very satisfied, please indicate how satisfied or dissatisfied are you with: The elapsed time to receive the incentive	Very dissatisfied	0	0%
	Dissatisfied	0	0%
	Neither satisfied nor dissatisfied	1	25%
	Satisfied	1	25%
	Very satisfied	2	50%
	Don't know	0	0%

	Response	*(n=4)*	*Percent of Respondents*
Using a scale of very dissatisfied, dissatisfied, neither satisfied nor dissatisfied, satisfied, very satisfied, please indicate how satisfied or dissatisfied are you with: The savings on your monthly bill	Very dissatisfied	0	0%
	Dissatisfied	0	0%
	Neither satisfied nor dissatisfied	3	75%
	Satisfied	0	0%
	Very satisfied	1	25%
	Don't know	0	0%

	Response	*(n=4)*	*Percent of Respondents*
Using a scale of very dissatisfied, dissatisfied, neither satisfied nor dissatisfied, satisfied, very satisfied, please indicate how satisfied or dissatisfied are you with: The incentive amount	Very dissatisfied	0	0%
	Dissatisfied	0	0%
	Neither satisfied nor dissatisfied	0	0%
	Satisfied	1	25%
	Very satisfied	3	75%
	Don't know	0	0%

	Response	*(n=4)*	*Percent of Respondents*
Using a scale of very dissatisfied, dissatisfied, neither satisfied nor dissatisfied, satisfied, very satisfied, please indicate how satisfied or dissatisfied are you with: The quality of work performed by your contractor	Very dissatisfied	0	0%
	Dissatisfied	0	0%
	Neither satisfied nor dissatisfied	0	0%
	Satisfied	1	25%
	Very satisfied	3	75%
	Don't know	0	0%

	Response	*(n=4)*	*Percent of Respondents*
Using a scale of very dissatisfied, dissatisfied, neither satisfied nor dissatisfied, satisfied, very satisfied, please indicate how satisfied or dissatisfied are you with: Overall program overall	Very dissatisfied	0	0%
	Dissatisfied	0	0%
	Neither satisfied nor dissatisfied	0	0%
	Satisfied	1	25%
	Very satisfied	3	75%
	Don't know	0	0%

Appendix K: C&I RCxL Project-Level Analyses

This section contains project-level analyses for the impact evaluation of the Commercial and Industrial Retro-Commissioning Lite Program.

Project Number AEPIM-13-000013-R

Executive Summary

Under project AEPIM-13-00027-R, the customer received incentives from Indiana Michigan Power for performing compressed air system retrofits and control systems upgrades. The realization rate for this project is 140%.

Project Description

The customer performed the following retrofits:

- Installation of new computer controlled flow controller and compressor sequencer
- Removal of air knife system which utilized compressed air
- Installation of new electric blower in place of compressed air knife system

The project application states that the compressed air system has an efficiency of 4.80 kWh per thousand cubic feet of air (kWh/MCF). Using a compressed air simulation tool, it was estimated that the system would have a final efficiency of 3.30 kWh/MCF.

Measurement and Verification Effort

During the M&V visit, ADM verified that the new air blower and new compressor control system was in operation as expected. ADM used compressed air system logger data collected by the implementation contractor, as well as information collected on site, in order to verify savings. Using the provided monitoring data for the post period, ADM was able to determine that the compressed air system has an average efficiency of 2.95 kWh/MCF.

The energy savings are calculated as:

$$kWh/MCF_{Reduction} = kWh/MCF_{Baseline} - kWh/MCF_{As-Built}$$

$$kWh = kWh/MCF_{Reduction} \times Annual\ MCF$$

Where,

$kWh/MCF_{Baseline}$= Average kilowatt-hour energy to produce 1,000 CFM in the baseline

$kWh/MCF_{As\text{-}Built}$= Average kilowatt-hour energy to produce 1,000 CFM in the as-built

Annual MCF = Annual compressed air demand for the plant

It was also determined that post-installation period had a weekly air demand of 28,156 MCF compared to the pre-period 16,439 MCF. Due to production data being unavailable for correlation purposes, ADM used the average of the pre and post weekly MCF demand. This results in a weekly demand of 22,298 MCF and an annual demand of 1,159,471 MCF.

The installation of the new electric blower allowed for the removal of the original air knife. The removal of the air knife reduces the overall load on the compressed air system; however, a new electrical demand is introduced to the facility as the blower uses and electric 10 Hp motor. The impact of the new blower on the over savings for the facility was calculated using the following equation:

$$kWh = \frac{V \times A \times PF \times \sqrt{3}}{1{,}000} \times Hrs$$

Where,

kWh	= Annual kWh of blower to be subtracted from total annual savings
V	= Voltage of system, 477
A	= Amp draw of blower motor, 14.6
PF	= Power factor of blower motor, 0.8
Hrs	= Annual hours of operation, 5,120

Results

Verified Gross Savings/Realization Rates

Measure Category	*kWh Savings*		
	Expected	*Realized*	*Realization Rate*
Compressed Air System	1,486,348	2,087,242	140.4%
Total	1,486,348	2,087,242	140.4%

The project-level realization rate is 140%. The high realization rate can be attributed to the ex-ante post simulation under predicting the efficiency of the system at 3.30 kWh/MCF. The post monitoring data provided to ADM by the facility confirms that the system had an average efficiency of 2.95 kWh/MCF. The other contributing factor is the increased overall usage of the system, as determined by the post monitoring data. Because the usage was higher than expected, the savings potential for the compressed air system was higher as well.

Project Number AEPIM-13-000064-R

Executive Summary

Under project AEPIM-13-000064-R, the customer received incentives from Indiana Michigan Power for performing retro-commissioning on their compressed air system. The identified measures included, leak repairs, zero loss drain valves, elimination of open blowing, installation of low pressure blower/ air knives, reduction of pressure set-point, and optimization of system automation controls. The realization rate for this project is 84%.

Project Description

The facility relies on seven air compressors of various sizes to supply compressed air for manufacturing purposes. In order to reduce the energy consumption of the system, a retro-commissioning study was conducted to identify energy savings measures. From the recommendations of the study, the facility repaired 100 CFM worth of air leaks, and installed 34 zero loss drain valves, effectively reducing the overall demand on the system by 184 CFM. The facility also eliminated IL#13 open blowing, accounting for 40 CFM of demand, along with replacing air knives yielding an additional 50 CFM or reduced demand.

Previously the compressors were operated manually based upon manufacturing demand. This operation resulted in compressors operating at idle thus wasting unnecessary energy. Automated controls were installed allowing the seven compressors to turn on/off automatically dependent upon the demand of the manufacturing process. This effectively eliminated the standby loss of the compressors sitting idle.

Measurement and Verification Effort

During the M&V visit, ADM verified that the claimed measures had been installed and/or executed. ADM staff also interviewed facility staff about the typical operation of the plant and how production varied throughout the year. As ADM was informed that production is relatively constant throughout the year, ADM relied on pre-monitoring performed by the retro-commissioning provider. The retro-commissioning provider installed power monitoring equipment on all seven air compressors for approximately one week. During this baseline monitoring period, four different load profiles were identified and categorized as; peak, high average, low average, and low. The average CFM output of each compressor during these four load profiles can be seen in the following table:

Baseline Compressor Output

#	Compressor Model	Peak	High Average	Low Average	Low
1	Ingersoll-Rand - EP150	628	502	554	535
2	Ingersoll-Rand - EP200	798	660	505	531
3	Ingersoll-Rand - EP200	712	651	525	0
4	Ingersoll-Rand - EPE200-2S	866	763	543	629
5	Ingersoll-Rand - EP200	941	537	467	478
6	Ingersoll-Rand - EPE200-2S	963	514	492	0
7	Quincy - QSI500	430	430	435	416
Total		5,346	5,337	4,057	3,522

With the known baseline operating requirements for each demand profile and the impacts of demand reduction that the claimed measures will have, the following table defines constitutes of demand for facility:

Pre and Post Constitutes of Demand

Category	*Peak*		*High Average*		*Low Average*		*Low*	
	Current	*Proposed*	*Current*	*Proposed*	*Current*	*Proposed*	*Current*	*Proposed*
Production: Good & Bad (scfm)	4,652	4,652	3,240	3,240	2,746	2,746	1,829	1,829
#1 ECM – Leaks (scfm)	400	300	400	300	400	300	400	300
#2 ECM – Drains (scfm)	84	0	84	0	84	0	84	0
#3 ECM - IL #13 Cooler (scfm)	40	0	40	0	40	0	40	0
#4 ECM - System Automation (scfm)	0	0	0	0	0	0	0	0
#5 ECM - Artificial Demand (scfm)	161	0	292	0	252	0	236	0
Total Compressed Air Demand (scfm)	5,337	4,952	4,057	3,540	3,522	3,046	2,589	2,129
Network Pressures (PSI)	96	90	106	90	106	90	112	90
Compressor Power (kW)	1,049.35	985.34	1,006.67	688.98	986.60	606.92	673.74	424.13
Dryer Power (kW)	31.08	28.84	23.62	20.64	20.51	17.76	15.08	12.42
Total Power (kW)	1,080.43	1,014.17	1,030.30	709.62	1,007.10	624.68	688.82	436.55
Annual Operating Hours	2,034	2,034	2,607	2,607	2,868	2,868	1,251	1,251
Annual Consumption (kWh)	2,197,600	2,062,825	2,685,825	1,849,977	2,888,375	1,791,583	861,713	546,121
Annual Savings (kWh)	134,774		836,007		1,096,792		315,592	
Total Annual Savings (kWh)	2,383,166							

The proposed compressor energy consumption was calculated using compressor efficiency curves, and known staging due to the new automated system controls. The new controls are designed to operate one compressor at a time until fully loaded. Once a compressor becomes fully loaded, a second compressor comes on line to handle the additional load.

Results

Verified Gross Savings/Realization Rates

Measure Category	*kWh Savings*			*kW Savings*
	Expected	*Realized*	*Realization Rate*	*Realized*
Compressed Air	2,835,563	2,383,166	84%	272.1
Total	2,835,563	2,383,166	84%	272.1

The overall project savings had a realization rate of 84%. The difference in savings can be attributed to the ex-ante savings assuming that overall efficiency of the compressed air system is significantly increasing in the “Low Average” and “Low” proposed operating profiles. The following table utilizes the reported ex-ante values, and calculates the system efficiencies which are reported in kW/100 CFM.

Ex-Ante Compressed Air System Efficiencies

Category	*Low Average*		*Low*	
	Current	*Proposed*	*Current*	*Proposed*
Compressed Air Demand (CFM)	5,369	4,881	5,342	4,817
Compressor Power (kW)	1,129.52	679.41	1,125.75	580.49
System Efficiency (kW/100 CFM)	21.04	13.92	21.07	12.05

The significant increase in system efficiency is something that would not be a result of the claimed measures above, thus leading to a significant overestimation in annual savings. ADM was able to determine that discrepancy in efficiencies was due to a broken calculation within the ex-ante Excel calculator.

Project Number AEPIM-13-000073-R

Executive Summary

Under project AEPIM-13-00073-R, the customer received incentives from Indiana Michigan Power for performing compressed air system upgrades which included the following: leak repair, a new flow controller, receiver and compressor sequencer. The realization rate for this project is 87%.

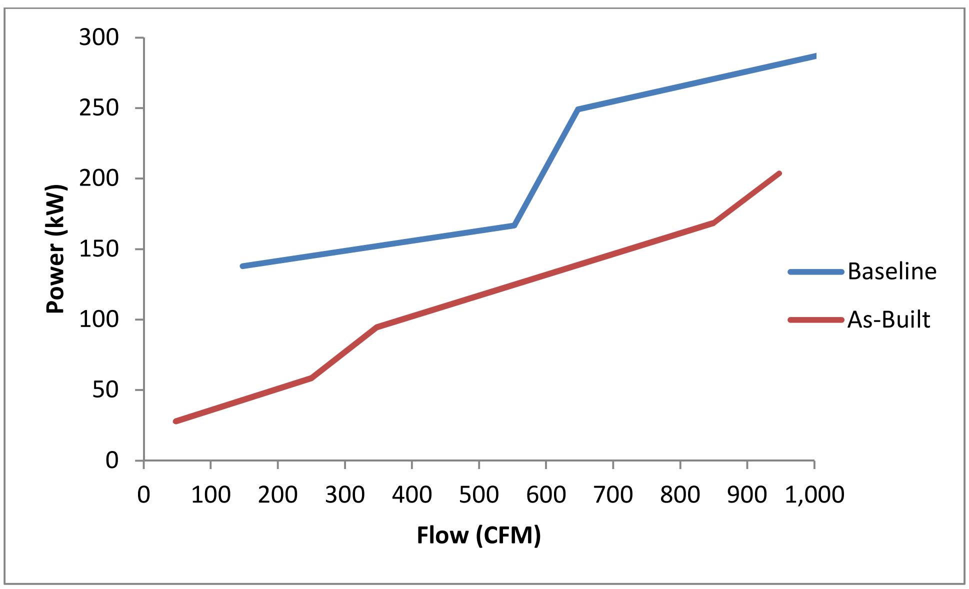
Project Description

The customer relies on a bank of four compressors to supply its compressed air needs for manufacturing. In order to improve the efficiency of the system, a retro-commissioning study was performed to identify energy savings measures. As a result of this study, the following retrofit measures were identified and performed:

- Installation of new computer controlled flow controller and compressor sequencer
- 125 CFM of leak repairs
- Installation of a new 1,550 gallon receiver

The installation of the compressor sequencer allows the compressors to more efficiently stage as it takes advantage of the load/unload features or the existing compressors, while the receiver offers capacitance for the system. The graph below represents the system efficiency curves before and after the installation of the sequencer and receiver:

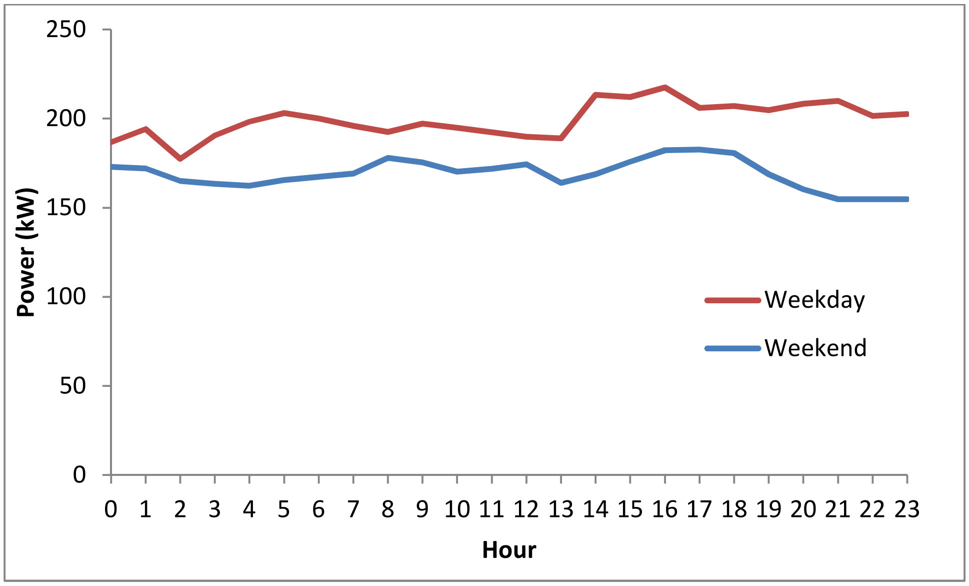
Compressed Air System Efficiency Curves



Measurement and Verification Effort

During the M&V visit, ADM verified the installation of the of the flow controller, sequencer and storage tank. In order to calculate energy savings for the performed measures, ADM used post compressor system monitoring data, provided by the implementation contractor. Using this data, two typical operating profiles were derived: one for weekdays and one for weekends. This is attributed to many manufacturing facilities having varying demand requirements between weekdays and weekends, as displayed below:

Typical As-Built Operating Profiles



ADM calculated the resultant CFM based on kW demand of the as-built compressed air system. This was accomplished using the compressors sequencer efficiency curves derived by the implementation contractor, which were based on CAGI curves. Typically, pre and post CFM requirements remain the same; however the facility performed 125 CFM of repair leaks. In order to account for this improvement, the baseline CFM requirements were increased by 125 CFM for each hour based on the as-built CFM. Resultant baseline kW was calculated using the efficiency curve, as previously discussed.

Annualized savings was then calculated using the following equation:

$$kWh_{savings} = \left[\left(\sum_{0}^{23} kW_{Base\ Wk} - \sum_{0}^{23} kW_{As-Built\ Wk}\right) * 5 - \left(\sum_{0}^{23} kW_{Base\ Wd} - \sum_{0}^{23} kW_{As-Built\ Wd}\right) * 2\right] \times \#_{Wks}$$

Where,

$kWh_{savings}$	=	Annual energy savings.
$kW_{base\ Wk}$	=	Average kW demand of baseline compressed air system during week for a given hour.
$kWh_{As\text{-}Built\ Wk}$	=	Average kW demand of as-built compressed air system during week for a given hour.
$kW_{base\ Wd}$	=	Average kW demand of baseline compressed air system during weekend for a given hour.
$kWh_{As\text{-}Built\ Wd}$	=	Average kW demand of as-built compressed air system during weekend for a given hour.
$\#wks$	=	Number of weeks per year that the compressed air system is operational.

Results

Verified Gross Savings/Realization Rates

Measure Category	*kWh Savings*			*kW Savings*
	Expected	*Realized*	*Realization Rate*	
Compressed Air System RCxL	966,960	841,401	87%	101.0
Total	966,960	841,401	87%	101.0

The low realization rate can be attributed to the ex-ante calculations using a straight average method to estimate the average kW consumptions. Using this method, the as-built and baseline compressor efficiency profiles are non-linear to one another. An example of this can be seen in the "*Compressed Air System Efficiency Curves*" graphic, which shows a greater savings potential when demand is approximately 700 CFM compared to when the demand is 500 CFM. Therefore, savings is highly dependent upon the frequency of a particular CFM load demand.

Project Number AEPIM-13-000075-R

Executive Summary

Under project AEPIM-13-000075-R, the customer upgraded lighting and HVAC systems. The savings derived from these upgrades are 750,444 kWh, with a realization rate of 68%.

Project Description

The facility implemented the following measures:

- Implemented a night setback for zones served by the unit and controlled by pneumatic VAV boxes and RTU#1
- Added time of use schedules for roof top HVAC units
- Added time of use schedules for air handler units
- Added time of use schedules for the exhaust fans
- Added time of use schedules for makeup air units
- Adjusted temperature setpoints in one room
- Added motion sensors to Office lighting
- Implemented Time-of-Day schedules for Plant lighting
- Removed lamps from vending machines

Measurement and Verification Effort

During the M&V site visit, ADM's field engineers verified installation and operation of the lighting upgrades and HVAC control systems. Photographs of the new hardware were taken, and screenshots of the HVAC controls & schedules were obtained.

Generally, an eQuest model of the building would be created, but large swings in facility operation made utility rate calibration very problematic. A billing regression using R statistics software was conducted in an attempt to determine the presence of weather dependencies, but none were detected. Furthermore, insufficient post-retrofit billing data prohibited ADM's staff from completing a comprehensive regression study.

Instead, engineering calculations for the time-of-use scheduling of HVAC systems and exhaust fans, contingent on ex-ante power estimates, were conducted.

The equation used for savings is:

$$kWh_{savings} = kW_{demand} \times (Hrs_{Pre} - Hrs_{Post})$$

Where:

$kWh_{savings}$ = *Annual energy savings*

kW_{demand} = *kW demand of endues based upon one time power measurements*

Hrs_{pre} = *Pre-scheduling operating hours*

Hrs_{post} = *Post-scheduling operating hours*

HVAC Time of Use Savings Calculations

Description	*Quantity*	*kW Demand*	*Annual Existing Hours*	*Annual Hours*	*Annual Saved Hours*	*Annual kWh Savings*
RTU # 2	1	3.99	8760	4,432	4,328	17,278
RTU # 3	1	2.69	8760	4,432	4,328	11,636
AHU # 3	1	5.54	4380	2,346	2,034	11,266
AHU # 4	1	0.10	8760	4,693	4,067	413
AC Unit # 1	1	0.09	8760	4,693	4,067	367
EF # 7	1	10.02	8760	7,248	1,512	15,152
EF # 8	1	8.88	8760	7,248	1,512	13,427
EF # 9	1	8.23	8760	7,248	1,512	12,442
EF # 10	1	10.10	8760	7,248	1,512	15,275
EF # 11	1	9.94	8760	7,248	1,512	15,029
EF # 12	1	11.24	8760	7,248	1,512	17,000
EF # 13	1	11.32	8760	7,248	1,512	17,123
EF # 14	1	11.32	8760	7,248	1,512	17,123
MAU # 01	1	14.75	8760	7,248	1,512	22,297
MAU # 02	1	14.83	8760	7,248	1,512	22,420
MAU # 03	1	43.51	8760	7,248	1,512	65,782
MAU # 04	1	43.67	8760	7,248	1,512	66,029
MAU # 05	1	8.07	8760	7,248	1,512	12,196
MAU # 06	1	9.53	8760	7,248	1,512	14,413
MAU # 07	1	9.21	8760	7,248	1,512	13,920
MAU # 08	1	6.35	8760	7,248	1,512	9,609
MAU # 09	1	7.01	8760	7,248	1,512	10,594
MAU # 10	1	6.11	8760	7,248	1,512	9,239
AC Unit # 2	1	0.09	8760	4,693	4,067	367
Conveyors	44	39.51	8760	6,257	2,503	98,899
TV & Monitors	38	0.74	8760	6,257	2,503	1,864
Total						511,158

Savings for RTU #1 were calculated independently, as the RTU is equipped with a VFD, which has reduced supply during afterhours. The fan savings were calculated using fan affinity laws, which can be observed in the table provided below:

RTU#1 Setback Savings Calculations

% Flow	%Time		Hours		kWh		
	Pre	Post	Pre	Post	Pre	Post	Savings
100%	100%	20%	8,760	1,752	35,458	7,092	28,367
90%	0%	0%	0	0	0	0	0
80%	0%	0%	0	0	0	0	0
70%	0%	15%	0	1,314	0	2,030	-2,030
60%	0%	50%	0	4,380	0	4,464	-4,464
50%	0%	15%	0	1,314	0	819	-819
40%	0%	0%	0	0	0	0	0
30%	0%	0%	0	0	0	0	0
20%	0%	0%	0	0	0	0	0
10%	0%	0%	0	0	0	0	0
Total					35,458	14,404	21,054

HVAC systems AHU#1 and AHU#2 were originally set to maintain a space temperature of 58F, but it was determined that the temperature could be safely reset to 70F. The ex-ante analysis used energy simulations to determine savings of 6,488 kWh. ADM verified the input and concluded that the claimed savings were within reason.

The savings associated with the lighting controls were calculated as follows:

$$kWh_{savings} = \sum_{Area} \frac{\left[\left(N_{pre} \times W_{pre} \times t_{pre}\right) - \left(N_{post} \times W_{post} \times t_{post}\right)\right] \times HCIF}{1{,}000}$$

Where:

$kWh_{savings}$	= *Annual energy savings*
N	= *Number of fixtures*
W	= *Wattage of each fixture*
t	= *Lighting operating hours*
HCIF	= *HVAC interactive factor*

Provided in the table below are the expected and realized energy savings derived from lighting retrofit.

Lighting Controls Retrofit Savings Calculations

Space	*Fixture Type*	*Quantity (Fixtures)*		*Wattage*		*Hours*		*Realized kWh Savings*	*HCIF*
		Old	*New*	*Old*	*New*	*Old*	*New*		
Space Type 1	4' 3L T8	2	2	70	70	8,760	8,239	80	1.10
Space Type 1	4' 3L T8	2	2	70	70	8,760	7,978	120	1.10
Space Type 1	4' 3L T8	4	4	70	70	8,760	8,239	161	1.10
Space Type 1	4' 3L T8	2	2	70	70	8,760	8,499	40	1.10
Space Type 1	4' 3L T8	2	2	70	70	8,760	8,760	0	1.10
Space Type 2	4' 3L T8	1	1	70	70	8,760	5,892	221	1.10
Space Type 2	4' 3L T8	1	1	70	70	8,760	5,892	221	1.10
Space Type 1	4' 3L T8	4	4	70	70	8,760	8,499	80	1.10
Space Type 3	4' 3L T8	15	15	70	70	8,760	4,589	4,820	1.10
Space Type 4	4' 1L T8	7	0	23	23	8,760	0	1,574	1.10
Space Type 4	2' 1L T8	1	0	18	18	8,760	0	174	1.10
Space Type 5	4' 3L T8	4	4	70	70	8,760	8,760	0	1.10
Space Type 5	4' 3L T8	6	6	70	70	8,760	8,760	0	1.10
Space Type 6	4' 3L T8	1	1	70	70	8,760	730	619	1.10
Space Type 7	4' 3L T8	2	2	70	70	8,760	8,499	40	1.10
Space Type 8	4' 3L T8	8	8	70	70	8,760	8,499	161	1.10
Space Type 9	4' 3L T8	6	6	70	70	8,760	1,981	3,133	1.10
Space Type 9	T8 U-Tube	1	1	23	23	8,760	1,981	172	1.10
Space Type 10	4' 3L T8	11	11	70	70	8,760	1,981	5,744	1.10
Space Type 11	4' 3L T8	4	4	70	70	8,760	8,760	0	1.10
Space Type 11	100W Inc	4	4	100	100	8,760	8,760	0	1.10
Space Type 12	4' 3L T8	16	16	70	70	8,760	7,300	1,799	1.10
Space Type 12	4' 3L T8	6	6	70	70	8,760	7,300	675	1.10
Space Type 12	100W Inc	4	4	100	100	8,760	7,300	644	1.10
Space Type 13	4' 3L T8	6	6	70	70	8,760	1,981	3,133	1.10
Space Type 14	4' 3L T8	7	7	70	70	8,760	1,981	3,655	1.10
Space Type 15	4' 3L T8	1	1	70	70	8,760	8,760	0	1.10
Space Type 16	4' 3L T8	6	6	70	70	8,760	1,460	3,374	1.10
Space Type 17	4' 4L T8	16	16	93	93	8,760	8,030	1,162	1.07
Space Type 17	4' 2L T12	4	4	72	72	8,760	8,030	226	1.07
Space Type 18	4' 4L T8	12	12	93	93	8,760	8,030	871	1.07
Space Type 1	4' 4L T8	5	5	93	93	8,760	7,978	389	1.07
Space Type 1	4' 2L T12	4	4	72	72	8,760	7,978	242	1.07
Space Type 1	4' 2L T12	4	4	72	72	8,760	7,978	242	1.07
Space Type 19	8' 2L T12HO	24	24	123	123	8,760	2,190	19,395	1.00
Space Type 20	4' 3L T8	12	12	70	70	8,760	7,978	705	1.07
Space Type 1	4' 3L T8	22	22	70	70	8,760	6,153	4,306	1.07
Space Type 21	4' 4L T5HO	6	6	234	234	8,760	1,460	11,008	1.07

Space	*Fixture Type*	*Quantity (Fixtures)*		*Wattage*		*Hours*		*Realized kWh Savings*	*HCIF*
		Old	*New*	*Old*	*New*	*Old*	*New*		
Space Type 22	4' 4L T8	2	2	93	93	8,760	8,395	73	1.07
Space Type 23	4' 2L T5HO	7	7	117	117	8,760	7,720	852	1.00
Space Type 23	4' 4L T5HO	50	50	234	234	8,760	7,720	12,168	1.00
Space Type 23	4' 6L T5HO	284	284	351	351	8,760	7,720	103,671	1.00
Space Type 23	4' 8L T5HO	53	53	468	468	8,760	7,720	25,796	1.00
Total								211,744	

Results

Verified Gross Savings/Realization Rates

Measure Category	*kWh Savings*			*kW Savings*
	Expected	*Realized*	*Realization Rate*	*Realized*
HVAC & Equip. Scheduling	898,115	538,700	60%	-
Lighting Controls	208,959	211,744	101%	23.75
Total	1,107,074	750,444	68%	23.75

The realization rate for HVAC and equipment upgrades is 60%. The discrepancy in savings can be attributed to overestimating the reduction of operating hours for exhaust fans and make-up air units in ex-ante savings calculations. The ex-ante calculations assumed that post operating hours would be 6,628 and 4,680 for the exhaust fans and make-up air handling units, respectively. During the site visit, ADM reviewed the facility's BMS and concluded that the exhaust fans and make-up air handling units were scheduled to operate for 7,248 hours annually.

Project Number AEPIM-13-000077-R

Executive Summary

Under project AEPIM-13-00077-R, the customer received incentives from Indiana Michigan Power for performing an equipment run hour reduction. The realization rate for this project is 111%. This project qualifies for a rebates under the program due to the facility being required to use a third party to perform reprogramming of the total building automation system equipment schedules to reduce equipment run time.

Project Description

The customer performed the following retrofits:

- Reduced equipment fan run time through control system scheduling

Measurement and Verification Effort

During the M&V visit, ADM verified that the equipment was in operation and was controlled by the building control system based on the newly scheduled times. ADM verified operational occupancy schedules through the building automation system with on-site facility personnel in order to verify savings.

The energy savings are calculated as:

$$kWh_{savings} = kW_{fan} \times (Run\ Hours_{Pre} - Run\ Hours_{Post})$$

Where,

$kWh_{savings}$ = Annual energy savings.

kW_{fan} = Fan kW demand, based on manufacturer data

$Run\ Hours_{pre}$ = Annual operating hours before the schedule changes were implemented

$Run\ Hours_{post}$ = Annual operating hours after the schedule changes were implemented

The following table details the savings for each roof top unit affected by the system scheduling:

Rooftop Unit Scheduling Savings

Unit #	Description	CFM	KW	Annual Existing Hours	Annual Proposed Hours	Annual Saved Hours	kWh savings
1	RTU # 1	1,600	1.06	1,541	650	891	946
2	RTU # 2	1,600	1.10	1,477	650	827	906
3	RTU # 3	1,600	1.10	1,433	650	783	858
4	RTU # 4	2,000	1.61	2,371	1,898	473	760
5	RTU # 5	2,000	1.64	3,147	2,522	625	1,026
6	RTU # 6	2,000	1.64	2,258	1,898	360	592
7	RTU # 7	2,000	1.61	2,548	2,210	338	543
8	RTU # 8	2,000	1.33	2,512	2,340	172	229
9	RTU # 9	1,600	1.03	2,357	2,340	17	17
10	RTU # 10	1,600	1.03	2,382	2,340	42	43
11	RTU # 11	1,600	1.06	2,342	2,340	2	2

12	RTU # 12	1,600	1.57	1,302	598	704	1,109
13	RTU # 13	2,000	1.61	1,368	598	770	1,238
14	RTU # 14	1,600	1.64	1,390	390	1,000	1,643
15	RTU # 15	1,600	1.10	1,332	390	942	1,032
16	RTU # 16	1,600	1.64	1,046	390	656	1,077
17	RTU # 17	1,600	1.10	1,029	390	639	700
18	RTU # 18	3,000	1.68	947	390	557	935
19	RTU # 19	5,000	2.12	3,153	390	2,763	5,863
20	RTU # 20	4,000	1.61	1,882	1,092	790	1,270
21	RTU # 21	4,000	1.78	1,097	676	421	750
22	RTU # 22	4,000	3.05	1,608	598	1,010	3,075
23	RTU # 23	4,000	2.70	3,642	3,640	2	6
24	RTU # 24	3,000	1.57	1,981	858	1,123	1,769
25	RTU # 25	2,000	1.33	3,691	3,640	51	68
26	RTU # 26	2,000	1.47	3,701	3,640	61	90
27	RTU # 27	4,000	2.98	3,338	3,250	88	262
28	RTU # 28	4,000	3.15	3,799	3,640	159	501
29	RTU # 29	4,000	2.81	3,889	3,640	249	698
30	RTU # 30	4,000	2.84	3,674	3,640	34	98
31	RTU # 31	3,400	1.85	3,721	3,640	81	149
32	RTU # 32	3,400	1.85	4,027	3,640	387	715
33	RTU # 33	3,000	3.05	1,830	1,248	582	1,774
34	RTU # 34	4,000	2.87	1,833	1,170	663	1,905
35	RTU # 35	4,000	2.84	2,388	884	1,504	4,273
36	RTU # 36	4,000	2.87	1,784	832	952	2,738
37	RTU # 37	12,000	6.78	0	0	0	0
38	RTU # 38	7,000	2.94	1,125	598	527	1,551
39	RTU # 39	4,000	2.87	963	390	573	1,647
40	RTU # 40	4,000	4.21	1,048	520	528	2,224
41	RTU # 41	30,000	16.91	1,096	520	576	9,738
42	RTU # 42	30,000	16.84	1,037	520	517	8,713
43	RTU # 43	4,000	5.07	1,040	520	520	2,633
44	RTU # 45	3,000	1.78	1,247	260	987	1,756
45	RTU # 46	5,000	3.49	1,373	78	1,295	4,519
46	RTU # 50	3,000	1.80	2,378	2,340	38	68
47	RTU # 51	0	0.00	67	52	15	0
48	RTU # 52	6,000	3.59	3,510	2,470	1,040	3,737
49	RTU # 53	1,600	1.10	451	52	399	437
50	RTU # 54	3,000	1.57	3,196	2,496	700	1,103
51	RTU # 55	8,000	5.03	2,232	1,378	854	4,298
52	RTU # 56	8,000	4.96	1,315	1,300	15	77
Total							82,159

Results

Verified Gross Savings/Realization Rates

Measure Category	kWh Savings		
	Expected	Realized	Realization Rate
BAS Scheduling	73,943	82,159	111.1%
Total	73,943	82,159	111.1%

The high realization rate can be attributed to the ex-ante calculations including a 10% reduction of annual energy savings.

Project Number AEPIM-13-000122-R

Executive Summary

Under project AEPIM-13-00122-R, the customer received incentives from Indiana Michigan Power for performing an equipment run hour reduction, along with an occupancy sensor reprogramming at one facility. The realization rate for this project is 77%.

Project Description

The customer performed the following retrofits:

- Reduced HVAC and exhaust fan run time through control system scheduling
- Reprogrammed common area occupancy sensors to fully utilize their controls

The system scheduling encompassed the reprogramming of the facility building management system to reduce HVAC operating hours. Originally, the operating schedule was 6 a.m. to 10 p.m., Monday through Saturday. The new schedule reduced the operating hours from 7 a.m. to 8 p.m., Monday through Friday.

Prior to the project, the occupancy sensors were not enabled in common areas. Maintenance staff reported that the lights were operational 24/7 in hallways and other common areas, regardless of whether the building was occupied.

Measurement and Verification Effort

During the M&V visit, ADM verified that the equipment was in operation and was controlled by the building control system based on the newly scheduled times. ADM verified operational occupancy schedules through the building automation system with on-site facility personnel.

The energy savings for HVAC and exhaust fan scheduling are calculated as:

$$kWh_{savings} = kW_{fan} \times (Run\ Hours_{Pre} - Run\ Hours_{Post})$$

Where,

$kWh_{savings}$	=	Annual energy savings.
kW_{fan}	=	Fan kW demand, based on manufacturer data
$Run\ Hours_{pre}$	=	Annual operating hours before the schedule changes were implemented
$Run\ Hours_{post}$	=	Annual operating hours after the schedule changes were implemented

The following tables detail the savings for each HVAC unit and exhaust fan affected by the system scheduling:

HVAC Fan Scheduling Savings

System	Quantity	Motor HP	Hours of Operation			Motor Eff	kWh Savings		RR
			Pre	Post	Reduction		Ex-Ante	Ex-Post	
AC-1	1	15.0	5,035	2,840	2,195	91.7%	23,723	22,765	96%
AC-2	1	10.0	5,035	2,840	2,195	91.0%	15,815	15,294	97%
AC-3	1	10.0	5,035	2,840	2,195	91.0%	15,815	15,294	97%
AC-4	1	1.0	5,035	2,840	2,195	82.5%	1,637	1,687	103%
AC-5	1	15.0	5,035	2,840	2,195	91.7%	23,723	22,765	96%
AC-6	1	7.5	5,035	2,840	2,195	91.7%	11,861	11,383	96%
AC-7	1	7.5	5,035	2,840	2,195	91.7%	11,861	11,383	96%
AC-8	1	10.0	5,035	2,840	2,195	91.0%	15,815	15,294	97%
AC-9	1	2.0	5,035	2,840	2,195	82.5%	3,275	3,374	103%
AC-10	1	7.5	5,035	2,840	2,195	91.7%	11,861	11,383	96%
AC-11	1	15.0	5,035	2,840	2,195	91.7%	23,723	22,765	96%
AC-12	1	10.0	5,035	2,840	2,195	91.0%	15,815	15,294	97%
AC-13	1	7.5	5,035	2,840	2,195	91.7%	11,861	11,383	96%
AC-14	1	10.0	5,035	2,840	2,195	91.0%	15,815	15,294	97%
AC-15	1	10.0	5,035	2,840	2,195	91.0%	15,815	15,294	97%
AC-16	1	10.0	5,035	2,840	2,195	91.0%	15,815	15,294	97%
AC-17	1	10.0	5,035	2,840	2,195	91.0%	15,815	15,294	97%
AC-18	1	10.0	5,035	2,840	2,195	91.0%	15,815	15,294	97%
AC-19	1	5.0	5,035	2,840	2,195	89.5%	7,908	7,775	98%
AC-20	1	7.5	5,035	2,840	2,195	91.7%	11,861	11,383	96%
AC-21	1	10.0	5,035	2,840	2,195	91.0%	15,815	15,294	97%
AC-22	1	7.5	5,035	2,840	2,195	91.7%	11,861	11,383	96%
AC-23	1	5.0	5,035	2,840	2,195	89.5%	7,908	7,775	98%
AC-24	1	5.0	5,035	2,840	2,195	89.5%	7,908	7,775	98%
AHU-1	1	7.5	5,035	2,840	2,195	91.7%	11,861	11,383	96%
AHU-2	1	10.0	5,035	2,840	2,195	91.0%	15,815	15,294	97%
AHU-3	1	20.0	5,035	2,840	2,195	92.4%	31,630	30,124	95%
Total							388,426	374,715	96%

Exhaust Fan Scheduling Savings

System	Quantity	Motor HP	Hours of Operation			Motor Eff	kWh Savings		RR
			Pre	Post	Reduction		Ex-Ante	Ex-Post	
EF-28	1	3.00	5,035	2,840	2,195	89.5%	4,912	4,665	95%
EF-29	1	0.50	5,035	2,840	2,195	83.0%	928	838	90%
EF-30	1	0.17	5,035	2,840	2,195	83.0%	309	279	90%
EF-39	1	0.50	5,035	2,840	2,195	83.0%	928	838	90%
EF-44	1	0.75	5,035	2,840	2,195	83.0%	1,392	1,258	90%
EF-48	1	0.50	5,035	2,840	2,195	83.0%	928	838	90%
EF-54	1	0.01	5,035	2,840	2,195	83.0%	15	14	90%
EF-57	1	0.01	5,035	2,840	2,195	83.0%	15	14	90%
Total							9,427	8,744	93%

ADM calculated the cooling savings from the scheduling change using an equivalent full load hour method (EFLH). The baseline and as-built EFLHs were determined using DEER prototypical eQuest models. The prototypical model was run using TMY3 weather data in which the baseline model assumed the pre-existing HVAC schedule, while the as-built model operated based upon the post-project operating schedule.

The cooling energy savings are calculated as:

$$kWh_{savings} = Tons \times kW/Ton_{Chiller} \times (EFLH_{Pre} - EFLH_{Post})$$

Where,

$kWh_{savings}$ = Annual energy savings due to installed chiller controls

$kW_{chiller}$ = Chiller kW demand at full load, based on manufacturer specifications

$EFLH_{pre}$ = Equivalent full load hours of chiller prior to schedule changes

$EFLH_{post}$ = Equivalent full load hours of chiller after schedule changes

Savings Calculation Assumptions

Cap (Tons)	Eff (kW/Ton)	EFLH		Annual kWh		kWh Savings		RR
		Baseline	As-Built	Baseline	As-Built	Ex-Ante	Ex-Post	
593	0.7	330	209	136,983	86,756	242,251	50,227	21%
Total						242,251	50,227	21%

Lighting occupancy sensor energy savings are calculated as:

$$kWh_{savings} = \sum_{Area} [HCIF \times (N_{base} \times W_{base} \times Hrs_{base} - N_{as-built} \times W_{as-built} \times Hrs_{as-built})/1000]$$

Where:

$kWh_{savings}$ = *Annual energy savings*

N_{base} = *Number of baseline fixtures*

$N_{as\text{-}built}$ = *Number of as-built fixtures*

W_{base} = *Wattage of each baseline fixture*

$W_{as\text{-}built}$ = *Wattage of each as-built fixture*

Hrs_{base} = *Baseline lighting operating hours*

$Hrs_{as\text{-}built}$ = *As-Built lighting operating hours*

HCIF = *HVAC interactive factor*

The table shown below presents expected and realized energy savings for the lighting retrofit installed under the project.

Lighting Occupancy Sensor Savings Calculations

Measure	Quantity (Fixtures)		Wattage		Hours		kWh Savings		RR	Heating Cooling Interaction Factor
	Old	New	Old	New	Old	New	Ex-Ante	Ex-Post		
Enable occupancy Sensors for corridor lighting	542	542	59	59	8,760	2,080	213,613	223,200	105%	1.076
Total							216,613	223,200	105%	

Results

Verified Gross Savings/Realization Rates

Measure Category	*kWh Savings*		
	Expected	*Realized*	*Realization Rate*
HVAC Fan Runtime Reduction	388,426	374,715	96%
Exhaust Fan Runtime Reduction	9,427	8,744	93%
Cooling Runtime Reduction	242,251	50,227	21%
Occupancy Sensor Programming	213,613	223,200	104%
Total	853,717	656,887	77%

The low realization rate can be attributed to the chiller savings. Ex ante calculations assumed a chiller runtime reduction from 5,035 to 2,840 annual operation hours. It was assumed that, had the chiller been operation during those 2,195 hours, it would have been operating at an average load of 40%. This results in an over estimation of chiller utilization and does not give consideration to economizing hours.

Project Number AEPIM-13-000177-R

Executive Summary

Under project AEPIM-13-000177-R, the customer received incentives from Indiana Michigan Power for implementing occupancy on/off scheduling for six (6) air-handling units for one building. The realization rate for this project is 40%.

Project Description

The customer's facility relies on six air handler units to supply cooling and heating. Originally, the AHUs operated annually without night setbacks or time-of-day scheduling. Four of the six AHUs are equipped with VFDs on the supply fans for VAV system operation. The remaining AHUs are constant volume supply fans for multi-zone air distribution.

In accordance with new controlled scheduling, the air handlers are scheduled to start at approximately 7AM and shutdown at 10PM. Four of the AHUs are scheduled to be inoperative during weekends, while the multi-zone units AHU #5 and #6 will continue to operate.

Measurement and Verification Effort

During the M&V site visit, ADM verified that the facility's AHUs were operating according to the new control schedule. ADM's staff collected site information through staff interviews and observation to determine activity levels throughout the building.

The ex-post electrical savings were calculated using a VSD calculator for fans provided by the US Department of Energy AMO Energy Resources Center. ADM's analysis used input data such as motor horsepower, efficiency, load at fan design cfm, fan type, and annual operating hours, which were collected during the site visit. Savings calculations for Air Handlers 1 through 4 involved a fan percent capacity schedule. This schedule was determined by utilizing a prototypical California DEER model for the facility type to simulate how a typical VFD supply fan would operate under the appropriate conditions. The resulting fan cfm and new control schedule were significant components of the savings calculations. Energy savings for AHU-5 and AHU-6 were the result of implementing new control schedules. The following tables present the resulting capacity schedule.

VFD Fan Load Profile

% of Capacity	*% Time*	
	24/7	*Scheduled*
10%	0.00%	0.00%
20%	0.00%	0.00%
30%	0.00%	0.00%
40%	15.08%	55.67%
50%	63.47%	17.90%
60%	8.41%	11.91%
70%	6.65%	8.34%
80%	4.11%	4.97%
90%	1.79%	1.02%
100%	0.49%	0.19%
Annual Hours	8,760	3,900

Provided below are the savings for each air handler:

AHU Scheduling kWh Savings

AHU	*Hours*		*VFD*	*kWh*			*Claimed*	*RR*
	Pre	*Post*		*Pre*	*Post*	*Savings*		
1	8,760	3,900	Y	45,167	18,122	27,044	97,577	28%
2	8,760	3,900	Y	45,167	18,122	27,044	97,577	28%
3	8,760	3,900	Y	35,168	14,111	21,057	65,051	32%
4	8,760	3,900	Y	35,168	14,111	21,057	65,051	32%
5	8,760	5,460	N	110,107	68,628	41,479	65,051	64%
6	8,760	5,460	N	119,224	74,311	44,913	65,051	69%
Total				390,001	207,406	182,595	455,358	40%

Results

Verified Gross Savings/Realization Rates

Measure Category	*kWh Savings*			*kW Savings*
	Expected	*Realized*	*Realization Rate*	*Realized*
AHU Schedule	455,358	182,595	40%	--
Total	455,358	182,595	40%	--

The discrepancy in savings can be attributed to inaccurate assumptions made during the ex-ante analysis. Initially, air handlers were expected to operate for 4,836 hours annually. At the conclusion of multiple staff interviews and EMS screen shot analyses, it was determined that operating hours were less than expected.

Upon further review, ADM discovered that the amperage of each fan was also overestimated for ex-ante calculations. ADM verified the design amperage ratings for each air handler supply fan during the site visit and through mechanical equipment schedules and determined that baseline consumption was misstated.

Project Number AEPIM-13-000179-R

Executive Summary

Under project AEPIM-13-000179-R, the customer received incentives from Indiana Michigan Power for making compressed air system upgrades. The realization for this project is 107%

Project Description

A contractor was commissioned to recommend compressed air system improvements. The customer replaced air compressors to increase system efficiency, implemented piping modifications to reduce system pressure, replaced an air dryer to eliminate wasted compressed air, and repaired leaks in the system to eliminate wasted compressed air.

The old setup consisted of the following equipment:

- (2) Sullair 10-40L.
- (1) Ingersoll-Rand XF60.
- (1) Gardner Denver EDF QKA air compressors.
- (1) Sullair SAR 1000 desiccant air dryer.

The new system consists of the following equipment:

- (1) Quincy QSI 300i with VFD.
- (1) Quincy QSI 500i.
- (1) 10 HP compressor used only during maintenance periods.
- (1) 7.5 HP air compressors used only during maintenance periods.
- (1) Zeks 300HSGA400 cycling air dryer.

Measurement and Verification Effort

During the M&V site visit, ADM verified that the new equipment was in place, as expected. It was determined that the operation of the system did not meet recommendations made by the contractor report.

The report indicated that the QSI 300i would be capable of meeting demand for the entire system. However, ADM’s field engineers determined that the QSI 300i would fail to meet this expectation. The facility implemented the QSI 500i to meet air demand, and maintained the QSI 300i—along with two older compressors—for back-up. It was also determined that the system did not make the intended pressure reduction from 100 psig to 90 psig, but was operating at 98 psig instead.

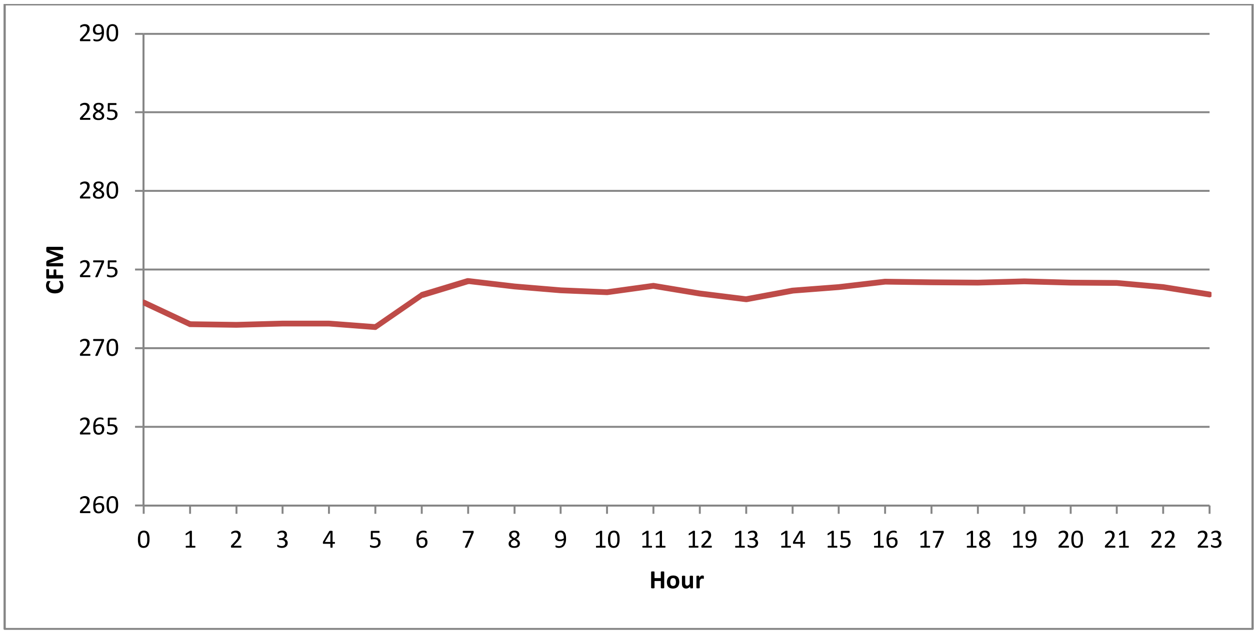
ADM installed power monitoring on the QSI 500i compressor, for a four day period, to measure compressor demand. ADM’s field engineers also took one-time power measurements on the QSI 500i, during the sludge process, and the QSI 300i while the QSI 500i was inoperative. ADM interviewed the site contact to determine an annual usage profile for the compressor. System demand was steady year-round, with the exception of increased demand during a sludge process that utilizes a diaphragm pump every two weeks. As-built system demand was separated into the following three profiles:

- Profile 1: QSI 500i and Zeks air dryer during normal operation

- Profile 2: QSI 500i and Zeks air dryer during a sludge process
- Profile 3: QSI 300i, two older compressors, and Zeks air dryer during maintenance on the 500i

Profile 1: ADM established an hourly CFM demand profile for the QSI 500i using monitoring data and CAGI data sheets. This CFM profile was subsequently used in addition to CAGI data sheets to determine the dryer power demand. The following graph represents a typical CFM operating profile for Profile 1:

Profile 1 Typical As-Built CFM Demand



Profile 2: ADM referenced CAGI data sheets and used a one-time power measurement of the QSI 500i to determine CFM demand during the sludge process. The resulting CFM demand was used to calculate dryer demand.

Profile 3: In relation to methods previously discussed, ADM used a one-time power measurement of the QSI 300i and referenced CAGI data sheets to determine CFM demand. The resulting CFM demand was used to calculate dryer demand.

ADM accounted for normal and sludge process operations, system pressures, and CFM reduction in their evaluation of baseline conditions for the CFM demand profile. Power data provided by the contractor report were used in replacement of insufficient baseline system data.

$$CFM_{hourly\_pre} = (CFM_{hourly\_post} + 150 + 14) * 100/98$$

Where,

CFM_{hourly_pre} = hourly CFM profile for the baseline system

150 = CFM reduction from removal of the old desiccant air dryer

14 = CFM reduction from leak repairs

100/98 = baseline/post ratio of system pressures

$$kW_{hourly\_pre} = CFM_{hourly_{pre}}/(\frac{scfm}{kW})$$

Where,

kW_{hourly_pre} = hourly demand of baseline system

(scfm/kW) = system specific power from Air Power USA report

The following table presents system pressure, average equipment power and air demand for each profile.

Usage Profiles for Pre- and Post- Systems

Profile	*Equipment*	*System Pressure (psig)*	*Air Demand (CFM)*	*Power (kW)*	*Annual Hours*	*Annual kWh*
Post Profile 1	QSI 500i, Zeks Air Dryer	98	273	75.28	7,764	584,444
Post Profile 2	QSI 500i, Zeks Air Dryer	98	291	78.35	936	73,338
Post Profile 3	QSI 300i, 7.5 HP compressor, 10HP compressor, Zeks Air Dryer	98	273	64.58	60	3,875
Total Post Consumption						661,657
Pre Profile 1	(2) Sullair LP-40, Ingersoll-Rand XF60, desiccant air dryer	100	446	134.82	4,350	586,463
Pre Profile 2	(2) Sullair LP-40, Gardner Denver EDF-QKA, desiccant air dryer	100	446	156.03	4,350	678,738
Pre Profile 3	(2) Sullair LP-40, Ingersoll-Rand XF60, desiccant air dryer	100	464	140.19	30	4,206
Pre Profile 4	(2) Sullair LP-40, Gardner Denver EDF-QKA, desiccant air dryer	100	464	162.25	30	4,867
Total As-Built Consumption						1,274,274
Annual Savings						612,617

Results

Verified Gross Savings/Realization Rates

Measure Category	*kWh Savings*			*kW Savings*
	Expected	*Realized*	*Realization Rate*	*Realized*
Compressed Air System Upgrade	572,028	612,617	107%	83.89
Total	572,028	612,617	107%	83.89

Project Number AEPIM-13-000235-R

Executive Summary

Under project AEPIM-13-000235-R, the customer received incentives from Indiana Michigan Power for performing a chiller schedule control retrofit. The realization rate for this project is 9%.

Project Description

The customer performed the following retrofits:

- Added small 15-ton FCU chiller to building control system
- Set up chiller to only be enabled when fan coil units are on (on occupancy schedule)

Measurement and Verification Effort

During the M&V visit, ADM verified that the both chiller and control system were in operation. The chiller is controlled by building control system as claimed in the project application. ADM verified operational occupancy schedules and chiller operation information with on-site facility personnel.

ADM calculated the savings of the chiller controls using an equivalent full load hour method (EFLH). The baseline and as-built EFLHs were determined using DEER prototypical eQuest models. The prototypical office model was run using TMY3 weather data in which the baseline model assumed the chiller was operational 24/7, while the as-built operated based upon the supplied operating schedule.

The energy savings are calculated as:

$$kWh_{savings} = kW_{Chiller} \times (EFLH_{Pre} - EFLH_{Post})$$

Where,

$kWh_{savings}$ = Annual energy savings due to installed chiller controls

$kW_{chiller}$ = Chiller kW demand at full load, based on manufacturer specifications

$EFLH_{pre}$ = Equivalent full load hours of chiller prior to installation of controls

$EFLH_{post}$ = Equivalent full load hours of chiller after installation of controls

Savings Calculation Assumptions

Coefficient	*Value*	*Source*
$kW_{Chiller}$	19.0	Manufacturer Literature
$EFLH_{pre}$	1,185	DEER eQuest Model
$EFLH_{post}$	936	DEER eQuest Model

Results

Verified Gross Savings/Realization Rates

Measure Category	*kWh Savings*		
	Expected	*Realized*	*Realization Rate*
Chiller control	49,979	4,731	9%
Total	49,979	4,731	9%

The project-level realization rate is 9%. The low realization rate for the project can be attributed to the assumptions in the ex-ante calculation methodology. The ex-ante calculations assumed the annual chiller operating hours were reduced from 8,760 to 4,784. It was assumed that during the 3,976 hour reduction that the chiller would have been operating at full load; however, the chiller does not run continuously at full load.

Project Number AEPIM-13-000339-R

Executive Summary

Under project AEPIM-13-000339-R, the customer received incentives from Indiana Michigan Power for reducing runtime on the existing heat pump condenser water pumps, by installing a DX cooling unit with economizer controls in the IT server room. The realization rate for this project is 24%.

Project Description

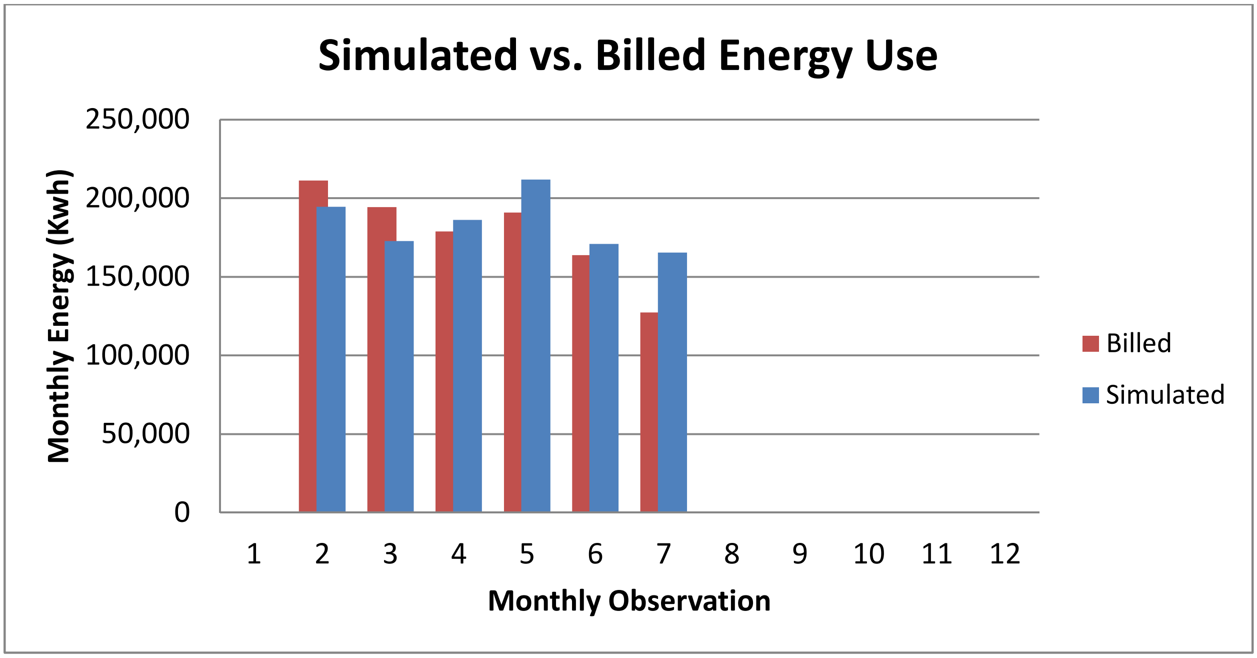
A portion of the facility's heating, cooling, and ventilation requirements are met through the use of a water source heat pump (WSHP) system. When the system was designed and built in 2011, a WSHP unit was installed in the building's IT server room. The system's condenser water pumps were required to operate continuously to meet the server room's cooling load. As a result of project implementation, the WSHP unit was replaced with an independent DX air handler, abating the need for continuous use of the water pumps. The energy savings for this project can be attributed to the reduction of operating hours for both the main condenser water pumps and the cooling tower pumps.

Measurement and Verification Effort

During the M&V site visit, ADM verified that the new DX cooling unit was operating properly, and that the existing building management system (BMS) schedules had been adjusted to allow the pumps to turn off during vacant hours. ADM's staff noted building construction type, schedules, heating and cooling set-points, and interviewed staff to determine activity levels throughout the facility.

The ex-post electrical savings were calculated using a calibrated eQUEST (ver. 3-64) computer simulation model. The simulation was designed to reflect baseline WSHP and pump control strategy, and was later compared with billing data to ensure accuracy. The results of the calibrated model are provided below:

eQUEST Baseline Calibration



The as-built model was created by replacing the WSHP unit with an air cooled DX cooling unit, as discussed in the baseline model. Removal of the IT WSHP unit from the condenser water loop reduced pump energy consumption by allowing the condenser water and cooling tower pumps to turn off during vacant hours. The DX air handler also includes air side economizer controls that improved the energy savings associated with this project. The annual savings are calculated by taking the difference between annual consumption of the baseline and as-built eQuest model, as shown in the table below:

Annual kWh Energy Savings

End Use	*Baseline*	*As-Built*	*Savings*
Lighting	821,400	821,400	0
Misc. Equipment	287,400	287,400	0
Heating	131700	131400	300
Cooling	348,600	340,200	8,400
Heat Rejection	3,800	3,700	100
Pumps	208,700	142,800	65,900
Fans	319,800	322,900	-3,100
Exterior	137,100	137,100	0
Total	2,258,500	2,186,900	71,600

Results

Verified Gross Savings/Realization Rates

Measure Category	*kWh Savings*			*kW Savings*
	Expected	*Realized*	*Realization Rate*	*Realized*
IT HVAC Changes	283,542	70,700	25%	4.5
Economizer Add.	15,888	900	6%	0.2
Total	299,430	71,600	24%	4.7

The discrepancy in savings can be attributed to the faulty assumptions made during ex-ante analysis. Upgrades to the IT HVAC system were expected to significantly reduce operating hours for the heated loop pumps, cooling tower loop pumps, and the cooling tower fans. ADM estimated that annual operating hours would be reduced by 5,533 hours for each of the HVAC system modifications. The calibrated simulation model projected an annual reduction of 2,763 hours and 2, 620 hours for the heat pump loop pumps and cooling tower loop pumps, respectively. Further investigation revealed that the pumps were required to operate during off-hour zone calls for heating and cooling, in addition to operating during normal occupancy hours.

The ex-ante savings included an average flow rate of 75% through both the heat pump loop and cooling tower loop. However, the energy simulation model yielded an average baseline flow of 44% through the heat pump. Baseline energy consumption was significantly lower than estimates had predicted, leading to moderated ex-post energy savings.

Monitoring data and documents that were collected during the site visit substantiate the flow rates previously discussed, and indicate VFD speeds of below 49%. The external temperature during the site visit was 8°F, and the heat loop pumps were operating below 50% speed. According to the energy simulation model, the maximum speed required by the heat pump loop pumps is 50%. This is a common occurrence in cold temperatures, because the heating load is markedly increased under these conditions.

Project Number AEPIM-13-000409-R

Executive Summary

Under project AEPIM-13-00409-R, the customer received incentives from Indiana Michigan Power for implementing night setbacks and time of day damper controls. The realization rate for this project is 102%.

Project Description

The facility relies on six air handler units of a dual duct design to supply cooling and heating. Originally, the air handling units (AHUs) operated 24/7 with no night setbacks or time of day scheduling. Each AHU is equipped with VFDs on both the supply and return fans and were set to operate at 100 percent of full speed (60 Hz).

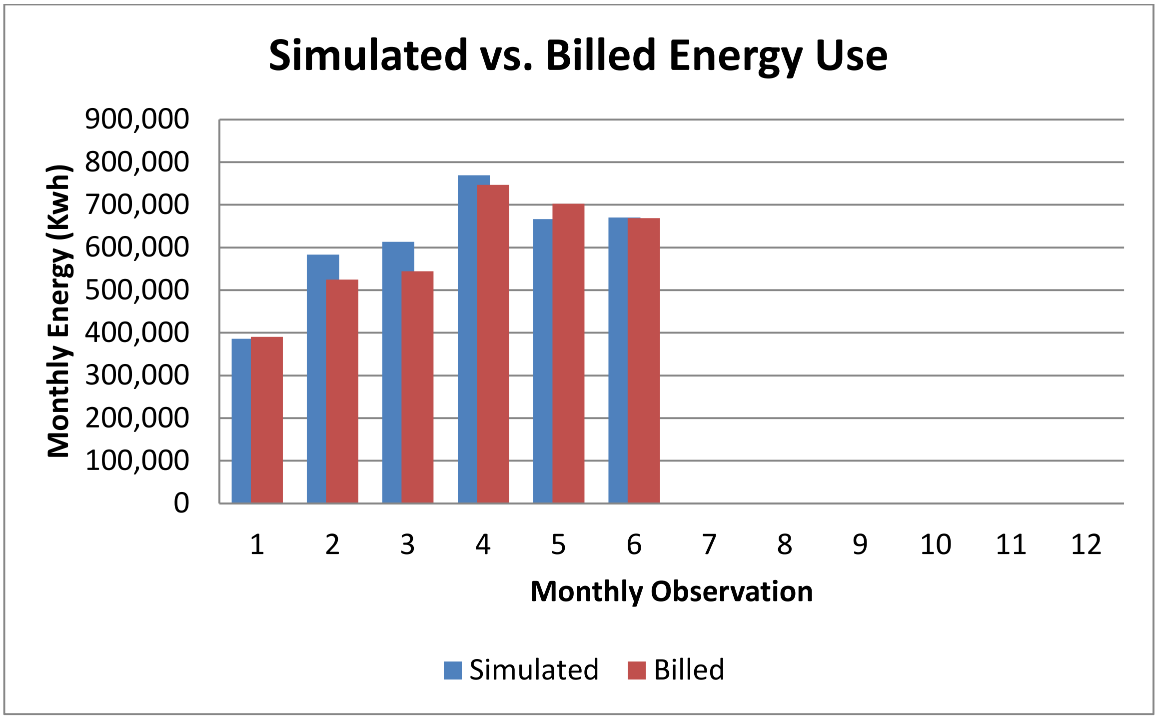
With the addition of the night setback controls, the air handlers are scheduled to start at approximately 5:00 AM and shut down, on average, at 8:00 PM. The air handlers are scheduled to be off on weekends as well, with the exception of AHU #4 which serves the portion of the building that operates 24/7 and, therefore, is always operational. During operating hours the fans are set to operate at 80% of full speed (48 Hz). If there is a call for heating or cooling after hours, the fans are limited to operate at 50% of full speed (30 Hz).

Measurement and Verification Effort

During the M&V visit, ADM verified that the facility was operating its AHUs with a night setback. ADM staff also noted building construction type, schedules, and heating and cooling set-points, and interviewed staff to determine activity levels throughout the facility.

The ex Post electrical savings were calculated using a calibrated eQUEST (ver. 3-64) computer simulation model. The simulation was first built using the baseline AHU control strategy which was compared to available billing data. The results of the calibrated model are shown below:

eQUEST Baseline Calibration



The as-built model was created by applying the AHU scheduling as previously discussed to the baseline model. This employment of night setbacks and time of day scheduling reduces fan energy consumption, along with cooling and heating energy. The annual savings is the difference between the annual consumption of the baseline and as-built eQuest model, which can be seen in the following table:

Annual kWh Energy Savings

End Use	*Baseline*	*As-Built*	*Savings*
Lighting	1,829,897	1,829,897	0
Misc. Equipment	1,408,504	1,408,504	0
Heating	0	0	0
Cooling	827,366	555,344	272,022
Heat Rejection	107,788	64,194	43,594
Pumps	537,470	552,393	-14,923
Fans	3,727,871	1,636,098	2,091,773
Exterior	63,783	63,783	0
Total	8,502,677	6,110,210	2,392,467

Results

Verified Gross Savings/Realization Rates

Measure Category	*kWh Savings*			*kW Savings*
	Expected	*Realized*	*Realization Rate*	*Realized*
Night Setbacks	2,349,369	2,392,467	102%	179.87
Total	2,349,369	2,392,467	102%	179.87

The difference in savings can be attributed to a number of discrepancies that ended up negating one another. The first assumption was that all air handlers would operate 8:00 AM till 5:00 PM Monday through Friday. However, it was determined through EMS screen shots and interviews with the facility staff this assumption was incorrect. This led to an over estimation in the reduction of runtime hours. It was also assumed that AHU#4 would follow the above mentioned schedule; however the EMS showed that the AHU operates 24/7.

Through further review, ADM discovered that the ex-ante calculations also assumed that the amperage of each fan remained constant between the pre and post conditions. ADM verified with site contacts that the fans operated at 100% in the baseline and at 80% of full speed during the scheduled on hours in the post. The post VFD speed was verified through one time power measurements and was used to inform the eQuest model. This reduction in fan speed created additional savings that were not initially claimed by the ex-ante thus canceling out the reduction in savings due to the verified fan schedules.

Appendix L: C&I RCxL Questionnaire for Decision Maker Survey

1. What sources, if any, does your organization rely on for information about ways to save energy at your facility? (Do not read list) (Select all that apply)
   1.An I&M Energy Specialist
   2.An I&M Account Representative
   3.The I&M website
   4.Brochures or advertisements
   5.Trade associations or business groups you belong to
   6.Trade journals or magazines
   7.Friends and colleagues
   8.An architect, engineer or energy consultant
   9.Equipment vendors or building contractors
   99. Other (please describe)

2. Which of the following policies or procedures, if any, does your organization have in place regarding energy efficiency improvements at [Facility/Location]? (Read list) (Select all that apply)
   1. An energy management plan
   2. Corporate policies that incorporate energy efficiency in operations and procurement
   3. Active training of staff on saving energy
   4. A numeric goal for energy savings
   5. A numeric goal for energy cost reduction
   99. Other (please specify): ____
   100. None

3. How does your organization decide to make energy efficiency improvements for this facility? Is the decision: (Read list)
   1. Made by one or two key people
   2. Based on staff recommendations to a decision maker
   3. Made by a group or committee
   4. Made in some other way
   5. Depends on how much the investment is

4. Which, if any, financial methods does your organization typically use to evaluate energy efficiency improvements at the [Facility/Location]? (Read list) (Select all that apply)
   1. Initial Cost
   2. Simple payback (provide numeric payback time if possible):
   3. Internal rate of return (provide numeric rate of return if possible):
   4. Life cycle cost
   5. None of these

5. How did you learn of the Retro-Commissioning Lite Program? (Do not read list) (Select all that apply)
    1. Approached directly by representative of the Retro-Commissioning Lite Program
    2. Received an information brochure on the Retro-Commissioning Lite Program
    3. From a retro-commissioning service provider
    4. An I&M customer service representative mentioned it
    5. I&M website
    6. Friends or colleagues
    7. An architect, engineer or energy consultant
    8. An equipment vendor or building contractor
    9. A utility bill insert
    10. An email from I&M
    99. Other (please explain)

6. Regarding your organization's decision to participate in the incentive program, who initiated the discussion about the incentive opportunity? Would you say…
    1. Your organization initiated it
    2. Your service provider initiated it
    3. The idea arose in discussion between your organization and your service provider
    97. Some other way (please specify)
    98. Don't Know

7. Which of the following people worked on completing your application for the program incentives, including gathering required documentation? (Read List) (Select all that apply)
    1. Yourself
    2. Another member of your company
    3. A retro-commissioning service provider
    4. Someone else (please define)
    98. Don't know

[DISPLAY Q8 IF Q7 = 1]
8. Thinking back to the application process, please rate the clarity of information on how to complete the application. Would you say…
    1. Not at all clear
    2. Somewhat clear
    3. Mostly clear
    4. Completely clear
    98. Don't know

[DISPLAY Q8A IF QA = 1 or 2]
8A.What information, including instructions on forms, needs to be further clarified?

[DISPLAY Q8B IF Q7 = 1]

8B. Using a scale of completely unacceptable, somewhat unacceptable, somewhat acceptable, completely acceptable, how would you rate the following…

	Completely unacceptable	Somewhat unacceptable	Somewhat acceptable	Completely acceptable	Don't know
a. the ease of finding how to apply for incentives on I&M's website					
b. the ease of using the application forms					
c. the time it took to have the application approved					
d. the effort required to provide required invoices or other supporting documentation					
e. the overall application process					

[DISPLAY Q8C IF Q7 = 1]
8C. Did you have a clear sense of whom you could go to for assistance with the application process?

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

9. Did you have a clear sense of who you could go to for assistance in finding a retro-commissioning service provider?
   1. Yes
   2. No
   98. Don't know

10. Before participating in the Retro-Commissioning Lite Program, had you completed similar energy use optimization projects at [Facility/Location]?
    1. Yes
    2. No
    98. Don't know

11. Has your organization paid for any energy efficiency improvements in the last three years for which you did not apply for a financial incentive through an energy efficiency program?
    1. Yes, paid for energy efficiency improvements but did not apply for incentive.
    2. No energy efficiency improvements were paid for by the organization.
    3. No, an incentive was applied for.
    98. Don't know

    [DISPLAY Q11A IF Q11 = 1]
    11A. Why didn't you apply for a financial incentive for the energy efficiency improvements? (Don't read)
    1. Didn't know whether improvements qualified for incentives
    2. Didn't know about incentives until after efficiency improvements were completed
    3. Didn't have time to complete paperwork for the incentive application

4. Too much paperwork for the incentive application
5. The incentive was insufficient
97. Other (please specify)
98. Don't know

[DISPLAY Q11B IF Q11 = 3]
11B. Did you receive all of your incentives for these past energy efficiency projects?
1. Yes
2. No
98. Don't know

12. Did you have plans to complete the retro-commissioning project at the [Facility/Location] before participating in the Retro-Commissioning Lite Program?
    1. Yes
    2. No
    98. Don't know

[DISPLAY Q12A IF Q12 = 1]
12A. Would you have gone ahead with this planned retro-commissioning even if you had not participated in the program?
1. Yes
2. No
98. Don't know

13. Did you have previous experience to the with the Retro-Commissioning Lite Program before completing the project at the [Facility/Location]?
    1. Yes
    2. No
    98. Don't know

13A. How important was previous experience with the Retro-Commissioning Lite Program in making your decision to retro-commission the facility? Would you say… (Read list)
1. Very important
2. Somewhat important
3. Only slightly important
4. Not at all important
98. Don't know

14. Did a Retro-Commissioning Lite Program representative or other I&M representative recommend that you retro-commission the facility at the [Facility/Location]?
    1. Yes
    2. No
    98. Don't know

[DISPLAY Q14 A IF Q14 = 1]
14A. If the Retro-Commissioning Lite Program representative or other I&M representative had not recommended that you retro-commission the facility, how likely is it that you would have done it anyway? Would you say… (Read list)

1. Definitely would have
2. Probably would have
3. Probably would not have
4. Definitely would not have
98. Don't know

15. Would your organization have been financially able to retro-commission the facility at the [Facility/Location] without the assistance from the Retro-Commissioning Lite Program?
    1. Yes
    2. No
    98. Don’t know

16. If the financial incentive provided by the Retro-Commissioning Lite Program had not been available, how likely is it that you would have had the [Facility/Location] retro-commissioned anyway? Would you say… (Read list)
    1. Definitely would have
    2. Probably would have
    3. Probably would not have
    4. Definitely would not have
    98. Don't know

17. We would like to know whether the availability of information and financial incentives through the Retro-Commissioning Lite Program affected the quantity of energy efficiency improvements that you implemented at the [Facility/Location].

    Did you implement more energy efficiency improvements than you otherwise would have without the program?
    1. Yes
    2. No
    98. Don’t know

18. We would like to know whether the availability of information and financial incentives through the Retro-Commissioning Lite Program affected the timing of the retro-commissioning of the facility at the [Facility/Location].

    Did you retro-commission the facility earlier than you otherwise would have without the program?
    1. Yes
    2. No, program did not affect timing of retro-commissioning.
    98. Don’t know

18A. When would you have otherwise retro-commissioned the facility?
1. Less than 6 months later
2. 6-12 months later
3. 1-2 years later
4. 3-5 years later
5. More than 5 years later

19. Now I would like you to think about the energy saving recommendations that were identified during the retro-commissioning audit of the [Facility/Location].

    Did your organization implement all of the energy saving recommendations that were identified during the audit?
    1. Yes
    2. No
    98. Don't know

    [DISPLAY Q19A IF Q19 = 2]
    19A. For the recommendations that your organization <u>did not</u> implement, why did you not implement them?

20. Now I would like you to think about the energy saving recommendations that you implemented at the [Facility/Location].

Did the energy savings measures implemented through the retro-commissioning program meet your expectations? Would you say that your expectations….
1. Were exceeded
2. Were met
3. Were mostly met
4. Were not met
98. Don't know

[DISPLAY Q20A IF Q0 = 4]
20A. Please explain in what ways the energy efficiency measure did not meet your expectations.

21. How did the incentive amount that you received compare to what you expected?
1. It was much less
2. It was somewhat less
3. It was about the amount expected
4. It was somewhat more
5. It was much more
98. Don't know

22. Because of your experience with the incentive program, have you bought, or are you likely to buy, energy efficient equipment without applying for a financial incentive or rebate?

1. Yes, have already bought non-incentivized efficiency equipment because of the experience with the program.
2. Yes, likely to buy efficiency equipment because of the experience with the program.
3. No

98. Don't know

[DISPLAY Q22A IF Q22 = 2 or 98]
22A.We'd like to call you in a few months for a very short follow-up about other efficiency purchases, if that would be alright. Please provide us with the best person to contact and their phone number.

[DISPLAY Q22B IF Q22 = 1]
22B. What energy efficient equipment did you purchase?

22C. What motivated you to purchase this equipment?

22D. Have you installed the equipment?

1. Yes
2. No

98. Don't know

[DISPLAY Q22D.1 IF Q22D = 1]
22D.1 In what month and year did you install that equipment?

22E. Was this equipment installed, or will it be installed, at the same facility (or facilities) as where the incentive project was completed?

1. Yes
2. No

98. Don't know

[DISPLAY Q22E.1 IF Q22E = 2]
22E.1. Where was (or will be) the equipment installed?

22F. How important was your experience with the program to your decision to implement the additional energy efficiency measures?

1. Very important
2. Somewhat important
3. Only slightly important
4. Not at all important

98. Don't know

22G. How important was your past participation in any programs offered by Indiana-Michigan Power to your decision to implement the additional energy efficiency measures?

1. Very important

2. Somewhat important
3. Only slightly important
4. Not at all important
98. Don't know

22H. Why didn't you apply for or receive incentives for those items?
1. Didn't know whether equipment qualified for financial incentives
2. Equipment did not qualify for financial incentives
3. Too much paperwork for the financial incentive application
4. Financial incentive was insufficient
5. Didn't have time to complete paperwork for financial incentive application
6. Didn't know about financial incentives until after equipment was purchased
99. Other reason (please describe):

The following few questions pertain to your communications with the program staff. Program staff are anyone that reviewed your application, conducted site inspections, determined your incentive amount, or processed your incentive check. Program staff are not anyone hired by you to conduct an audit, design your system, or install your hardware.

23. In the course of doing this project did you have any interactions with program staff?
1. Yes
2. No
98. Don't know

[DISPLAY Q23A IF Q23 = 1]
23A. How knowledgeable were program staff about the issues you discussed with them?
1. Not at all knowledgeable
2. Slightly knowledgeable
3. Somewhat knowledgeable
4. Fairly knowledgeable
5. Very knowledgeable

24. Using a scale of very dissatisfied, dissatisfied, neither satisfied nor dissatisfied, satisfied, very satisfied, please indicate how satisfied or dissatisfied are you with:
a. how long it took program staff to address your questions or concerns
b. how thoroughly program staff addressed your question or concern

25. Using a scale of very dissatisfied, dissatisfied, neither satisfied nor dissatisfied, satisfied, very satisfied, please indicate how satisfied or dissatisfied are you with:
a. The recommendations made for saving energy
b. The energy saving improvements you made
c. The savings on your monthly bill
d. The incentive amount
e. The amount of time it took to receive the incentive
f. The quality of the service provided by your retro-commissioning service provider
g. The effort required for the application process

h. The program overall.

[DISPLAY Q26 IF Q25a-h = 1 or 2]
26. Please describe in what ways you were not satisfied with the program.

27. Do you have any other comments that you would like to relay to I&M about energy efficiency in commercial and industrial facilities or about their programs?

28. About how many employees work for your organization?
   1. 1-9 employees
   2. 10-50 employees
   3. 50-250 employees
   4. Over 250 employees

29. What industry is your organization in?
   1. Accommodation and Food Services
   2. Administrative and Support and Waste Management and Remediation Services
   3. Agriculture, Forestry, Fishing, and Hunting
   4. Arts, Entertainment, and Recreation
   5. Construction
   6. Educational Services
   7. Finance and Insurance
   8. Health Care and Social Assistance
   9. Information
   10. Management of Companies and Enterprises
   11. Manufacturing
   12. Mining
   13. Professional, Scientific, and Technical Services
   14. Public Administration
   15. Real Estate Rental and Leasing
   16. Retail Trade
   17. Transportation and Warehousing
   18. Utilities
   19. Wholesale Trade
   99. Other

This completes the survey. If you have any additional questions regarding this survey or the program please contact Torey Harris at Indiana/Michigan Power at 260.408.3506. Thank you very much for your time!

Appendix M: C&I RCxL Service Provider Interview Guide

1. How did you first become a retro-commissioning service provider for the program?

2. Approximately what portion of your firms work is represented by jobs related to the program?

3. Does your firm have many established clients located in Indiana-Michigan's Indiana territory?

4. How much interaction do you have with program staff?
    a. Who do you interact with? [Indiana Michigan Staff, Lockheed Martin staff]
    b. What are the main purposes of these interactions? [Data transfer, program issues, updates, etc.]
    c. If you have a question about the program, where do you go to find the information?
    d. Is the program staff responsive and helpful?

5. Have you participated in any training provided by the program?
    a. If so, was this training about how the program works or about technical aspects of completing retro-commissioning projects?
    b. Was the training helpful? If so, why was it helpful?
    c. Do you have any suggestions for how training could be improved?

6. Are there any aspects of the participation process that you would recommend be modified? [If needed: the main phases of the participation process are the application phase, study phase, implementation phase, verification phase]
    a. What works well?
    b. What are the challenges with the process?
    c. Do you discuss issues with the program with program staff, or to recommend program changes?

7. Have you received any feedback from participants about the program? If so, what? [Possible types of feedback: regarding program experiences, satisfaction, desires for program changes]

8. Do you provide retro-commissioning services through any retro-commissioning programs offered by other utilities?
    a. If so, how does the Indiana Michigan program compare to other programs? [Possible points of comparison: the incentive level and structure, the participation process, the requirements for becoming a service provider, the project documentation that service providers provide]

9. Did you have a prior working relationship with any of the customers for whom you have performed retro-commissioning through the program? Please Explain.

10. How much do you promote the program to your existing customers?

11. Do you promote the program at sites that are not among your current customers?

12. Is there anything the program could do to help you be more effective in promoting the program?

13. Do your customers face barriers to retro-commissioning their facilities, with or without program assistance?
    a. Are the barriers different for different kinds of organizations? [probe for knowledge of benefits of retro-commissioning, staff resources, budget restrictions, building characteristics such as age]
    b. What could be done to overcome these barriers?

14. Are there different barriers that prevent organizations from participating in the Retro-Commissioning Lite Program specifically?
    a. What could be done to overcome these barriers?
    b. Are there different barriers for different types of organizations? [Probe for awareness, budget restrictions, timelines]

15. What do you perceive to be the demand for the services provided by the program?
    a. Do you believe that this level of demand has changed, or is likely to change over time?

Now I would like to ask you a few questions about [the project you completed/one of the projects you completed].

16. According to our records, you completed a [RCx Track] Project at [Organization Name] How likely do you think it is that [Organization Name] would have had the same retro-commissioning services performed if the program had not been available?
    a. Would the project have been smaller in scope without the program or would they not do it at all? Why?

17. How aware were the facility staff at [Organization Name] of the equipment performance issues identified through the retro-commissioning study PRIOR to conducting the study?

18. How aware were the facility staff at [Organization Name] of the measures or upgrades that you recommended PRIOR to conducting the study?
    a. Do you think they would have implemented any of them if the program had not been available? Which ones?
    b. In your opinion, why were the measures not previously implemented?

[Ask if more than one project completed]

19. Now thinking more generally about retro-commissioning projects you have completed through the program, are there any issues that customers are typically more/less aware of?

20. In general, how aware were participants of the measures and/or upgrades recommended to them prior to the retro-commissioning study?
    a. In your opinion, why were the measures not previously implemented?

21. Overall, how satisfied are you with your experiences working with Retro-Commissioning Lite program? Please explain.

22. Do you have any recommendations on how to improve the program or the role that service providers play in the program?

[Ask if more than one project completed]

23. Now thinking more generally about retro-commissioning projects you have completed through the program, are there any issues that customers are typically more/less aware of?

24. In general, how aware were participants of the measures and/or upgrades recommended to them prior to the retro-commissioning study?
    a. In your opinion, why were the measures not previously implemented?

25. Overall, how satisfied are you with your experiences working with Retro-Commissioning Lite program? Please explain.

26. Do you have any recommendations on how to improve the program or the role that service providers play in the program?

Appendix N: C&I HVAC Service Provider Interview Guide

1. How long have you been a listed service provider for the HVAC Tune-Up Program?

2. Did your organization offer HVAC Tune Ups before the I&M Program started in 2012?

3. Does your business sell HVAC roof-top units, provide HVAC services, or both?
    a. Do you feel that the HVAC Tune Ups compliment your product and service offerings?
    b. From a business perspective, do you think the HVAC Tune-Up services offered through the program provide an attractive service for you to offer your customers?
    c. What other types of products and service does your organization offer?

4. Do you provide services throughout I&M's service territory or just part of it?
    [If not sure what the service territory is, ask which regions they offer the program]

5. Do you promote the HVAC Tune-Up Program to every customer that needs HVAC services?
    a. Thinking about the last year, could you provide a rough approximation of the number of clients you have discussed the HVAC Tune-Up Program incentives with?
    b. If they are unable to answer, ask them if they would characterize it as a few, several, or a lot.

[If they have promoted the program with any customers, ask the following questions]

6. When discussing HVAC Tune-Up Projects with customers, what do you discuss with them to encourage them to complete a project?
    [Possible prompts]
    a. I&M Incentives
    b. Energy cost savings
    c. Improved operation of HVAC equipment
    d. Increased longevity of HVAC equipment

7. For customers that do not want to complete an HVAC Tune-Up project, what reasons do they give?

8. What do you think prevents customers from completing HVAC Tune-Up projects?
    Probe for:
    a. Energy cost savings are too low
    b. Incentives are too low
    c. Not an attractive service offering for companies to offer?
    d. Program requirements are too restrictive (ask for specifics)

9. Have you received any training from the implementation contractor Lockheed Martin?

   a. If so, was it valuable? Did it cover how to sell projects to customers?
   b. If not, have you been invited to attend any training sessions? If so, do you plan to attend?

10. Do you have any other suggestions for what I&M could do to increase number of their customer's participating in the program or improve the program overall?